CHAPTER 3

SYSTEMS DEVELOPMENT AND DOCUMENTATION TECHNIQUES

SUGGESTED ANSWERS TO DISCUSSION QUESTIONS

**3.1 Identify the DFD elements in the following narrative: A customer purchases a few items from a local grocery store. Jill, a salesclerk, enters the transaction in the cash register and takes the customer’s money. At closing, Jill gives both the cash and the register tape to her manager.**

**Data Flows**: merchandise, payment, cash and register tape

**Data Source**: customer

**Processes**: capture sales and payment data and collect payment, give cash and register tape to manager

**Storage**: sales file (register tape), cash register

**3.2** **Do you agree with the following statement: “Any one of the systems documentation procedures can be used to adequately document a given system”? Explain.**

It is usually not sufficient to use just one documentation tool. Every tool documents a uniquely important aspect of a given information system. For example, system flowcharts are employed to understand physical system activities including inputs, outputs, and processing. In contrast, data flow diagrams provide a graphic picture of the logical flow of data within an organization.

Each alternative is appropriate for a given aspect of the system. As a result, they work together to fully document the nature and function of the information system.

**3.3** **Compare the guidelines for preparing flowcharts and DFDs. What general design principles and limitations are common to both documentation techniques?**

Similar design concepts include the following:

* Both methods require an initial understanding of the system before actual documentation begins. This insures that the system is properly represented by the diagram.
* Both measures require the designer to identify the elements of the system and to identify the names and relations associated with the elements.
* Both methods encourage the designer to show only the regular flows of information and not to be concerned with unique situations.
* Both approaches require more than one “pass” through the diagramming or flowcharting process to accurately capture the essence of the system.

The product of both methods is a model documenting the flow of information and/or documents in an information system. Both documentation methods are limited by the nature of the models they employ, as well as by the talents and abilities of the designer to represent reality.

**3.4** **Your classmate asks you to explain flowcharting conventions using real-world examples. Draw each of the major flowchart symbols from memory, placing them into one of four categories: input/output, processing, storage, and flow and miscellaneous. For each symbol, suggest several uses.**

The major flowcharting symbols and their respective categories are shown in Fig. 3.8 in the text.

With respect to how the symbols are used, student answers will vary. Possible examples include the following:

# Input/Output Symbols

* **Document:** an employee time card, a telephone bill, a budget report, a parking ticket, a contract
* **Display:** student information monitors, ATM monitors, the monitor on your microcomputer.
* **Manual input:** cash registers, ATM machines

# Processing Symbols

* **Processing:** processing a student payroll program, assessing late fees
* **Manual operation:** writing a parking ticket, preparing a paper report, collecting and entering student payments

# Storage Symbols

* **Magnetic disk:** alumni information data base, a report stored on your PC hard disk
* **Magnetic tape:** archival student information
* **On-line storage:** a student information data base or an airline reservation data base stored on-line.
* **File:** purchase order file for a department, a student housing contract file

Flow (Miscellaneous)

* **Communication link:** a telephone linkage that connects you to an on-line data base.

**SUGGESTED ANSWERS TO THE PROBLEMS**

**3.1** **Prepare flowcharting segments for each of the following operations:**

Assorted Flowcharting Segments:

1. **processing transactions stored on magnetic tape to update a master file stored on magnetic tape**



1. **processing transactions stored on magnetic tape to update a database stored on a magnetic disk**



1. **converting source documents to magnetic tape using a computer-based optical character reader (OCR)**



1. **processing OCR documents online to update a database on magnetic disk**



**3.1** (continued) Assorted Flowcharting Segments

**e. reading data from a magnetic disk into the computer to be printed on a report**



**f. using a computer or terminal to </inst>key data from source documents to a file stored on a magnetic disk**



**g. manually sorting and filing invoices numerically**



**3.1** (continued) Assorted Flowcharting Segments

**h. using a terminal to enter source document data and send it to a </inst>remote location where an online processing system records it in a database stored on magnetic disk**



1. **a scheduled automatic backup of an internal hard drive to an external hard drive**



**j. using a terminal to </inst>query customer sales data maintained on a magnetic disk**



**3.1** (continued) Assorted Flowcharting Segments

**k. enter employee hours recorded on time cards in the payroll transaction file maintained on disk and update wage data maintained on the payroll master file**



**3.1** (continued) Assorted Flowcharting Segments

**l. use a terminal to </inst>access a price list maintained on disk to complete a purchase order. An electronic copy of the purchase order is sent to the vendor and a backup copy is printed and filed by vendor name**



**m. update an airline reservation on a Web-based airline reservation system from a home computer**

**3.2** Happy Valley Utility Company

1. **Draw a system flowchart of the billing operations, commencing with the computer preparation of the meter reading forms and ending with the mailing of customer bills.**



**3.2**

**b. Draw a system flowchart depicting customer payments processing, starting with the mail room operations and ending with the two printed reports.**



**3.3** **<para>Prepare a system flowchart of the process described.**</para></problem>

**Payroll Processing for Dewey Construction Company:**



**3.4** **Prepare a document flowchart to reflect how ANGIC Insurance Company processes its casualty claims.**



**3.5**

1. **Prepare a document flowchart that indicates the interaction and use of these documents among all departments at Beccan Company’s central facility. It should provide adequate internal control over the receipt, issuance, replenishment, and payment of tires and supplies. You may assume that there is a sufficient number of document copies to ensure that the perpetual inventory system has the necessary basic internal controls.</para><source>**
2. **Use the instructor proUsing the flowcharting conventions discussed in Focus 3.2, critique the instructor provided CMA solution. List all the ways the CMA solution violates those flowcharting guidelines.**

Adapted from the CMA Exam. Note: the CMA solution shown does not follow the flowcharting conventions discussed in the chapter. When the authors use this problem they have the students critique the CMA exam solution (assignment 3.5b), based upon the conventions discussed in Focus 3.2.



**3.6**

**a. Prepare a context diagram and level 0 DFD to document the payroll processing system at No-Wear Products.**

**Context Diagram for the payroll processing system at No-Wear Products**



**3.6** a. (continued.)

**Level 0 Data Flow Diagram for the payroll processing system at No-Wear Products.**



3.6 **b. Prepare a document flowchart to document the payroll processing system at No-Wear Products.**



**3.7**

1. **Prepare a context diagram and a level 0 DFD to document accounts payable processing at S&S.**



**3.7** a. (continued.) **Level 0 Data Flow Diagram of S&S Accounts Payable**



# 

**3.7**

**b. Prepare a document flowchart to document accounts payable processing at S&S.**



**3.8**

**a. Develop a context diagram and a level 0 DFD of the acquisition/payment system at Oriental Trading.**



* 1. a. (continued**) Level 0 Data Flow Diagram: Acquisition/Payment System at Oriental Trading:**



**3.8**

**b. Prepare a document flowchart to document the acquisition/payment system at Oriental Trading.**



**3.9**

**a. Develop a context diagram and a level 0 DFD for the cash receipts system at S&S.</para></listitem>**



**3.9** a. (continued) **Level 0 Data Flow Diagram of the Cash Receipts System at S&S:**



**3.9**

1. **Prepare a document flowchart to document the cash receipts system at S&S.**



**3.10 <para>Draw a context diagram and at least two levels of DFDs for the preceding operations.**</para></problem>



**3.10.**  **Level 0 Data Flow Diagram for a mail order company:**



**3.10.** **Level 1 Data Flow Diagram for a mail order company:**



**3.11**

1. **Prepare a context diagram and at least two levels of DFDs for this operation.**



**Level 0 Data Flow Diagram for a course registration system:**



**3.11** a. (continued) **Level 1 Data Flow Diagram for a registration system:**



**3.11**

1. **Prepare a document flowchart to document this operation.**



* 1. **You recognize weaknesses in the existing system and believe a document flowchart would be beneficial in evaluating this client’s internal control in preparing for your examination of the financial statements.</para>**

1. **Complete the flowchart given in <link linkend="ch03fig12" preference="1">Figure 3-12<xref linkend="ch03fig12" label="3-12"/></link>, for sales and cash receipts of Charting, Inc., by labeling the appropriate symbols and indicating information flows.** Adapted from the 1969 CPA Exam



**3.12a** (Continued)

**3.12**

1. **Using the guidelines for preparing flowcharts in <link linkend="ch03sb02" preference="0">Focus 3-2<xref linkend="ch03sb02" label="3-2"/></link> and the flowcharting symbols shown in <link linkend="ch03fig08" preference="0">Figure 3-8<xref linkend="ch03fig08" label="3-8"/></link>, critique the flowchart shown in <link linkend="ch03fig12" preference="0">Figure 3-12<xref linkend="ch03fig12" label="3-12"/></link>. List the ways the flowchart violates the guidelines or uses improper symbols.**

The flowchart in Fig. 3.12 violates the General Guidelines for Preparing Flowcharts in the following ways.

* 1. The text uses the Terminal symbol (the oval) to indicate an external party. Figure 3.12 uses a large arrow to indicate items coming into the system (mail, cash, and items received from the bank). It uses a line with an arrow that stops in a small vertical line, accompanied by To customer (or To Bank), to indicate items exiting the system.

2. The solution has the mail clerk, the sales clerk, and the inventory control clerk in one column. Three columns would be better.

3. Additional comments (Prepare remittance advice if needed) are not enclosed in an annotation box.

4. Each manual processing symbol does not have an input and an output. For example, the symbols under mail clerk and sales clerk do not have an input.

5. The file symbol (the triangle) does not need the word File in it. The symbol itself conveys that it is a file.**3.13** Bottom Manufacturing Corporation Charge Sales System

**a. List the procedures or the internal documents that are labeled letters <emphasis>*c*</emphasis> to <emphasis>*r*</emphasis> in the flowchart of Bottom Manufacturing Corporation’s charge sales system. Organize your answer as follows (Note that the explanations of the letters <emphasis>*a*</emphasis> and <emphasis>*b*</emphasis> in the flowchart are entered as examples):**

**</para></listitem>**

|  |  |
| --- | --- |
| <informaltable id="informaltable2" frame="none" float="0" type="untbl1"><tgroup cols="2" colsep="0" rowsep="0" align="left"><colspec colnum="1" colname="c01" colwidth="500"/><colspec colnum="2" colname="c02" colwidth="500"/><thead><row><entry valign="top"><para>**Flowchart Symbol Letter**</para></entry> | <entry valign="top"><para>**Procedures or Internal Document**</para></entry></row></thead> |
| <tbody><row><entry valign="top"><para>a</para></entry> | <entry valign="top"><para>Prepare six-part sales order.</para></entry></row> |
| <row><entry valign="top"><para>b</para></entry> | <entry valign="top"><para>File by order number.</para></entry></row></tbody></tgroup></informaltable> |

FLOWCHART

SYMBOL INTERNAL CONTORL PROCEDURE

LETTER OR INTERNAL DOCUMENT

1. Prepare six-part sales order.
2. File by order number.
3. Approve customer credit and terms.
4. Release merchandise to shipping department.
5. File by sales order number.
6. File pending receipt of merchandise.
7. Prepare bill of lading.
8. Copy of bill of lading to customer.
9. Ship merchandise to customer.
10. File by sales order number.
11. Customer purchase order and sales order.
12. File pending notice of shipment.
13. Prepare three-part sales invoice.
14. Copy of invoice to customer.
15. Post to (or enter in) sales journal.
16. Account for numerical sequence.
17. Post to customer accounts.
18. File by (payment due) date. (CPA Examination, adapted)

**b. Using the guidelines for preparing flowcharts in <link linkend="ch03sb02" preference="0">Focus 3-2<xref linkend="ch03sb02" label="3-2"/></link> and the flowcharting symbols shown in <link linkend="ch03fig08" preference="0">Figure 3-8<xref linkend="ch03fig08" label="3-8"/></link>, critique the flowchart shown in <link linkend="ch03fig13" preference="0">Figure 3-13<xref linkend="ch03fig13" label="3-13"/></link>. List the ways the flowchart violates the guidelines or uses improper symbols.**

Fig. 3.13 violates the General Guidelines for Preparing Flowcharts in the following ways:

1. The text uses the Terminal symbol (the oval) to indicate an external party. Figure 3.13 uses the off page connector symbol.

2. Document numbers should be placed in the top right hand corner of the document symbol.

3. Sales order 2 is not shown passing through manual symbols labeled g and i so that it can end up in the file shown at the bottom of the shipping column. The same thing happens in the other columns.

1. Sales order 4 is filed in the finished goods department, yet the shipping column (third set of symbols in the column) shows sales order 4. This should be sales order 2, not 4.
2. The line showing information being posted to the accounts received ledger should come out of symbol q and should be a dotted line. The line to the sales journal (below symbol o) should also be a dotted line.
3. In the shipping column, when the three Bills of Lading are created, the arrow downward to symbol i should come from copy 2 of the Bill of Lading, not copy 3. The same applies to the sales invoice in the Billing Column (arrow from copy 1).
4. Instead of using annotation symbols to tell how documents are filed, use the letter D for date, N for numerically, and A for alphabetically. When more than one document is being filed (symbols j, l, and bottom of Billing Column) or the method of filing is unclear (symbol r, file sales invoice by payment due date) an annotation symbol can be used.

Additional items to improve efficiency of flowchart

1. Symbols p and q could be combined into one symbol.

**3.14**

1. **Prepare and file a tax return with the tax owed to the Internal Revenue Service.**

**Context**



**Level 0**



**3.14 (continued)**

**b. A customer pays an invoice with a check. Accounts receivable is updated to reflect the payment. The check is recorded and deposited into the bank.**

**Context**



**Level 0**



**3.14 (continued)**

**c. A customer places an online order to purchase merchandise. The order is approved, filled, and sent to the customer with an invoice.**

**Context**



**Level 0**



**3.14 (continued)**

**d. An inventory request is received by the purchasing department. The purchasing department prepares and sends a purchase order to the appropriate vendor.**

**Context**



**Level 0**



**3.14 (continued)**

**e. A vendor invoice is received, reviewed, and compared against the appropriate purchase order, then paid and filed.</para></listitem>**

**Context**



**Level 0**



**3.14 (continued)**

**f. A bill of lading for ordered inventory is received from a vendor, recorded, checked against the appropriate purchase order, and filed.**

Context



Level 0



**3 .15 <para>Prepare a program flowchart to help Melanie program this process.**</para></problem>



**3.16**

|  |  |
| --- | --- |
| 1. **Statements are prepared and sent to customers from data contained in the accounts receivable data store.** | K |
| 1. **A customer sends a sales invoice to the accounts payable process.** | D |
| 1. **A check is manually prepared from data on a vendor invoice.** | G |
| 1. **The cash receipt process updates the cash receipts data store.** | H |
| 1. **A sales invoice is manually prepared and sent to a customer.** | I |
| 1. **A report is prepared from data stored on magnetic tape.** | C |
| 1. **Billing data are entered online and used to update the sales order file and the customer master file.** | A |
| 1. **Data from a cancelled invoice are used to update the cash disbursements ledger.** | J |
| 1. **A sales order is prepared manually. Copy 1 is sent to the warehouse and copy 2 is filed.** | B |
| 1. **An accounts receivable aging report is prepared from the accounts receivable master file and the cash receipts master file, both stored on disk.** | E |
| 1. **An error listing and batch total are compared and filed.** | F |

**3.17** Students are to replicate the flowchart presented in the problem using documentation software such as Visio, Microsoft Word, Microsoft Excel, etc.

**3.18** Students are to replicate the data flow diagram presented in the problem using documentation software such as Visio, Microsoft Word, Microsoft Excel, etc.

**SUGGESTED ANSWERS TO THE CASES**

**3-1** <para>**You are the systems analyst for the Wee Willie Williams Widget Works (also known as Dub 5, which is a shortened version of 5 Ws). Dub 5 produces computer keyboard components. It has been producing keyboards for more than 20 years and has recently signed an exclusive 10-year contract to provide the keyboards for all Dell personal computers. As the systems analyst, you have been assigned the task of developing a level 0 DFD for Dub 5’s order processing system. You have finished gathering all the information you need to develop the first-pass DFD and now want to complete the diagram.**</para>

**Level 0 DFD for Dub 5:**



**3-2 Level 1 DFD for Dub 5:**



Note: The Order Rejection notice shown on the context level diagram and the level 0 diagram can take two forms: The Over Credit Limit Notice or the Credit Application. These two items are shown on the level 1 DFD.