End of Chapter Solutions

Notes:

- This document contains **all** the solutions to the end-of-chapter questions for the 12th edition. This includes any altered or added questions for the 11th edition of the book.
- Page number references have been removed from the answers.
- The 12th edition of the book contains only end of chapter exercises of three types: questions, discussion topics, and projects. All other exercises that appeared at the end of each chapter in previous editions, such as "Apply Your Knowledge" from the 10th edition, have been removed from the body of the textbook.

Chapter 1: Introduction to Systems Analysis and Design

Chapter 1 – Introduction to Systems Analysis and Design: Chapter 1 provides an introduction to systems analysis and design by describing the role of information technology in today's dynamic business environment.

Questions

1. What is information technology and why is it important to society?

   Information technology (IT) *refers to the combination of hardware, software, and services that people use to manage, communicate, and share information. More than ever, business success depends on information technology. The headlines in* **Error! Reference source not found.** *offer dramatic examples of how information technology issues such as data privacy, mobile devices, and social media affects our society. We live in a world where we can be traced, analyzed, and surveilled without our knowledge. This raises many important questions, such as how to secure personal data while still providing useful functionality and business value.*

2. What are the five main components of an information system?

   An information system has five key components, as shown in **Error! Reference source not found.**: *hardware, software, data, processes, and people.*

3. Explain how ridesharing services such as Uber and Lyft are disrupting traditional taxicab business models.

   Business today is being shaped by three major trends: rapidly increasing globalization, technology integration for seamless information access across a wide variety of devices such as laptops and smartphones, and the rapid growth of cloud-based computing and software services. These trends are being driven by the immense power of the Internet.

   Ridesharing services such as Uber and Lyft are disrupting traditional taxicab business models through disintermediation: connecting drivers directly to customers, bypassing the traditional dispatch service. They are also disrupting the traditional limitation on who can drive a taxicab (medallion owners) to allow anyone with a car and who wants to earn some extra money to do so, all via mobile apps and cloud-based technology.

4. Describe the business profile of a home improvement store like Home Depot or Lowe's and how it is used.

   A business profile is an overview of a company's mission, functions, organization, products, services, customers, suppliers, competitors, constraints, and future direction. Although much of this information is readily available, a systems analyst usually needs to do additional research and fact-finding to fill out missing or incomplete information. A business profile is the starting point for the modeling process, and a systems analyst can describe and simplify an information system by using a set of business models and business process models. Students should be able to understand the business of home improvement stores, supply the basic information, and fill in the details.

5. What are the seven types of information systems used in business?

   The seven types of information systems used in business are: enterprise computing systems, transaction processing systems, business support systems, knowledge management systems, user productivity systems, digital assistants, and systems integration.

6. What types of information do the four organizational levels common to many businesses need?

*A typical organizational model identifies business functions and organizational levels, as shown in **Error! Reference source not found.**. A systems analyst must understand the company's organizational model to recognize who is responsible for specific processes and decisions and to be aware of what information is required by whom.*

***Top managers** develop long-range plans, called strategic plans, which define the company's overall mission and goals. To plot a future course, top managers ask questions such as "How much should the company invest in information technology?", "How much will Internet sales grow in the next five years?", or "Should the company build new factories or contract out production functions?" Top managers focus on the overall business enterprise and use IT to set the company's course and direction. To develop a strategic plan, top managers also need information from outside the company, such as economic forecasts, technology trends, competitive threats, and governmental issues.*

*Just below the top management level, most companies have a layer of **middle managers** and **knowledge workers**. Middle managers provide direction, necessary resources, and performance feedback to supervisors and team leaders. Because they focus on a somewhat shorter time frame, middle managers need more detailed information than top managers but somewhat less than supervisors who oversee day-to-day operations.*

Knowledge workers include systems analysts, programmers, accountants, researchers, trainers, human resource specialists, and other professionals. Knowledge workers also use business support systems, knowledge management systems, and user productivity systems. Knowledge workers provide support for the organization's basic functions. Just as a military unit requires logistical support, a successful company needs knowledge workers to carry out its mission.

***Supervisors**, often called **team leaders**, oversee operational employees and carry out day-to-day functions. They coordinate operational tasks and people, make necessary decisions, and ensure that the right tools, materials, and training are available. Like other managers, supervisors and team leaders need decision support information, knowledge management systems, and user productivity systems to carry out their responsibilities.*

***Operational employees** include users who rely on transaction processing systems to enter and receive data they need to perform their jobs. In many companies, operational users also need information to handle tasks and make decisions that were assigned previously to supervisors.*

7. Compare three system development methods.

Many options exist for developing information systems, but the most popular alternatives are structured analysis, which is a traditional method that still is widely used, object-oriented (o-o) analysis, which is a more recent approach that many analysts prefer, and agile methods, which include the latest trends in software development. Figure 1-17 provides an overview of the three methods.

8. Name the tools that enable the systems analyst to develop, manage, and maintain large-scale information systems.

All systems development methods must be supported by tools to enable the systems analyst to develop, manage, and maintain large-scale information systems. These tools go by various names, including application lifecycle management (ALM), also called product lifecycle management (PLM); integrated development environments (IDE); and computer-aided systems engineering (CASE), also called computer-aided software engineering. CASE tools provide an overall framework for systems development and support a wide variety of design methodologies, including structured analysis and object-oriented analysis.

9. Summarize the seven main functions of the IT department.

The IT department develops and maintains information systems. The IT group provides technical support, which includes seven main functions: application development, systems support and security, user support, database administration, network administration, web support, and quality assurance. These functions overlap considerably and often have different names in different companies.

10. What are the roles and responsibilities of a systems analyst in a modern business?

A systems analyst investigates, analyzes, designs, develops, installs, evaluates, and maintains a company's information systems. To perform those tasks, a systems analyst constantly interacts with users and managers within and outside the company. A systems analyst helps develop IT systems that support business requirements. To succeed, analysts often must act as translators. For example, when they describe business processes to programmers, they must speak a language that programmers will understand clearly. Typically, the analyst builds a series of models, diagrams, and decision tables and uses other descriptive tools and techniques. Similarly, when communicating with managers, the analyst often must translate complex technical issues into words and images that nontechnical people can grasp. To do this, the analyst uses various presentation skills, models, and communication methods.

Analysts are often the company's best line of defense against an IT disaster—a system that is technically sound but fails because it does not meet the needs of users and managers. When this occurs, poor communication is usually to blame. For an analyst, the most valuable skill is the ability to listen. An effective analyst will involve users in every step of the development process and listen carefully to what they have to say. As the process continues, the analyst will seek feedback and comments from the users. This input can provide a valuable early warning system for projects that might other- wise go off the track.

Discussion Topics

1. Some experts believe that the growth in e-commerce will cause states and local governments to lose tax revenue, unless Internet transactions are subject to sales tax. What is one argument that supports this view, and one that opposes it?

*This issue has sparked strong differences of opinion among national and state leaders, consumer advocacy groups, and trade associations whose members offer online sales and services. Those who believe that Internet transactions should not be taxed often point to other sales channels, such as mail order firms that conduct no physical operations within a state or locality, and therefore do not collect sales tax. Should the Internet be treated differently? Opponents of a tax-free Internet often cite the impact on local and state government, and suggest that **all** channels should operate on a level playing field. You might ask your students to research and debate this issue. Also, you might follow this topic as news occurs during the course.*

2. When team members are geographically dispersed, communication becomes more challenging. Explain how groupware can increase user productivity in this context.

*Companies provide employees at all levels with technology that improves productivity. User productivity systems include groupware, which enables users to share data, collaborate on projects, and work in teams – irrespective of where they are physically located. One popular groupware product is Slack, shown in **Error! Reference source not found.**. Slack provides common app integration and unified communication channels for distributed teams.*

3. Under what circumstances should a systems analyst recommend an agile methodology over structured development or object-oriented analysis?

Although most projects utilize one approach, it is not unusual for system developers to mix and match methods to gain a better perspective. In addition to these three main development

methods, some organizations choose to develop their own in-house approaches or use techniques offered by software suppliers, tool vendors, or consultants. Many alternatives exist, and IT experts agree that no single development method is best in all cases. An approach that works well for one project might have disadvantages or risks in another situation. The important thing is to understand the various methods and the strengths and weaknesses of each approach.

Although agile methods are becoming popular, analysts should recognize that these approaches have advantages and disadvantages. By their nature, agile methods can allow developers to be much more flexible and responsive but can be riskier than more traditional methods. For example, without a detailed set of system requirements, certain features requested by some users might not be consistent with the company's larger game plan.

Other potential disadvantages of agile methods can include weak documentation, blurred lines of accountability, and too little emphasis on the larger business picture. Also, unless properly implemented, a long series of iterations might actually add to project cost and development time. The bottom line is that systems analysts should understand the pros and cons of any approach before selecting a development method for a specific project.

4. Should the IT director report to the company president, or somewhere else? Does it matter?

No clear organizational pattern exists. Perhaps the strongest case for having the IT department report to the president is that information technology is a vital corporate asset, and should not be "owned" by a particular department or function. IT can have a huge impact on profitability, and deserves equal attention from the top executive.

However, not everyone agrees with this view, and many would argue that IT should report to the chief financial officer, because financial functions require the most IT support. Also, the operation of the IT department represents a large expense for most companies, and the chief financial officer probably is in the best position to monitor and control this expense.

5. Rapid advancements in areas such as machine learning and predictive analytics in data science are affecting the daily operations of many IT departments. What should a systems analyst do to stay current?

The demand for systems analysts is expected to remain strong. Systems analysts need to track trends in information technology because technological changes affect business operations, career opportunities, and enterprise strategies. As depicted in Figure 1-31, many of the developments related to big data are driving trends in information technology – trends the system analyst must follow to stay current.

Projects

1. Contact three people at your school who use information systems. List their positions, the information they need, the systems they use, and the business functions they perform.

Students can perform this task as individuals or work in teams. It might be interesting to compare and discuss the various ways in which the departments manage information.

2. Visit three websites to learn more about agile system development. Prepare a list of the sites you visited and a summary of the results.

Many sites describe and discuss agile methods. Students should have no trouble finding material on agile methods and spiral models and preparing a summary of the results. Several sites are shown in the text, and a simple search will produce a list of many more.

3. Model-based systems engineering (MBSE) is one of the leading methods used by systems analysts to develop information systems. Cameo Systems Modeler is one of the leading tools supporting MBSE. Research magazine articles and the web to learn more about this tool's

capabilities. Identify three of its strengths in terms of improving the quality of the finished product.

Cameo Systems Modeler is a well-known product with many sources of information about the tool available to the students. To limit the scope of the investigation, have the students focus on using the tool specifically to improve product quality.

4. Explore the *Critical Thinking Community* website at *criticalthinking.org*. Identify three important topics currently being discussed, and describe your findings.

You might encourage students to explore beyond the suggested link and challenge them to identify additional resources and issues. Also consider asking them to examine their own approach to learning, and whether they would consider themselves to be critical thinkers.

5. Compare the corporate culture of three leading IT companies and show how their statement of values could attract (or repel) systems analysts from joining their organization.

It would be insightful for examine a traditional company, such as IBM, which has an established but dynamic corporate culture that has withstood the test of time. Newer companies such as Facebook are also quite large, but their culture originates in a different space than that of IBM. The culture of a Silicon Valley startup is different yet again, and the type of employee they seek may have different professional goals – particularly if they are at the start of their career.

Chapter 2: Analyzing the Business Case

Chapter 2 – Analyzing the Business Case: Chapter 2 explains how to analyze a business case. This chapter also explains why it is important to understand business operations and requirements, how IT projects support a company's overall strategic plan, how systems projects get started, and how systems analysts conduct a feasibility study and perform preliminary investigations, which concludes with a report to management.

Questions

1. Why should a systems analyst be interested in strategic planning?

   Strategic planning is the process of identifying long-term organizational goals, strategies, and resources. A strategic plan looks beyond day-to-day activities and focuses on a horizon that is three, five, ten, or more years in the future. The IT team must deliver IT resources to support the firm's long-term strategic goals. Therefore, IT managers and systems analysts must understand and participate in strategic planning activities.

2. List the four factors involved in a SWOT analysis.

   During strategic planning, top managers ask a series of questions that is called a SWOT analysis because it examines a company's strengths (S), weaknesses (W), opportunities (O), and threats (T). Each question leads to an IT-related issue, which in turn requires more review, analysis, and planning.

3. Describe how CASE tools can support strategic planning.

   Many organizations still rely on the IT group to provide guidance when it comes to selecting tools to support strategic planning activities. Some analysts stick to traditional text-based methods, using Microsoft Word tables, to provide structure and clarity. Others prefer a spreadsheet, such as Microsoft Excel, because it is easy to display priorities and the relative importance of planning assumptions.

   *A more sophisticated approach is to use a CASE tool to define and document the overall environment. Such tools can integrate various statements, entities, data elements, and graphical models into an overall structure. The result is more consistency, better quality, and much less effort for the system analyst. **Error! Reference source not found.** shows a cloud-based road mapping software product from Aha! that provides integrated support for product strategy visioning and strategy development.*

4. List five questions the business case should answer.

   The business case should answer questions such as the following:

   - *Why are we doing this project?*

   - *What is the project about?*

   - *How does this solution address key business issues?*

   - *How much will it cost and how long will it take?*

   - *Will we suffer a productivity loss during the transition?*

   - *What is the return on investment and payback period?*

   - *What are the risks of doing the project? What are the risks of not doing the project?*

   - *How will we measure success?*

- *What alternatives exist?*

5. What are the six main reasons for systems requests?

   *As **Error! Reference source not found.** shows, the six main reasons for systems requests are stronger controls, reduced cost, more information, better performance, improved service to customers, and more support for new products and services.*

6. Explain the two main factors affecting systems requests.

   *Internal and external factors affect every business decision that a company makes, and IT projects are no exception. **Error! Reference source not found.** shows internal and external factors that shape corporate IT choices. Internal factors include the strategic plan, top managers, user requests, information technology department, existing systems and data, and company finances. External factors include technology, suppliers, customers, competitors, the economy, and government.*

7. Describe the role of the systems review committee in processing systems requests.

   In most organizations, the IT department receives more systems requests than it can handle. Many organizations assign responsibility for evaluating systems requests to a group of key managers and users. Many companies call this group a systems review committee or a computer resources committee. A committee approach provides a variety of experience and knowledge. With a broader viewpoint, a committee can establish priorities more effectively than an individual, and one person's bias is less likely to affect the decisions.

8. Define operational, economic, technical, and schedule feasibility.

   *As shown in **Error! Reference source not found.**, a feasibility study uses four main yardsticks to measure a proposal: operational feasibility, economic feasibility, technical feasibility, and schedule feasibility. Operational feasibility means that a proposed system will be used effectively after it has been developed. Economic feasibility means that the projected benefits of the proposed system outweigh the estimated costs usually considered the total cost of ownership (TCO), which includes ongoing support and maintenance costs, as well as acquisition costs. Technical feasibility refers to the technical resources needed to develop, purchase, install, or operate the system. Schedule feasibility means that a project can be implemented in an acceptable time frame.*

9. List seven questions the systems analyst should consider when assessing project priorities.

   After rejecting systems requests that are not feasible, the systems review committee must establish priorities for the remaining items. When assessing a project's priority, a systems analyst should consider the following:

   - *Will the proposed system reduce costs? Where? When? How? By how much?*

   - *Will the system increase revenue for the company? Where? When? How? By how much?*

   - *Will the systems project result in more information or produce better results? How? Are the results measurable?*

   - *Will the system serve customers better?*

   - *Will the system serve the organization better?*

   - *Can the project be implemented in a reasonable time period? How long will the results last?*

   - *Are the necessary financial, human, and technical resources available?*

10. What are the five steps of a preliminary investigation?

*A systems analyst conducts a preliminary investigation to study the systems request and recommend specific action. After obtaining an authorization to proceed, the analyst interacts with managers, users, and other stakeholders, as shown in the model in **Error! Reference source not found.**. During a preliminary investigation, a systems analyst typically follows a series of steps, as shown in Figure 2 14. The exact procedure depends on the nature of the request, the size of the project, and the degree of urgency. The five steps of a preliminary investigation are: understand the problem or opportunity; define the project scope and constraints; perform fact-finding; analyze project usability, cost, benefit, and schedule data; and evaluate feasibility.*

Discussion Topics

1. One of your coworkers says, "Mission statements are nice, but they really don't change things down here where the work gets done." How would you reply?

   Remind students of the famous story of the airline pilot who informed the passengers that there was bad news and good news. The bad news was that they were lost, but the good news was that they were making great time. The obvious point is that without a long-term mission, an organization cannot establish goals, objectives, and milestones. The real challenge for a company is to motivate employees to feel that they are contributing directly and significantly to the organization's success.

2. Discuss how a company's financial status can affect systems projects.

   A company's financial status is one of the internal factors that can affect system projects. If the company is going through a difficult time, the project may be postponed until there is more cash available to finance the effort. On the other hand, if the company is enjoying financial success, the decision to embark on a new project may be easier to make.

3. The vice president of accounting says to you, the IT director, "This request procedure takes too long. My people know what they are doing, and their systems requests are necessary and important." She suggests that the IT department bypass the initial steps and immediately get to work on her requests. What would you say to her?

   You must answer two points in the vice president's statement. The first point is that the accounting department requests should bypass the approval and priority-setting process. The second point is that the initial phases of the systems development life cycle are unnecessary.

   To respond to the first point, you should point out that the purpose of the approval cycle is to recognize and reject those projects that are unnecessary or impractical. The approval cycle, therefore, poses no threat to worthy accounting department projects. Even more critical is the setting of priorities for the approved systems requests, all of which presumably are important and necessary. Most often, the total time necessary to complete approved systems requests exceeds the available information systems staff time. Information systems staff time is a scarce resource that must be managed wisely. Priority must be given those projects that are considered the most necessary and most valuable to the entire organization. Even one systems request bypassing the approval and priority-setting cycle could, therefore, harm the organization.

   It is possible that the vice president of accounting complained because the organization's approval and priority-setting cycle takes too long, unnecessarily delaying the start of critical projects. You should check this out; perhaps these procedures could be streamlined and improved.

   To answer the second point, you should explain a problem cannot be solved without first understanding it. The systems development life cycle was developed as a logical series of steps to respond to feasible systems requests. Unnecessarily bypassing any one step could result in an inferior solution to the systems request.

4. When setting priorities for system requests, the highest priority goes to projects that provide the greatest benefit, at the lowest cost, in the shortest period of time. How would you reconcile projects that can produce good results in the short term versus projects that can produce excellent results in the long term?

With the mission statement as a backdrop, a firm develops short-term goals and objectives. For example, the company might establish one-year, three-year, and five-year goals for expanding market share. To achieve those goals, the company might develop a list of shorter-term objectives. However, a systems analyst also has to consider the company's strategic plan, which looks beyond day-to-day activities and focuses on a horizon that is three, five, ten, or more years in the future.

5. The final task in the preliminary investigation is to summarize the results and recommendations in a report and/or in a presentation. Which form of communication, written or oral, do you think is the most effective for conveying your findings to management?

The final task in the preliminary investigation is to summarize the results and recommendations, which can be conveying to management in a report and/or in a presentation. The written report and the oral presentation are examples of the need for systems analysts to develop strong communications skills. The report includes an evaluation of the systems request, an estimate of costs and benefits, and a case for action, which is a summary of the project request and a specific recommendation.

The specific format of a preliminary investigation report varies. The most effective form of conveying information depends on the skills of the author (the systems analyst) and preferences of the audience (the manager). There is no general "best method."

Projects

1. Use the Internet to find three examples of corporate mission statements.

Students should have no trouble locating three examples of mission statements. Perhaps the easiest method would be to search on the phrase "mission statement." You also might encourage students to share the mission statement of the company for which they work and analyze the mission statement of your school or organization, if it has one.

2. Prepare a SWOT analysis of your school or your employer.

A SWOT analysis examines a firm's technical, human, and financial resources. The student's SWOT analysis should address the following questions:

- *What are our strengths, and how can we use them to achieve our business goals?*

- *What are our weaknesses, and how can we reduce or eliminate them?*

- *What are our opportunities, and how do we plan to take advantage of them?*

- *What are our threats, and how can we assess, manage, and respond to the possible risks?*

3. A mind map is a diagram used to visually organize information. Identify a tool that supports the creation of mind maps and explain how they can be a valuable part of strategic planning.

Mind maps, balanced scorecards, and gap analysis are all valuable techniques that can be part of strategic planning in an organization. There are several tools available that support the creation and/or use of mind maps for strategic planning. Have the students focus on this aspect of the tool's capabilities.

4. Visit the website for an IT magazine and find an article that discusses business cases. Summarize the article and what you learned from it.

Answers will vary. Students should easily locate more than enough sources to come up with a good understanding of what a business case is, and why it is important.

5. Think of a problem you have experienced at school or at work and draw a sample fishbone diagram with at least two levels.

*A popular technique for investigating causes and effects is called a fishbone diagram, as shown in **Error! Reference source not found.**. A fishbone diagram is an analysis tool that represents the possible causes of a problem as a graphical outline. When using a fishbone diagram, an analyst first states the problem and draws a main bone with sub-bones that represent possible causes of the problem. In each area, the analyst identifies possible causes and draws them as horizontal sub-bones. In this manner, the analyst adds additional sub-bones to the diagram, until he or she uncovers root causes of a problem, rather than just the symptoms.*