Chapter 2 discussed business processes and data. As seen from the narratives used in Chapter 2, we usually describe business processes in greater detail than in other courses, such as a financial accounting course. We developed the notion of events to help you organize your thinking about business processes. Finally, we explained AIS data in terms of these business events and transaction cycles. Chapter 3 will continue our focus on business processes and AIS data. Our objective is to help you organize information about business processes in an easy-to-understand graphical form and understand graphical representations that others have developed. We will use activity diagrams in future chapters as an aid in evaluating internal control (Chapter 4) and in documenting details of revenue and acquisition cycles (Chapters 9–11).

The process of diagramming systems has many benefits. For accountants, as evaluators of systems and as auditors, activity diagrams provide a more systematic way to analyze a company’s processes. Diagrams highlight key aspects of a business process (e.g., responsibilities, events, documents, and tables). As you will see in Chapter 4, accountants consider these elements in understanding risks in the business process and in highlighting internal control problems. SAS No. 941 recognizes the usefulness of such documentation techniques and suggests that auditors use them as needed, especially for complex systems with a large number of transactions. As designers and consultants, the discipline required for diagramming helps ensure that the analysis and design effort is thorough. Accountants often obtain information from a variety of sources. By synthesizing the information and developing diagrams, they can obtain a better understanding of

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the system. Finally, activity diagrams are simple and easy for users with little training to read. Thus, such diagrams offer an effective way of communicating information about business processes and accounting systems to users.

**The UML Activity Diagram**

Several techniques are available for documenting business processes. In this text, we use the **unified modeling language (UML)**, a language used for specifying, visualizing, constructing, and documenting an information system. UML was developed as a tool for object-oriented analysis and design by Grady Booch, Jim Rumbaugh, and Ivar Jacobson. However, it can be used to understand and document any information system. The UML is increasingly being used in industry. It is an open standard that has established itself as the common modeling language throughout the software and systems development industry. The standard continues to be developed and updated under the control of the **Object Management Group (OMG)**, an open membership, not-for-profit consortium of companies in the computer industry. Current voting members include such companies as Borland, Hewlett-Packard, Rational Software, Raytheon, Sun Microsystems, Unisys, and the W3 Consortium (which is responsible for setting standards for HTML and XML). Another reason for our choice of UML is that it provides an inventory of diagrams for documenting business processes and information systems. We will use different UML diagrams throughout this text. Chapter 3 focuses on UML activity diagrams. In other chapters, we will discuss UML class diagrams and use case diagrams. In the following paragraphs, we introduce the characteristics of diagrams with a simple analogy.

Assume that you want to take a vacation. You have decided to drive to your destination, a city several hundred miles away from your home. Considerable detail might be involved in understanding the directions to the new place. If these directions are given to you in narrative form, you may find it difficult to grasp and remember all the information. Instead of written instructions, a map, which is a graphical representation, might make it easier for you to find your destination.

We face the same challenge as the traveler when studying accounting systems. For example, in Chapter 4, you will use detailed descriptions of business processes to understand risks and controls. These descriptions can be overwhelming. A graphical representation, rather than a narrative alone, can facilitate your understanding. The **UML activity diagram** plays the role of a “map” in understanding business processes by showing the sequence of activities in the process. Glance ahead at Example 3.2 on page 63 to see an example of such a diagram. Even though you may never have seen an activity diagram before, you can still comprehend it in a general way. UML activity diagrams and maps have several common characteristics that make them useful:

- Both maps and activity diagrams provide graphical representations of information that are easier to comprehend than narrative descriptions.
- Maps use standard symbols to convey information (e.g., highway names, distances, and state parks). Similarly, activity diagrams use standard symbols to represent various elements of a business process (e.g., events, agents, documents, and files).
- Maps and activity diagrams are prepared by experts but can be read by users with little training. Consistent use of a relatively small set of symbols in maps and activity diagrams makes it easy for readers to understand them.
- Both maps and activity diagrams can provide high-level, as well as low-level, views. A traveler might use a high-level map to understand routes between cities and a more detailed map to see the streets in the city of destination. Similarly, activity diagrams can be created to show an overview of a process. If one needs to take a closer look at individual events, a detailed activity diagram can be created for a single event.
Overview and Detailed Activity Diagrams

In this text, we organize activity diagrams into two types:

- The overview diagram presents a high-level view of the business process by documenting the key events, the sequence of these events, and the information flows among these events.

- The detailed diagram is similar to a map of a city or town. It provides a more detailed representation of the activities associated with one or two events shown on the overview diagram.

The UML is flexible and allows activity diagrams to be constructed at different levels of detail. We organize activity diagrams into overview and detailed diagrams because we find this approach useful in documenting and analyzing internal controls, an important objective of this text.

UML is one of many approaches that can be used to model AIS. Although we use UML extensively throughout this text, you might encounter other ways of documenting business processes during your professional career. Two common techniques include data flow diagrams (DFDs) and systems flowcharts. Returning to our travel analogy, the different techniques essentially represent various ways of drawing maps. Both symbols and the organization of information about business processes can be changed. Regardless of which technique you use in a particular situation, you must identify components such as events, agents, documents, and files. Our focus is on helping you understand these components and their organization.

The remainder of this chapter is divided into two parts. Part I, “Overview Activity Diagrams” and Part II, “Detailed Activity Diagrams.” Depending on the depth of knowledge desired, the reader may choose to focus on Part I without reading Part II. For most, an understanding of overview diagrams will be sufficient for understanding the activity diagrams presented in the remaining chapters.

PART I  OVERVIEW ACTIVITY DIAGRAMS

This part is divided into two sections. The first section is an introduction and focuses on understanding overview activity diagrams. The second section focuses on preparing overview activity diagrams.

UNDERSTANDING OVERVIEW ACTIVITY DIAGRAMS

Before we explain how to draw an activity diagram, you should learn how to read one. This section of the chapter explains how you can interpret activity diagrams. Recall the revenue cycle for Angelo’s Diner in Chapter 2. Example 3.1 shows the same narrative, except that it is organized according to the events in the process that were identified in Chapter 2. Review Example 3.1 carefully because we will be using this example throughout the chapter.

Example 3.1
Annotated Narrative—Events

Angelo’s Diner

Event 1: Take order. The customer arrives and sits at a table or at the counter. If a table is not available, the customer waits in the waiting area. When a table becomes available, the customer sits at the table. When the customer is ready to order, he calls the server. The server records the customer’s order on a prenumbered sales ticket.

(continued)
Example 3.2 displays the overview activity diagram that illustrates the events described in Example 3.1. We will be taking a careful look at this diagram to understand its organization and symbols.

The various elements of Angelo’s business process, represented in Example 3.2, are described next. We have highlighted these elements (e.g., events, people, documents and tables) as well as the corresponding activity diagram symbols.

- Example 3.1 identifies six events for which the server, kitchen staff, cashier, and manager are responsible. The six events are shown in swimlanes. A swimlane is a column in an activity diagram that separates activities or events according to the person or department responsible for the particular event or activity.

- Agents outside the organization (e.g., the customer) are also represented by swimlanes.

- Finally, the computer system (the register in this case) used to record and process AIS data is represented by a swimlane.

- A solid circle represents the start of the process. It appears in the swimlane of the agent (inside or outside the organization) who initiates the process. In Angelo’s Diner, the revenue process is initiated by the customer. Hence, the solid circle is shown in the Customer column.

- The six events are shown by rounded rectangles.

- Recall that we focus on responsible employees or departments within the organization while identifying events. However, people outside the organization often

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**Event 2: Prepare food.** The server gives the sales ticket to the kitchen staff. The kitchen staff prepares the meal using the information on the sales ticket.

**Event 3: Serve food.** When the meal is ready, it is placed on the shelf between the kitchen and dining area. The server picks up the meal and the sales ticket from the shelf and serves the food. While the customer is eating, the server enters the prices on the sales ticket and leaves it at the customer’s table.

**Event 4: Ring up sale.** The customer gives the cash and the completed sales ticket to the cashier. The cashier enters the code of each item. The register uses the price lookup tables stored in the register to display the price. After all the items have been entered, the register displays the total. The register stores the information about sales of various items during the day. The cashier puts the cash in the drawer and gives the customer the appropriate amount of change.

**Event 5: Close register.** At the end of each shift, the cashier closes the register. The cashier then prints the sales summary.

**Event 6: Reconcile cash.** The cashier gives the sales summary to the manager. The manager checks that all prenumbered sales tickets issued during the day have been collected. The manager then computes the total dollar amount of these tickets. Next, the manager counts the cash and compares this amount with the total shown on the sales summary and the total of the sales tickets.
initiate events. Two events in Angelo’s business process are initiated by people outside the organization.

- Event 1 is initiated when the customer orders.
- Event 4 is initiated when the customer takes the completed sales ticket to the cashier.
In information systems, we call the customer’s action a **trigger** that causes an agent inside the organization to perform some subsequent action. Two additional rounded rectangles (Order food and Pay cash) correspond to these triggers on the activity diagram.  

- Continuous lines with arrows are used to show the sequence of events. Note that there is an arrow from the trigger to the event for Events 1 and 4. For the other events, we have shown an arrow from the immediately preceding event.

- We use a document symbol to represent source documents and reports. The following symbol represents a sales ticket. In UML, the capital letter(s) followed by a colon (e.g., S:) before the name of the document represents the fact that we are referring to a typical document created during the process. We indicate the status of the object below its name. For example, initially, we mark the status of the order as “in progress.” After the server enters the price, we change the status to “completed.” Status information can help readers see what happens to documents as they flow between events.

- Dotted lines with arrows are used to represent the flow of information between events. For example, the server prepares the sales ticket (dotted arrow from Take order to Sales ticket). This document acts as a trigger for the kitchen staff (dotted arrow from Sales ticket to Prepare food).

- Data may be read from or recorded in computer files during business events. The following table symbol shows an Inventory table. The words *table* and *file* can be used interchangeably. In Chapter 2, we used the word *file* to represent a master file, a transaction file, or the data stored in one of these files. In database systems, the word *table* is usually used. Since we focus on relational databases in the chapters on AIS applications, we will predominately use the word *table* instead of *file* from now on.

- Dotted lines are used to connect events and tables to show how table data are created or used by events. For example, the dotted line to the Sale table represents the sale being recorded.

- A bull’s-eye represents the end of the process.

Complete the requirements in Focus on Problem Solving exercise 3.a in the end-of-chapter section to test your understanding of basic symbols used in activity diagrams. The next section explains how to prepare activity diagrams.

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2 Some events were triggered by other events earlier in the business process rather than by agents outside the organization. For example, the server triggers the “Prepare food” event by giving the sales ticket to the kitchen staff. No additional rounded rectangle was needed to represent this trigger. The reason is that the server’s action (Take order) is already represented as an event. In contrast, the customer’s actions were not represented as separate events. Hence, rounded rectangles were added to clarify that the customer’s actions initiated the server’s (and cashier’s) activities.
PREPARING OVERVIEW ACTIVITY DIAGRAMS

The previous section explained how to read an overview activity diagram, using basic symbols whose meanings were explained. This section provides detailed guidelines on creating overview activity diagrams. The steps that you will use are briefly stated in Key Point 3.1.

Key Point 3.1  Steps for Preparing Overview Activity Diagrams

Preliminary Steps:

Step 1: Read the narrative and identify key events. Use the guidelines in Chapter 2 to identify events.

Step 2: Annotate the narrative to clearly show event boundaries and event names.

Steps for Preparing the Activity Diagram:

Step 3: Represent agents participating in the business process using swimlanes.

Step 4: Diagram each event. Show the sequence of these events.

Step 5: Draw documents created and used in the business process. Show the flow of information from events to documents, and vice versa.

Step 6: Draw tables (files) created and used in the business process. Show the flow of information from events to tables, and vice versa.

We will use the Angelo’s Diner case throughout this section to illustrate these steps. For each step, we will show you how that step was applied in building the overview activity diagram for Angelo’s Diner. You have already seen the finished product as Example 3.2 in the previous section. Now, we will show you how we developed it.

For each step, you will then be asked to complete a related Focus on Problem Solving exercise for Westport Indoor Tennis. After completing all of the exercises, you will have a complete overview activity diagram.

Preliminary Steps Illustrated

Step 1: Read the narrative and identify key events. Before you can prepare overview activity diagrams, you must recognize events.

Angelo’s Diner: We read the narrative from Chapter 2 and identified the start of each new event using the guidelines provided in Chapter 2. Example 3.1 shows the events in this business process.

As instructed in Focus on Problem Solving exercise 3.b in the end-of-chapter section, read the narrative about Westport Indoor Tennis and determine the events.

Step 2: Annotate the narrative to clearly show event boundaries and event names. Guidelines on naming events are as follows:
a. Use broad names that reflect the purpose of the event (e.g., Make reservation, Ship goods, etc.).

b. Avoid names that focus on detailed steps in the event (e.g., Key in reservation).

c. Be specific. Avoid names such as “Process information.” Information is a general word and does not convey much content to your reader. Use more precise event names (e.g., Process order or Prepare sales order).

d. Start event names with a verb. For example, name the event “Process orders” rather than “Order processing” or “Order system.”

e. Do not include employee or department names in event names. For example, use the name “Process order” rather than “Sales clerk processes orders.” Activity diagrams provide a distinct way of representing responsibilities. If you include employee names in the event name, you will unnecessarily use long event names that provide no additional information.

The annotated narrative for Angelo’s Diner is shown in Example 3.1 on pages 61–62. Focus on Problem Solving exercise 3.c in the end-of-chapter section requires you to prepare an annotated narrative. Use the format in Example 3.1.

**Preparing the Activity Diagram Illustrated**

**Step 3: Represent people or devices participating in the business process using swimlanes.** Guidelines for representing people or devices include the following:

a. Create a swimlane for each person or department responsible for various events in the narrative.

b. Create a swimlane for entities outside the organization that initiate events in the process (e.g., customer or supplier).

c. Create a swimlane for the computer system. This text focuses on computerized AIS. Computer terminals, printers, registers, and similar devices, may be considered a part of the computer system. It may be better to view these devices as a single agent rather than as separate agents. However, in some situations, the documentation will be more informative if actors are not combined this way. For example, the main computer system and the handheld devices used by salespeople may be shown as separate agents. We will generally not show any events in the Computer column, because a human rather than a computer is usually responsible for the event. However, the human agent responsible for the event often records information on the computer (see discussion of master and transaction files in Chapter 2). We will show the data stored in the computer system in the Computer column in order to represent the effects of the events on AIS data. Later in the chapter, we will construct detailed activity diagrams in which we will show the activities performed by the computer.

d. Write the name of the appropriate person or department in the swimlane. Make sure that actor names are specific (use cash receipts clerk rather than employee).

**Common errors in representing people or devices that should be avoided.** Students sometimes set up columns for ledgers or documents. Computer systems are represented as a swimlane because the computer can perform actions. However, documents, files, ledgers, and binders cannot perform any activity. Do not set up swimlanes for such objects.

The swimlanes that we developed for Angelo’s Diner are shown in Example 3.3.
Step 4: Diagram each event, and show the sequence of events in the business process.
Guidelines for documenting events and the sequence of events are as follows:

a. Draw a solid circle to represent the start of the process. The solid circle is shown in
the swimlane for the agent (inside or outside the organization) who initiates the
process. In Angelo’s Diner, it is drawn in the Customer column.

Start with the first event.

b. If the event is triggered by an agent outside the organization, show a rounded rectan-
gle for the trigger. For example, Event 1 is initiated when the customer calls the server
to give an order. The rounded rectangle “Order food” represents this trigger.

c. Set up a rounded rectangle for the event in the swimlane of the person or depart-
ment within the organization who is responsible for the event. For example, a rounded rectangle “Take order” is set up in the Server column.

d. If the event is triggered by an agent outside the organization, connect the trigger (see Step b) to the event with a continuous line.

e. Otherwise, connect the previous event to the current event with a continuous line.

Repeat Steps b through e for each subsequent event.

f. Draw a bull’s-eye to represent the end of the process. Set up the bull’s-eye in the swimlane for the agent performing the last event. Connect the last event to the bull’s-eye with a continuous line.

Common errors in documenting events and sequences of events include the following:

a. All the events identified in Steps 1 and 2 are not shown on the activity diagram.

b. Additional events not identified in Steps 1 and 2 are shown on the activity diagram.

c. Continuous lines connecting events are not shown.

d. Events are labeled with agent names. Agent names should not be included in event names because agent names are represented in swimlanes. For example, it is unnecessary to label an event “Server takes order.” The fact that “Take order” is in the Server swimlane conveys who is responsible for the event.

e. Event names are not consistent with the names identified in Step 2.

Following the guidelines for Step 4, we added events to the activity diagram in Example 3.4.

Show the sequence of events for Westport Indoor Tennis by completing the Focus on Problem Solving exercise 3.e. in the end-of-chapter section.

**Step 5: Draw documents created and used in the business process. Show the flow of information from events to documents, and vice versa.** Guidelines for representing documents and document flows include the following:

a. Draw a document symbol below the event that creates or modifies a document.

b. Draw dotted lines to connect events and documents as follows:

- Draw a flow from an event to a document to show that a document is being prepared or modified by the event. For example, Example 3.5 shows a flow from the “Take order” event to the Sales ticket.

- Draw a dotted line from a document to an event to show that information on a document is being reviewed or used by the event or activity. In the example diagram, one such flow is the flow from the Sales ticket to the “Prepare food” event.

- If a document appears multiple times during the process, add status information showing how the object changes during the business process. For example, the sales ticket initially has the status “in progress.” The status is changed to “completed” once the meal is served. In an ideal situation, the status of the ticket would not change once it is completed by the server. However, if the prices entered by the server do not agree with the price lookup table, corrections may be made. Thus, we change status of “completed” sales ticket to “paid” once the cashier rings up the sale. There is usually no need to show a document symbol again (after its creation) unless it is modified or updated. Sometimes, for clarity, we may repeat the same document (or a modified version of one shown earlier) in the swimlane of the agent.
c. Note that we focus on events that use, create, or modify documents. We do not show the physical transfer of objects. For example, the sales ticket must be physically given by the kitchen staff (Prepare food) to the server (Serve food). We do not show an arrow from “Prepare food” to the sales ticket, and from the sales ticket to “Serve food” to avoid confusion. For example, if we showed the flows, a reader might think that the “Prepare food” activity changes the sales ticket. Also, these additional object symbols and flows complicate the diagram without adding much value. Since the sales ticket is used by the kitchen staff and then again by the server, we can easily infer that it is given to the server by the kitchen staff.

Common errors in representing documents and document flows include the following:

a. Verbs (e.g., Send sales ticket) are mistakenly used in naming documents. The dotted lines represent information flows. Hence, we do not need verbs in the document names.
b. Documents are not connected to events. Make sure all important flows are shown.

One of the major benefits of an activity diagram is that it helps you understand the flow of information in an AIS. As you will see in Chapter 4, information flows are very important in analyzing internal control.

Following the guidelines for Step 5, we added documents to the activity diagram in Example 3.5.

Perform the requirements in Focus on Problem Solving exercise 3.f in the end-of-chapter section for Westport Indoor Tennis.
Step 6: Draw tables (files) created and used in the business process. Show the flow of information from events to tables, and vice versa. Guidelines for representing tables and flow of information to and from tables include the following:

a. Show computer tables in the Computer column. Only the computer system can read or write information from or to these tables.

b. Draw a flow from a table to an event to represent the fact that information in a table is being reviewed or used by the event.

c. Draw a flow from an event to a table to show that a record is being created or updated by the event or activity. Thus, we can see that the Sale and Inventory Tables are being modified by the preceding record and updated activities.

d. Include status information to show how the object changes during the business process. For example, the quantity of the inventory item changes during the sales process.

Common errors in representing tables and flow of information to and from tables include the following:

a. Tables are named with verbs (e.g., Record order or Update inventory). Use nouns (e.g., Order or Inventory) to label tables.

b. Table attributes are listed instead of table names. Table names are a more compact way of representing tables on activity diagrams. Labeling individual attributes makes the diagram harder to understand.

c. All flows between events and tables are not shown. As with documents, flow of information to and from tables is important in understanding accounting systems and controls. Make sure that you include all important flows.

Following the guidelines for Step 6, we added tables to the activity diagram in Example 3.6.

Perform the requirements in Focus on Problem Solving exercise 3.g in the end-of-chapter section for Westport Indoor Tennis.
Example 3.6
Angelo’s Diner
Overview Activity
Diagram: Documents
(Step 6)
PART II  DETAILED ACTIVITY DIAGRAMS

Like Part I, this part is divided into two sections. The first section is an introduction and focuses on understanding detailed activity diagrams. The second section focuses on preparing detailed activity diagrams.

UNDERSTANDING DETAILED ACTIVITY DIAGRAMS

This section introduces detailed activity diagrams. The overview diagrams discussed in previous sections are useful in understanding key events in a business process, the responsibility for these events, and the transfer of information between events. Even though thinking about business processes in terms of events is useful, accountants also have to consider detailed activities in each event. Detailed activity diagrams show information about activities in specific events. We repeat the information about typical activities from Chapter 2 in Key Point 3.2.

Key Point 3.2  Typical Activities in an Event

Chapter 2 identified several common activities including the following:

- Record information about an event (e.g., date, agents involved in an event, quantity and price of goods or services purchased or sold, etc.) on a source document.
- Record information about an event (e.g., date, agents involved in an event, quantity and price of goods or services purchased or sold, etc.) in a transaction file.
- Check information (e.g., availability of inventory, whether customer is in excess of credit limit, etc.) in computer files.
- Compare documents (e.g., picking ticket and packing slip).
- Set up reference data about entities (e.g., set up customer or inventory information).
- Update information about entities (e.g., update a customer’s balance due or the quantity of inventory on hand).
- Prepare a report or print a document.

Example 3.7 shows another annotated narrative for Angelo’s Diner. For preparing overview diagrams, we identified events in the business process. In order to prepare detailed activity diagrams, we need to recognize individual activities within each event. The superscript numbers indicate the specific activities. For example, the “Take order” event consists of five activities.

Example 3.7 also presents information in a simple two-column format called a workflow table. The actors performing specific activities are listed in the column on the left. The corresponding activities are listed on the right. The activities have been listed using verbs in active voice (e.g., arrives, sits, etc.). Because activities are shown in the swim-lane of the agent performing them, the workflow table makes it easy to prepare detailed activity diagrams.
Example 3.7  Annotated Narrative—Activities and Work Flow Table

Angelo’s Diner

Event 1: Take order. The customer arrives\(^1\) and sits\(^2\) at a table or at the counter. If a table is not available, the customer waits\(^3\) in the waiting area. When a table becomes available, the customer sits\(^4\) at the table. When the customer is ready to order, he or she calls the server.\(^5\) The server records\(^6\) the customer’s order on a prenumbered sales ticket.

Event 2: Prepare food. The server gives\(^7\) the sales ticket to the kitchen staff. The kitchen staff prepares\(^8\) the meal using the information on the sales ticket.

Event 3: Serve food. When the meal is ready, it is placed\(^9\) on the shelf between the kitchen and dining area. The server picks\(^10\) up the meal and the sales ticket from the shelf and serves\(^11\) the food. While the customer is eating, the server enters\(^12\) the prices on the sales ticket and leaves\(^13\) it at the customer’s table.

Event 4: Ring up sale. The customer gives\(^14\) the cash and the completed sales ticket to the cashier. The cashier enters\(^15\) the code of each item. The register uses the price lookup tables stored in the register to display\(^16\) the price. After all the items have been entered, the register displays\(^17\) the total. The register stores\(^18\) the information about sales of various items during the day. The cashier puts\(^19\) the cash in the drawer and gives\(^20\) the customer the appropriate amount of change.

Event 5: Close register. At the end of each shift, the cashier closes\(^21\) the register and then prints\(^22\) the sales summary.

Event 6: Reconcile cash. The cashier gives\(^23\) the sales summary to the manager. The manager checks\(^24\) that all prenumbered sales tickets issued during the day have been collected. The manager then computes\(^25\) the total dollar amount of these tickets. Next, the manager counts\(^26\) the cash receipts and compares\(^27\) this amount with the total shown on the sales summary and the total of the sales tickets.

<table>
<thead>
<tr>
<th>Actor</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer</td>
<td>1. Arrives at the diner.</td>
</tr>
<tr>
<td></td>
<td>2. Sits at a counter/table.</td>
</tr>
<tr>
<td></td>
<td>3. Waits in waiting area if table is not available.</td>
</tr>
<tr>
<td></td>
<td>4. Sits at a table when one is available.</td>
</tr>
<tr>
<td></td>
<td>5. Calls server.</td>
</tr>
<tr>
<td>Server</td>
<td>6. Records customer’s order on a prenumbered sales ticket.</td>
</tr>
<tr>
<td>Server</td>
<td>7. Gives the sales ticket to the kitchen staff.</td>
</tr>
<tr>
<td>Kitchen staff</td>
<td>8. Prepares the meal.</td>
</tr>
<tr>
<td>Server</td>
<td>10. Picks up meal and sales ticket.</td>
</tr>
<tr>
<td></td>
<td>11. Serves food.</td>
</tr>
<tr>
<td></td>
<td>12. Enters prices on sales ticket.</td>
</tr>
<tr>
<td></td>
<td>13. Leaves sales ticket at customer’s table.</td>
</tr>
<tr>
<td>Customer</td>
<td>14. Gives cash and completed sales ticket to cashier.</td>
</tr>
<tr>
<td>Cashier</td>
<td>15. Enters item code.</td>
</tr>
<tr>
<td>Register</td>
<td>16. Displays price.</td>
</tr>
<tr>
<td></td>
<td>17. Displays total.</td>
</tr>
<tr>
<td></td>
<td>18. Stores sales data.</td>
</tr>
<tr>
<td>Cashier</td>
<td>19. Puts the cash in the drawer.</td>
</tr>
<tr>
<td></td>
<td>20. Gives change to customer.</td>
</tr>
</tbody>
</table>
Examples 3.8, 3.9, 3.10, and 3.11 show a set of detailed activity diagrams for Angelo’s Diner. Example 3.8 shows the diagram for the first event (Take order). We have prepared a single activity diagram (Example 3.9) for the next two events (Prepare food and Serve food) because the two are closely related and not much detail is available.
about the “Prepare food” event. Example 3.10 is the detailed diagram for the next event (Ring up sale). Finally, we have combined the next two events (Close register and Reconcile cash) into one detailed diagram (Example 3.11). Again, these two events are closely related and not much detail is available about Event 5. We have included the activity numbers from the workflow table as superscripts in these figures. These superscripts will help you understand the relationships among the workflow table, the overview activity diagram, and the detailed activity diagrams. Since such annotation is not necessary, we have not included it in the problem-solving solutions at the end of the chapter.

Note that the same symbols are used in the detailed diagram as in the overview diagram. The rounded rectangle represents things that people or departments do during a business process. The difference lies in the detail. On the overview diagram, we show the entire event by one rounded rectangle. On the detailed diagram, we show each activity that occurs within an event with a separate rounded rectangle. Similarly, responsibility for activities and information flows are represented in the same way as in an overview diagram.

We will use two additional symbols in detailed diagrams: a branch and a note.

- A diamond symbol is used to show a branch in activity diagrams. A branch is a point where processing splits into two or more paths. For example, in Example 3.6, the customer performs different actions depending on whether a table is available. The condition for the execution of activities on a branch is shown after the diamond. Branching can also be used on overview diagrams. But we usually show exceptions and alternative scenarios only in detailed diagrams. Thus, you are more likely to need this symbol while preparing detailed diagrams.

- Once we have prepared a set of activity diagrams for a business process, we must be able to cross-reference these diagrams. The UML note symbol enables us to make reference to more detailed information available in another diagram or document. Here is an example of a note:

Example 3.12 includes notes to show the related detailed diagrams. From these notes, we can see which events are represented in Examples 3.8, 3.9, 3.10, and 3.11.

Complete the requirements in Focus on Problem Solving exercise 3.h in the end-of-chapter section to review the process of constructing detailed activity diagrams.
Example 3.9
Detailed Activity Diagram for Prepare Food and Serve Food Events

Example 3.10
Detailed Activity Diagram for Ring up Sale Event
Example 3.11
Detailed Activity Diagram for Close Register and Reconcile Cash Events
Example 3.12

Linking Overview Activity Diagram and Detailed Activity Diagrams for Angelo's Diner with Notes

Customer       Server       Kitchen Staff       Cashier       Manager       Register

Order Food → Take Order → Prepare Food → Serve Food → Pay Cash

See Example 3.8

Sales Ticket (in progress)

S: Sales ticket (in progress)

Ring Up Sale → Close Register → Reconcile Cash

See Example 3.10

S: Sales ticket (completed)

See Example 3.11

S: Sales ticket (completed)

See Example 3.9

S: Sales ticket (in progress)

S: Sales ticket (completed)

P: Price lookup

Sales Ticket

Total

SS: Sales summary

Sales Ticket

Total

S: Sales ticket (completed)

Sales Ticket

Total

S: Sales ticket (completed)
PREPARING DETAILED ACTIVITY DIAGRAMS

The previous section explained how to read detailed activity diagrams. The symbols used in the detailed and overview diagrams are the same. The major difference is that rounded rectangles in the detailed diagrams represent activities and not events. This section focuses on preparing a detailed activity diagram. (Key Point 3.3 lists the steps to be followed.) We do not repeat the guidelines common to both types of diagrams (e.g., swimlanes, documents, and tables).

Key Point 3.3
Steps for Preparing Detailed Activity Diagrams

Step 1: Annotate narrative to show activities.

Step 2: Prepare a workflow table.

Step 3: Identify necessary detailed diagrams.

Step 4: For each detailed diagram, perform the following substeps:

4a. Set up swimlanes for the agents participating in the event or events represented in the detailed diagram.

4b. Add a rounded rectangle for each activity in the event(s) being documented in that detailed diagram.

4c. Use continuous lines to show the sequence of the activities.

4d. Set up any documents created or used by the activities in that diagram.

4e. Use dotted lines to connect activities and documents.

4f. Document any tables created, modified, or used by the activities in the diagram in the computer column.

4g. Use dotted lines to connect activities and tables.

Step 1: Annotate the narrative to show activities. Highlight the verbs in your narrative that represent activities. Examples include the following:

- Review data.
- Compare documents.
- Record data in source documents.
- Enter data into a computer system.
- Record data in transaction files.
- Update files.
- Maintain master files.
- Send information to another agent.

Apply Step 1 to Westport Indoor Tennis in Focus on Problem Solving exercise 3.i in the end-of-chapter section.

Step 2: Prepare a workflow table. Set up a table using a two-column format. As shown in this table, we identify the business events with which the activities are associated.
### Actor Activity

<table>
<thead>
<tr>
<th>Actor</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2a. Enter the actor for the first activity in the left-hand column.

2b. Enter each activity performed by this actor in the right-hand column. Describe the actions using active voice. For example, change a sentence “Telephone orders are received by the order entry clerk” to “The order entry clerk receives the telephone orders.”

2c. Identify the next activity.

- If the next activity is performed by the same actor, enter the activities in the right-hand column but do not repeat the name of the actor in the left-hand column.
- If the next activity is performed by a different actor, enter the appropriate actor in the left-hand column and the activity in the right-hand column.

2d. Number the activities consecutively.

2e. Repeat Steps 2c and 2d until you have entered all the activities in the narrative in the workflow table.

Apply Step 2 to prepare a workflow table for Westport Indoor Tennis in Focus on Problem Solving exercise 3.j in the end-of-chapter section.

### Step 3: Identify necessary detailed diagrams.

You may choose to construct a separate detailed diagram for each event in your business process. Alternatively, if there is not much detail available on some events, you may include more than one event in the detailed diagram if desired.

### Step 4: For each detailed diagram, perform Steps 4a through 4g.

4a. Set up swimlanes for the agents participating in the event(s) represented in the detailed diagram.

4b. Add a rounded rectangle for each activity in the event(s) being documented in that detailed diagram. Refer to the workflow table to identify activities. As in the overview diagram, set up the rounded rectangle in the swimlane of the agent performing that activity. Note that in the overview diagram, no rounded rectangles were shown in the Computer column because human agents are usually responsible for events. However, the computer is engaged in individual activities as seen in the workflow table, so rounded rectangles appear in the computer swimlane in detailed diagrams.

4c. Use continuous lines to show the sequence of the activities. You may need to use branching as explained in the previous section.

4d. Set up any documents created or used by the activities in that diagram.

4e. Use dotted lines to connect activities and documents.

4f. Document any tables created, modified, or used by the activities in the diagram in the Computer column.

4g. Use dotted lines to connect activities and tables.

Use Steps 1–4 to complete the requirements in Focus on Problem Solving exercise 3.k in the end-of-chapter section.
OVERVIEW AND DETAILED ACTIVITY DIAGRAMS

We conclude this chapter with an example that includes overview and detailed activity diagrams for ELERBE, Inc. The following UML activity diagram documentation is provided:

1. Annotated narrative showing events and activities.
2. Workflow table.
3. Overview activity diagram for the revenue process.
4. Detailed activity diagrams.

The annotated narrative for ELERBE, Inc., is given in Example 3.13. The superscript numbers indicate the specific activities. Following the narrative, we show the company’s workflow table.

In Examples 3.14, 3.15 and 3.16 we show the overview diagram of ELERBE’s revenue process and two detailed activity diagrams.

Example 3.13 ELERBE, Inc.: Revenue Process and Work Flow

**Event 1: Accept customer order.** A book-store manager sends\(^1\) an order with details of all books (ISBN, author, title, publication year, quantities). The order entry clerk enters\(^2\) the order data into the computer. The computer system checks\(^3\) whether the order is from an existing customer. If the order is from a new customer, it creates\(^4\) a customer record in the Customer File in the computer system. Then, the system checks\(^5\) whether inventory is available. The order details are recorded\(^6\) in the Order and Order_Detail Tables by ELERBE’s computer system. The computer system also updates\(^7\) the quantity allocated for orders in the Inventory Table. The computer prints\(^8\) two copies of the sales order. The clerk sends\(^9\) one copy of the sales order to the warehouse (picking ticket). The second copy serves as a packing slip, which the clerk sends\(^10\) to the Shipping Department to serve as a packing slip.

**Event 2: Pick goods.** A warehouse employee uses the picking ticket to locate\(^11\) goods to be picked. In addition to the products and quantities, the picking tickets identify warehouse locations to make it easy for warehouse employees to assemble the orders. The employee picks\(^12\) the goods from the warehouse for shipping. The warehouse employee packs\(^13\) the goods in a package, notes\(^14\) the actual amounts packed on the picking ticket, and sends\(^15\) the package to the shipping department.

**Event 3: Ship goods.** Once the shipping clerk receives the goods and picking tickets from the warehouse, the clerk reconciles\(^16\) the picking ticket and packing slip and updates\(^17\) the packing slip for any changes indicated on the picking ticket. The clerk then prepares\(^18\) a bill of lading describing the packages, carrier, and route, and attaches\(^19\) it to the package. The clerk gives\(^20\) the package to the carrier. Then, the shipping clerk enters\(^21\) the shipment data into the computer system. The computer records\(^22\) the shipment data in Shipment and Shipment_Detail Tables and updates\(^23\) the quantity on hand. The packing slip is sent\(^24\) to ELERBE’s billing department.

**Workflow Table for ELERBE, Inc.**

<table>
<thead>
<tr>
<th>Actor</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bookstore manager</td>
<td>1. Sends an order with a details of all books (ISBN, author, title, publication year, quantities).</td>
</tr>
<tr>
<td>Order entry clerk</td>
<td>2. Enters the order into the computer system.</td>
</tr>
<tr>
<td>Computer</td>
<td>3. Checks whether the order is from an existing customer.</td>
</tr>
<tr>
<td></td>
<td>4. Creates a customer record, if the customer is new.</td>
</tr>
<tr>
<td></td>
<td>5. Checks whether inventory is available.</td>
</tr>
<tr>
<td></td>
<td>6. Records the order details in the Order and Order_Detail Tables.</td>
</tr>
</tbody>
</table>
## Example 3.13  Concluded

<table>
<thead>
<tr>
<th>Actor</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order entry clerk</td>
<td>7. Updates the quantity allocated for orders in the Inventory Table.</td>
</tr>
<tr>
<td></td>
<td>8. Prints two copies of the sales order.</td>
</tr>
<tr>
<td></td>
<td>9. Sends one copy of the sales order to the warehouse (picking ticket).</td>
</tr>
<tr>
<td></td>
<td>10. Sends the second copy (packing slip) to the Shipping Department.</td>
</tr>
<tr>
<td><strong>EVENT:</strong> PICK GOODS</td>
<td></td>
</tr>
<tr>
<td>Warehouse employee</td>
<td>11. Locates goods to be picked.</td>
</tr>
<tr>
<td></td>
<td>12. Picks goods from warehouse for shipping.</td>
</tr>
<tr>
<td></td>
<td>13. Packs goods in a package.</td>
</tr>
<tr>
<td></td>
<td>14. Notes amount picked on the picking ticket.</td>
</tr>
<tr>
<td></td>
<td>15. Sends package with updated picking ticket to the Shipping Department</td>
</tr>
<tr>
<td><strong>EVENT:</strong> SHIP GOODS</td>
<td></td>
</tr>
<tr>
<td>Shipping clerk</td>
<td>16. Reconciles the picking ticket and packing slip.</td>
</tr>
<tr>
<td></td>
<td>17. Updates the packing slip for any changes indicated on the picking ticket.</td>
</tr>
<tr>
<td></td>
<td>18. Prepares a bill of lading describing the packages, carrier, route, etc.</td>
</tr>
<tr>
<td></td>
<td>19. Attaches the bill of lading to the package.</td>
</tr>
<tr>
<td></td>
<td>20. Gives package to the carrier.</td>
</tr>
<tr>
<td></td>
<td>21. Enters shipment data into the computer system.</td>
</tr>
<tr>
<td>Computer</td>
<td>22. Records shipment data in the Shipment and Shipment Details Table.</td>
</tr>
<tr>
<td></td>
<td>23. Updates the quantity on hand.</td>
</tr>
<tr>
<td>Shipping clerk</td>
<td>24. Sends the packing slip to the Billing Department.</td>
</tr>
</tbody>
</table>
Example 3.14
Overview Diagram for ELERBE’s Revenue Process

See Example 3.15

Send Order

Accept Order

P: Picking Ticket

PS: Packing Slip

Pick Goods

See Example 3.16

Ship Goods

C: Customer
I: Inventory
O: Order
OD: Order Detail
S: Shipment

Picking Ticket (picked)

P: Picking Ticket (shipped)

PS: Packing Slip (shipped)

I: Inventory (sold)

C: Customer
I: Inventory
O: Order
OD: Order Detail
S: Shipment

Picking Ticket (picked)

P: Picking Ticket (shipped)

PS: Packing Slip (shipped)

I: Inventory (sold)
Example 3.15
Detailed Activity Diagram for ELERBE's Order Event
Example 3.16
Detailed Activity Diagram for ELERBE’s Picking and Shipping Events
A final practice opportunity is given in Focus on Problem Solving exercise 3.1 in the end-of-chapter section.

**SUMMARY**

As we noted before, it is essential that accountants understand a business process, the context in which an information system is created and used. In Chapter 2, revenue and acquisition cycles were introduced. A method was developed and used for identifying events within a process. We also emphasized the identification of internal agents who were responsible for the events. Breaking a process into these components is an important step in understanding it.

In this chapter, we demonstrated how to represent events graphically using UML activity diagrams. As in Chapter 2, the focus was on responsibilities and events in a process. Because varying degrees of detail will be needed, depending on their use, two levels of activity diagrams were developed—overview and detailed. We believe that the discipline of diagramming events leads to a better understanding of a process and a better communication of that understanding. We will continue to use activity diagrams for this reason, particularly in Chapter 4, when we consider internal control and in Chapters 9–12, when the acquisition and revenue cycles are explored in detail.

**KEY TERMS**

*Branch.* A point in an activity diagram where processing splits into two or more paths. The path taken depends on a particular condition. For example, once goods are ready for shipment, the goods are either (a) shipped by U.S. mail or (b) shipped by courier, depending on the wishes of the customer. (76)

*Detailed diagram.* A UML activity diagram that provides a detailed representation of the activities associated with one or two of the events shown on an overview diagram (see definition of overview diagram). (61)

*Note.* A symbol in a diagram that is used to make reference to more detailed information available in another diagram or document. (76)

*Overview diagram.* A UML activity diagram that presents a high-level view of the business process by documenting the key events, the sequence of these events, and the information flows between these events. (61)

*Swimlane.* A column in an activity diagram that is used to separate events or activities according to the person or department responsible for the particular event or activity. (62)

*Trigger.* An occurrence that causes a subsequent activity or event. A telephone call from a customer may trigger a “Take order” event. The completion of a picking operation may trigger a shipping event. (64)

*Unified modeling language (UML).* A modeling language for specifying, visualizing, constructing, and documenting an information system. UML was developed as a tool for object-oriented analysis and design but can be used to understand and document any information system. In this chapter, we used UML activity diagrams. In later chapters, we will use UML class diagrams and use case diagrams. (60)

*UML activity diagram.* A diagram that shows the sequence of activities in a process. (60)

*Workflow table.* A two-column table that identifies the actors and actions in a process. (73)
**ACTIVITY DIAGRAM SYMBOLS**

- **Solid circle.** Start of a process in an activity diagram.
- **Rounded rectangle.** Event, activity, or trigger.
- **Continuous line.** Sequence from one event or activity to the next.
- **Dotted line.** Flow of information between events.
- **Document.** Represents a source document or report.

---

**Focus on Problem Solving**

**Important Note to Students:** The solutions to the following Focus on Problem Solving exercises appear in a special section at the end of the text. After completing each exercise, you should check your answer and make sure you understand the solution before reading further.

---

**3.a Reading Overview Activity Diagrams (P1)***

**Required:**

Explain how you would interpret the following information on an activity diagram:

1. A rounded rectangle.
2. A dotted line connecting the “Record order” event with the Picking ticket document. The arrow is from the “Record order” event to the Picking ticket.
3. A dotted line from the Customer table to the “Record order” event.
4. A continuous line connecting the “Record order” event and the “Pick goods” event. The arrow points to the “Pick goods” event.
5. A bull’s-eye after an event.
6. A solid circle followed by an event.
7. A rounded rectangle, labeled “Ship goods,” in the swimlane for the shipping clerk.

---

**3.b Identify Events (Step 1) (P2)**

**Westport Indoor Tennis**

Westport Indoor Tennis offers tennis clinics for children and adults. New customers usually call to inquire about clinics before registration. The receptionist records initial data about the customer (e.g., name, address, telephone number, prior experience, and preferences) on a customer form. The receptionist gives the form to the coach. The coach calls the customer and recommends appropriate clinics based on age and experience.

When a customer decides to register, he or she completes a sign-up sheet and gives it to the receptionist. The receptionist enters the clinic level and days into the computer. The computer checks availability in the Clinics File. Then, the receptionist enters the customer name in the computer system. It determines whether the name exists in the Customer File. If the customer has taken lessons or attended clinics in the past, the computer displays the customer information. If the customer is new,
the computer creates a new customer record. The receptionist then collects the payment from the customer. The receptionist enters the payment into the computer. Then, the computer records the sign-up information and updates clinic availability.

The receptionist prints a receipt and gives it to the customer. At the beginning of the session, the receptionist prints the final student lists for all clinics. On the first day of the session, the receptionist gives them to the coach. The coach checks that the name of every student attending the sessions appears on the lists and then records the attendance on the sheet.

**Required:**
Determine the events in the preceding process. If you have already done this as a result of a Focus on Problem Solving exercise in Chapter 2, review your work.

3.c **Annotate Narrative (Step 2) (P2)**
Westport Indoor Tennis

**Required:**
Use your identification of events from exercise 3.b to create an annotated narrative. Use the same format that was used in the Angelo’s Diner case in Example 3.1.

3.d **Agents and Activity Diagrams (Step 3) (P2)**
Westport Indoor Tennis

**Required:**
Prepare a partial overview diagram for the narrative in exercise 3.b showing swimlanes for people or devices involved in the process.

3.e **Events and Activity Diagrams (Step 4) (P2)**
Westport Indoor Tennis

**Required:**
Add to the partial overview diagram for Westport Tennis that you created in exercise 3.d, showing key events in the business process and the sequence of these events.

3.f **Documents and Activity Diagrams (Step 5) (P2)**
Westport Indoor Tennis

**Required:**
Add to the partial overview diagram for Westport Indoor Tennis that you created in response to the problem in exercise 3.e to show the creation and use of documents by these events.

3.g **Tables and Activity Diagrams (Step 6) (P2)**
Westport Indoor Tennis

**Required:**
Add to the partial overview diagram for Westport Indoor Tennis that you created in response to the problem in exercise 3.f to show the creation, modification, and use of information in tables.

3.h **Reading Detailed Activity Diagrams (P3)**
Angelo’s Diner

**Required:**
Review the diagrams in Examples 3.8 through 3.12. Explain the following items on these diagrams:
1. The symbol in the Cashier column that reads “See Example 3.10” in Example 3.12.
2. The diamond symbol in Example 3.8.
3. The labels “Available” and “Not available” in Example 3.8.
4. The dotted line from the Price lookup table to the rounded rectangle “Displays Price” in Example 3.10.
5. The dotted line from the Sales ticket to “Prepares Food” in Example 3.9.
6. The rounded rectangle “Displays Total” in the Computer column in Example 3.10.

3.i **Annotating Narrative for Detailed Activity Diagrams (P4)**

Westport Indoor Tennis

Required:
Annotate the narrative for Westport Indoor Tennis to show its activities. Use the format in Example 3.7 on pages 74–75.

3.j **Workflow Tables and Detailed Activity Diagrams (P4)**

Westport Indoor Tennis

Required:
Prepare a workflow table for Westport Indoor Tennis using the format in Example 3.7 on pages 74–75.

3.k **Preparing a Detailed Activity Diagram, Sign-up Activities (P4)**

Westport Indoor Tennis Club

Required:
Prepare a detailed activity diagram for Westport Indoor Tennis for the event that starts with the completed sign-up sheet and ends when the receipt is given to the customer. Refer to your workflow table from exercise 3.j to identify the start and end of this event.

3.l **Registration Process (P2, P4)**

Iceland Community College

Business majors at Iceland Community College register for classes as follows:

The student completes a registration card indicating the courses that she is interested in taking in the following semester. The student also updates her degree plan sheet to reflect all courses taken through the current semester. The degree plan sheet lists all course requirements for the student’s major. As a student completes these requirements, she checks off the requirement on the sheet. The student takes the completed registration card and degree plan sheet to the meeting with the advisor. The advisor reviews the registration card and degree plan sheet. He makes sure that the student has taken the prerequisite courses and selected appropriate courses. He signs the registration card.

The student takes the signed registration card to the registrar’s office. The registrar’s office clerk enters the information into the computer system. The computer checks the student record. Then, the clerk enters the course number and section number of each course selected by the student. The computer checks that the course is available. Once all the classes have been entered, the clerk accepts the registration. The computer records the registration details, reduces the seat availability, and prints the registration slip. The clerk gives the slip to the student. The registration slip lists the student details (e.g., social security number, name, etc.) and the details of each course for which the student has registered (course number, description, section, date, time and location). Once the registration period is over, the registrar’s clerk prints an enrollment report. The enrollment report shows the number of students in each class. The clerk sends the enrollment report to the dean. The dean reviews the enrollment report. If a class has low enrollment, the dean requests the registrar to cancel the class.

Required:
1. Prepare a workflow table for Iceland Community College.
2. Prepare an overview activity diagram for the registration process.
3. Prepare a detailed activity diagram for the registration event.
REVIEW QUESTIONS

1. Why are diagrams of business processes useful to accountants?
2. What is an overview activity diagram?
3. What is a detailed activity diagram? How does it differ from an overview activity diagram? How is it similar?
4. How are responsibilities for events shown on an overview activity diagram?
5. How are events and the sequence of events shown on overview activity diagrams?
6. How are documents represented on overview activity diagrams? What is the meaning of dotted lines to or from events to documents?
7. How do you show the flow of information to or from computer files on activity diagrams?
8. What does the rounded rectangle represent on a detailed activity diagram?
9. What symbol could you use to cross-reference overview and detailed activity diagrams?

EXERCISES

The following exercises are based on the MallMart Company narrative. Review the narrative carefully before completing the exercises.

MallMart Company Layaway Plan. MallMart Company is a retail store that sells a wide variety of clothing, electronics, and household goods. Their layaway plan works as follows:

A customer selects a product to put on layaway and brings it to the customer service clerk. The clerk determines whether the particular item can be placed on layaway. Any item that is on sale, on clearance, or a seasonal item (e.g., lawn furniture) is not qualified. The customer completes a customer form with name, address, and telephone number and is assigned a customer account number. An invoice is prepared identifying the item and showing the total cost (including tax) less a 10 percent down payment that the customer must make immediately. The customer signs one copy of the invoice and returns it to the clerk. The customer gives the clerk cash or a check for the 10 percent payment. The product is tagged with the customer’s number and stored at a special place in the back of the store. The clerk enters the information about the customer in the computer system. The layaway details (date, layaway items, the total amount due on the invoice, and the cash payment) are also recorded in the computer system. The status field in the layaway record is set to “open.”

The customer can make payments at any time, but the full amount must be paid within 60 days. Payments can be made at the cash register or by mail. The clerk records the payments in the computer system. When the final payment is received, the clerk changes the status field in the layaway record to “paid.” The customer is given or sent a receipt that shows the customer name, layaway items, and amount paid. The customer arrives to pick up the merchandise and presents the invoice. The clerk uses the computer to check that the final payment has been made. The merchandise is given to the customer, and the sale is recorded in the system. The layaway status is changed to “closed.” The customer signs the invoice copy to indicate that the goods have been received and gives it to the clerk. The quantity on hand of the inventory is reduced. Twice a week, the manager prepares a report of expired layaways (payment is not completed by 60 days). A check is prepared for all but $10 of the money collected on expired layaways and mailed to the customer. The information about the refund check is recorded in the computer system. The layaway status is changed to “expired.”

Part I

E3.1. Create a partial overview activity diagram with swimlanes for each agent involved in MallMart’s business process.

E3.2. Modify the partial overview activity diagram from E3.1 to show events and the sequence of these events. Show the start and end of the process on your diagram.
Part I

E3.3. Modify the partial overview activity diagram from E3.2 to show documents and flow of information to and from documents.

E3.4. Modify the partial overview activity diagram from E3.3 to show tables and the flow of information to and from tables.

Part II

E3.5. Draw a detailed activity diagram for the event involving the creation of the layaway agreement. (This event includes all activities from the beginning of the process until the layaway agreement details are recorded and the status is set to “open.”)

E3.6. Modify the overview activity diagram for MallMart’s AIS to link it to the detailed activity diagram developed in E3.5.

Problem Solving on Your Own

Important Note to Students:
The following problem solving (PS) assignments tie closely to the Focus on Problem Solving exercises on pages 88–90. However, the solutions to these are not provided in the text.

Part I

PS3.1 Rent-a-Limo Co. (Similar to Focus on Problem Solving assignment 3.c)
Required: Review the narrative in Exhibit 2PS.1 on p. 46 and your solution to PS2.1. Use your identification of events in PS2.1 to create an annotated narrative. Use the same format that was used in the Angelo’s Diner case in Example 3.1 on pp. 61–62.

PS3.2 Rent-a-Limo Co.
Required: Review the narrative in Exhibit 2PS.1 on p. 46 and your solution to PS3.1.
1. (Similar to Focus on Problem Solving exercise 3.d)
   Prepare a partial overview diagram, for the revenue cycle of the Rent-a-Limo Co. Show swimlanes for the people and devices involved in the process.
2. (Similar to Focus on Problem Solving exercise 3.e)
   Add to the partial overview diagram in Requirement 1 and show key events in the business process and the sequence of these events.
3. (Similar to Focus on Problem Solving exercise 3.f)
   Add to the partial overview diagram in Requirement 2 to show the creation and use of documents by these events.
4. (Similar to Focus on Problem Solving exercise 3.g)
   Add to the diagram in Requirement 3 and show the creation and use of information in tables.

PS3.3 Westport Indoor Tennis
This problem relates to the Westport Indoor Tennis case (Focus on Problem Solving exercises 3.b, 3.c, 3.d, 3.e, 3.f, and 3.g).
Consider the variations in the following three alternative processes for tennis lessons at Westport.

a. Westport Indoor Tennis charges a flat fee. The customer pays this amount at the time of signing up for the session.

b. Westport Indoor Tennis charges a flat fee. The customer must pay this amount before the clinics start. Customers may sign up early but make the payment later (e.g., on the day of the first clinic).
c. Westport Indoor Tennis charges by clinic attended. The customer will be charged for a session only if he or she attends that session. Customers pay the organization every month. For example, if the session starts in the middle of a month and lasts for eight weeks, the customer makes three payments.

**Required:**

1. Focus Problem Solving exercises 3.b–3.g require you to prepare the overview activity diagram for Westport Indoor Tennis under alternative a. Modify the narrative for Westport Tennis on pages 88–89 for alternative b. The current narrative assumes cash is paid at time of sign-up. Assume that the receptionist collects the cash from customers.

2. (Similar to Focus on Problem Solving exercise 3.b) Determine the events in the modified process.

3. (Similar to Focus on Problem Solving exercise 3.c) Create an annotated narrative for the modified process using the format in Example 3.1.

4. (Similar to Focus on Problem Solving exercises 3.d – 3.g) Discuss the changes that you would make to the overview diagram in FPS 3.5 on page 614 to get the overview diagram for Westport Tennis for alternative b. The overview diagram should be consistent with the narrative that you developed in requirement 3.

5. (Similar to Focus on Problem Solving exercises 3.b–3.g) Repeat requirements 1 to 4 for alternative c (monthly payment, but charged only for sessions attended). Assume that the coach records attendance at the time of the session. The coach gives the attendance sheets to the receptionist.

**PROBLEMS**

**Part I**

**P3.1. Bedford Medical Associates** The process begins when a patient calls the office with a request for an appointment. The receptionist asks for the patient’s name and telephone number. The receptionist reviews the doctor's schedule to find an available time slot and then records the appointment in the computer.

Upon arrival, the patient signs in on an appointment sheet. The receptionist checks that the patient insurance information is still valid. The receptionist pulls the patient’s medical folder and places it on a counter. The folders are stacked so that the one most recently pulled is at the bottom. When an examination room becomes available, a nurse takes a patient folder from the top of the stack. The nurse then calls the patient’s name and takes the patient to an examination room. The nurse records the reason for the visit.

The doctor reviews the patient information, examines the patient, and updates the patient folder. The patient takes the folder to the receptionist. The patient makes the co-payment. The receptionist prepares a receipt, reviews the patient folder, and enters the billing data into the computer system. Bills are then sent to insurance companies.

**Required:**

The following figure shows the overview activity diagram for Bedford Medical Associates. Review the figure and the preceding narrative to answer the following questions:

1. What can you learn about the process used by Bedford Medical Associates from the diagram? Discuss the key components of the diagram in terms of the activity diagram symbols presented in the textbook.

2. Compare the content of the diagram to the narrative. What elements of the business process described in the narrative are represented on the diagram?
P3.2. **Tasty Burger** A customer arrives at Tasty Burger and waits in line to place an order. When an employee becomes available, the customer places an order. The employee keys the order information into the register, which is a point-of-sale device connected to the office computer. The register displays the amount due. The employee collects the amount due and gives the customer his or her change. The computer records the sale and updates the inventory. The employee then gives the food to the customer.

Registers are assigned to employees for a certain period. When this period is over, the manager either reassigns the drawer to someone else or decides to close it. If the manager decides to close the drawer, she enters a register report command. The register generates a report showing how much cash should be in the drawer. The manager then counts the actual cash in the drawer and compares it to the register's amount and records the overage or shortage (if any).

At the end of the day, the manager closes all the drawers and counts the cash. The manager prepares a daily summary report. The report includes total amount collected, sales, sales tax, and amount short or over for the day. After finishing the report, the manager leaves the restaurant and deposits the cash in the night deposit slot at the bank.

**Required:**
1. Determine the events in Tasty Burger’s process, and annotate the narrative accordingly.
2. Prepare an overview activity diagram for Tasty Burger.
P3.3. Bowden Building Supplies  Bowden Building Supplies sells building supplies in San Antonio. They offer free delivery of goods within the city. Bowden uses the following system for recording credit sales to builders.

A builder gives an order to a sales clerk. The sales clerk completes a prenumbered delivery slip for the sales order. Two copies of the delivery slip are sent to the warehouse, and one copy is sent to the Billing Department. A warehouse employee uses the delivery slip to pick the goods. The employee gives the goods and the two delivery slips to a driver. The driver delivers the goods to the customer. The customer signs the delivery slip. The customer keeps one copy and gives the other copy back to the driver. Signed delivery slips are forwarded to the Billing Department each evening.

The following morning, the billing clerk checks to see that the sequence of prenumbered documents is complete. The clerk calculates the dollar total of the sales using an adding machine and then enters the information from the delivery slips into the computer. The computer records the sale and updates the customer’s balance and inventory balance. The computer prints a list of sales, the total number of delivery slips entered, and the total dollar amount of sales. The clerk checks the adding machine totals with the totals generated by the computer and verifies that the number of delivery slips entered equals the number of prenumbered slips. The computer prints three copies of customer invoices. The first copy is mailed to the customer, the second is filed by Billing, and the third is forwarded to Accounts Receivable.

Required:
1. Determine the events in this process, and annotate the narrative accordingly.
2. Prepare an overview activity diagram for this process.

P3.4. Wright Printing Company  Wright Printing Company designs and prints business cards, invoices, letterhead, vinyl signs, and banners. Customers place orders by completing an order form. The customer pays a minimum deposit of 10 percent. A salesperson accepts the order and payment and records the deposit details on the order form. The customer is given one copy of the form. Another copy is placed in the customer folder. A customer can order multiple products from the company. For example, a customer may order business cards and invoices. The customer folder includes the new order as well as any designs used for various products ordered by that customer in the past. The layouts of business cards and invoices and a list of the customer’s employees (for business cards) would be included in the customer folder.

The salesperson gives the customer folder to the manager. Some orders require the design of new products. The customer in our previous example may want to order envelopes and letterhead. A customer may also need modifications to existing designs. For example, if business cards are required for a new employee of a business or if the business changes location, the information for specific products is changed. If the order is for a new or modified product, the manager reviews the folder and sends it to a graphic designer. Otherwise, the manager sends the folder to the Production Department. The graphic designer creates a layout for the product. The designer gives the layout to the manager. The manager faxes the layout to the customer for approval, adds the approved layouts to the customer folder, and sends the customer folder with the required order and design information to the Production Department. When the order is finished, it is sent to the manager. The manager prepares an invoice. The customer is then notified that the order is ready.

Required:
1. Annotate this narrative to show events.
2. Prepare an overview activity diagram for this process.
Part II

P3.5. Silver City Library A description of the process for issuing membership cards to new members and for checking out and returning books follows. The narrative has been organized according to the events in the process.

Process membership application. To become a member, an applicant completes an application form with details including name, address, and telephone number. The applicant submits the application form and proof of residence to the librarian. Applicants must be from the town of Raynham. The librarian reviews the form and proof of residence and then enters the member information into the computer system. The computer records the information in the Member File. The librarian prints a temporary membership card with member details. The librarian gives the temporary card to the member.

Prepare permanent membership card. The member gives the temporary card to the secretary. The secretary takes a photograph of the applicant and prepares the permanent card with photo identification.

Check out books. Books owned by the library are labeled with a bar code. There is a record for each book in the system with the following information: ISBN, title, author, number of pages, class, copy #, and status. The class refers to whether the book can be circulated or must be held in the reference section of the library. A member selects books from shelves and presents a valid card and the books to the librarian. The librarian enters the member identification into the computer system. The computer then displays member information and any books currently on loan to that member. The librarian checks whether the books are past due and that no more than five books are loaned to a member at any one time. The librarian then scans the bar code of each book. The computer displays the class (circulation or reference) of the book and the librarian checks that the books are not from the reference section. The computer records the checkout event details, changes the book status to “checked out,” and updates the amount of year-to-date checkouts. The librarian desensitizes the books and gives them to the member. After two weeks, the books must be returned.

Return books. Returned books are scanned by the librarian and then returned to the shelves. The computer records the return and updates the book status to “available.”

Required:
The following figure shows a detailed activity diagram for Silver City Library. Review the figure and the narrative to answer the following questions:

1. What can you learn about the process used by Silver City Library from the diagram? Discuss the key components of the diagram in terms of the activity diagram symbols presented in the textbook.

2. Compare the content of the detailed diagram to the business process description.

3. Assume that you have decided to prepare an overview diagram for Silver City Library. How does the following diagram relate to the overview activity diagram for Silver City Library?
Commercial Activity Diagram for Silver City Library

Member

- Gives Application

Librarian

- Reviews Application
- Enters Member Data

Secretary

- Takes Photograph
- Prepares Permanent Card
- Gives Card to Member

Computer

- Records Member Data

Temporary Card

- Prints Temporary Card
- Gives Card to Member

Permanent Card

- Gives Card to Member
P3.6. Austin National Bank

The following narrative describes the process for tracking the time spent on audits at Austin National Bank. It has been organized according to the events in the process.

**Prepare audit plan.** Austin National Bank has several branches throughout the city of Austin. The Internal Audit Department audits various departments in all branches. At the beginning of each year, the manager of the Internal Audit Department prepares an annual audit plan that lists all audits projected, audit start dates, budgeted hours, and auditors assigned. The manager enters the audit plan into the computer. The computer records the plan in the Audits Master File.

**Prepare timesheets.** Several auditors can be involved in the performance of a single audit, and over the course of a week, an auditor may be involved in more than one audit. Every week, each auditor prepares a timesheet. The timesheet is used to track the amount of time spent by the auditor on different audits during the week. The auditors send the timekeeping sheets to the secretary.

**Record timesheets.** At the end of every week, the secretary enters the details of the work performed and time spent by each auditor on each audit from the timekeeping sheets into the computer. The computer records the data in a Timekeeping File. The total amount of hours spent on audits by each auditor during the year is updated in the Auditor Master File. The total time spent on each audit is also updated in the Audits Master File.

**Review audit list.** At the end of the year, the manager of the Internal Audit Department prepares an audit list that summarizes the total time spent on each audit and the budgeted hours. The manager reviews this information when deciding on the budgeted hours for each audit in the next year.

**Required:**

1. Prepare a workflow table for Austin National Bank.
2. Prepare a detailed activity diagram to show the activities in preparing and recording timesheets (the Prepare timesheets and Record timesheets events).

P3.7. Accounts Payable System at Garner Clothing Company

The following narrative describes the accounts payable and cash disbursements system at Garner Clothing Company. The narrative has been organized according to the events in the process.

**Record supplier invoices.** The accounts payable clerk picks up mail from the mailroom. She stamps the invoice with the current date and pulls the corresponding purchase orders from the unpaid file drawer. She also pulls receiving documents to make sure that the items were received. Then, she checks to see if prices and quantities match on the documents. She assembles a data entry packet that includes the purchase order, invoice, and receiving document. She stamps the prepared packets with a voucher number and writes the supplier number. The accounts payable clerk adds shipping and handling charges if necessary. When enough invoices are accumulated, she calculates batch totals. She enters the batch into the computer. The invoices are recorded in an Invoice File. The invoice record includes an Invoice_Status field. This field is set to “open” when the invoice is recorded. The computer prints a batch summary listing showing the number of invoices and total amount of the invoices. The clerk checks the computer total with the manual total.

**Prepare checks.** The accounts payable clerk prepares checks for payment every week. The system generates a list of all open invoices that should be paid this week. An invoice will be selected for payment if an early payment discount would be lost by waiting until next week or if the invoice would become past due by next week. The clerk prints a cash requirements report that lists each invoice selected for payment and the total cash required. She compares the checkbook balance to the report to determine whether there is adequate cash to make the required payments. The payments are recorded in a Payment File, and the status of the invoice is changed to “paid” in the Invoice File. Then, the clerk prints two-part checks.

**Stamp checks.** She gives the checks to the controller. The controller puts a signature stamp on the checks.

**Make payment.** The accounts payable clerk then staples one part of the check to the invoice and mails the other part to the supplier. She files the paid claims in the Paid File.
Required:

1. Prepare a workflow table for the preceding process.

2. Prepare a detailed activity diagram for the event “Record supplier invoices.”

**P3.8. Lambert Insurance** Lambert Insurance’s business process starts when a customer calls and requests an automobile insurance quote. A receptionist notes the customer information on a fact finder form. The information includes the customer’s name, address, telephone number, vehicle identification number, make/model of vehicle, number of drivers, ages, anti-theft device, prior insurance, and coverage. The fact finder form is given to the agent. Based on the information gathered, the agent decides on a rate. If the customer has had a license for more than five years, has not had any tickets or accidents in the past three years, and has had prior insurance for at least a year with no lapse of more than 30 days without coverage, he or she gets the lowest rate. If any requirement is not met, the customer will have to pay a higher rate. The agent then enters all the information into the computer system. The computer prints the quotes. The quote is faxed to the customer for review.

After the final approval of the price, the customer comes into the office and signs the agreement binder (with details of the coverage). The binder shows the vehicles insured, the named drivers, coverage details, amount of payment made, agent’s signature, and customer’s signature. Then, the customer makes an initial payment (cash or check) for the first and second months of coverage. The agent records the agreement details into the computer system. Every month, the home office prepares monthly statements. These statements are mailed to the customer. The customer sends a check and the statement to the agent. The agent reviews the statement and check and then enters the payment details into the computer. The computer records the payment and updates the customer’s balance.

Required:

1. Prepare a workflow table for Lambert Insurance.

2. Prepare a detailed activity diagram showing the process from the initial customer call at the start of the narrative to the activity of faxing the quote to the customer.

In each of the following problems, the first requirement relates to the chapter’s Part 1 and the remaining requirements relate to Part 2.

**P3.9. McMillan Networking** McMillan Networking provides Web design and hosting services. The company is also an Internet service provider (ISP). The company began operations recently. It has two consultants who provide the various services. Most of their clients are individuals or small businesses. The following narrative focuses on their ISP activities.

Individuals or business owners contact the company to inquire about services. The secretary describes various options; the charges are different depending on the plan. If the customer is interested, the secretary sets up an appointment with one of the consultants.

The consultant discusses the details with the client. The consultant completes an agreement form describing the services. Services vary according to the monthly fee and the number of minutes per month allowed before extra charges, if any, are applied. The customer information (customer number, name, address, and telephone number) is entered into the computer and recorded in the Customer File. Then, the agreement details are entered into the computer and recorded in an Agreements File. Customers usually bring their computer to the company’s office when they come for their appointments. The consultant installs the necessary software and performs setup tasks to provide Internet access.

At the end of every month, a secretary uses the computer to record the monthly charge, and the system increases the customer’s balance due. The computer prints invoices. The bill shows the current month’s charges as well as any past balance. The secretary mails it to the customer. Customers usually pay by check. The secretary receives the checks and places the cash receipts in a file. At the end of the day, the secretary calculates the dollar totals of the cash receipts using an adding machine. The secretary enters the payment details about the checks received that day into the computer. The payment is recorded, and the customer balance is reduced. The computer displays summary data about the batch (the total number of cash receipts entered and the total amount). The secretary checks that the batch totals and record counts generated by the computer equal the adding machine totals and then edits the cash receipts data. A deposit slip is printed. The secretary gives the checks and deposit slips to one of the consultants for deposit.
Required:
2. Prepare a workflow table for McMillan’s revenue process (Part II).
3. Prepare a detailed activity diagram showing the process for collecting payments (Part II).
4. Modify the overview diagram in Requirement 1 to link it to the detailed diagram (Part II).

P3.10. College Dining Services
This narrative describes part of the accounting system used at College Dining Services. College Dining operates student cafés and faculty dining rooms on college campuses across the country. We focus on the ordering process in student dining halls operated by College Dining Services at one college. The production manager is responsible for ordering decisions. Every week, the production manager takes a physical count of inventory and writes it in the inventory ledger. The amount of inventory carried at any time is low, and a perpetual inventory system is not needed.

The company uses food planning software to provide information for ordering decisions. The software stores recipe information and menus. The menus are generally repeated once a month. A purchasing clerk selects a menu from the list in the food planning system. The system uses the Menu File to identify the specific menu items to be served on that day. For example, one menu may offer customers the choice of lasagna or chicken pot pie as an entrée. For each menu item, a portion factor is available in the Menu File. The portion factor and projected attendance are used to calculate the number of portions to prepare for each item. For example, if the portion factor for lasagna is 0.9 and the projected attendance is 300, then 270 portions of lasagna will be prepared.

Once the menu items are identified, the system uses the Recipe File to determine the ingredients required to prepare one portion of each menu item. The total amount of each ingredient is calculated by multiplying the amount per portion by the number of portions. Then, the system prints out an ordering list that identifies the amount of each inventory item required. As noted earlier in the narrative, the business does not maintain the current amount of each inventory item in the storeroom. Thus, it can only suggest that two cartons of tomatoes are required for tomorrow. If one carton is already available in the storeroom, then the production manager must order only one carton. The manager reviews the ordering list and decides on the items to be ordered. The manager then writes the items to be ordered on a purchase order (PO) and sends it to the supplier.

The receiver receives the goods from suppliers and accepts goods after matching them with the PO and the supplier packing slip. The receiver stamps the date on the items received and stores them in such a way that older items are always used earlier. The receiver checks the items received on the PO and forwards it to Accounts Payable. At the end of each day, the chefs complete a worksheet indicating how much of each menu item was prepared as well as leftover amounts. Past trends are used in revising portion factors. For example, if the chef’s worksheet indicates that only half the lasagna portions were used last time it was served, the production manager might reduce the portion factor from 0.9. The revised portion factor is entered into the computer system. The computer system records it in the Menu File.

Required:
1. Prepare an overview diagram for this process (Part I).
2. Prepare a workflow table for this process (Part II).
3. Prepare a detailed activity diagram showing the process for preparing the ordering list (Part II).
4. Modify the overview diagram in Requirement 1 to link it to the detailed diagram (Part II).

P3.11. Lakeview Hotel
Lakeview Hotel uses a manual system for recording reservations. A receptionist at Lakeview receives a request from a customer for a room. The customer specifies the type of room that she requires (e.g., smoking or nonsmoking). The receptionist checks the Reservation Calendar to see if a room is available for that date or series of days. There is a separate page for each day in the reservation calendar, and each page is organized into two sections, smoking and nonsmoking. An example of a page follows.
The receptionist records each reservation in the Reservation Calendar by entering the person’s name, in pencil, next to the room number for each day of the stay. The receptionist also records the customer’s name, address, and so on, on a form that is added to the Guest Folder. A third recording completes the process. The details of the reservation are recorded in a Reservations Journal. Entries to the journal are made daily and appear in the order in which the reservations were made.

When the guest arrives, the receptionist checks the Reservation Calendar to make sure that a reservation has been made. The receptionist places a checkmark next to the customer’s name to indicate that the customer actually stayed in the hotel. The receptionist then gives the keys to the customer.

At the end of the stay, the customer gives a checkout form and the key to the receptionist. In the Reservation calendar, the receptionist enters the customer’s initials next to each day of stay. The receptionist calculates charges for the room and other services and prepares an invoice. The customer pays the amount due. The receptionist prepares two copies of the receipt and gives one copy to the customer. The receptionist places the cash in the cash box with the second copy of the receipt.

**Required:**
1. Prepare a workflow table (Part I).
2. Prepare an overview activity diagram for Lakeview’s process (Part II).
3. Prepare the detailed activity diagrams for Lakeview’s process (Part II).
4. Modify the overview activity diagram (see Requirement 2) to link it to the detailed diagrams (Part II).

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**P3.12. International Perspective: Garcia U.S. Customs Brokers**

Garcia U.S. Customs Brokers helps customers import merchandise into the United States from Mexico. The business has been operating since 1995. The process of bringing merchandise into the United States is complex. First, the customer’s documents (invoices, bill of lading, and packing list) are received by fax or e-mail. Garcia assigns an account executive to each client. The account executive reviews these documents. Additional documents may be required in some situations. For example, a NAFTA Certificate of Origin should be included for shipments originating in Canada or Mexico to qualify for reduced duty or duty-free entry. The account executive advises the client if any additional documents are needed.

The account executive then classifies each item on the invoice in terms of the Harmonized Tariff Schedule of the United States. If needed, she discusses merchandise classification with the client. Once the items are classified, duties are calculated. The account executive enters the details of the import into the computer, and the computer records the details in an Imports File. The computer prepares a customs entry from the information in the Imports File. The entry is submitted electronically to U.S. Customs using ABI (Automatic Broker Interface).
Once the entry has been reviewed, the company receives electronic notification from U.S. Customs. If necessary, the account executive submits a modified entry. If no modifications are needed, a certification document is included in the information from Customs. The account executive prints the certification information. The account executive then determines whether an examination of the documents is required for that shipment. If Customs wants to examine the documents, the account executive gives a hard copy of the documents (customs entry, certification, invoice, bill of lading, and packing list) to the company dispatcher. The dispatcher takes the documents to U.S. Customs for review. The details of the documents reviewed are recorded by Customs in its computer system.

Once the trailer crosses the border and the goods are released from customs, the account executive receives an electronic notification from U.S. Customs with the release date and time. The release date and time are entered into the computer system where they are recorded in a Releases File. Customs duty and taxes may have to be paid to Customs at the time of entry for some merchandise or within 10 days from the date of Customs release. For some clients, the broker handles the payment of duties and taxes. For such clients, the account executive pays duties to Customs electronically.

Required:
1. Prepare a workflow table (Part I).
2. Prepare an overview activity diagram for Garcia’s process (Part II).
3. Prepare a detailed activity diagram for the process of filing the customs entry. Include activities from the start of the narrative to the filing of the customs entry through ABI (Part II).
4. Modify the overview activity diagram (see Requirement 2) to link it to the detailed diagram (Part II).

DATABASE PROJECT

The database project requires you to design and implement an AIS for a business of your choice. Chapter 2 asked you to describe the business process and AIS documents. Chapter 3 focuses on documenting the business process using UML activity diagrams.

DB3.1 Annotate the narrative that you prepared for DB2.2 in Chapter 2 to show events and activities.
DB3.2 Prepare an overview activity diagram for this business process.
DB3.3 Prepare a set of detailed activity diagrams for this business process.
DB3.4 Modify the overview activity diagram (from DB3.2) to link it to the detailed diagrams (from DB3.3).

COMPREHENSIVE CASE—HARMONY MUSIC SHOP

Refer to the end-of-text Comprehensive Case section (pages 595-606) for the case description and requirements related to this chapter.