



WelTec

Te Whare Wānanga o te Awakairangi



西安科技大学高新学院
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IT5507 Fundamentals of Data Science

Data and Process Modelling

Chapter Objectives

- ▶ Describe data and process modeling concepts and tools, including data flow diagrams, a data dictionary, and process descriptions
- ▶ Describe the symbols used in data flow diagrams and explain the rules for their use
- ▶ Draw data flow diagrams in a sequence, from general to specific

Overview of Data and Process Modeling Tools

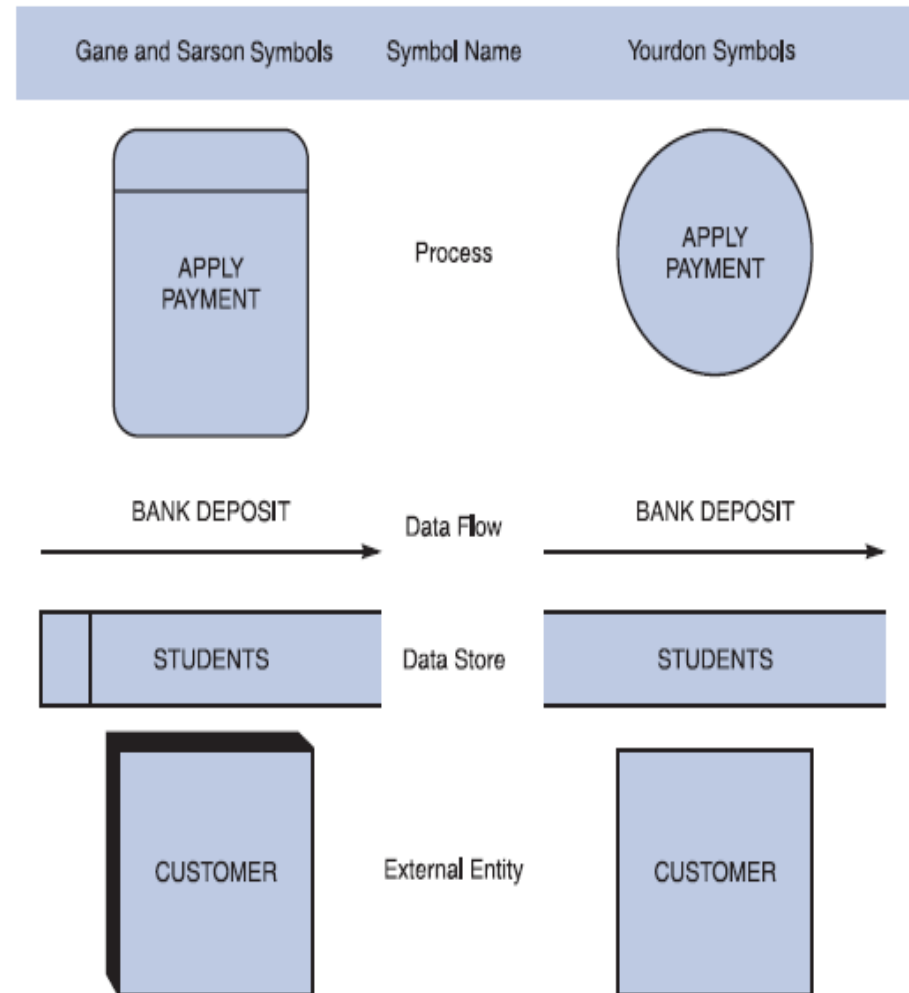
- ▶ **Logical Model:** Shows what the system must do, regardless of how it will be implemented physically
- ▶ **Physical Model:** Describes how the system will be constructed
- ▶ **Data flow diagram (DFD)** – Uses various symbols to show how the system transforms input data into useful information

Data Flow Diagrams

- ▶ A data flow diagram (DFD) shows how data moves through an information system but does not show program logic or processing steps
- ▶ A set of DFDs provides a logical model that shows what the system does, not how it does it

Data Flow Diagrams (Cont. 1)

- ▶ DFD Symbols
 - Four basic symbols
 - Gane and Sarson
 - Yourdon

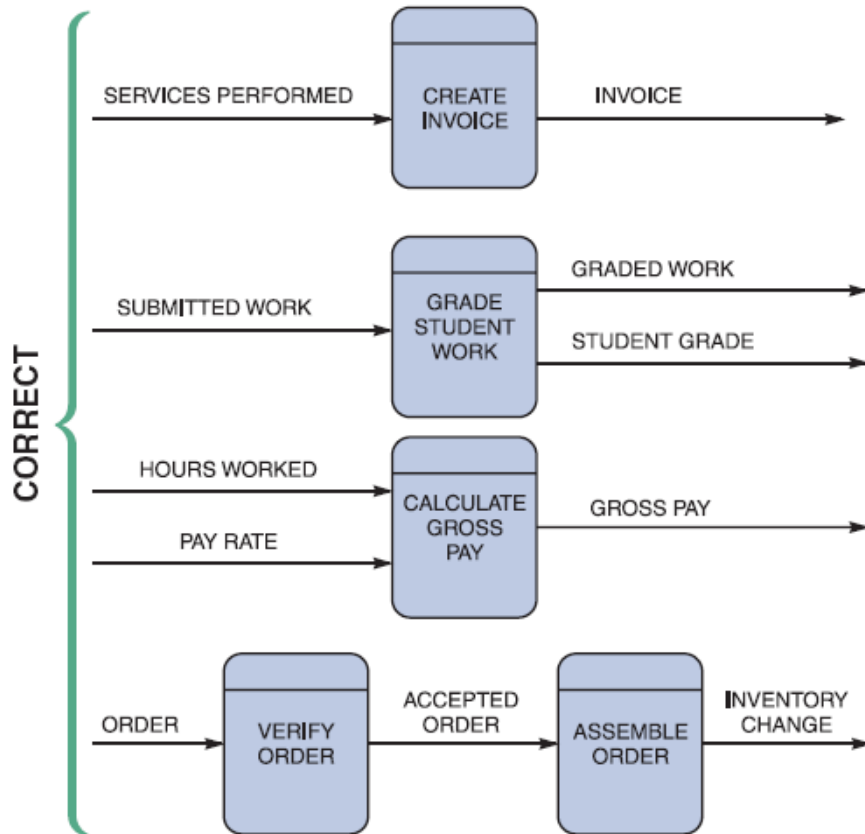


Data Flow Diagrams (Cont. 2)

Process Symbol

- Must have at least one input and at least one output
- Contains **business logic** that transforms the data
- Process name identifies its function (verb)
- Examples” : “apply rent payment” or “calculate commission
- In DFDs, a process symbol can be referred to as a **black box**

Data Flow Diagrams (Cont. 3)



▶ Data Flow Symbol

- Represents one or more data items
- The symbol for a data flow is a line with a single or double arrowhead

Data Flow Diagrams (Cont. 4)

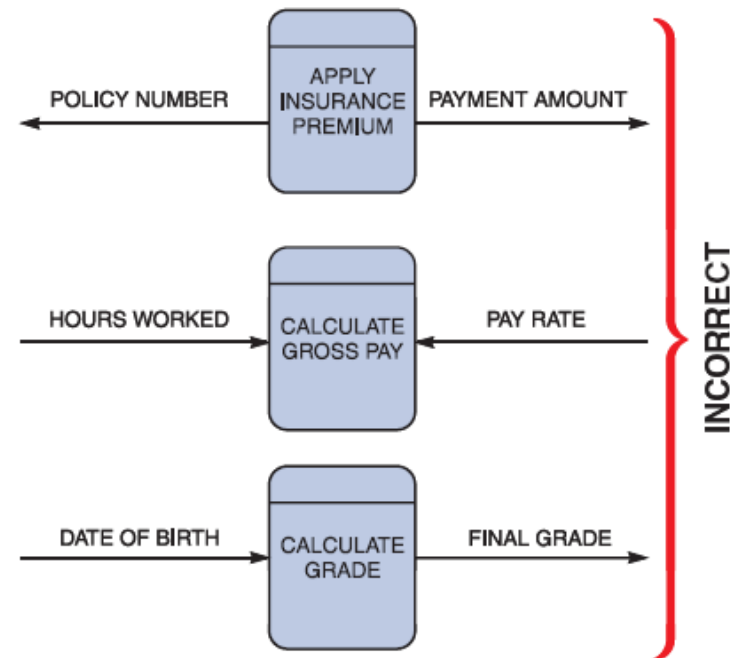
▶ Data Flow Symbol

- Following data flow and process combinations must be avoided

- Spontaneous generation

- Black holes

- Gray holes

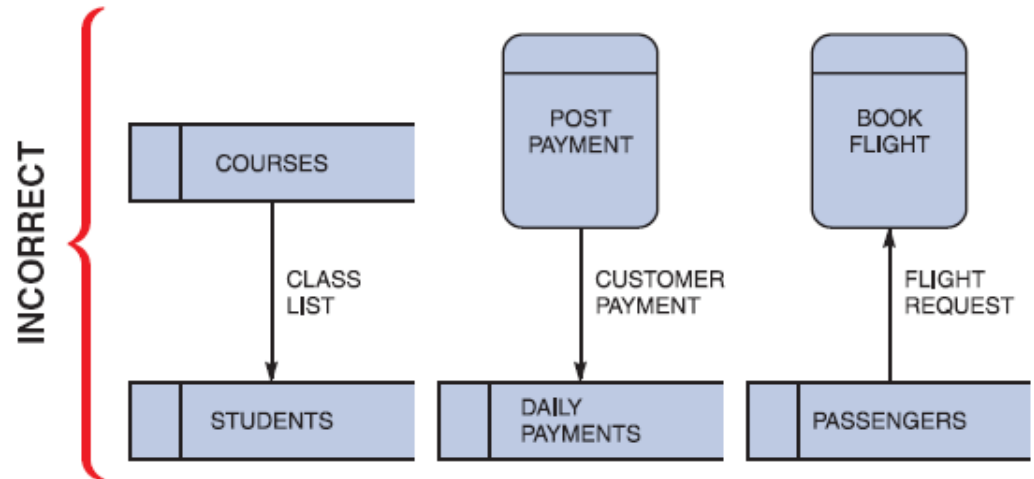
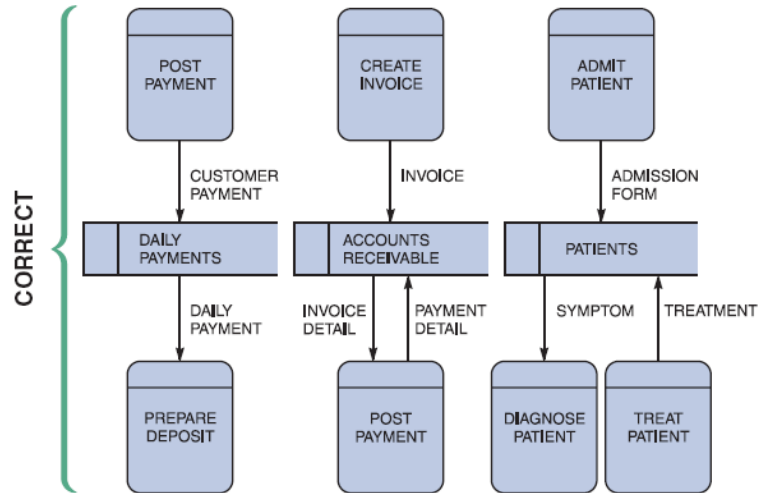


Data Flow Diagrams (Cont. 5)

Data Store symbol

- Represent data that the system stores
- A DFD does not show the detailed contents of a data store — the specific structure and data elements are defined in the data dictionary
- A data store must be connected to a process with a data flow

Data Flow Diagrams – Data Stores use

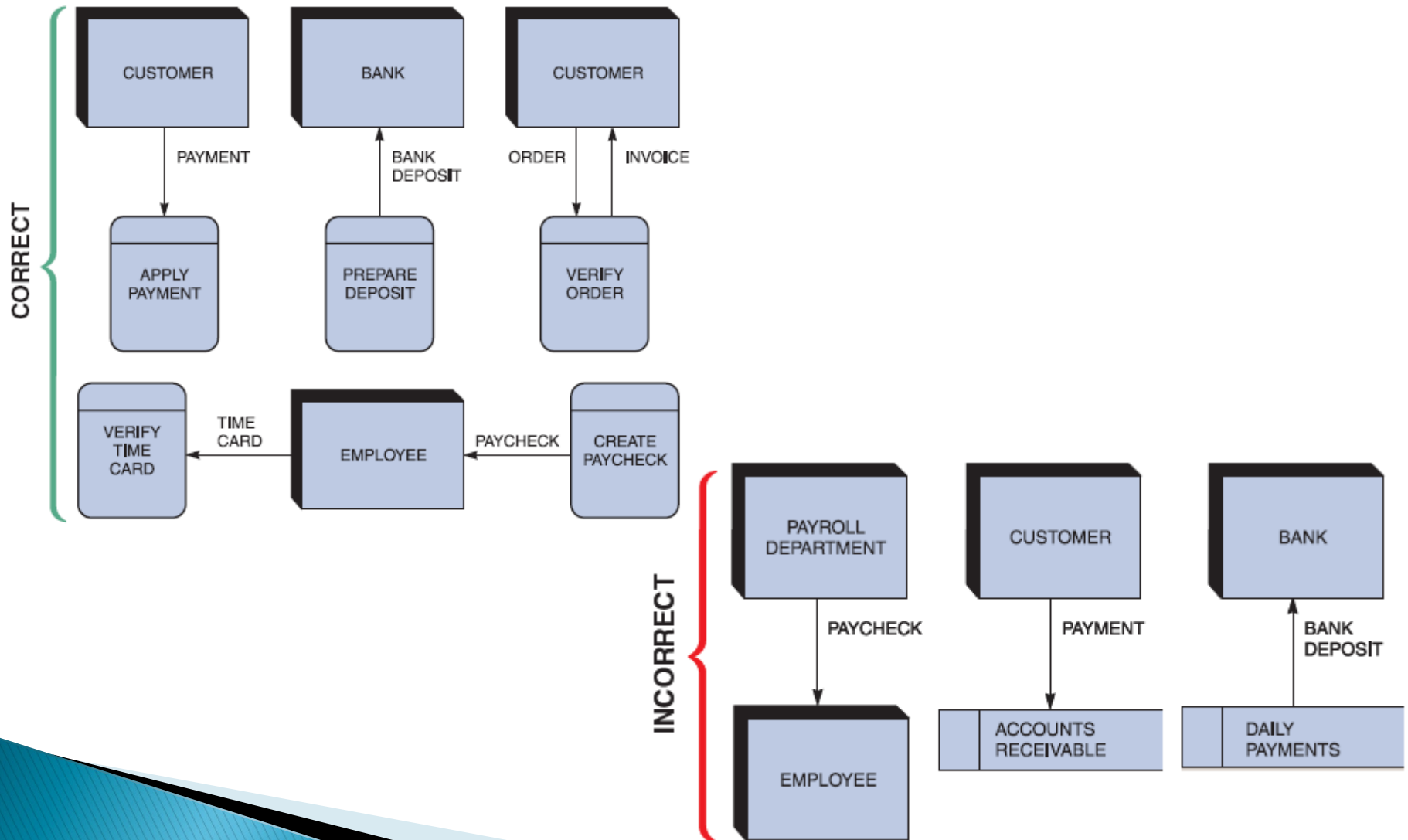


Data Flow Diagrams (Cont. 7)

Entity Symbol

- Shows how the system interfaces with the outside world
- A DFD shows only external entities that provide data to the system or receive output from the system
- DFD entities also are called **terminators** because they are data origins or final destinations
- Each entity must be connected to a process by a data flow

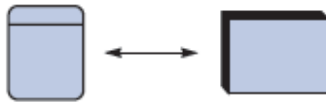
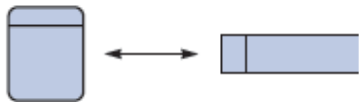
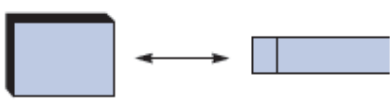
Data Flow Diagrams – Ex-Entity use



Data Flow Diagrams (Cont. 9)

► Keep in mind:

- All flow lines must be *labeled*
- Large processes can be broken down into smaller components

Correct and Incorrect Examples of Data Flows		
	Process to Process	✓
	Process to External Entity	✓
	Process to Data Store	✓
	External Entity to External Entity	✗
	External Entity to Data Store	✗
	Data Store to Data Store	✗

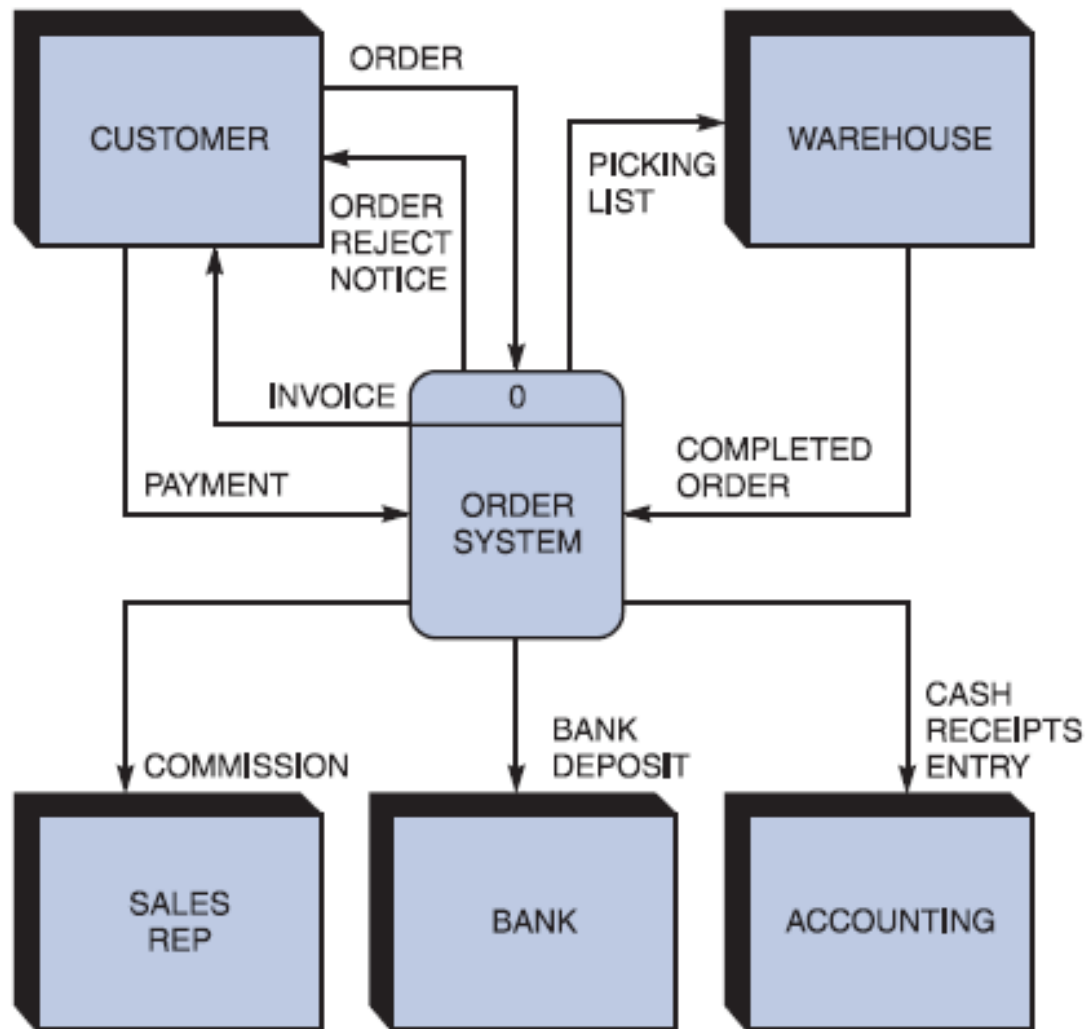
Creating a Set of DFDs

- ▶ Create a graphical model of the information system based on your fact-finding results
 - First, you will review a set of guidelines for drawing DFDs
 - Then you will learn how to apply these guidelines and create a set of DFDs using a three-step process

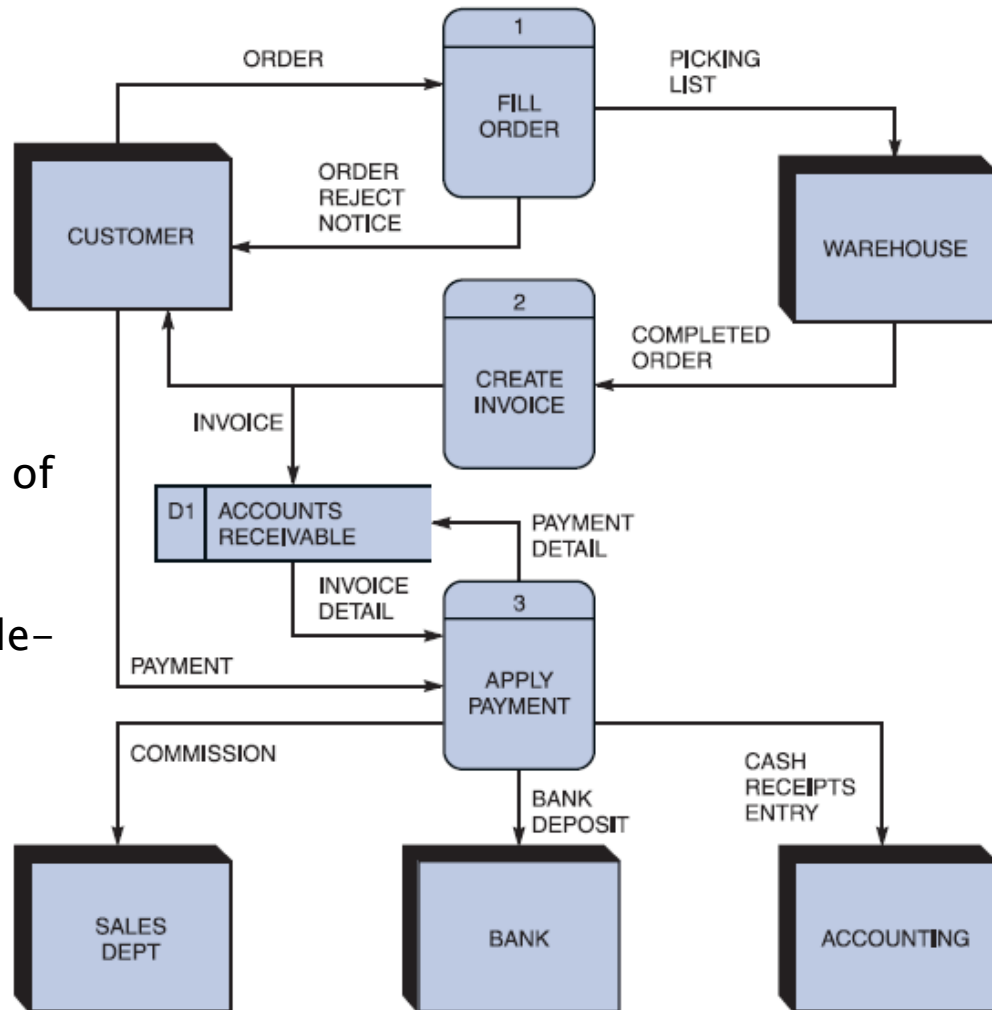
Creating a Set of DFDs

- ▶ Guidelines for Drawing DFDs
 - Draw the context diagram so that it fits on one page
 - Use the name of the information system as the process name in the context diagram
 - Use unique names within each set of symbols
 - Do not cross lines
 - Provide a unique name and reference number for each process
 - Ensure that the model is accurate, easy to understand, and meets the needs of its users

Step 1: Draw a Context Diagram

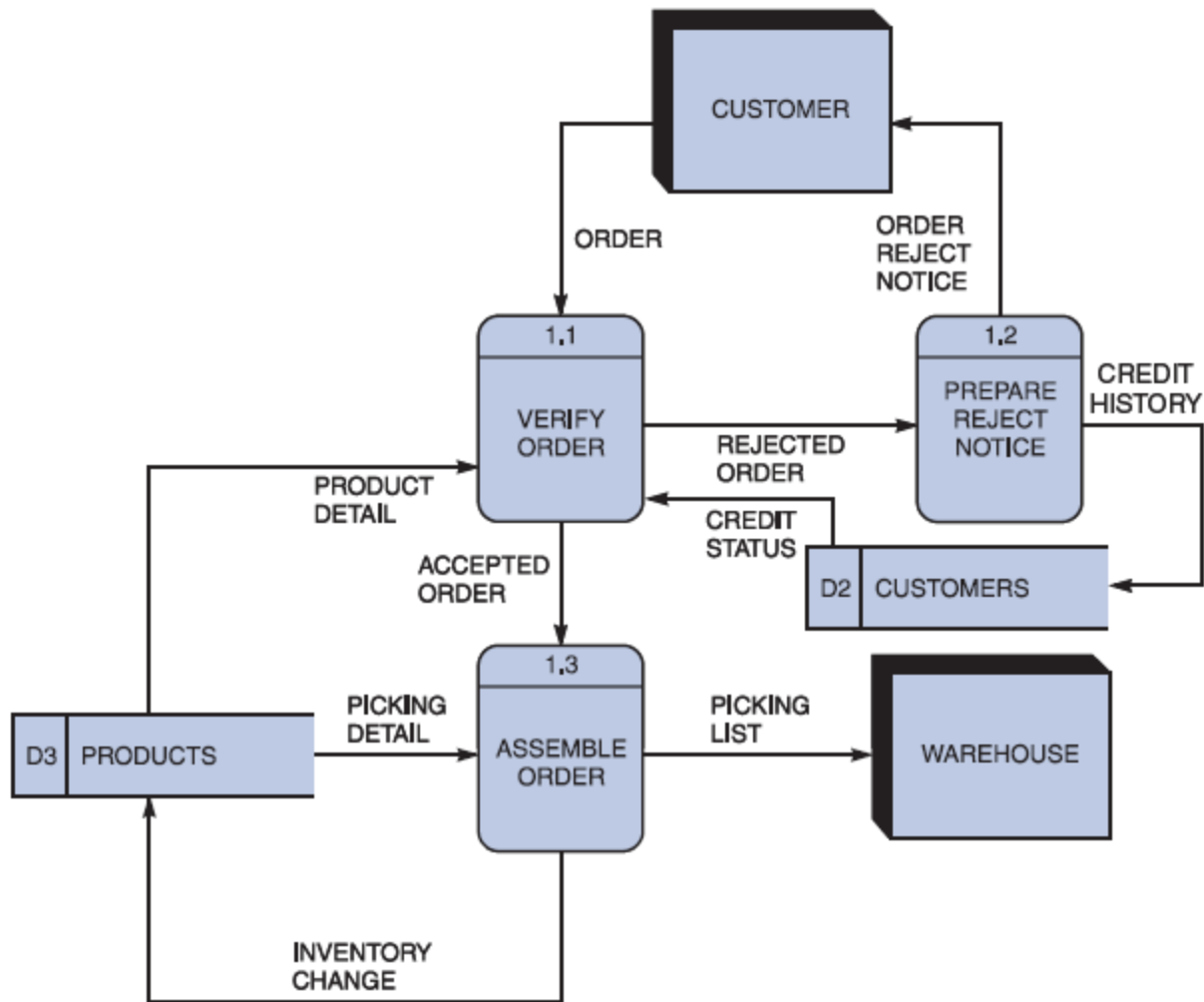


Step 2: Draw a Diagram Level 0 DFD



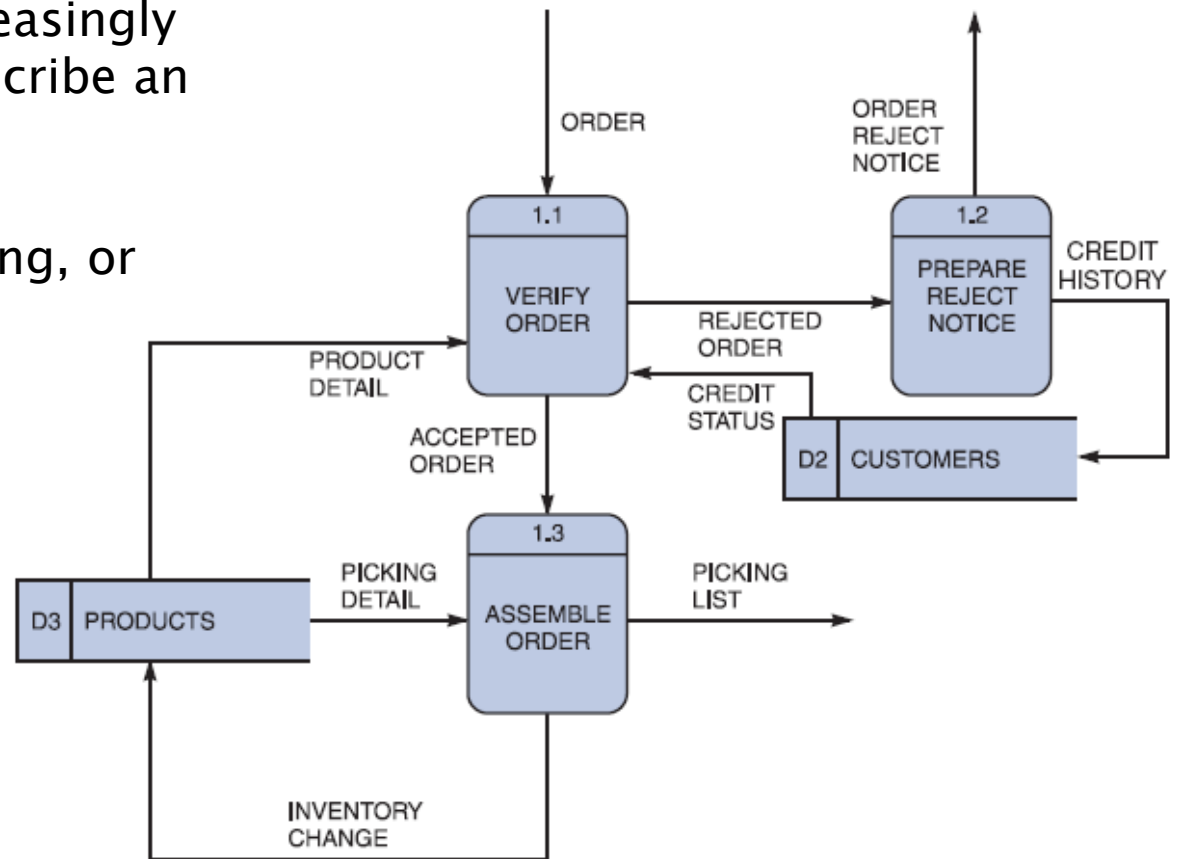
- Diagram 0 is an exploded view of process 0
- If same data flows in both directions, you can use a double-headed arrow
- Parent diagram
- Child diagram
- Functional primitive

Step 3: Draw the Lower Level 1 Diagrams

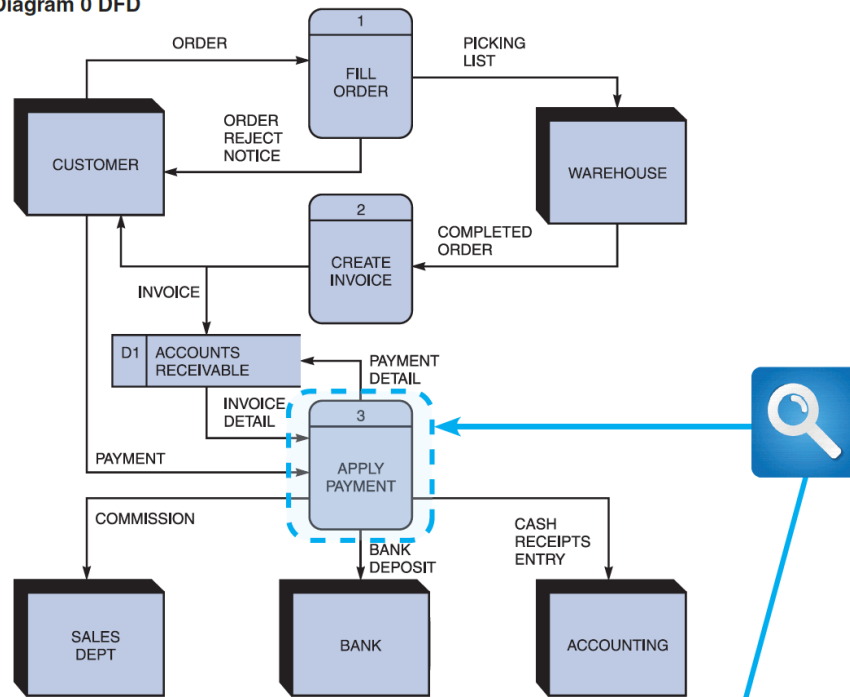


Creating a Set of DFDs

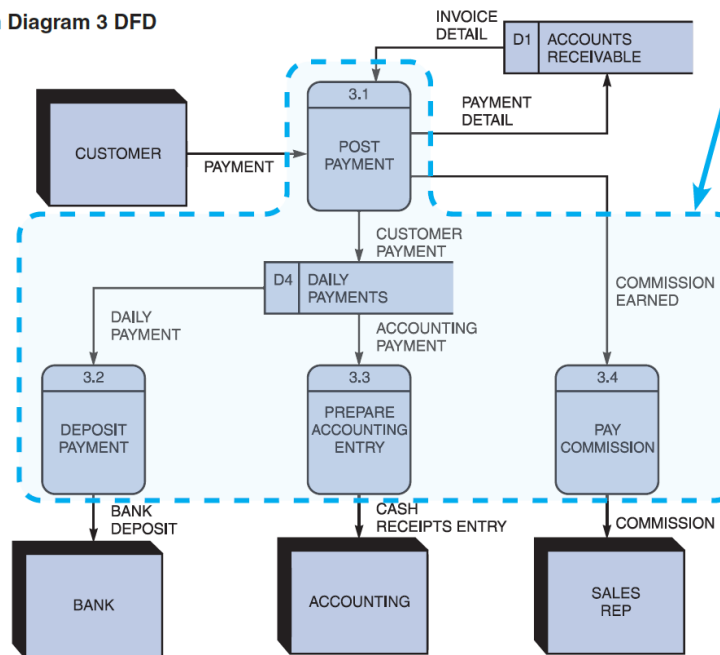
- ▶ Must use *leveling* and *balancing* techniques
- ▶ Leveling examples
 - Uses a series of increasingly detailed DFDs to describe an information system
 - Exploding, partitioning, or decomposing



Order System Diagram 0 DFD

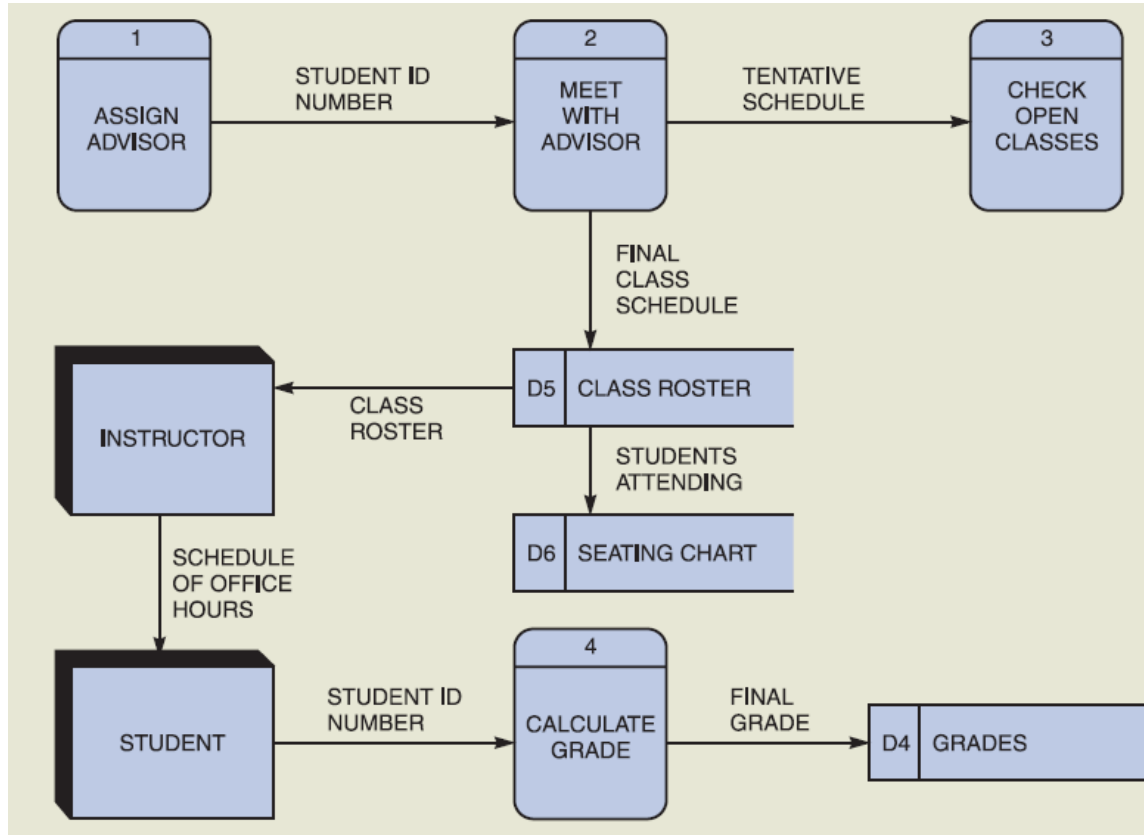


Order System Diagram 3 DFD



You are the IT director at Big Ten University. As part of a training program, you decide to draw a DFD that includes some obvious mistakes to see whether your newly hired junior analysts can find them. You came up with the diagram 0 DFD shown in below Figure. Based on the rules discussed earlier, how many problems should the analysts find?

GROUP DISCUSSION



1. ASSIGN ADVISOR, process 1, has no input, it is a spontaneous generating process.
2. CHECK OPEN CLASSES, process 3, has no output and is a black hole process.
3. CALCULATE GRADE, process 4 is taking STUDENT ID NUMBER as input using which it cannot produce output and its is a gray hole process.
4. CLASS ROSTER and SEATING CHART data stores cannot be connected with a data flow.
5. The data store SEATING CHART does not have an outgoing data flow.
6. INSTRUCTOR and STUDENT external entities cannot be connected with a data flow. INSTRUCTOR entity does not connect to a process. Also, an external entity cannot be directly connected to a data store.
7. GRADES and SEATING CHART data stores are black holes, do not have an outgoing data flow.
8. INSTRUCTOR entity does not connect to a process.

