DATA FLOW DIAGRAM

SYSTEMS ANALYSIS AND DESIGN
KENDALL & KENDALL

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PROCESS MODEL

- **Process model**
  - A formal way of representing how a business system operates
  - Illustrates the activities that are performed and how data moves among them

DATA FLOW DIAGRAMS

- **Data Flow Diagrams - Introduction**
  Data flow diagrams can be used to provide a clear representation of any business function. The technique starts with an overall picture of the business and continues by analysing each of the functional areas of interest. This analysis technique can be carried out to precisely the level of detail required. The technique exploits a method called top-down expansion to conduct the analysis in a targeted way.

DATA FLOW DIAGRAMS

- Graphical representation of a system's data and how the processes transform the data, is known as Data Flow Diagram (or DFD)
- DFD is one of the most important tools in a structured system analysis. It presents a method of establishing relationship between functions or processes of the system with information it uses.
- DFD is a key component of the system requirement specification, because it determines what information is needed for the process before it is implemented
- Data flow diagrams are the most commonly used way of documenting the process of current & required systems.
- 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

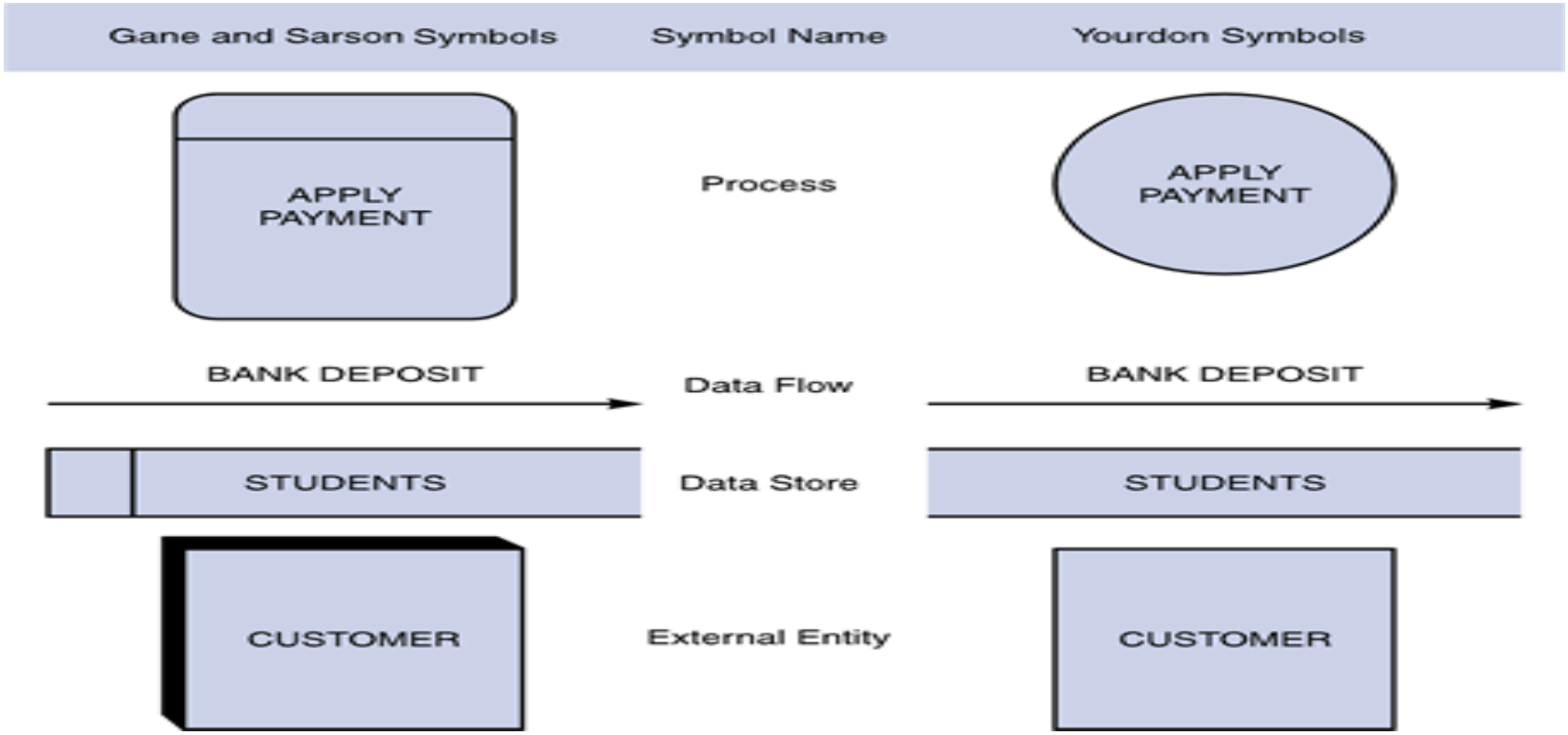
- Data flow diagram supports 4 main activities:
  - Analysis: DFD used to determine requirements of users
  - Design: DFD used to map out plan and illustrate solutions to analysts and users while designing a new system
  - Communication: DFD is simple and easy to understand to analysts and users
  - Documents: DFD used to provide special description of requirements and system design. DFD provide an overview of key functional components of the system but it does not provide any detail on these components.

DATA FLOW DIAGRAMS

- DFD Symbols
  - DFDs use four basic symbols that represent processes, data flows, data stores, and entities
  - Symbols are referenced by using all capital letters for the symbol name
- Components of DF Diagrams
  - Processes change data
  - Data flows between processes
  - External entities interact from outside
  - Data stores hold data internally

DATA FLOW DIAGRAMS

- Two different standard sets can be used
  - DeMarco and Yourdan
  - Gane and Sarson



Data flow diagram symbols, symbol names, and examples for the Gane and Sarson and Yourdon symbol sets. [1]

DATA FLOW DIAGRAMS

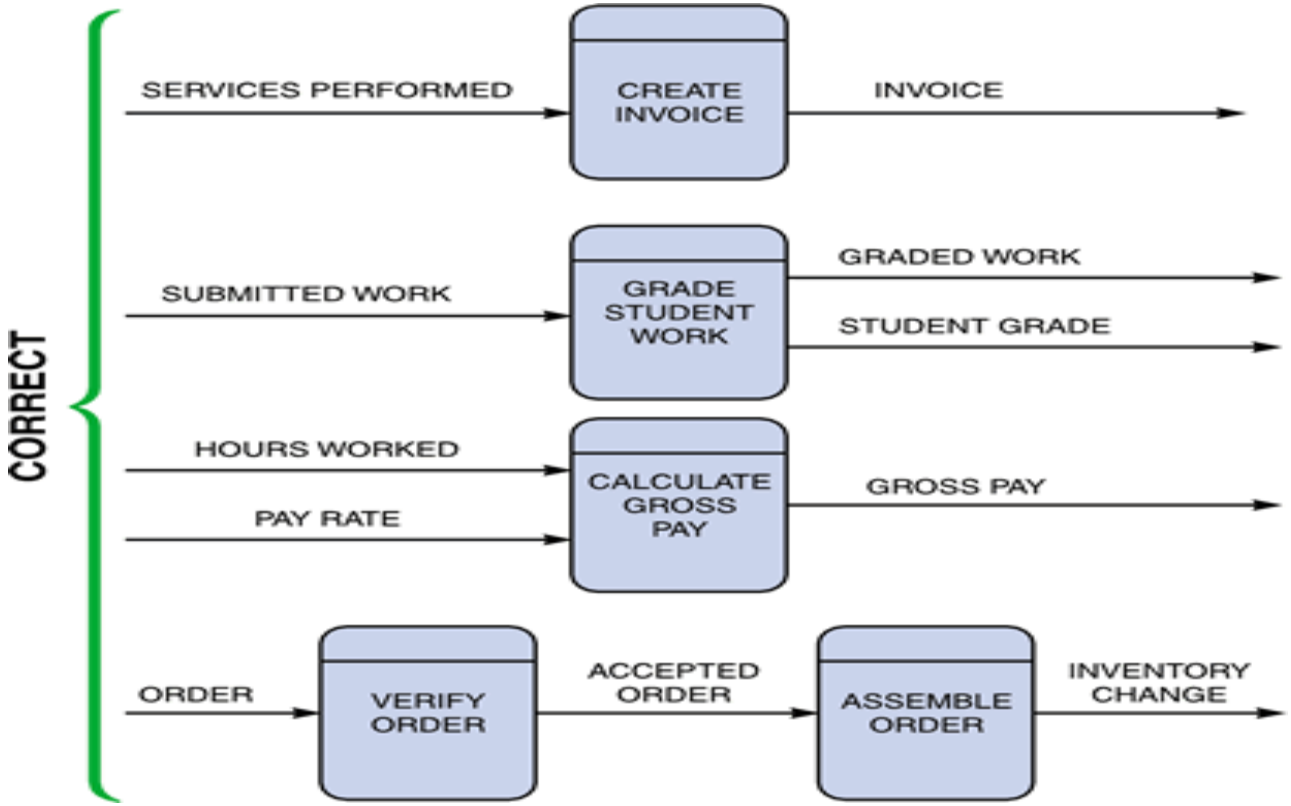
- Process symbol
  - Receives input data and produces output that has a different content, form, or both
  - Contain the business logic which determines how a system handles data and produces useful information. Business logic, also called business rules, reflect the operational requirements of the business.
  - Process name identifies a specific function and consists of verb, and an adjective, if necessary
  - a process symbol can be referred to as a black box, because the inputs, outputs, and general functions of the process are known, but the underlying details and logic of the process are hidden

DATA FLOW DIAGRAMS

- DFD Symbols
  - Data flow symbol
  - A data flow is a path for data to move from one part of the information system to anther
    - Represents one or more data items
    - The detailed content of the data flow does not appear in the DFD
    - The symbol for a data flow is a line with a single or double arrowhead
    - A data flow name consists of a singular noun and an adjective, if needed
    - Is detailed in the data dictionary

DATA FLOW DIAGRAMS

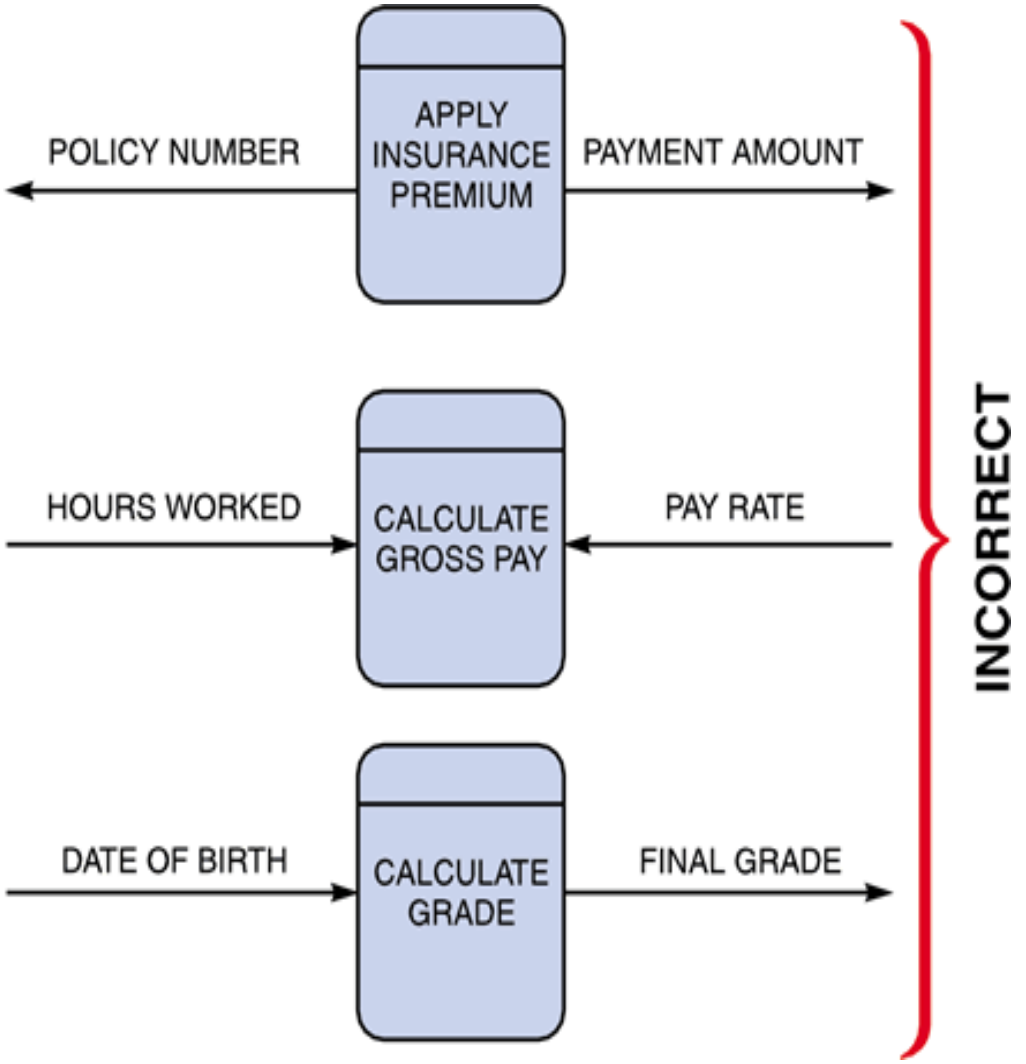
- At least one data flow must enter and one data flow must exit each process symbol



Examples of correct combinations of data flow and process symbols. [1]

DATA FLOW DIAGRAMS

- Examples of incorrect combinations of data flow and process symbols.
- APPLY INSURANCE PREMIUM has no input and is called a spontaneous generation process.
- CALCULATE GROSS PAY has no outputs and is called a black hole process.
- CALCULATE GRADE has an input that is obviously unable to produce the output. This process is called a gray hole.



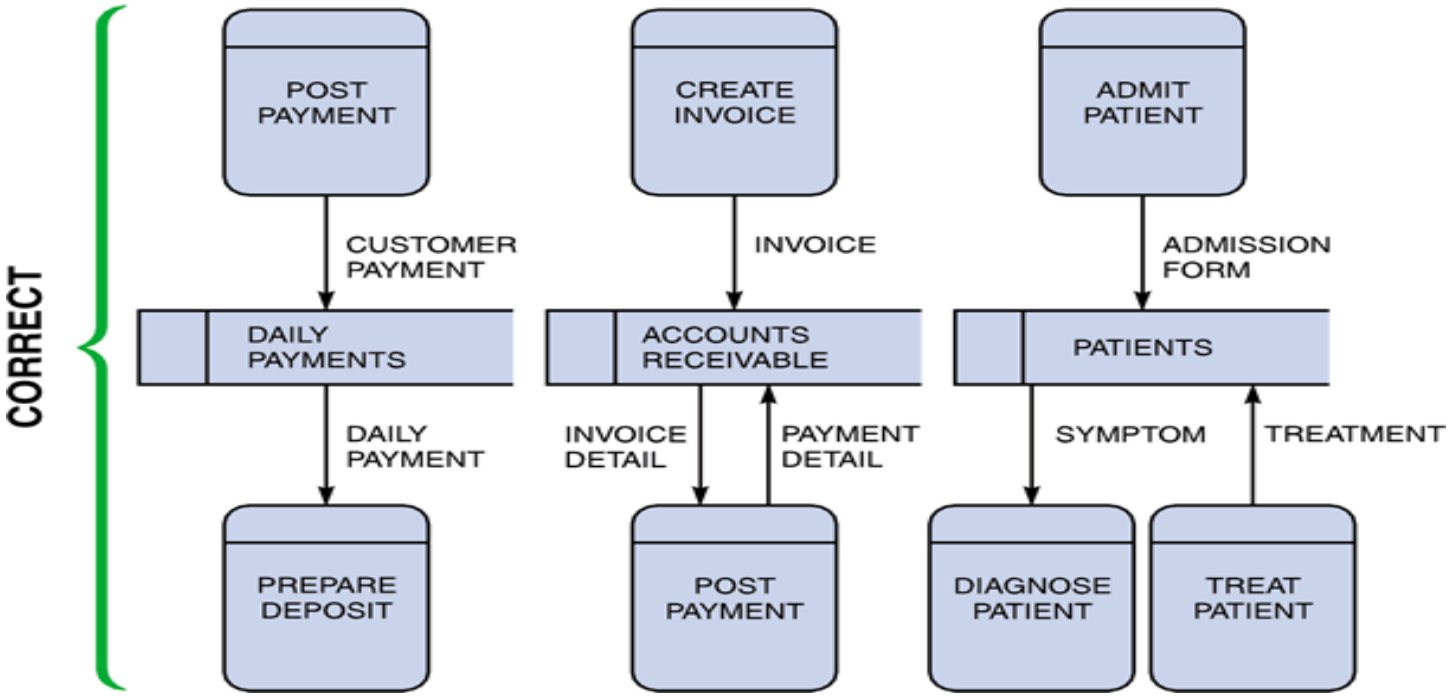
[1]

DATA FLOW DIAGRAMS

- DFD Symbols
  - Data store symbol
    - Represent data that the system stores
    - A DFD does not show the detailed content of data store
    - The physical characteristics of a data store are unimportant because you are concerned only with a logical model
    - Is a flat rectangle that is open on the right side and closed on the left side
    - A data store name is a plural name consisting of a noun and adjectives, if needed
    - can be duplicated, one or more times, to avoid line crossing.
    - is detailed in the data dictionary

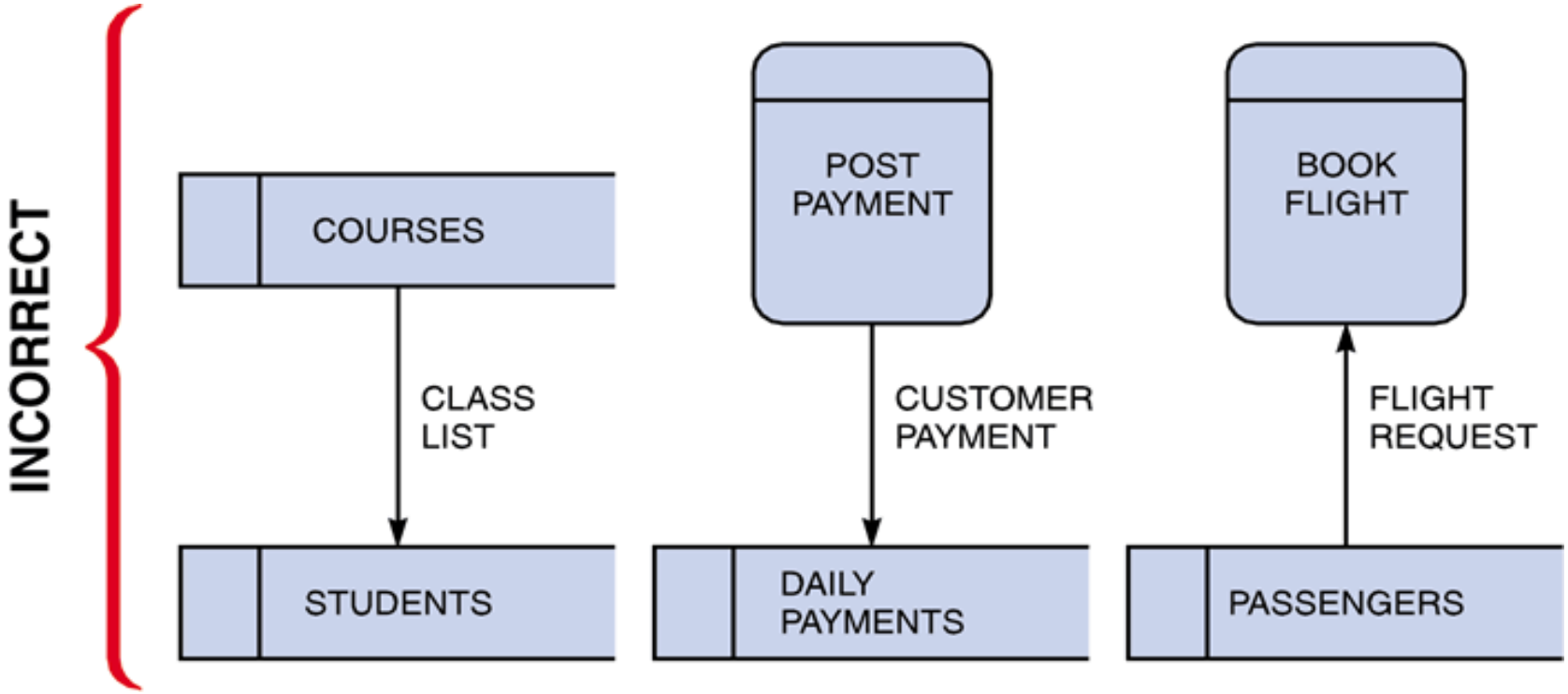
DATA FLOW DIAGRAMS

- A data store must be connected to process with a data flow
- A data store must have at least one incoming and one outgoing data flow
- One exception when data store has no input data flow because it contains fixed reference data that is not updated by the system



Examples of correct uses of data store symbols in a data flow diagram. [1]

DATA FLOW DIAGRAMS



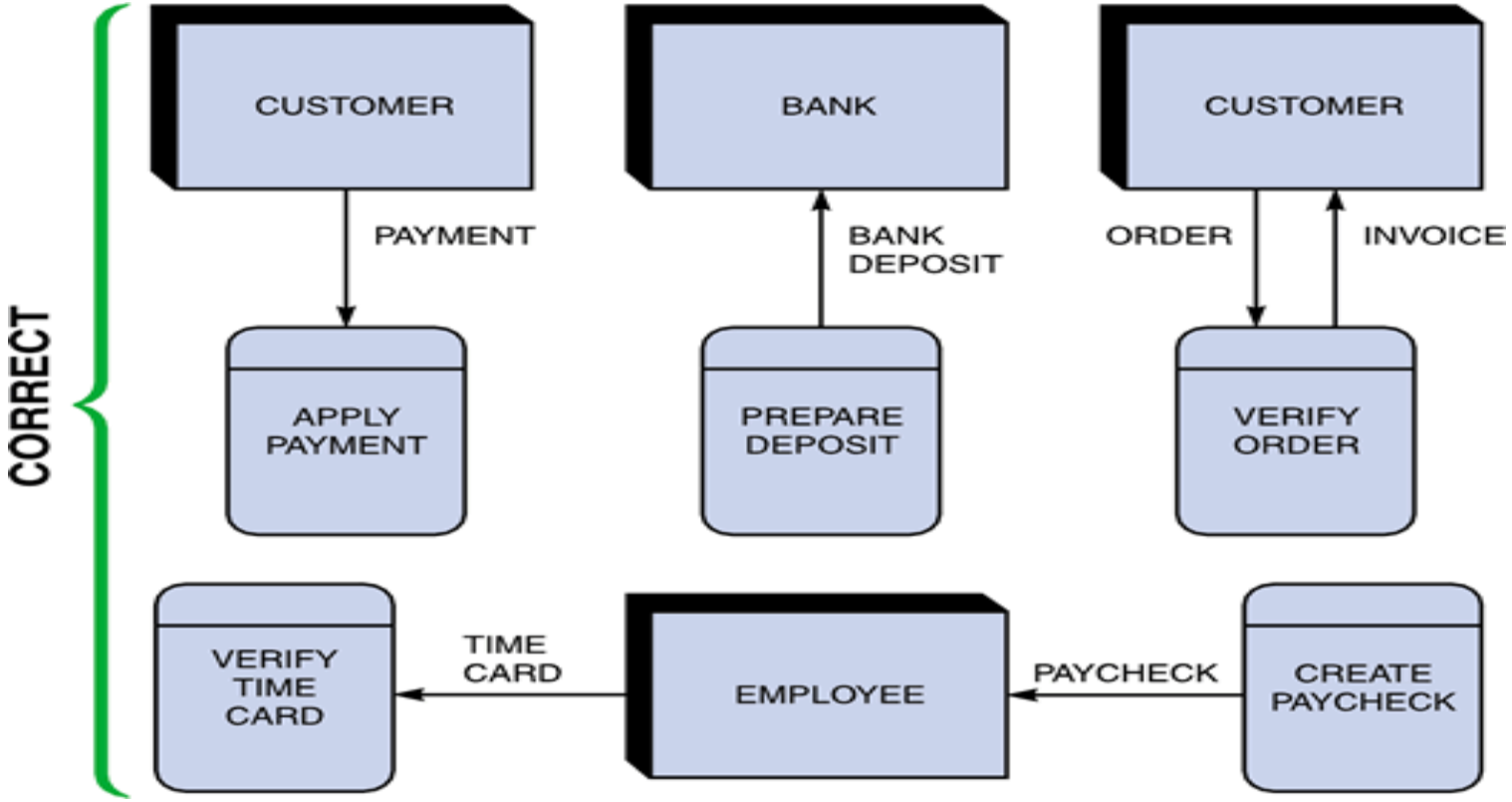
- Examples of incorrect uses of data store symbols: two data stores cannot be connected by a data flow without an intervening process, and each data store should have an outgoing and incoming data flow. [1]

DATA FLOW DIAGRAMS

- DFD Symbols
  - Entity Symbol
    - Symbol is a rectangle, which may be shaded to make it look three-dimensional
    - An entity name is the singular form of a department, outside organization, other information system, or person
    - Name of the entity appears inside the symbol
    - A DFD shows only the external entities that provide data to the system or receive output from the system
    - can be duplicated, one or more times, on the diagram to avoid line crossing.
    - determine the system boundary. They are external to the system being studied. They are often beyond the area of influence of the developer.
    - go on margins/edges of data flow diagram
    - Entities also called
    - Terminators: because they are data origins or final destination
    - Source: for entity that supplies data to the system
    - Sink: for entity that receives data from the system

DATA FLOW DIAGRAMS

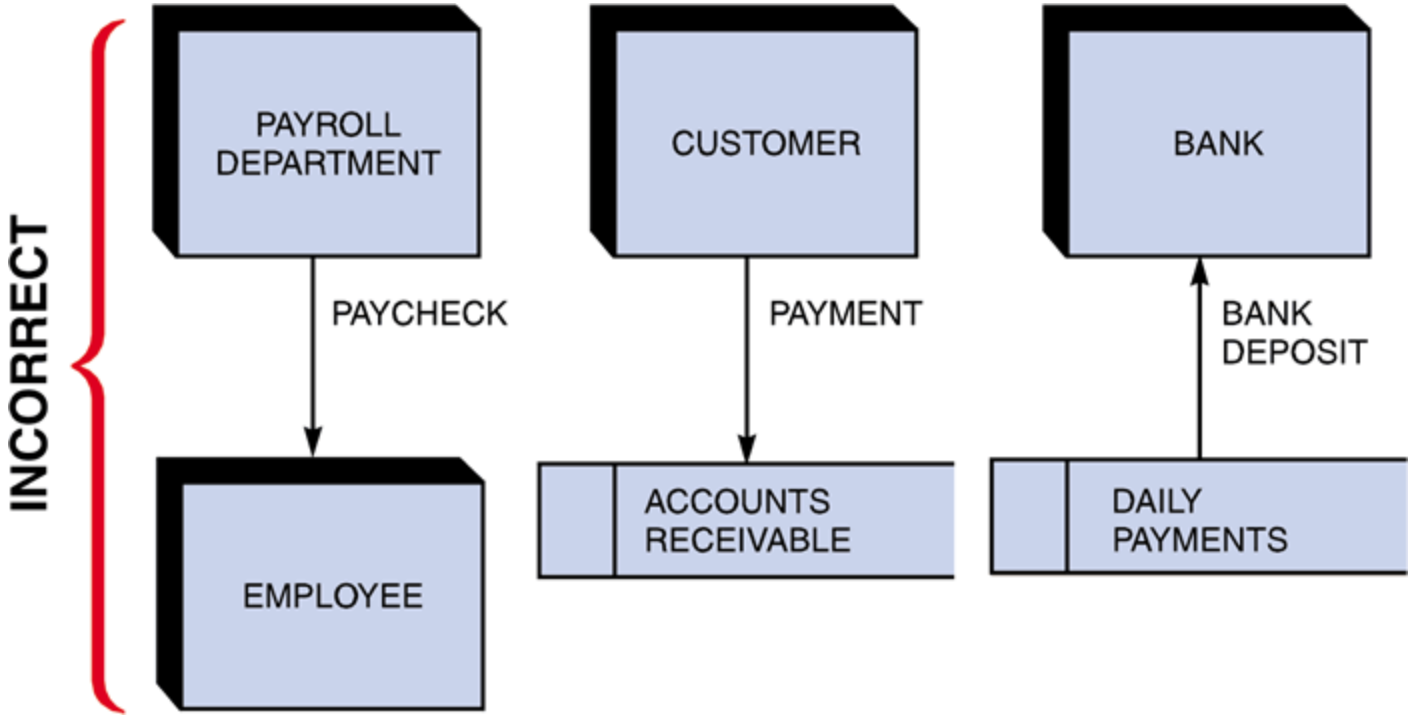
- Entity can be connected with a process only



Examples of correct uses of external entities in a data flow diagram.[1]

DATA FLOW DIAGRAMS

- Examples of incorrect uses of external entities. An external entity must be connected by a data flow to a process, and not directly to a data store or to another external entity. [1]



DATA FLOW DIAGRAMS

- Rules for connecting processes, data stores, and entities in a DFD. [1]

	YES	NO
A process to another process	✓	
A process to an external entity	✓	
A process to a data store	✓	
An entity to another entity		✓
An entity to a data store		✓
A data store to another data store		✓

Creating Data Flow Diagrams

Steps:

1. Create a list of activities
2. Construct Context Level DFD
   (identifies external entities and processes)
3. Construct Level 0 DFD
   (identifies manageable sub process)
4. Construct Level 1- n DFD
   (identifies actual data flows and data stores)
5. Check against rules of DFD

DFD NAMING GUIDELINES

- External Entity → Noun
- Data Flow → Names of data
- Process → verb phrase
  - a system name
  - a subsystem name
- Data Store → Noun

Creating Data Flow Diagrams

Lemonade Stand Example

Creating Data Flow Diagrams

Example

The operations of a simple lemonade stand will be used to demonstrate the creation of dataflow diagrams.

Steps:

1. Create a list of activities
   - Old way: no Use-Case Diagram
   - New way: use Use-Case Diagram
2. Construct Context Level DFD
   (identifies sources and sink)
3. Construct Level 0 DFD
   (identifies manageable sub processes)
4. Construct Level 1- n DFD
   (identifies actual data flows and data stores)

Creating Data Flow Diagrams

Example

Think through the activities that take place at a lemonade stand.

1. Create a list of activities

Customer Order
Serve Product
Collect Payment
Produce Product
Store Product

Creating Data Flow Diagrams

Example

Also think of the additional activities needed to support the basic activities.

1. Create a list of activities

Customer Order
Serve Product
Collect Payment
Produce Product
Store Product
Order Raw Materials
Pay for Raw Materials
Pay for Labor

Creating Data Flow Diagrams

Example

Group these activities in some logical fashion, possibly functional areas.

1. Create a list of activities

Customer Order
Serve Product
Collect Payment

Produce Product
Store Product

Order Raw Materials
Pay for Raw Materials

Pay for Labor

Creating Data Flow Diagrams

Example

Create a context level diagram identifying the sources and sinks (users).

Customer Order
Serve Product
Collect Payment

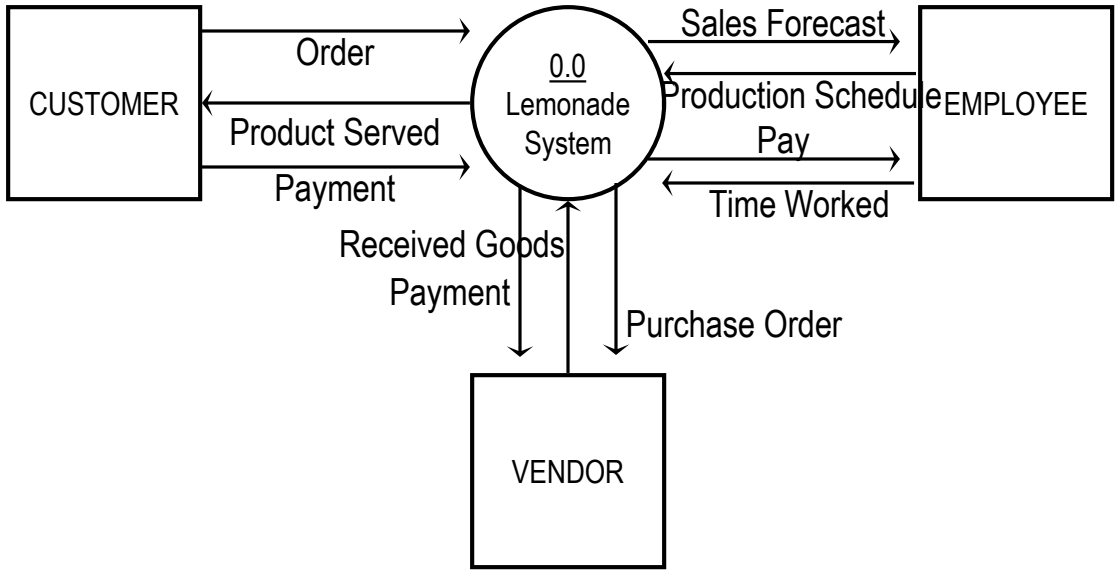
Produce Product
Store Product

Order Raw Materials
Pay for Raw Materials

Pay for Labor

2. Construct Context Level DFD (identifies sources and sink)

Context Level DFD



Creating Data Flow Diagrams

Example

Create a level 0 diagram identifying the logical subsystems that may exist.

Customer Order
Serve Product
Collect Payment

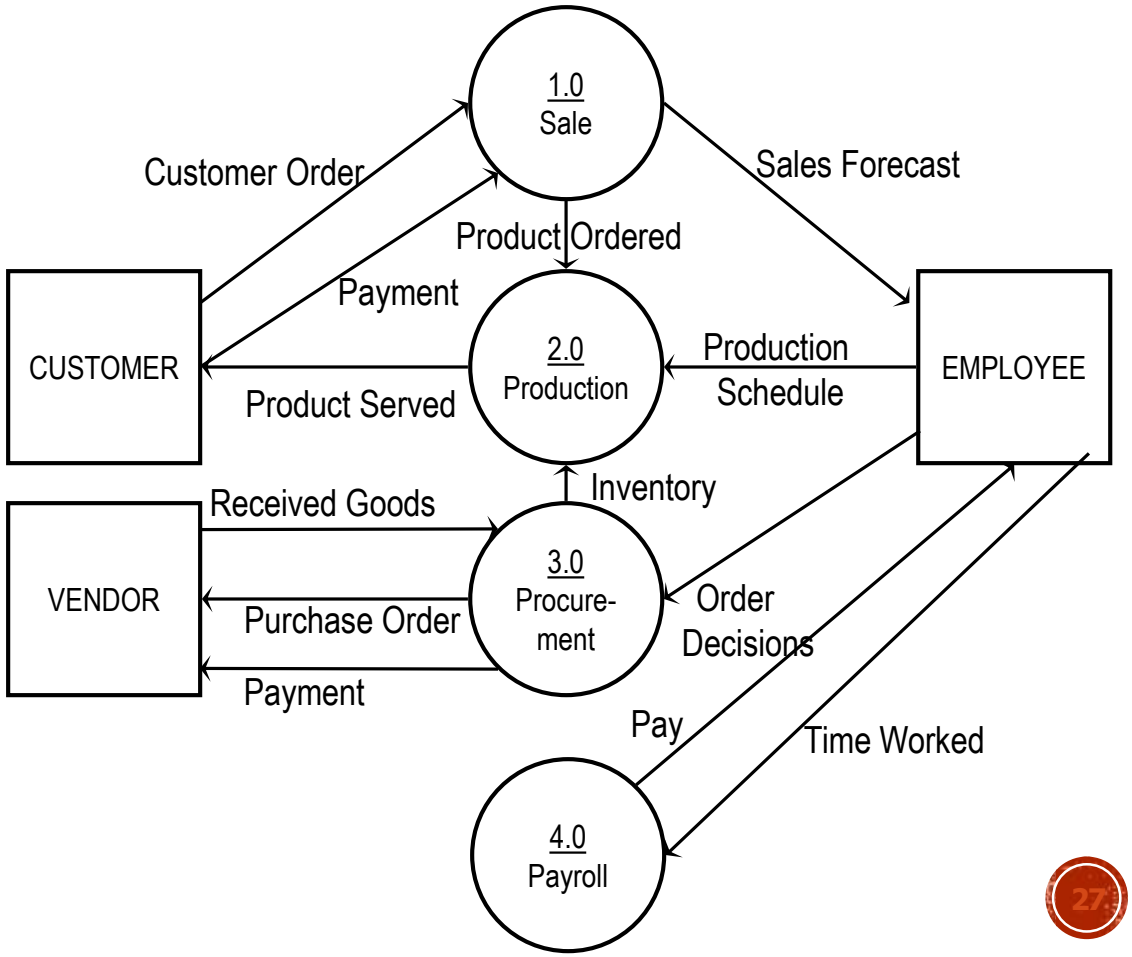
Produce Product
Store Product

Order Raw Materials
Pay for Raw Materials

Pay for Labor

3. Construct Level 0 DFD
(identifies manageable sub processes)

Level 0 DFD



Creating Data Flow Diagrams

Example

Create a level 1 decomposing the processes in level 0 and identifying data stores.

Customer Order
Serve Product
Collect Payment

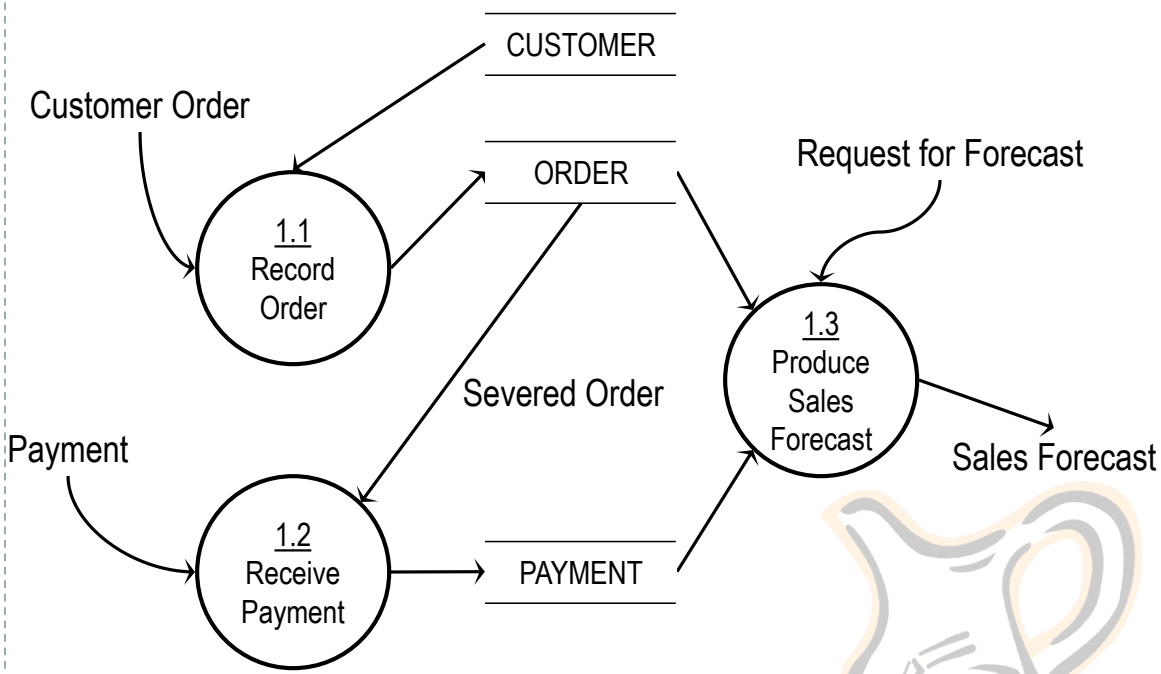
Produce Product
Store Product

Order Raw Materials
Pay for Raw Materials

Pay for Labor

4. Construct Level 1- n DFD
(identifies actual data flows and data stores)

Level 1 DFD



Creating Data Flow Diagrams

Example

Create a level 1 decomposing the processes in level 0 and identifying data stores.

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Collect Payment

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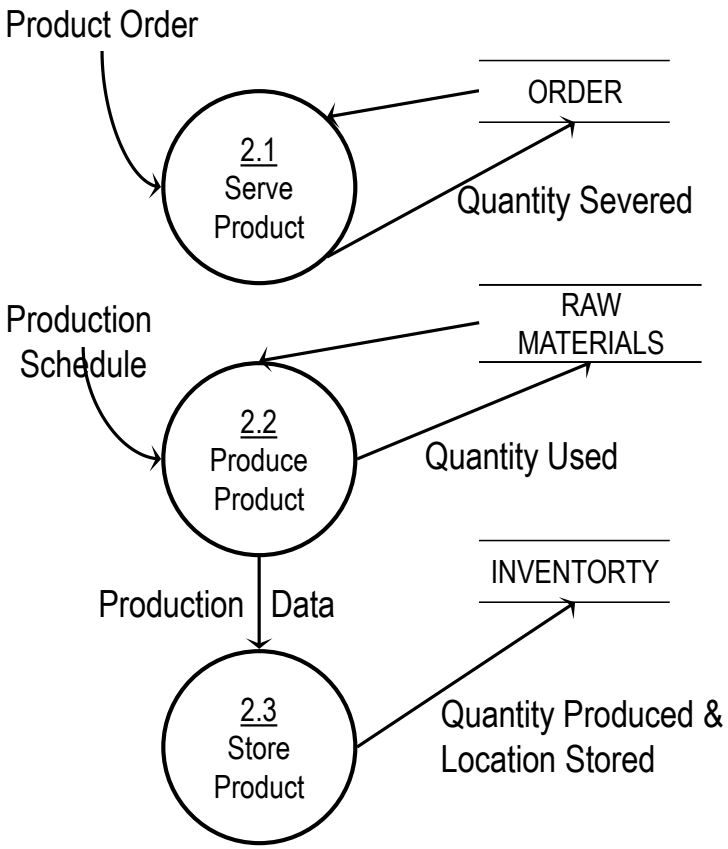
Store Product

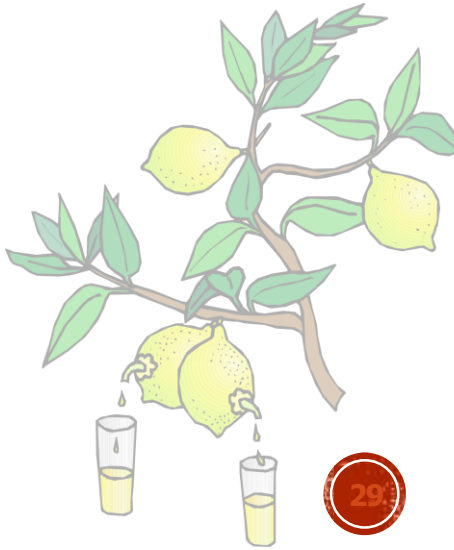
Order Raw Materials
Pay for Raw Materials

Pay for Labor

4. Construct Level 1 (continued)

Level 1 DFD





Creating Data Flow Diagrams

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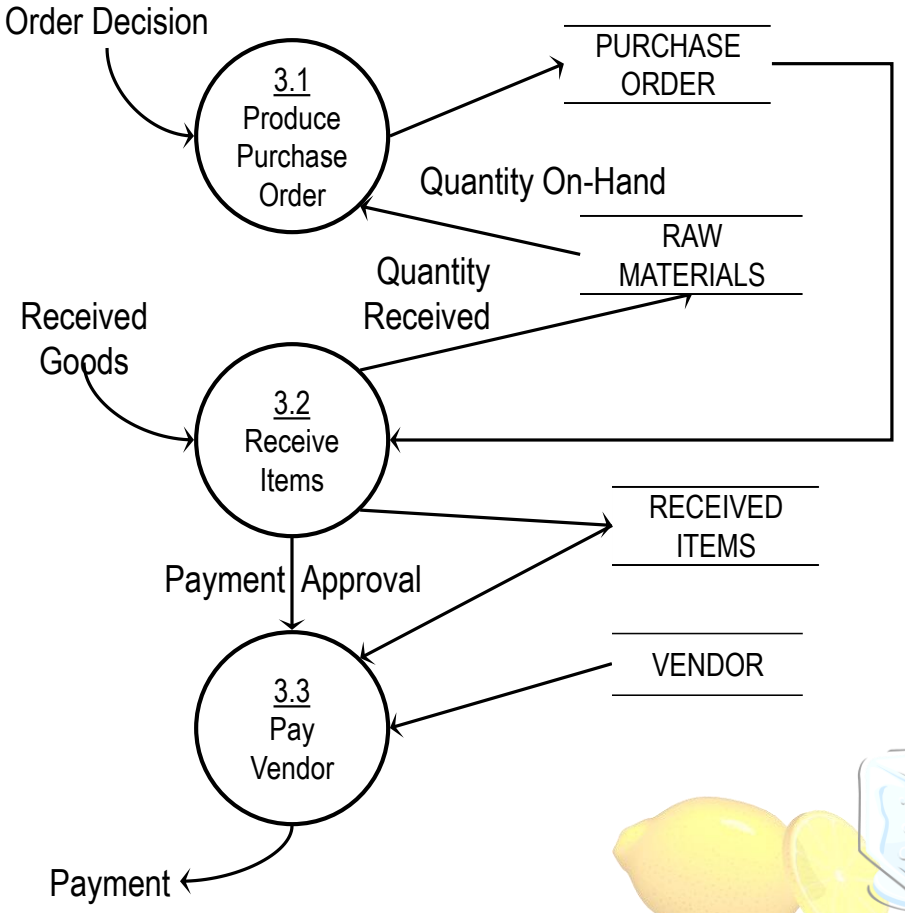
4. Construct Level 1 (continued)

Level 1 DFD



Creating Data Flow Diagrams

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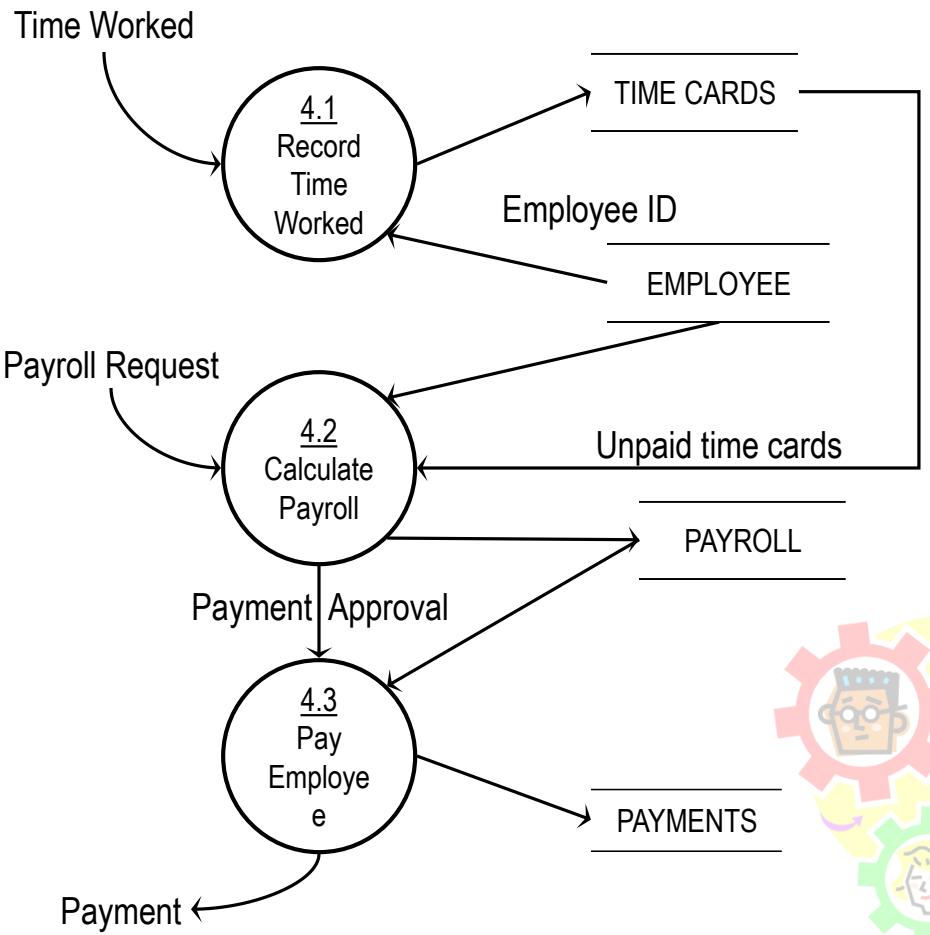
4. Construct Level 1 (continued)

Level 1 DFD



Process Decomposition