five

Determining System Requirements

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Chapter Objectives

After studying this chapter, you should be able to:

- Describe options for designing and conducting interviews and develop a plan for conducting an interview to determine system requirements.
- Explain the advantages and pitfalls of observing workers and analyzing business documents to determine system requirements.
- Participate in and help plan a joint application design (JAD) session.
- Use prototyping during requirements determination.
- Select the appropriate methods to elicit system requirements.
- Explain business process reengineering (BPR) and how it affects requirements determination.
- Understand how requirements determination techniques apply to development of Internet applications.

Chapter Preview . . .

Systems analysis is the part of the systems development life cycle in which you determine how a current information system in an organization functions. Then you assess what users would like to see in a new system. As you learned in Chapter 1, the two parts to analysis are determining requirements and structuring requirements. Figure 5-1 illustrates these parts and highlights our focus in this chapter—determining system requirements.

Techniques used in requirements determination have become more structured over time. As we see in this chapter, current methods increasingly rely on computers for support. We first study the more traditional requirements determination methods, which include interviewing, observing users in their work environment, and collecting procedures and other written documents. We then discuss modern methods for collecting system requirements. The first of these methods is joint application design (JAD), which you first read about in Chapter 1. Next, you read about how analysts rely more and more on information systems to help them perform analysis. You learn how prototyping can be used as a key tool for some requirements determination efforts. We end the chapter with a discussion of how requirements determination continues to be a major part of systems analysis and design, even when organizational change is radical, as with business process reengineering, and new, as with developing Internet applications.

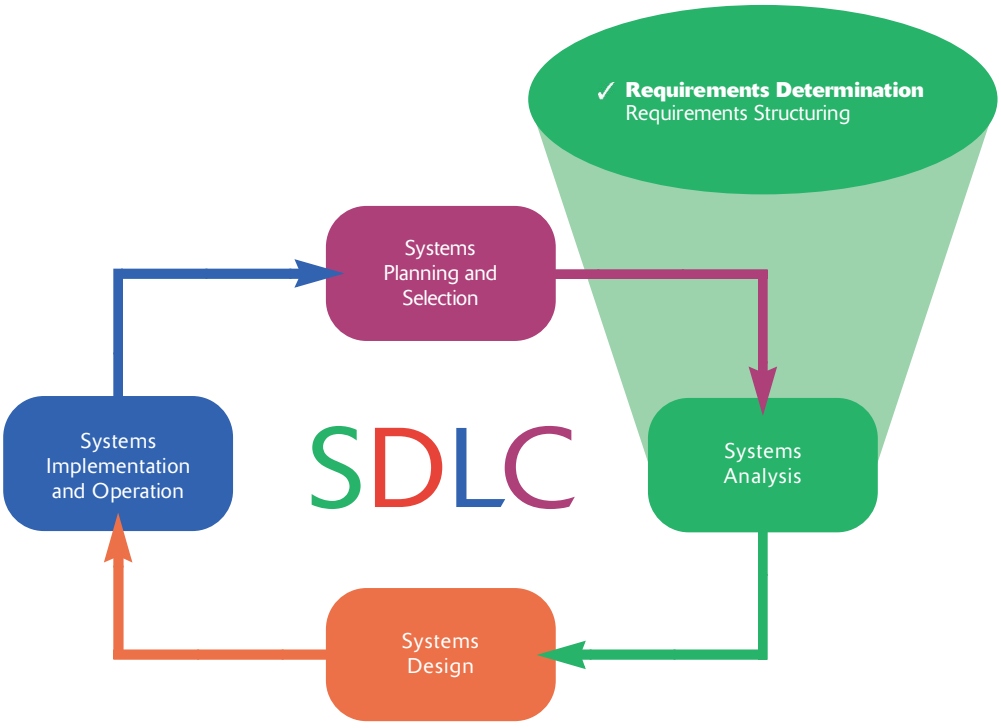

FIGURE 5-1
The four steps of the systems development life cycle (SDLC): (1) planning and selection, (2) analysis, (3) design, and (4) implementation and operation.

Performing Requirements Determination

As stated earlier and shown in Figure 5-1, the two parts to systems analysis are determining requirements and structuring requirements. We address these as two separate steps, but you should consider these steps as somewhat parallel and repetitive. For example, as you determine some aspects of the current and desired system(s), you begin to structure these requirements or to build prototypes to show users how a system might behave. Inconsistencies and deficiencies discovered through structuring and prototyping lead you to explore further the operation of the current system(s) and the future needs of the organization. Eventually your ideas and discoveries meet on a thorough and accurate depiction of current operations and the requirements for the new system. In the next section, we discuss how to begin the requirements determination process.

The Process of Determining Requirements

At the end of the systems planning and selection phase of the SDLC, management can grant permission to pursue development of a new system. A project is initiated and planned (as described in Chapter 4), and you begin determining what the new system should do. During requirements determination, you and other analysts gather information on what the system should do from as many sources as possible. Such sources include users of the current system, reports, forms, and procedures. All of the system requirements are carefully documented and made ready for structuring. Structuring means taking the system requirements you find during requirements determination and ordering them into tables, diagrams, and other formats that make them easier to translate into technical system specifications. We discuss structuring in detail in Chapters 6 and 7.

In many ways, gathering system requirements is like conducting any investigation. Have you read any of the Sherlock Holmes or similar mystery stories? Do you enjoy solving puzzles? The characteristics you need to enjoy solving mysteries and puzzles are the same ones you need to be a good systems analyst during requirements determination. These characteristics include:

- *Impertinence:* You should question everything. Ask such questions as "Are all transactions processed the same way?" "Could anyone be charged something other than the standard price?" "Might we someday want to allow and encourage employees to work for more than one department?"
- *Impartiality:* Your role is to find the best solution to a business problem or opportunity. It is not, for example, to find a way to justify the purchase of new hardware or to insist on incorporating what users think they want into the new system requirements. You must consider issues raised by all parties and try to find the best organizational solution.
- *Relaxing of constraints:* Assume anything is possible and eliminate the infeasible. For example, do not accept this statement: "We've always done it that way, so we have to continue the practice." Traditions are different from rules and policies. Traditions probably started for a good reason, but as the organization and its environment change, they may turn into habits rather than sensible procedures.
- *Attention to details:* Every fact must fit with every other fact. One element out of place means that the ultimate system will fail at some time. For example, an imprecise definition of who a customer is may mean that you purge customer data when a customer has no active orders; yet these past customers may be vital contacts for future sales.

- *Reframing:* Analysis is, in part, a creative process. You must challenge yourself to look at the organization in new ways. Consider how each user views his or her requirements. Be careful not to jump to this conclusion: "I worked on a system like that once—this new system must work the same way as the one I built before."

Deliverables and Outcomes

The primary deliverables from requirements determination are the types of information gathered during the determination process. The information can take many forms: transcripts of interviews; notes from observation and analysis of documents; sets of forms, reports, job descriptions, and other documents; and computer-generated output such as system prototypes. In short, anything that the analysis team collects as part of determining system requirements is included in these deliverables. Table 5-1 lists examples of some specific information that might be gathered at this time.

The deliverables summarized in Table 5-1 contain the information you need for systems analysis. In addition, you need to understand the following components of an organization:

- The business objectives that drive what and how work is done
- The information people need to do their jobs
- The data handled within the organization to support the jobs
- When, how, and by whom or what the data are moved, transformed, and stored
- The sequence and other dependencies among different data-handling activities
- The rules governing how data are handled and processed
- Policies and guidelines that describe the nature of the business, the market, and the environment in which it operates
- Key events affecting data values and when these events occur

TABLE 5-1: Deliverables for Requirements Determination

Types of Deliverables	Specific Deliverables
Information collected from conversations with users	Interview transcripts
	Notes from observations
	Meeting notes
Existing documents and files	Business mission and strategy statement
	Sample business forms and reports, and computer displays
	Procedure manuals
	Job descriptions
	Training manuals
	Flowcharts and documentation of existing systems
	Consultant reports
Computer-based information	Results from joint application design (JAD) sessions
	CASE repository contents and reports of existing systems
	Displays and reports from system prototypes

Such a large amount of information must be organized in order to be useful, which is the purpose of the next part of systems analysis—requirements structuring.

Requirements Structuring

The amount of information gathered during requirements determination could be huge, especially if the scope of the system under development is broad. The time required to collect and structure a great deal of information can be extensive and, because it involves so much human effort, quite expensive. Too much analysis is not productive, and the term *analysis paralysis* has been coined to describe a project that has become bogged down in an abundance of analysis work. Because of the dangers of excessive analysis, today's systems analysts focus more on the system to be developed than on the current system. Later in the chapter, you learn about joint application design (JAD) and prototyping, techniques developed to keep the analysis effort at a minimum yet still be effective. Other processes have been developed to limit the analysis effort even more, providing an alternative to the SDLC. Many of these are included under the name of *Agile Methodologies* (see Appendix B). Before you can fully appreciate alternative approaches, you need to learn traditional fact-gathering techniques.

Traditional Methods for Determining Requirements

Collection of information is at the core of systems analysis. At the outset, you must collect information about the information systems that are currently in use. You need to find out how users would like to improve the current systems and organizational operations with new or replacement information systems. One of the best ways to get this information is to talk to those directly or indirectly involved in the different parts of the organization affected by the possible system changes. Another way is to gather copies of documentation relevant to current systems and business processes. In this chapter, you learn about traditional ways to get information directly from those who have the information you need: interviews and direct observation. You learn about collecting documentation on the current system and organizational operation in the form of written procedures, forms, reports, and other hard copy. These traditional methods of collecting system requirements are listed in Table 5-2.

Interviewing and Listening

Interviewing is one of the primary ways analysts gather information about an information systems project. Early in a project, an analyst may spend a large amount of time interviewing people about their work, the information they use to

TABLE 5-2: Traditional Methods of Collecting System Requirements

Traditional Method	Activities Involved
Interviews with individuals	Interview individuals informed about the operation and issues of the current system and needs for systems in future organizational activities.
Observations of workers	Observe workers at selected times to see how data are handled and what information people need to do their jobs.
Business documents	Study business documents to discover reported issues, policies, rules, and directions, as well as, concrete examples of the use of data and information in the organization.

TABLE 5-3: Guidelines for Effective Interviewing

Guidelines	What Is Involved
Plan the interview	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 or tape-record the interview (if permission is granted).
Review notes	Review your notes within forty-eight 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.

do it, and the types of information processing that might supplement their work. Others are interviewed to understand organizational direction, policies, and expectations that managers have of the units they supervise. During interviewing, you gather facts, opinions, and speculation and observe body language, emotions, and other signs of what people want and how they assess current systems.

Interviewing someone effectively can be done in many ways, and no one method is necessarily better than another. Some guidelines to keep in mind when you interview are summarized in Table 5-3 and are discussed next.

First, prepare thoroughly before the interview. Set up an appointment at a time and for a duration that is convenient for the interviewee. The general nature of the interview should be explained to the interviewee in advance. You may ask the interviewee to think about specific questions or issues, or to review certain documentation to prepare for the interview. Spend some time thinking about what you need to find out, and write down your questions. Do not assume that you can anticipate all possible questions. You want the interview to be natural and, to some degree, you want to direct the interview spontaneously as you discover what expertise the interviewee brings to the session.

Prepare an interview guide or checklist so that you know in which sequence to ask your questions and how much time to spend in each area of the interview. The checklist might include some probing questions to ask as follow-up if you receive certain anticipated responses. You can, to some extent, integrate your interview guide with the notes you take during the interview, as depicted in a sample guide in Figure 5-2. This same guide can serve as an outline for a summary of what you discover during an interview.

The first page of the sample interview guide contains a general outline of the interview. Besides basic information on who is being interviewed and when, list major objectives for the interview. These objectives typically cover the most important data you need to collect, a list of issues on which you need to seek agreement (e.g., content for certain system reports), and which areas you need to explore. Also, include reminder notes to yourself on key information about the interviewee (e.g., job history, known positions taken on issues, and role with current system). This information helps you to be personal, shows that you consider the interviewee important, and may assist in interpreting some answers. Also included is an agenda with approximate time limits for different sections of the interview. You may not follow the time limits precisely, but the schedule helps you cover all areas during the time the interviewee is available. Space is also allotted for general observations that do not fit under specific questions

Interview Outline	
Interviewee: *Name of person being interviewed*	Interviewer: *Name of person leading interview*
Location/Medium: *Office, conference room, or phone number*	Appointment Date: Start Time: End Time:
Objectives: *What data to collect* *On what to gain agreement* *What areas to explore*	Reminders: *Background/experience of interviewee* *Known opinions of interviewee*
Agenda: Introduction Background on Project Overview of Interview Topics to Be Covered Permission to Tape Record Topic 1 Questions Topic 2 Questions … Summary of Major Points Questions from Interviewee Closing	Approximate Time: 1 minute 2 minutes 1 minute 5 minutes 7 minutes … 2 minutes 5 minutes 1 minute
General Observations: Interviewee seemed busy—probably need to call in a few days for follow-up questions because he gave only short answers. PC was turned off—probably not a regular PC user.	
Unresolved Issues, Topics Not Covered: He needs to look up sales figures from 2010. He raised the issue of how to handle returned goods, but we did not have time to discuss.	

(continues on next page)

FIGURE 5-2
A typical interview guide.

and for notes taken during the interview about topics skipped or issues raised that could not be resolved.

On subsequent pages, list specific questions. The sample form in Figure 5-2 includes space for taking notes on these questions. Because the interviewee may provide information you were not expecting, you may not follow the guide in sequence. You can, however, check off questions you have asked and write reminders to yourself to return to or skip other questions as the interview takes place.

Open-ended questions
Questions in interviews and on questionnaires that have no prespecified answers.

Choosing Interview Questions You need to decide on the mix and sequence of open-ended and closed-ended questions to use. **Open-ended questions** are usually used to probe for information when you cannot anticipate all possible responses or when you do not know the precise question to ask. The person being interviewed is encouraged to talk about whatever interests him or her within the general bounds of the question. An example is, "What would you say is the best thing about the information system you currently use to do your job?" or "List the three most frequently used menu

Interviewee:	Date:
Questions:	Notes:
When to ask question, if conditional *Question: 1* Have you used the current sales tracking system? If so, how often? *If yes, go to Question 2*	*Answer* Yes, I ask for a report on my product line weekly. *Observations* Seemed anxious—may be overestimating usage frequency
Question: 2 What do you like least about this system?	*Answer* Sales are shown in units, not dollars. *Observations* System can show sales in dollars, but user does not know this.

FIGURE 5-2
(continued)

options." You must react quickly to answers and determine whether any follow-up questions are needed for clarification or elaboration. Sometimes body language will suggest that a user has given an incomplete answer or is reluctant to provide certain information. If so, a follow-up question might result in more information. One advantage of open-ended questions is that previously unknown information can surface. You can then continue exploring along unexpected lines of inquiry to reveal even more new information. Open-ended questions also often put the interviewees at ease because they are able to respond in their own words using their own structure. Open-ended questions give interviewees more of a sense of involvement and control in the interview. A major disadvantage of open-ended questions is the length of time it can take for the questions to be answered. They also can be difficult to summarize.

Closed-ended questions provide a range of answers from which the interviewee may choose. Here is an example:

Closed-ended questions
Questions in interviews and on questionnaires that ask those responding to choose from among a set of specified responses.

Which of the following would you say is the one best thing about the information system you currently use to do your job (pick only one)?

a. Having easy access to all of the data you need
b. The system's response time
c. The ability to run the system concurrently with other applications

Closed-ended questions work well when the major answers to questions are well known. Another plus is that interviews based on closed-ended questions do not necessarily require a large time commitment—more topics can be covered. Closed-ended questions can also be an easy way to begin an interview and to determine which line of open-ended questions to pursue. You can include an "other" option to encourage the interviewee to add unexpected responses. A major disadvantage of closed-ended questions is that useful information that does not quite fit the defined answers may be overlooked as the respondent tries to make a choice instead of providing his or her best answer.

Like objective questions on an examination, closed-ended questions can follow several forms, including these choices:

- True or false
- Multiple choice (with only one response or selecting all relevant choices)
- Rating a response or idea on some scale, say, from bad to good or strongly agree to strongly disagree (each point on the scale should have a clear and consistent meaning to each person, and there is usually a neutral point in the middle of the scale)
- Ranking items in order of importance

Interview Guidelines First, with either open- or closed-ended questions, do not phrase a question in a way that implies a right or wrong answer. Respondents must feel free to state their true opinions and perspectives and trust that their ideas will be considered. Avoid questions such as "Should the system continue to provide the ability to override the default value, even though most users now do not like the feature?" because such wording predefines a socially acceptable answer.

Second, listen carefully to what is being said. Take careful notes or, if possible, record the interview on a tape recorder (be sure to ask permission first!). The answers may contain extremely important information for the project. Also, this may be your only chance to get information from this particular person. If you run out of time and still need more information from the person you are talking to, ask to schedule a follow-up interview.

Third, once the interview is over, go back to your office and key in your notes within forty-eight hours with a word processing program such as Microsoft Word. For numerical data, you can use a spreadsheet program such as Microsoft Excel. If you recorded the interview, use the recording to verify your notes. After forty-eight hours, your memory of the interview will fade quickly. As you type and organize your notes, write down any additional questions that might arise from lapses in your notes or ambiguous information. Separate facts from your opinions and interpretations. Make a list of unclear points that need clarification. Call the person you interviewed and get answers to these new questions. Use the phone call as an opportunity to verify the accuracy of your notes. You may also want to send a written copy of your notes to the person you interviewed to check your notes for accuracy. Finally, make sure to thank the person for his or her time. You may need to talk to your respondent again. If the interviewee will be a user of your system or is involved in some other way in the system's success, you want to leave a good impression.

Fourth, be careful during the interview not to set expectations about the new or replacement system unless you are sure these features will be part of the delivered system. Let the interviewee know that there are many steps to the project. Many people will have to be interviewed. Choices will have to be made from among many technically possible alternatives. Let respondents know that their ideas will be carefully considered. Because of the repetitive

nature of the systems development process, however, it is premature to say now exactly what the ultimate system will or will not do.

Fifth, seek a variety of perspectives from the interviews. Talk to several different people: potential users of the system, users of other systems that might be affected by this new system, managers and superiors, information systems staff, and others. Encourage people to think about current problems and opportunities and what new information services might better serve the organization. You want to understand all possible perspectives so that later you will have information on which to base a recommendation or design decision that everyone can accept.

Directly Observing Users

Interviewing involves getting people to recall and convey information they have about organizational processes and the information systems that support them. People, however, are not always reliable, even when they try to be and say what they think is the truth. As odd as it may sound, people often do not have a completely accurate appreciation of what they do or how they do it, especially when infrequent events, issues from the past, or issues for which people have considerable passion are involved. Because people cannot always be trusted to interpret and report their own actions reliably, you can supplement what people tell you by watching what they do in work situations.

For example, one possible view of how a hypothetical manager does her job is that a manager carefully plans her activities, works long and consistently on solving problems, and controls the pace of her work. A manager might tell you that is how she spends her day. Several studies have shown, however, that a manager's day is actually punctuated by many, many interruptions. Managers work in a fragmented manner, focusing on a problem or a communication for only a short time before they are interrupted by phone calls or visits from subordinates and other managers. An information system designed to fit the work environment described by our hypothetical manager would not effectively support the actual work environment in which that manager finds herself.

As another example, consider the difference between what another employee might tell you about how much he uses electronic mail and how much electronic mail use you might discover through more objective means. An employee might tell you he is swamped with e-mail messages and spends a significant proportion of time responding to e-mail messages. However, if you were able to check electronic mail records, you might find that this employee receives only three e-mail messages per day on average and that the most messages he has ever received during one eight-hour period is ten. In this case, you were able to obtain an accurate behavioral measure of how much e-mail this employee copes with, without having to watch him read his e-mail.

The intent behind obtaining system records and direct observation is the same, however, and that is to obtain more firsthand and objective measures of employee interaction with information systems. In some cases, behavioral measures will more accurately reflect reality than what employees themselves believe. In other cases, the behavioral information will substantiate what employees have told you directly. Although observation and obtaining objective measures are desirable ways to collect pertinent information, such methods are not always possible in real organizational settings. Thus, these methods are not totally unbiased, just as no one data-gathering method is unbiased.

For example, observation can cause people to change their normal operating behavior. Employees who know they are being observed may be nervous and make more mistakes than normal. On the other hand, employees under observation may follow exact procedures more carefully than they typically do. They may work faster or slower than normal. Because observation typically cannot

be continuous, you receive only a snapshot image of the person or task you observe. Such a view may not include important events or activities. Due to time constraints, you observe for only a limited time, a limited number of people, and a limited number of sites. Observation yields only a small segment of data from a possibly vast variety of data sources. Exactly which people or sites to observe is a difficult selection problem. You want to pick both typical and atypical people and sites and observe during normal and abnormal conditions and times to receive the richest possible data from observation.

Analyzing Procedures and Other Documents

As previously noted, interviewing people who use a system every day or who have an interest in a system is an effective way to gather information about current and future systems. Observing current system users is a more direct way of seeing how an existing system operates. Both interviewing and observing have limitations. Methods for determining system requirements can be enhanced by examining system and organizational documentation to discover more details about current systems and the organization they support.

We discuss several important types of documents that are useful in understanding system requirements, but our discussion is not necessarily exhaustive. In addition to the few specific documents we mention, other important documents need to be located and considered, including organizational mission statements, business plans, organization charts, business policy manuals, job descriptions, internal and external correspondence, and reports from prior organizational studies.

What can the analysis of documents tell you about the requirements for a new system? In documents you can find information about:

- Problems with existing systems (e.g., missing information or redundant steps)
- Opportunities to meet new needs if only certain information or information processing were available (e.g., analysis of sales based on customer type)
- Organizational direction that can influence information system requirements (e.g., trying to link customers and suppliers more closely to the organization)
- Titles and names of key individuals who have an interest in relevant existing systems (e.g., the name of a sales manager who has led a study of buying behavior of key customers)
- Values of the organization or individuals who can help determine priorities for different capabilities desired by different users (e.g., maintaining market share even if it means lower short-term profits)
- Special information-processing circumstances that occur irregularly that may not be identified by any other requirements determination technique (e.g., special handling needed for a few large-volume customers who require use of customized customer ordering procedures)
- The reason why current systems are designed as they are, which can suggest features left out of current software that may now be feasible and desirable (e.g., data about a customer's purchase of competitors' products not available when the current system was designed; these data now available from several sources)
- Data, rules for processing data, and principles by which the organization operates that must be enforced by the information system (e.g., each customer assigned exactly one sales department staff member as primary contact if customer has any questions)

One type of useful document is a written work procedure for an individual or a work group. The procedure describes how a particular job or task is performed, including data and information used and created in the process of performing the job. For example, the procedure shown in Figure 5-3 includes data (list of features and advantages, drawings, inventor name, and witness names) required to prepare an invention disclosure. It also indicates that besides the inventor, the vice president for research, the department head, and the dean must review the material and that a witness is required for any filing of an invention disclosure. These insights clearly affect what data must be kept, to whom information must be sent, and the rules that govern valid forms.

GUIDE FOR PREPARATION OF INVENTION DISCLOSURE
(See FACULTY and STAFF MANUALS for detailed Patent Policy and routing procedures.)

(1) DISCLOSE ONLY ONE INVENTION PER FORM.

(2) PREPARE COMPLETE DISCLOSURE.

The disclosure of your invention is adequate for patent purposes ONLY if it enables a person skilled in the art to understand the invention.

(3) CONSIDER THE FOLLOWING IN PREPARING A COMPLETE DISCLOSURE:

(a) All essential elements of the invention, their relationship to one another, and their mode of operation

(b) Equivalents that can be substituted for any elements

(c) List of features believed to be new

(d) Advantages this invention has over the prior art

(e) Whether the invention has been built and/or tested

(4) PROVIDE APPROPRIATE ADDITIONAL MATERIAL.

Drawings and descriptive material should be provided as needed to clarify the disclosure. Each page of this material must be signed and dated by each inventor and properly witnessed. A copy of any current and/or planned publication relating to the invention should be included.

(5) INDICATE PRIOR KNOWLEDGE AND INFORMATION.

Pertinent publications, patents or previous devices, and related research or engineering activities should be identified.

(6) HAVE DISCLOSURE WITNESSED.

Persons other than co-inventors should serve as witnesses and should sign each sheet of the disclosure only after reading and understanding the disclosure.

(7) FORWARD ORIGINAL PLUS ONE COPY (two copies if supported by grant/contract) TO VICE PRESIDENT FOR RESEARCH VIA DEPARTMENT HEAD AND DEAN.

FIGURE 5-3
Example of a written work procedure for an invention disclosure.

Procedures are not trouble-free sources of information, however. Sometimes your analysis of several written procedures reveals a duplication of effort in two or more jobs. You should call such duplication to the attention of management as an issue to be resolved before system design can proceed. That is, it may be necessary to redesign the organization before the redesign of an information system can achieve its full benefits. Another problem you may encounter is a missing procedure. Again, it is not your job to create a document for a missing procedure—that is up to management. A third and common problem happens when the procedure is out of date, which you may realize in your interview of the person responsible for performing the task described in the procedure. Once again, the decision to rewrite the procedure so that it matches reality is made by management, but you may make suggestions based upon your understanding of the organization. A fourth problem often encountered is that the formal procedures may contradict information you collected from interviews, questionnaires, and observation about how the organization operates and what information is required. As in the other cases, resolution rests with management.

Formal system
The official way a system works, as described in organizational documentation.

Informal system
The way a system actually works.

All of these problems illustrate the difference between formal systems and informal systems. A **formal system** is one an organization has documented; an **informal system** is the way in which the organization actually works. Informal systems develop because of inadequacies of formal procedures and individual work habits, preferences, and resistance to control. It is important to understand both formal and informal systems because each provides insight into information requirements and what is necessary to convert from present to future systems.

A second type of document useful to systems analysts is a business form, illustrated in Figure 5-4. Forms are used for all types of business functions, from recording an order to acknowledging the payment of a bill to indicating what goods have been shipped. Forms are important for understanding a system because they explicitly indicate what data flow in or out of a system. In the sample invoice form in Figure 5-4, we see space for data such as invoice number, the "bill to" address, the quantity of items ordered, their descriptions, rates, and amounts.

A printed form may correspond to a computer display that the system will generate for someone to enter and maintain data or to display data to online users. The most useful forms contain actual organizational data that allow you to determine the data characteristics actually used by the application. The ways in which people use forms change over time, and data that were needed when a form was designed may no longer be required.

A third type of useful document is a report generated by current systems. As the primary output for some types of systems, a report enables you to work backward from the information on the report to the data that must have been necessary to generate it. Figure 5-5 presents an example of a common financial accounting report, the statement of cash flows. You analyze such reports to determine which data need to be captured over what time period and what manipulation of these raw data is necessary to produce each field on the report.

If the current system is computer based, a fourth set of useful documents is one that describes the current information systems—how they were designed and how they work. Several different types of documents fit this description, everything from flowcharts to data dictionaries to user manuals. An analyst who has access to such documents is fortunate because many in-house-developed information systems lack complete documentation. Analysis of organizational documents and observation, along with interviewing and distributing questionnaires, are the methods used most for gathering system requirements. Table 5-4 (page 137) summarizes the comparative features of observation and analysis of organizational documents.

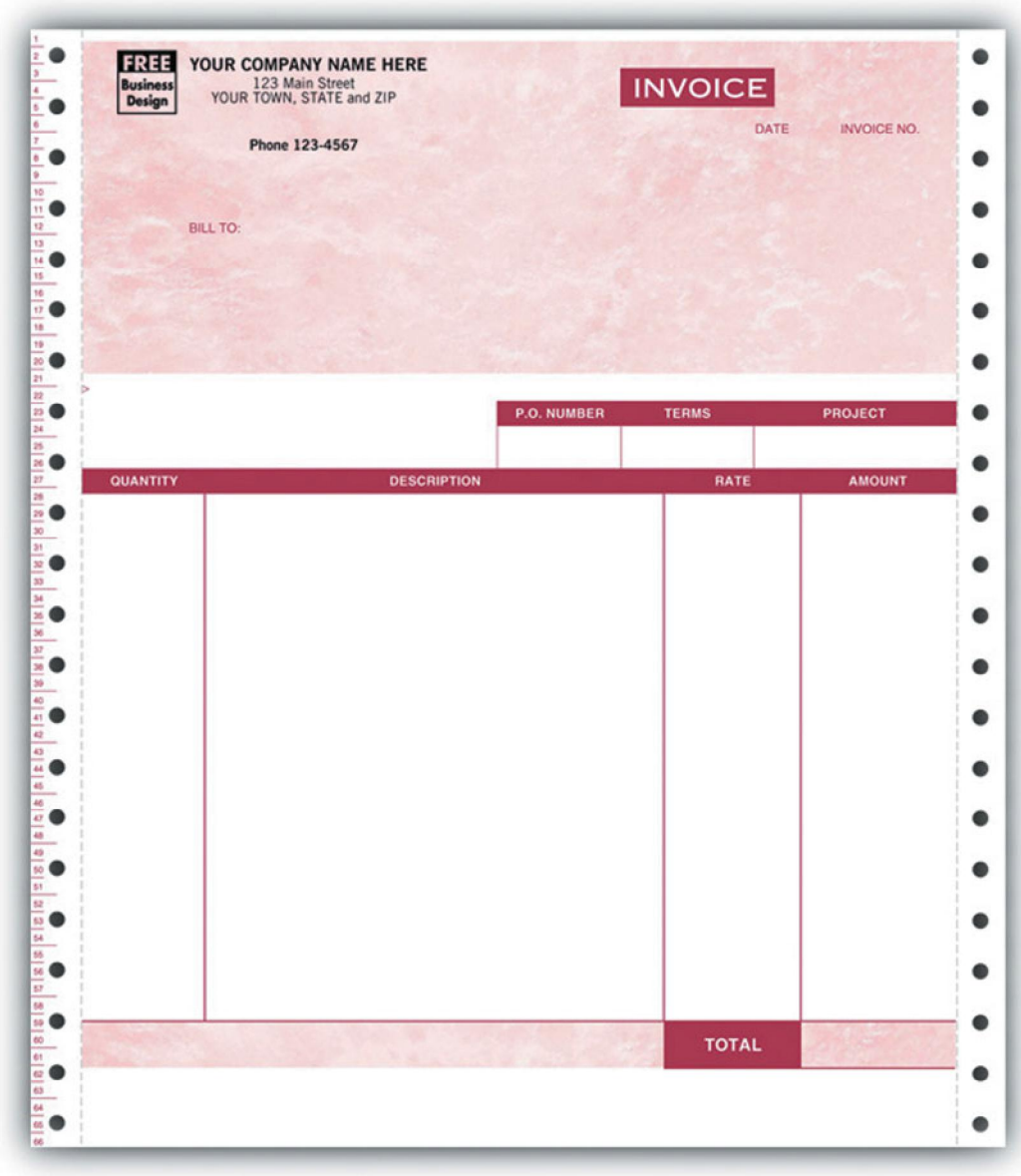

FIGURE 5-4
An example of a business form—an invoice form for QuickBooks.

Source: http://jnk.btobsource.com/NASApp/enduser/products/product_detail.jsp?pc=13050M#. Reprinted with permission.

Modern Methods for Determining System Requirements

Even though we called interviews, questionnaires, observation, and document analysis traditional methods for determining a system's requirements, all of these methods are still used by analysts to collect important information. Today, however, additional techniques are available to collect information about the current system, the organizational area requesting the new system, and what the new system should be like. In this section, you learn about two modern information-gathering techniques for analysis: joint application design (JAD) and prototyping. These techniques can support effective information collection and structuring while reducing the amount of time required for analysis.

FIGURE 5-5
An example of a report—an accounting balance sheet.

Mellankamp Industries
Statement of Cash Flows
October 1 through December 31, 2012

	Oct. 1–Dec. 31, 2012
OPERATING ACTIVITIES	
Net Income	$38,239.15
Adjustments to reconcile Net Income to Net cash provided by Operating Activities:	
Accounts Receivable	–$46,571.69
Employee Loans	–$62.00
Inventory Asset	–$18,827.16
Retainage	–$2,461.80
Accounts Payable	$29,189.66
Business Credit Card	$70.00
BigOil Card	–$18.86
Sales Tax Payable	$687.65
Net cash provided by Operating Activities	$244.95
INVESTING ACTIVITIES	
Equipment	–$44,500.00
Prepaid Insurance	$2,322.66
Net cash provided by Investing Activities	–$42,177.34
FINANCING ACTIVITIES	
Bank Loan	–$868.42
Emergency Loan	$3,911.32
Note Payable	–$17,059.17
Equipment Loan	$43,013.06
Opening Balance Equity	–$11,697.50
Owner's Equity: Owner's Draw	–$6,000.00
Retained Earning	$8,863.39
Net cash provided by Financing Activities	$20,162.68
Net cash increase for period	–$21,769.71
Cash at beginning of period	–$21,818.48
Cash at end of period	**–$43,588.19**

Joint Application Design

You were introduced to joint application design or JAD, in Chapter 1. There you learned JAD started in the late 1970s at IBM as a means to bring together the key users, managers, and systems analysts involved in the analysis of a current system. Since the 1970s, JAD has spread throughout many companies and industries. For example, it is quite popular in the insurance industry. The primary purpose of using JAD in the analysis phase is to collect systems requirements simultaneously from the key people involved with the system. The result is an intense and structured, but highly effective, process. Having all the key people

TABLE 5-4: Comparison of Observation and Document Analysis

Characteristic	Observation	Document Analysis
Information richness	High (many channels)	Low (passive) and old
Time required	Can be extensive	Low to moderate
Expense	Can be high	Low to moderate
Chance for follow-up and probing	Good: Opportunity for probing and clarification questions during or after observation	Limited: Probing possible only if original author is available
Confidentiality	Observee is known to observer; observee may change behavior when observed	Depends on nature of document; does not change simply by being read
Involvement of subject	Observees' involvement dependent on whether they know they are being observed	None, no clear commitment
Potential audience	Limited numbers and limited time (snapshot) of each	Potentially biased by which documents were kept or because document not created for this purpose

together in one place at one time allows analysts to see the areas of agreement and the areas of conflict. Meeting with all these important people for over a week of intense sessions allows you the opportunity to resolve conflicts or at least to understand why a conflict may not be simple to resolve.

JAD sessions are usually conducted in a location away from where the people involved normally work, in order to limit distractions and help participants better concentrate on systems analysis. A JAD may last anywhere from four hours to an entire week and may consist of several sessions. A JAD employs thousands of dollars of corporate resources, the most expensive of which is the time of the people involved. Other expenses include the costs associated with flying people to a remote site and putting them up in hotels and feeding them for several days.

The following is a list of typical JAD participants:

JAD session leader
The trained individual who plans and leads joint application design sessions.

- **JAD session leader:** The JAD leader organizes and runs the JAD. This person has been trained in group management and facilitation as well as in systems analysis. The JAD leader sets the agenda and sees that it is met. He or she remains neutral on issues and does not contribute ideas or opinions, but rather concentrates on keeping the group on the agenda, resolving conflicts and disagreements, and soliciting all ideas.
- *Users:* The key users of the system under consideration are vital participants in a JAD. They are the only ones who clearly understand what it means to use the system on a daily basis.
- *Managers:* Managers of the work groups who use the system in question provide insight into new organizational directions, motivations for and organizational impacts of systems, and support for requirements determined during the JAD.
- *Sponsor:* As a major undertaking, because of its expense, a JAD must be sponsored by someone at a relatively high level in the company such as a vice president or chief executive officer. If the sponsor attends any sessions, it is usually only at the beginning or the end.
- *Systems analysts:* 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.

Scribe
The person who makes detailed notes of the happenings at a joint application design session.

- **Scribe:** The scribe takes notes during the JAD sessions, usually on a personal computer or laptop.
- *IS staff:* Besides systems analysts, other IS staff, such as programmers, database analysts, IS planners, and data-center personnel, may attend the session. Their purpose is to learn from the discussion and possibly to contribute their ideas on the technical feasibility of proposed ideas or on the technical limitations of current systems.

JAD sessions are usually held in special-purpose rooms where participants sit around horseshoe-shaped tables, as in Figure 5-6. These rooms are typically equipped with whiteboards (possibly electronic, with a printer to make copies of what is written on the board). Other audiovisual tools may be used, such as magnetic symbols that can be easily rearranged on a whiteboard, flip charts, and computer-generated displays. Flip-chart paper is typically used for keeping track of issues that cannot be resolved during the JAD, or for those issues requiring additional information that can be gathered during breaks in the proceedings. Computers may be used to create and display form or report designs or to diagram existing or replacement systems. In general, however, most JADs do not benefit much from computer support. The end result of a completed JAD is a set of documents that detail the workings of the current system and the features of a replacement system. Depending on the exact purpose of the JAD, analysts may gain detailed information on what is desired of the replacement system.

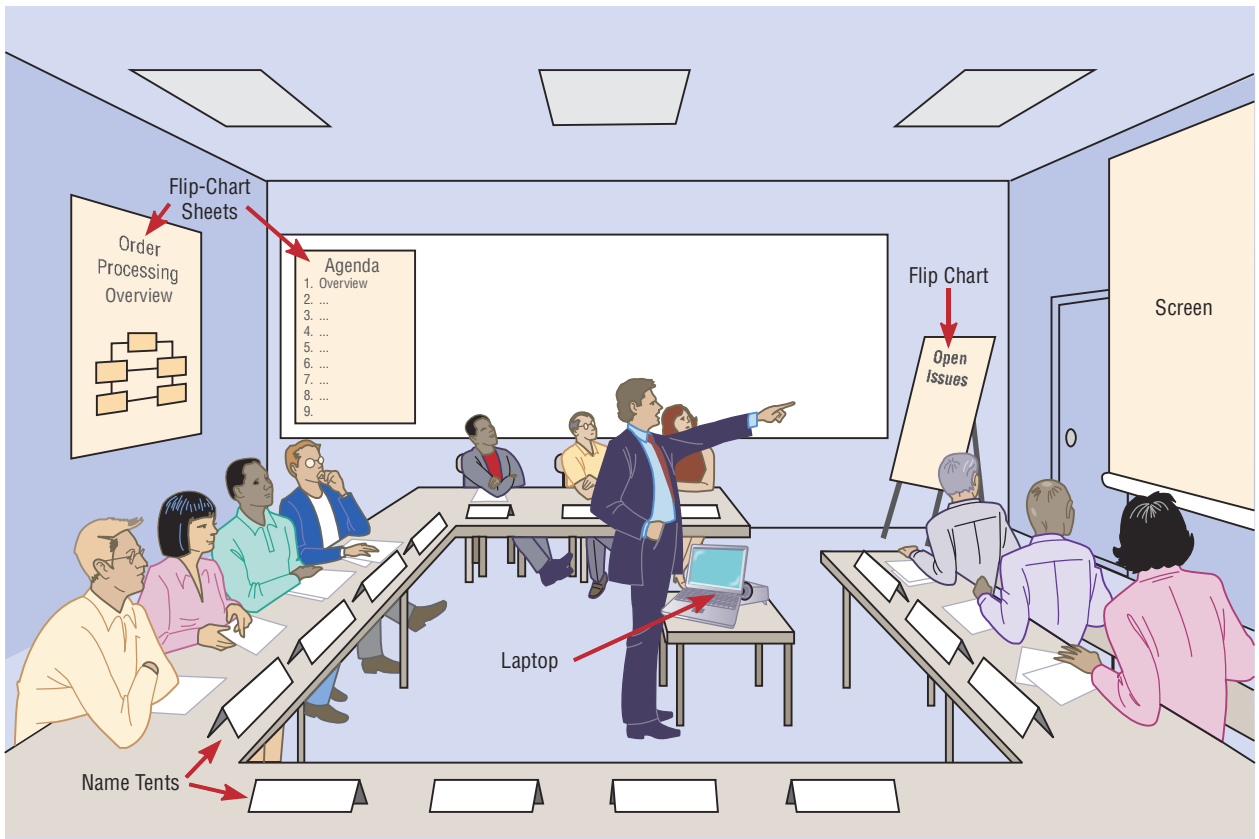

FIGURE 5-6
A typical room layout for a JAD session.
Source: Based on Wood and Silver, 1989.

Taking Part in a JAD Imagine that you are a systems analyst taking part in your first JAD. What might participating in a JAD be like? Typically, JADs are held off-site, in comfortable conference facilities. On the first morning of the JAD, you and your fellow analysts walk into a room that looks much like the one depicted in Figure 5-6. The JAD facilitator is already there. She is finishing writing the day's agenda on a flip chart. The scribe is seated in a corner with a laptop, preparing to take notes on the day's activities. Users and managers begin to enter in groups and seat themselves around the U-shaped table. You and the other analysts review your notes describing what you have learned so far about the information system you are all there to discuss. The session leader opens the meeting with a welcome and a brief rundown of the agenda. The first day will be devoted to a general overview of the current system and major problems associated with it. The next two days will be devoted to an analysis of current system screens. The last two days will be devoted to analysis of reports.

The session leader introduces the corporate sponsor, who talks about the organizational unit and current system related to the systems analysis study and the importance of upgrading the current system to meet changing business conditions. He leaves and the JAD session leader takes over. She yields the floor to the senior analyst, who begins a presentation on key problems with the system, which have already been identified. After the presentation, the session leader opens the discussion to the users and managers in the room.

After a few minutes of talk, a heated discussion begins between two users from different corporate locations. One user, who represents the office that served as the model for the original systems design, argues that the system's perceived lack of flexibility is really an asset, not a problem. The other user, who represents an office that was part of another company before a merger, argues that the current system is so inflexible as to be virtually unusable. The session leader intervenes and tries to help the users isolate particular aspects of the system that may contribute to the system's perceived lack of flexibility.

Questions arise about the intent of the original developers. The session leader asks the analysis team about their impressions of the original system design. If these questions cannot be answered during this meeting because none of the original designers are present nor are the original design documents readily available, the session leader assigns the question about intent to the "to-do" list. This question becomes the first item on a flip-chart sheet of to-do items, and the session leader gives you the assignment of finding out about the intent of the original designers. She writes your name next to the to-do item on the list and continues with the session. Before the end of the JAD, you must get an answer to this question.

The JAD will continue in this manner for its duration. Analysts will make presentations, help lead discussions of form and report design, answer questions from users and managers, and take notes on what is being said. After each meeting, the analysis team will meet, usually informally, to discuss what has occurred that day and to consolidate what they have learned. Users will continue to contribute during the meetings, and the session leader will facilitate, intervening in conflicts, seeing that the group follows the agenda. When the JAD is over, the session leader and her assistants must prepare a report that documents the findings in the JAD and then circulate it among users and analysts.

Using Prototyping during Requirements Determination

You were introduced to prototyping in Chapter 1 (see Figure 1-12 for an overview of prototyping). There you learned that prototyping is a repetitive process in which analysts and users build a rudimentary version of an information system based on user feedback. You also learned that prototyping could

replace the systems development life cycle or augment it. In this section, we see how prototyping can augment the requirements determination process.

To establish requirements for prototyping, you still have to interview users and collect documentation. Prototyping, however, allows you to quickly convert basic requirements into a working, though limited, version of the desired information system. The user then views and tests the prototype. Typically, seeing verbal descriptions of requirements converted into a physical system prompts the user to modify existing requirements and generate new ones. For example, in the initial interviews, a user might have said he wanted all relevant utility billing information on a single computer display form, such as the client's name and address, the service record, and payment history. Once the same user sees how crowded and confusing such a design would be in the prototype, he might change his mind and instead ask for the information to be organized on several screens but with easy transitions from one screen to another. He might also be reminded of some important requirements (data, calculations, etc.) that had not surfaced during the initial interviews.

You would then redesign the prototype to incorporate the suggested changes. Once modified, users would again view and test the prototype. Once again, you would incorporate their suggestions for change. Through such a repetitive process, the chances are good that you will be able to better capture a system's requirements. The goal with using prototyping to support requirements determination is to develop concrete specifications for the ultimate system, not to build the ultimate system.

Prototyping is most useful for requirements determination when:

- User requirements are not clear or well understood, which is often the case for totally new systems or systems that support decision making.
- One or a few users and other stakeholders are involved with the system.
- Possible designs are complex and require concrete form to evaluate fully.
- Communication problems have existed in the past between users and analysts, and both parties want to be sure that system requirements are as specific as possible.
- Tools (such as form and report generators) and data are readily available to rapidly build working systems.

Prototyping also has some drawbacks as a tool for requirements determination. They include the following:

- A tendency to avoid creating formal documentation of system requirements, which can then make the system more difficult to develop into a fully working system.
- Prototypes can become idiosyncratic to the initial user and difficult to diffuse or adapt to other potential users.
- Prototypes are often built as stand-alone systems, thus ignoring issues of sharing data and interactions with other existing systems.
- Checks in the SDLC are bypassed so that some more subtle, but still important, system requirements might be forgotten (e.g., security, some data-entry controls, or standardization of data across systems).

Radical Methods for Determining System Requirements

Whether traditional or modern, the methods for determining system requirements that you have read about in this chapter apply to any requirements determination effort, regardless of its motivation. Yet, most of what you have

learned has traditionally been applied to systems development projects that involve automating existing processes. Analysts use system requirements determination to understand current problems and opportunities, as well as what is needed and desired in future systems. Typically, the current way of doing things has a large impact on the new system. In some organizations, though, management is looking for new ways to perform current tasks. These ways may be radically different from how things are done now, but the payoffs may be enormous: Fewer people may be needed to do the same work; relationships with customers may improve dramatically; and processes may become much more efficient and effective, all of which can result in increased profits. The overall process by which current methods are replaced with radically new methods is referred to as **business process reengineering (BPR).**

Business process reengineering (BPR)
The search for, and implementation of, radical change in business processes to achieve breakthrough improvements in products and services.

To better understand BPR, consider the following analogy. Suppose you are a successful European golfer who has tuned your game to fit the style of golf courses and weather in Europe. You have learned how to control the flight of the ball in heavy winds, roll the ball on wide-open greens, putt on large and undulating greens, and aim at a target without the aid of the landscaping common on North American courses. When you come to the United States to make your fortune on the U.S. tour, you discover that improving your putting, driving accuracy, and sand shots will help, but the new competitive environment is simply not suited to your playing style. You need to reengineer your whole approach, learning how to aim at targets, spin and stop a ball on the green, and manage the distractions of crowds and press. If you are good enough, you may survive, but without reengineering, you will never become a winner.

Just as the competitiveness of golf forces good players to adapt their games to changing conditions, the competitiveness of our global economy has driven most companies into a mode of continuously improving the quality of their products and services. Organizations realize that creatively using information technologies can significantly improve most business processes. The idea behind BPR is not just to improve each business process but, in a systems-modeling sense, to reorganize the complete flow of data in major sections of an organization to eliminate unnecessary steps, combine previously separate steps, and become more responsive to future changes. Companies such as IBM, Procter & Gamble, Wal-Mart, and Ford have had great success in actively pursuing BPR efforts. Yet, many other companies have found difficulty in applying BPR principles. Nonetheless, BPR concepts are actively applied in both corporate strategic planning and information systems planning as a way to improve business processes radically (as described in Chapter 6).

BPR advocates suggest that radical increases in the quality of business processes can be achieved through creatively applying information technologies. BPR advocates also suggest that radical improvement cannot be achieved by making minor changes in existing processes but rather by using a clean sheet of paper and asking, "If we were a new organization, how would we accomplish this activity?" Changing the way work is performed also changes the way information is shared and stored, which means that the results of many BPR efforts are the development of information system maintenance requests, or requests for system replacement. You likely have encountered or will encounter BPR initiatives in your own organization. A recent survey of IS executives found that they view BPR to be a top IS priority for the coming years.

Identifying Processes to Reengineer

A first step in any BPR effort is to understand what processes need to change, what are the **key business processes** for the organization. Key business processes are the structured set of measurable activities designed to produce a

Key business processes
The structured, measured set of activities designed to produce a specific output for a particular customer or market.

specific output for a particular customer or market. The important aspect of this definition is that key processes are focused on some type of organizational outcome such as the creation of a product or the delivery of a service. Key business processes are also customer focused. In other words, key business processes would include all activities used to design, build, deliver, support, and service a particular product for a particular customer. BPR, therefore, requires you first to understand those activities that are part of the organization's key business processes and then to alter the sequence and structure of activities to achieve radical improvements in speed, quality, and customer satisfaction. The same techniques you learned to use for system requirements determination can be applied to discovering and understanding key business processes: interviewing key individuals, observing activities, reading and studying organizational documents, and conducting JAD sessions.

After identifying key business processes, the next step is to identify specific activities that can be radically improved through reengineering. Michael Hammer and James Champy, two academics who coined the term *BPR*, suggest systems analysts ask three questions to identify activities for radical change:

1. How important is the activity to delivering an outcome?
2. How feasible is changing the activity?
3. How dysfunctional is the activity?

The answers to these questions provide guidance for selecting which activities to change. Those activities deemed important, changeable, yet dysfunctional, are primary candidates for alteration. To identify dysfunctional activities, Hammer and Champy suggest you look for activities that involve excessive information exchanges between individuals, information that is redundantly recorded or needs to be rekeyed, excessive inventory buffers or inspections, and a lot of rework or complexity. An example of a dysfunctional process and how BPR is used to change it is presented at the end of Chapter 6.

Disruptive Technologies

Once key business processes and activities have been identified, information technologies must be applied to improve business processes radically. Hammer and Champy suggest that organizations think "inductively" about information technology. Induction is the process of reasoning from the specific to the general, which means that managers must learn about the power of new technologies and think of innovative ways to alter the way work is done. This approach is contrary to deductive thinking, in which problems are first identified and solutions then formulated.

Disruptive technologies
Technologies that enable the breaking of long-held business rules that inhibit organizations from making radical business changes.

Hammer and Champy suggest that managers especially consider disruptive technologies when applying deductive thinking. **Disruptive technologies** are those that enable the breaking of long-held business rules that inhibit organizations from making radical business changes. For example, Toyota is using production schedule databases and electronic data interchange (EDI)—an information system that allows companies to link their computers directly to suppliers—to work with its suppliers as if they and Saturn were one company. Suppliers do not wait until Saturn sends them a purchase order for more parts but simply monitor inventory levels and automatically send shipments as needed. Table 5-5 shows several long-held business rules and beliefs that constrain organizations from making radical process improvements. For example, the first rule suggests that information can appear in only one place at a time. However, the advent of distributed databases, which allow business units to share a common database, has "disrupted" this long-held business belief.

TABLE 5-5: Long-Held Organizational Rules That Are Being Eliminated through Disruptive Technologies

Rule	Disruptive Technology
Information can appear in only one place at a time.	Distributed databases allow the sharing of information.
Only experts can perform complex work.	Expert systems can aid nonexperts.
Businesses must choose between centralization and decentralization.	Advanced telecommunications networks can support dynamic organizational structures.
Managers must make all decisions.	Decision-support tools can aid nonmanagers.
Field personnel need offices where they can receive, store, retrieve, and transmit information.	Wireless data communication and portable computers provide a "virtual" office for workers.
The best contact with a potential buyer is personal contact.	Interactive communication technologies allow complex messaging capabilities.
You have to find out where things are.	Automatic identification and tracking technology knows where things are.
Plans get revised periodically.	High-performance computing can provide real-time updating.

Pine Valley Furniture WebStore: Determining System Requirements

In the last chapter, you read how Pine Valley Furniture's management began the WebStore project—to sell furniture products over the Internet. Here we examine the process followed by PVF to determine system requirements and highlight some of the issues and capabilities that you may want to consider when developing your own Internet-based application.

To collect system requirements as quickly as possible, Jim Woo and Jackie Judson decided to hold a three-day JAD session. In order to get the most out of these sessions, they invited a broad range of people, including representatives from sales and marketing, operations, and information systems. Additionally, they asked an experienced JAD facilitator, Cheri Morris, to conduct the session. Together with Cheri, Jim and Jackie developed an ambitious and detailed agenda for the session. Their goal was to collect requirements on the following items:

- System layout and navigation characteristics
- WebStore and site management system capabilities
- Customer and inventory information
- System prototype evolution

In the remainder of this section, we briefly highlight the outcomes of the JAD session.

System Layout and Navigation Characteristics

As part of the process of preparing for the JAD session, all participants were asked to visit several established retail Web sites, including www.amazon.com, www.landsend.com, www.sony.com, and www.pier1.com. At the JAD session, participants were asked to identify characteristics of these sites that they found

TABLE 5-6: Desired Layout and Navigation Feature of WebStore

Layout and Design
Navigation menu and logo placement should remain consistent throughout the entire site (this allows users to maintain familiarity while using the site and minimizes the number who get "lost" in the site).
Graphics should be lightweight to allow for quick page display.
Text should be used over graphics whenever possible.
Navigation
Any section of the store should be accessible from any other section via the navigation menu.
Users should always be aware of what section they are currently in.

appealing and those they found cumbersome; this allowed participants to identify and discuss those features that they wanted the WebStore to possess. The outcomes of this activity are summarized in Table 5-6.

WebStore and Site Management System Capabilities

After agreeing to the general layout and navigational characteristics of the WebStore, the session then turned its focus to the basic system capabilities. To assist in this process, systems analysts from the information systems department developed a draft skeleton of the WebStore based on the types of screens and capabilities of popular retail Web sites. For example, many retail Web sites have a "shopping cart" feature that allows customers to accumulate multiple items before checking out rather than buying a single item at a time. After some discussion, the participants agreed that the system structure shown in Table 5-7 would form the foundation for the WebStore system.

TABLE 5-7: System Structure of the WebStore and Site Management Systems

WebStore System	Site Management System
Main Page	User profile manager
Product line (catalog)	Order maintenance manager
• Desks	Content (catalog) manager
• Chairs	Reports
• Tables	Total hits
• File cabinets	Most-frequent page views
Shopping cart	User/time of day
Checkout	Users/day of week
Account profile	Shoppers not purchasing (used shopping cart—did not check out)
Order status/history	Feedback analysis
Customer comments	
Company information	
Feedback	
Contact information	

In addition to the WebStore capabilities, members of the sales and marketing department described several reports that would be necessary to manage customer accounts and sales transactions effectively. In addition, the department wants to be able to conduct detailed analyses of site visitors, sales tracking, and so on. Members of the operations department expressed a need to update the product catalog easily. These collective requests and activities were organized into a system design structure called the *Site Management* system, summarized in Table 5-7. The structures of both the WebStore and Site Management systems will be given to the information systems department as the baseline for further analysis and design activities.

Customer and Inventory Information

The WebStore will be designed to support the furniture purchases of three distinct types of customers:

- Corporate customers
- Home-office customers
- Student customers

To track the sales to these different types of customers effectively, the system must capture and store distinct information. Table 5-8 summarizes this information for each customer type identified during the JAD session. Orders reflect the range of product information that must be specified to execute a sales transaction. Thus, in addition to capturing the customer information, product and sales data must also be captured and stored; Table 5-8 lists the results of this analysis.

System Prototype Evolution

As a final activity, the JAD participants discussed, along with extensive input from the information systems staff, how the system implementation should evolve. After completing analysis and design activities, they agreed that the system implementation should progress in three main stages so that requirement changes could be more easily identified and implemented. Table 5-9 summarizes these stages and the functionality incorporated at each one.

At the conclusion of the JAD session, all the participants felt good about the progress that had been made and about the clear requirements that had been identified. With these requirements in hand, Jim and the information systems staff could begin to turn these lists of requirements into formal analysis and

TABLE 5-8: Customer and Inventory Information for WebStore

Corporate Customer	Home-Office Customer	Student Customer	Inventory Information
Company name	Name	Name	SKU
Company address	Doing business as (company name)	School	Name
Company phone	Address	Address	Description
Company fax	Phone	Phone	Finished product size
Preferred shipping method	Fax	E-mail	Finished product weight
Buyer name	E-mail		Available materials
Buyer phone			Available colors
Buyer e-mail			Price
			Lead time

TABLE 5-9 Stages of System Implementation of WebStore

Stage 1 (Basic Functionality)
Simple catalog navigation; two products per section—limited attribute set
25 sample users
Simulated credit card transaction
Full shopping cart functionality
Stage 2 (Look and Feel)
Full product attribute set and media (images, video)—commonly referred to as "product data catalog"
Full site layout
Simulated integration with Purchasing Fulfillment and Customer Tracking Systems
Stage 3 (Staging/Preproduction)
Full integration with Purchasing Fulfillment and Customer Tracking Systems
Full credit card processing integration
Full product data catalog

design specifications. To show how information flows through the WebStore, Jim and his staff will produce data-flow diagrams (Chapter 6). To show a conceptual model of the data used within the WebStore, they will generate an entity-relationship diagram (Chapter 7). Both of these analysis documents will become the foundation for detailed system design and implementation.

As we saw in Chapter 1, the systems analysis phase of the systems development life cycle includes determining requirements and structuring requirements. Chapter 5 focuses on requirements determination, the gathering of information about current systems, and the need for replacement systems. Chapters 6 and 7 address techniques for structuring the information discovered during requirements determination.

Key Points Review

1. **Describe options for designing and conducting interviews and develop a plan for conducting an interview to determine system requirements.**

   Interviews can involve open-ended and closed-ended questions. In either case, you must be precise in formulating a question in order to avoid ambiguity and to ensure a proper response. Making a list of questions is just one activity necessary to prepare for an interview. You must also create a general interview guide (see Figure 5-2) and schedule the interview.
2. **Explain the advantages and pitfalls of observing workers and analyzing business documents to determine system requirements.**

   During observation, you must try not to intrude or interfere with normal business activities so that the people being observed do not modify their activities from normal processes. Observation can be expensive because it is so labor intensive. Analyzing documents may be much less expensive, but any insights gained will be limited to what is available, based on the reader's interpretation. Often the creator of the document is not there to answer questions.
3. **Participate in and help plan a joint application design session.**

   Joint application design (JAD) brings together key users and adds structure and a JAD session leader to it. Typical JAD participants include the session leader, a scribe, key users, managers, a sponsor, systems analysts, and IS staff members. JAD sessions are usually held off-site and may last as long as one week.

4. **Use prototyping during requirements determination.**
   You read how information systems can support requirements determination with prototyping. As part of the prototyping process, users and analysts work closely together to determine requirements that the analyst then builds into a model. The analyst and user then work together on revising the model until it is close to what the user desires.
5. **Select the appropriate methods to elicit system requirements.**
   For requirements determination, the traditional sources of information about a system include interviews, questionnaires, observation, and procedures, forms, and other useful documents. Often many or even all of these sources are used to gather perspectives on the adequacy of current systems and the requirements for replacement systems. Each form of information collection has its advantages and disadvantages, which were summarized in Table 5-4. Selecting the methods to use depends on the need for rich or thorough information, the 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 and committed to a project, and the potential audience from which requirements should be collected.
6. **Explain business process reengineering and how it affects requirements determination.**
   Business process reengineering (BPR) is an approach to changing business processes radically.
7. **Understand how requirements determination techniques apply to development for Internet applications.**
   Most of the same techniques used for requirements determination for traditional systems can also be fruitfully applied to the development of Internet applications. Accurately capturing requirements in a timely manner for Internet applications is just as important as for more traditional systems.

Key Terms Checkpoint

Here are the key terms from the chapter. The page where each term is first explained is in parentheses after the term.

1. Business process reengineering (BPR) (p. 141)
2. Closed-ended questions (p. 129)
3. Disruptive technologies (p. 142)
4. Formal system (p. 134)
5. Informal system (p. 134)
6. JAD session leader (p. 137)
7. Key business processes (p. 141)
8. Open-ended questions (p. 128)
9. Scribe (p. 138)

Match each of the key terms above with the definition that best fits it.

____ 1. The search for, and implementation of, radical change in business processes to achieve breakthrough improvements in products and services.
____ 2. The person who makes detailed notes of the happenings at a joint application design session.
____ 3. Technologies that enable the breaking of long-held business rules that inhibit organizations from making radical business changes.
____ 4. The way a system actually works.
____ 5. The official way a system works as described in organizational documentation.
____ 6. The structured, measured set of activities designed to produce a specific output for a particular customer or market.
____ 7. Questions in interviews and on questionnaires that ask those responding to choose from among a set of specified responses.
____ 8. Questions in interviews and on questionnaires that have no prespecified answers.
____ 9. The trained individual who plans and leads joint application design sessions.

Review Questions

1. Describe systems analysis and the major activities that occur during this phase of the systems development life cycle.
2. What are some useful character traits for an analyst involved in requirements determination?
3. Describe three traditional techniques for collecting information during analysis. When might one be better than another?
4. What are the general guidelines for conducting interviews?
5. What are the general guidelines for collecting data through observing workers?
6. What are the general guidelines for collecting data through analyzing documents?
7. Compare collecting information through observation and through document analysis. Describe a hypothetical situation in which each of these methods would be an effective way to collect information system requirements.
8. What is JAD? How is it better than traditional information-gathering techniques? What are its weaknesses?
9. How has computing been used to support requirements determination?
10. Describe how prototyping can be used during requirements determination. How is it better or worse than traditional methods?
11. When conducting a business process reengineering study, what should you look for when trying to identify business processes to change? Why?
12. What are disruptive technologies, and how do they enable organizations to change their business processes radically?

Problems and Exercises

1. One of the potential problems mentioned in this chapter with gathering information requirements by observing potential system users is that people may change their behavior when observed. What could you do to overcome this potentially confounding factor in accurately determining information requirements?
2. Summarize the problems with the reliability and usefulness of analyzing business documents as a method for gathering information requirements. How could you cope with these problems to use business documents effectively as a source of insights on system requirements?
3. Suppose you were asked to lead a JAD session. List ten guidelines you would follow in playing the proper role of a JAD session leader.
4. Prepare a plan, similar to Figure 5-2, for an interview with your academic adviser to determine which courses you should take to develop the skills you need to be hired as a programmer/analyst.
5. Figure 5-2 shows part of a guide for an interview. How might an interview guide differ when a group interview is to be conducted?
6. JADs are powerful ways to collect system requirements, but special problems arise during group requirements collection sessions. Summarize these special interviewing and group problems, and suggest ways that you, as a group facilitator, might deal with them.
7. Suppose you are a systems analyst charged with gathering information requirements. You decide that you want to use prototyping to gather these requirements. It provides benefits beyond interviews and observations but also presents unique challenges. Discuss the challenges you expect to face and what processes you will put in place to prevent them from harming your information system.
8. Questionnaires can be administered both on paper and via the Internet. Online questionnaires allow for the use of complex analysis tools and real-time results. However, online questionnaires have idiosyncratic challenges. Three such challenges can be computer access concerns, getting users to participate, and employee concerns for privacy of results. Discuss when each concern is likely to impact the online questionnaire and how you would address each challenge.

Discussion Questions

1. The methods of data collection discussed in this chapter take a lot of time. What are some ways analysts can still collect the information they need for systems analysis but also save time? What methods can you think of that would improve upon both traditional and newer techniques?
2. Some of the key problems with information systems that show up later in the systems

development life cycle can be traced back to inadequate work during requirements determination. How might this issue be avoided?

3. Survey the literature on JAD in the academic and popular press and determine the "state of the art." How is JAD being used to help determine system requirements? Is using JAD for this process beneficial? Why or why not? Present your analysis to the IS manager at your work or at your university. Does your analysis of JAD fit with his or her perception? Why or why not? Is he or she currently using JAD, or a JAD-like method, for determining system requirements? Why or why not?
4. Is business process reengineering a business fad or is there more to it? Explain and justify your answer.

Case Problems

1. Pine Valley Furniture

Jackie Judson, vice president of marketing, and Jim Woo, a senior systems analyst, have been involved with Pine Valley Furniture's Customer Tracking System since the beginning of the project. After receiving project approval from the Systems Priority Board, Jim and his project development team turned their attention toward analyzing the Customer Tracking System.

During a Wednesday afternoon meeting, Jim and his project team members decide to utilize several requirements determination methods. Because the Customer Tracking System will facilitate the tracking of customer purchasing activity and help identify sales trends, various levels of end users will benefit from the new system. Therefore, the project team feels it is necessary to collect requirements from these potential end users. The project team will use interviews, observations, questionnaires, and JAD sessions as data-gathering tools.

Jim assigns you the task of interviewing Stacie Walker, a middle manager in the marketing department; Pauline McBride, a sales representative; and Tom Percy, assistant vice president of marketing. Tom is responsible for preparing the sales forecasts. In addition, Jim assigns Pete Polovich, a project team member, the task of organizing the upcoming JAD sessions.

a. Because Pete Polovich is organizing a JAD session for the first time, he would like to locate additional information about organizing and conducting a JAD session. Find information on JAD on the Web, and provide Pete with several recommendations for conducting and organizing a JAD session.
b. When conducting your interviews, what guidelines should you follow?
c. As part of the requirements determination process, what business documents should be reviewed?
d. Is prototyping an appropriate requirements determination method for this project?

2. Hoosier Burger

Juan Rodriquez has assigned you the task of requirements determination for the Hoosier Burger project. You are looking forward to this opportunity because it will allow you to meet and interact with Hoosier Burger employees. Besides interviewing Bob and Thelma Mellankamp, you decide to collect information from Hoosier Burger's waiters, cooks, and customers.

Mr. Rodriquez suggests that you formally interview Bob and Thelma Mellankamp and perhaps observe them performing their daily management tasks. You decide that the best way to collect requirements from the waiters and cooks is to interview and observe them. You realize that discussing the order-taking process with Hoosier Burger employees and then observing them in action will provide you with a better idea of where potential system improvements can be made. You also decide to prepare a questionnaire to distribute to Hoosier Burger customers. Because Hoosier Burger has a large customer base, it would be impossible to interview every customer; therefore, you feel that a customer satisfaction survey will suffice.

a. Assume you are preparing the customer satisfaction questionnaire. What types of questions would you include? Prepare five questions that you would ask.
b. What types of questions would you ask the waiters? What types of questions would you ask the cooks? Prepare five questions that you would ask each group.
c. What types of documents are you likely to obtain for further study? What types of documents will most likely not be available? Why?
d. What modern requirements determination methods are appropriate for this project?

3. Clothing Shack

The Clothing Shack is an online retailer of men's, women's, and children's clothing. The company has been in business for four years and makes a modest profit from its online sales.

However, in an effort to compete successfully against online retailing heavyweights, the Clothing Shack's marketing director, Makaya O'Neil, has determined that the Clothing Shack's marketing information systems need improvement.

Ms. O'Neil feels that the Clothing Shack should begin sending out catalogs to its customers, keep better track of its customer's buying habits, perform target marketing, and provide a more personalized shopping experience for its customers. Several months ago, Ms. O'Neil submitted a systems service request (SSR) to the Clothing Shack's steering committee. The committee unanimously approved this project. You were assigned to the project at that time and have since helped your project team successfully complete the project initiation and planning phase. Your team is now ready to move into the analysis phase and begin identifying requirements for the new system.

a. Whom would you interview? Why?
b. What requirements determination methods are appropriate for this project?
c. Based on the answers provided for Question b, which requirements determination methods are appropriate for the individuals identified in Question a?
d. Identify the requirements determination deliverables that will likely result from this project.

CASE: PETRIE'S ELECTRONICS

Determining Systems Requirements

Although the customer loyalty project at Petrie's Electronics had gone slowly at first, the past few weeks had been fast paced and busy, Jim Watanabe, the project manager, thought to himself. He had spent much of his time planning and conducting interviews with key stakeholders inside the company. He had also worked with the marketing group to put together some focus groups made up of loyal customers, to get some ideas about what they would value in a customer loyalty program. Jim had also spent some time studying customer loyalty programs at other big retail chains and those in other industries as well, such as the airlines, known for their extensive customer loyalty programs. As project manager, he had also supervised the efforts of his team members. Together, they had collected a great deal of data. Jim had just finished creating a high-level summary of the information into a table he could send to his team members (PE Table 5-1).

From the list of requirements, it was clear that he and his team did not favor building a system from scratch in-house. Jim was glad that the team felt that

PE TABLE 5-1: Requirements and Constraints for Petrie's Customer Loyalty Project

Requirements

- Effective customer incentives—System should be able to effectively store customer activity and convert to rewards and other incentives
- Easy for customers to use—Interface should be intuitive for customer use
- Proven performance—System as proposed should have been used successfully by other clients
- Easy to implement—Implementation should not require outside consultants or extraordinary skills on the part of our staff or require specialized hardware
- Scalable—System should be easily expandable as the number of participating customers grows
- Vendor support—Vendor should have proven track record of reliable support and infrastructure in place to provide it

Constraints

- Cost to buy—Licenses for one year should be under $500,000
- Cost to operate—Total operating costs should be no more than $1 million per year
- Time to implement—Duration of implementation should not exceed three months
- Staff to implement—Implementation should be successful with the staff we have and with the skills they already possess