Process Modeling

Lecture 8

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Learning Outcomes

End of this lecture you will be able to learn ,

- LO1: Determine the different aspects of functional modeling.
- LO2: Apply the knowledge of functional modeling to the problems.

INTRODUCTION

- Process modeling starts just after the requirement analysis.
- Modeling means making a conceptual design of the system.
- Conceptual Design includes 2 parts:

  1. **Process modeling**
     - organizing and documenting the systems processes, inputs, output and data stores.
  2. **Data modeling**
     - organizing and documenting the system data.

PROCESS MODELING

Process Modeling

- These models generally give the following information:
  1. What processes make up the system?
  2. What data are used in each process?
  3. What data are stored?
  4. What type of data enters and leaves the system?

Process Modeling …

- Data are transformed into information as it flows through a computer-based system.
- This information transformation consists of
  1. **Input –** can be texts, numbers, files, images etc.
  2. **Process**
     - Different methods used to change the input.
     - Utilizes hardware, software and human elements
  3. **Output -** the results generated during transformation

- Transformation can be a single logical comparison, complex numerical algorithms, rule-inference approach of an expert system.

DATA FLOW DIAGRAM

Data flow Diagram

- Flow models illustrate the flow of a system
- Help to better understand the functionality of the system.
- Can be created regardless of size and complexity.

Example: DFD – Data Flow Diagram

- # A graphical tool used to analyze the movement of data through a manual or automated system.
- # Illustrates transformation of data from input to output, through processes.
- # Logical and independent of the physical components.

DFD ELEMENTS

DFD ELEMENTS

1. PROCESS
2. EXTERNAL ENTITY
3. DATA FLOW
4. DATA STORE

DFD ELEMENTS

1. PROCESS

- TRANSFORMS INPUTS INTO OUTPUTS.
- USUALLY DESCRIBED BY VERBS (SELECT, PURCHASE, CALCULATE, ADJUST, UPDATE)

DFD ELEMENTS

2. EXTERNAL ENTITY

- CAN BE A PERSON, ORGANIZATION, OR OTHER SYSTEMS THAT PROVIDES DATA (DATA SOURCE) TO A PROCESS IN THE SYSTEM OR RECEIVES DATA (DATA DESTINATION) FROM A PROCESS

DFD elements

3. Data Flow

- Movement of data between processes, data stores, external entities

DFD ELEMENTS

4. Data Store

- A location where data is stored.
- Example: file, database or hard disk

Process

Transformation

- Select
- Purchase
- Calculate
- Adjust
- Update

External Entity

Provides data or Receives Data

- Person
- Organization
- External systems

Data Flow

Movement of data

- between processes, data stores, external entities

Data Store

Storage Location

- File
- Database
- Hard disk

DFD SYMBOLS

NOTATIONS USED FOR DFD

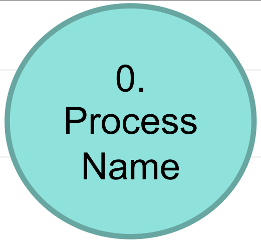
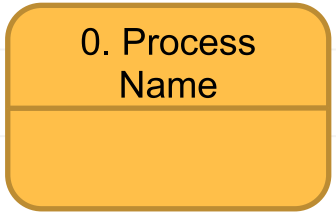
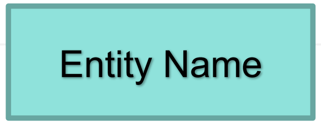
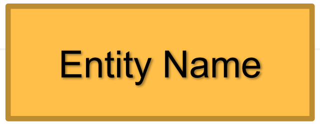
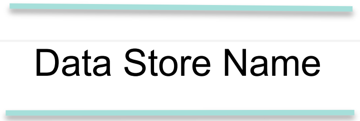
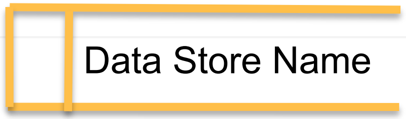
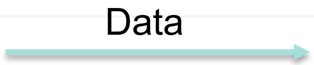
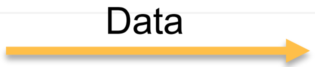
# There are different notions used to draw DFD.

# The 2 main notations are,

1. **Yourdon & Coad notation**
2. **Gane & Sarson notation**

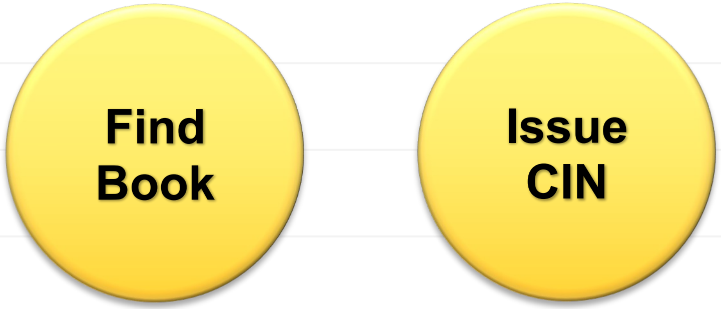
Note: You can adopt any notation, but do not mix the symbols of both the notations.

DFD SYMBOLS

Element	Yourdon & Coad	Gane & Sarson
Process		
External Entity		
Data Store		
Data Flow		

Processes

- A system consists of subsystems which carries out a specific function.
- Each function consists of one or more processes.
- Process is a specified act that transforms inputs to some outputs.
- Represented using a circle:
- E.g.



Processes cntd…

- A process is a specified activity in an enterprise that is executed repeatedly. Processes are ongoing.
    - **Example**: Generation of a bill, Recording Sales
- A process can be described in terms of inputs and outputs.
    - **Example**: Consider a Point of Sales system. when preparing a bill prices of various items are taken as inputs and print the bill
- A process has definable starting and ending points
    - Example: Consider the above Bill generation. The process starts when item number is entered.
    - The process ends when the sales get completed.
- A process identifies what is done, not how

Guidelines for drawing Processes

- All functional requirements in the system requirement specification (SRS) should be mapped to process in the DFD.

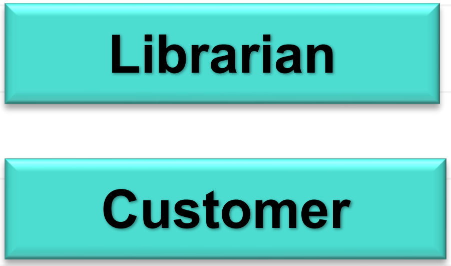
do not omit system functionality!

do not invent new system functionality!

- Every process has a number
- A name (verb phrase)
- One or more input data flows
- One or more output data flows

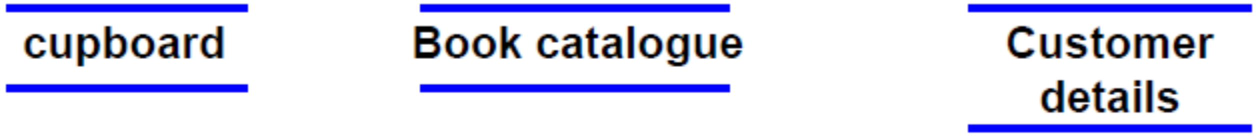
External Entities

- External entities represent things which are outside the system being modeled:
  - they produce data input to the system
  - they consume data output from the system
- Represented using a rectangle.
- E.g.



Data Store

- A data store represents storage location of the data. For example,
  - a physical store such as an in-tray;
  - a logical store such as a file or database.
- Data stores can be connected to processes, not to external entities.
- Represented using a pair of parallel lines:

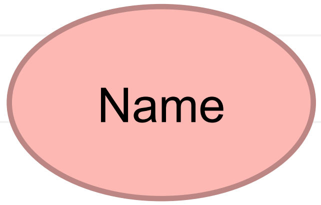
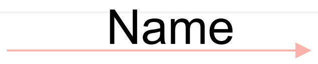
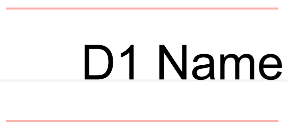
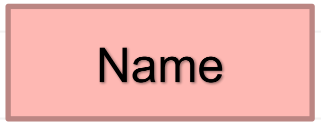


Data Flow

- Each flow symbol is annotated with the name of the data or material it carries.
- An essential (logical) DFD can only contain data (not material) flows.
- Represented using an arrow:

Book title
CIN

- Flow occurs in the direction of the arrow.

Data Flow Diagram Element	Description	DeMarco and Yourdan Symbol
Process	Every process has a number A name (verb phrase) A description One or more input data flows One or more output data flows	
Data flow	Has a name (a noun) A description One or more connections to a process	
Data store	Has a number A name (a noun) A description One or more input data flows One or more output data flows	
External entity	Has a name (a noun) A description	

STEPS IN CONSTRUCTING DFD

1. Build Context Diagram
2. Build Level-1 Diagram
3. Decompose Level 1 as needed and build Level 2 diagrams
4. Balance DFD Levels
5. Validate DFDs with user

BUILD CONTEXT DIAGRAM

- An abstract view of the system is represented using a context diagram.
- The entire system is shown as a single process, labeled with the name of the system.
- Shows all the outside entities that receive data from or input data to the system.
- No Data store.

Build Context Diagram...

Context Diagram can contain only 3 items:

1. One process (represents the entire system)
2. All External entities (data sources/sinks)

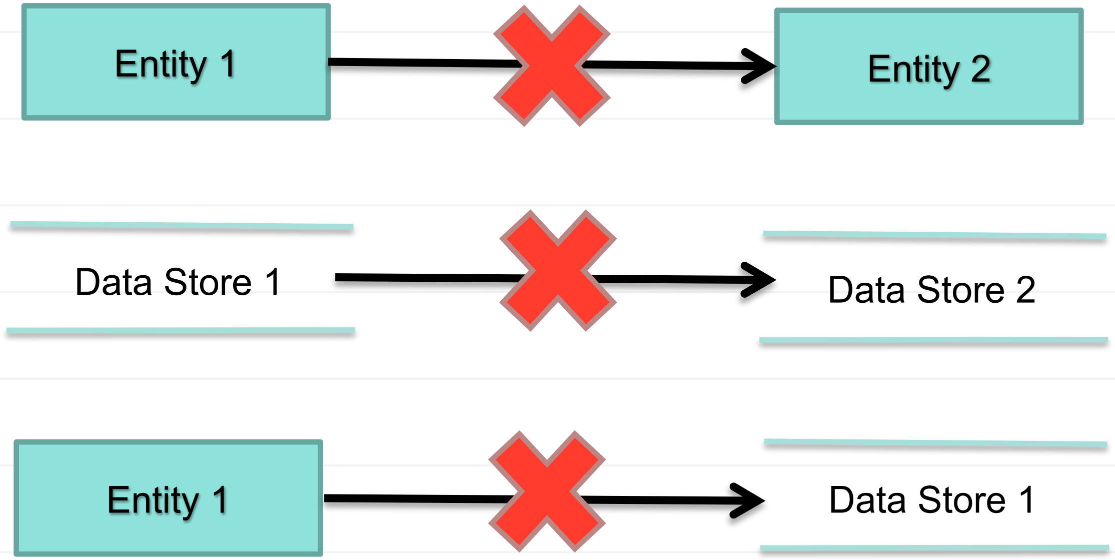
   [a single process labeled "0"that represents the entire system]

3. External data flows from/to external entities (inputs / outputs)

Steps to construct the context diagram

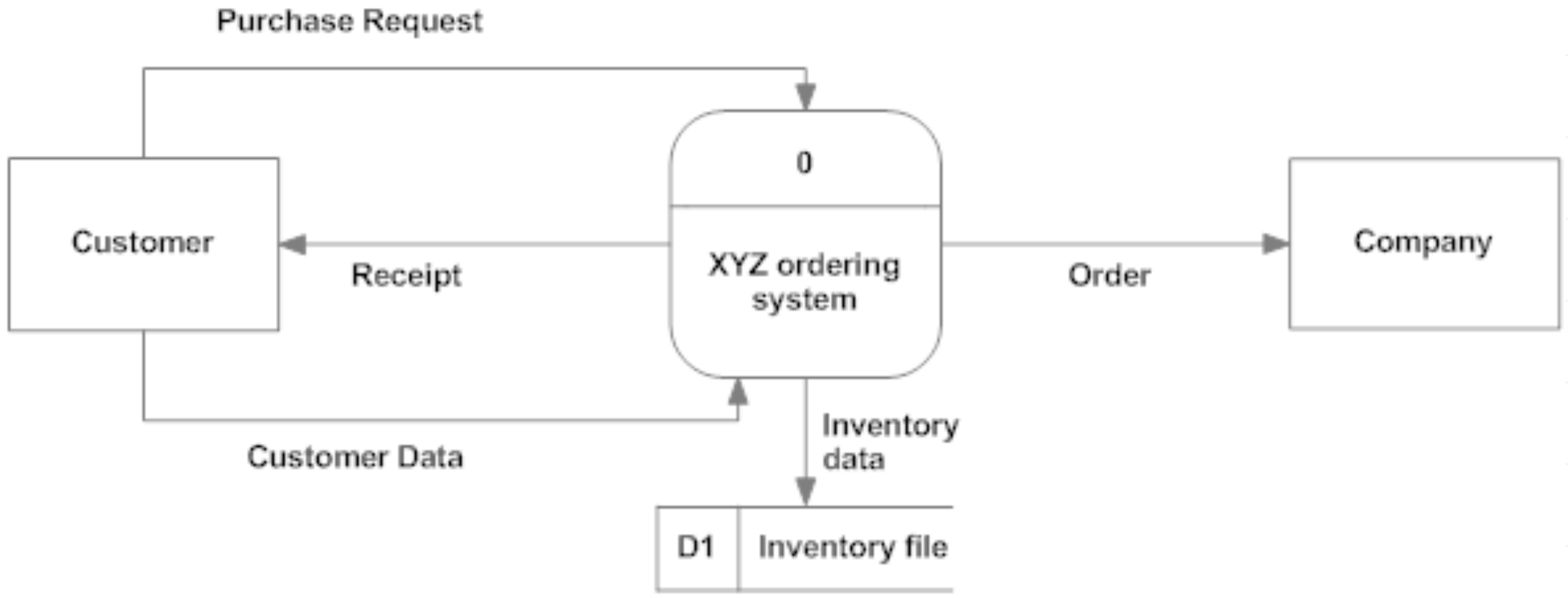
1. Identify and list all external entities.
2. Identify and list inputs to and outputs from external entities.
3. Create context diagram.

YOU CANNOT CONNECT THE FOLLOWINGS DIRECTLY



- Two entities or data stores cannot communicate each other directly.
- Every data flow should go through the process.

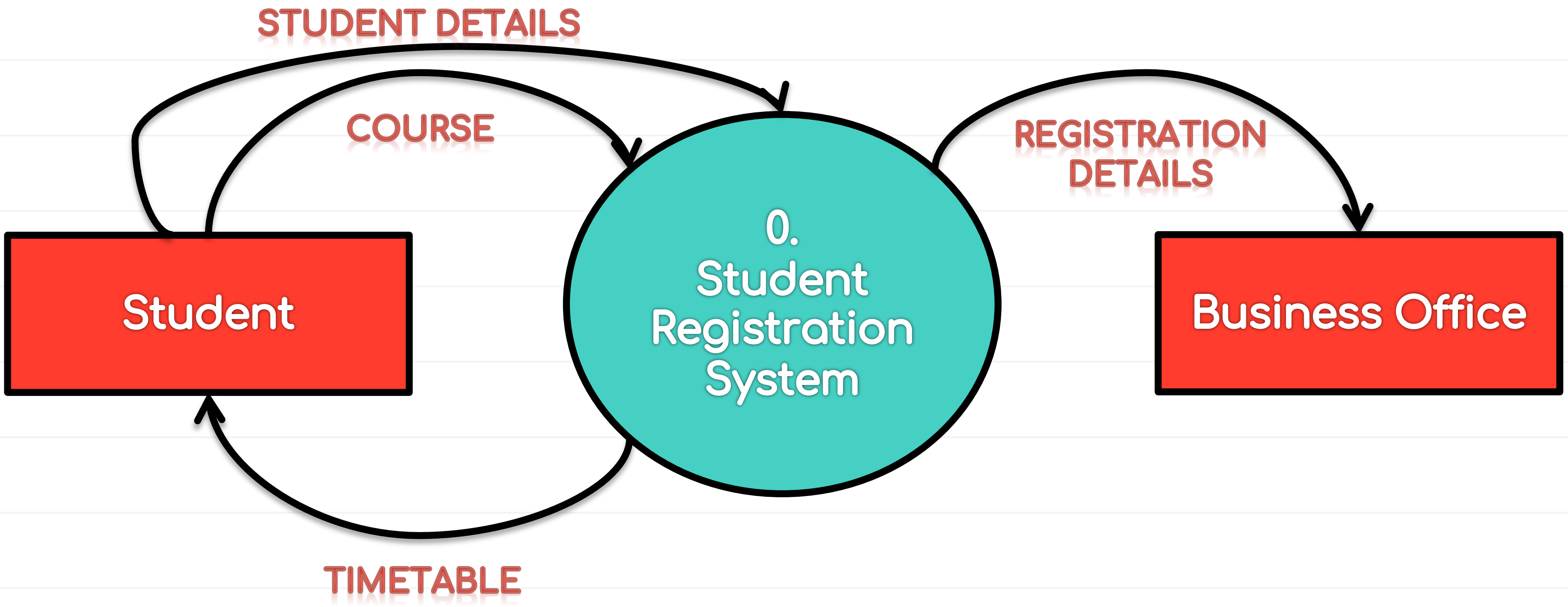
Is there anything wrong with the below context diagram?



Activity 1 : Online Student Registration System

- Students can select the Course they would like to join.
- Student Registration System registers the student's details and forward the new registration details to the Business Office.
- The system also emails the Timetable to the registered student

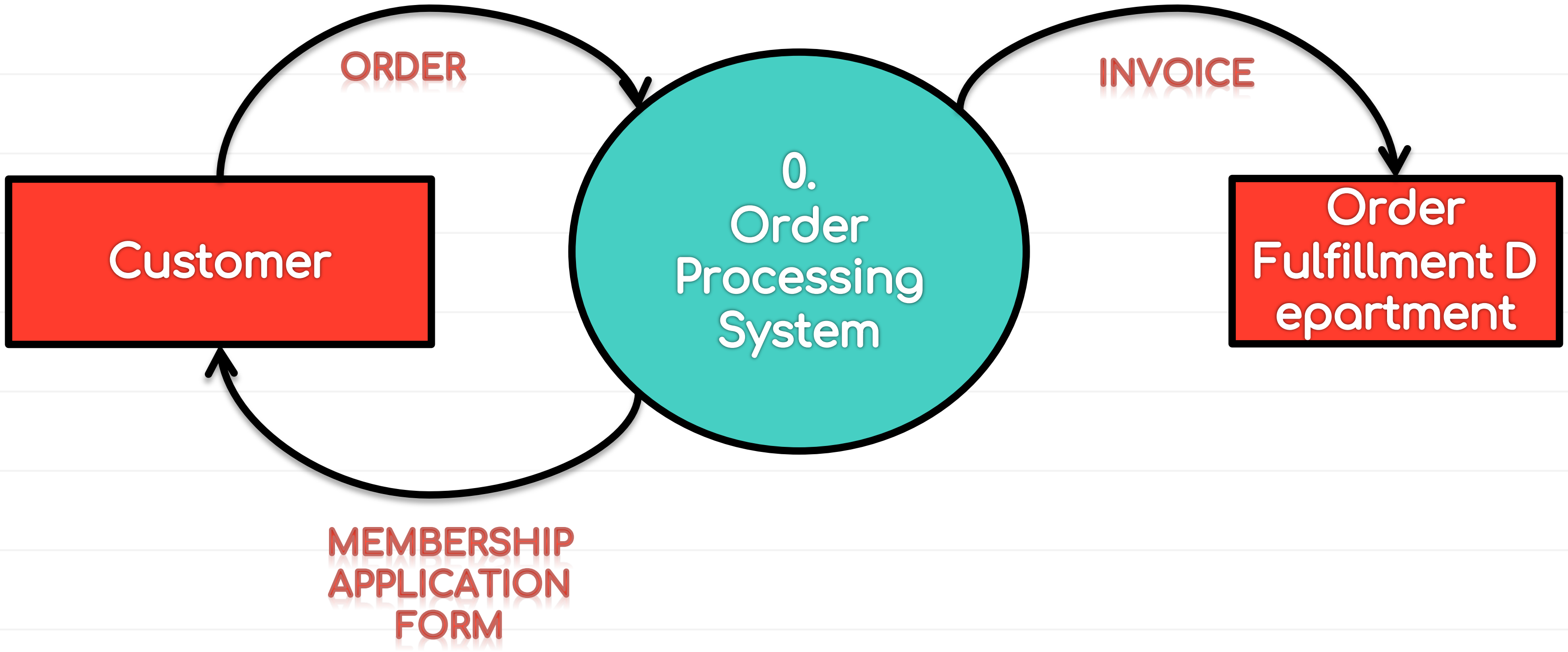
Context Diagram – Online Student Registration System

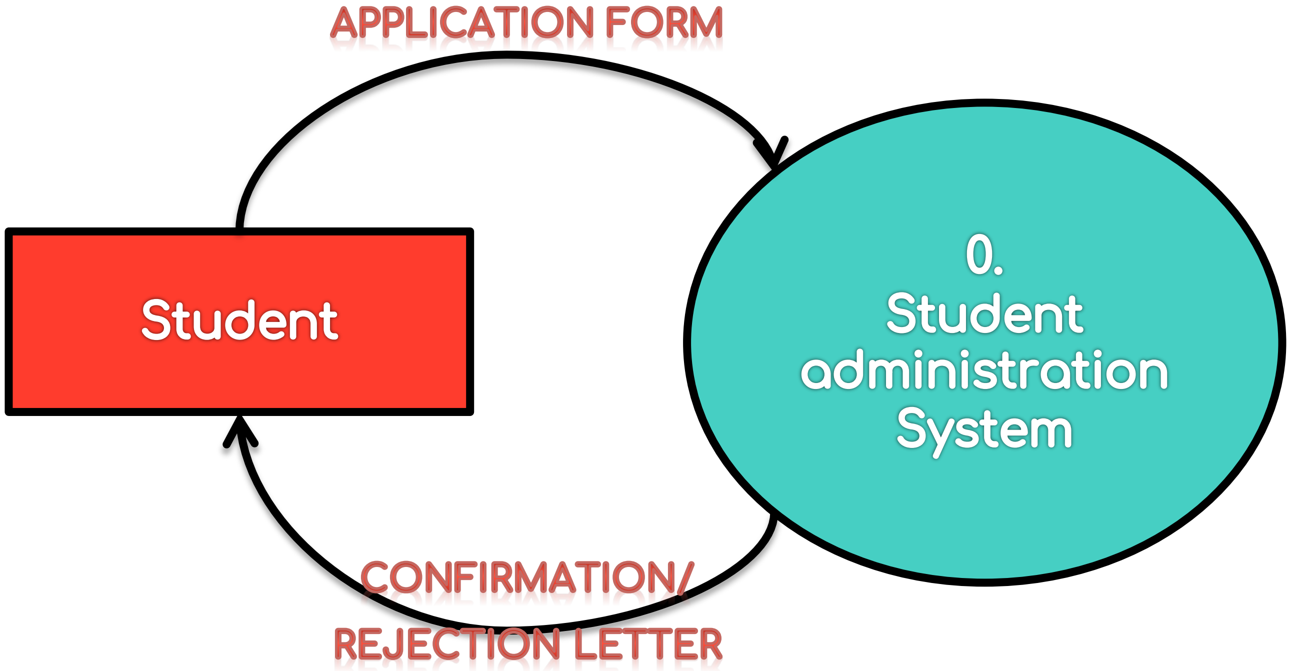


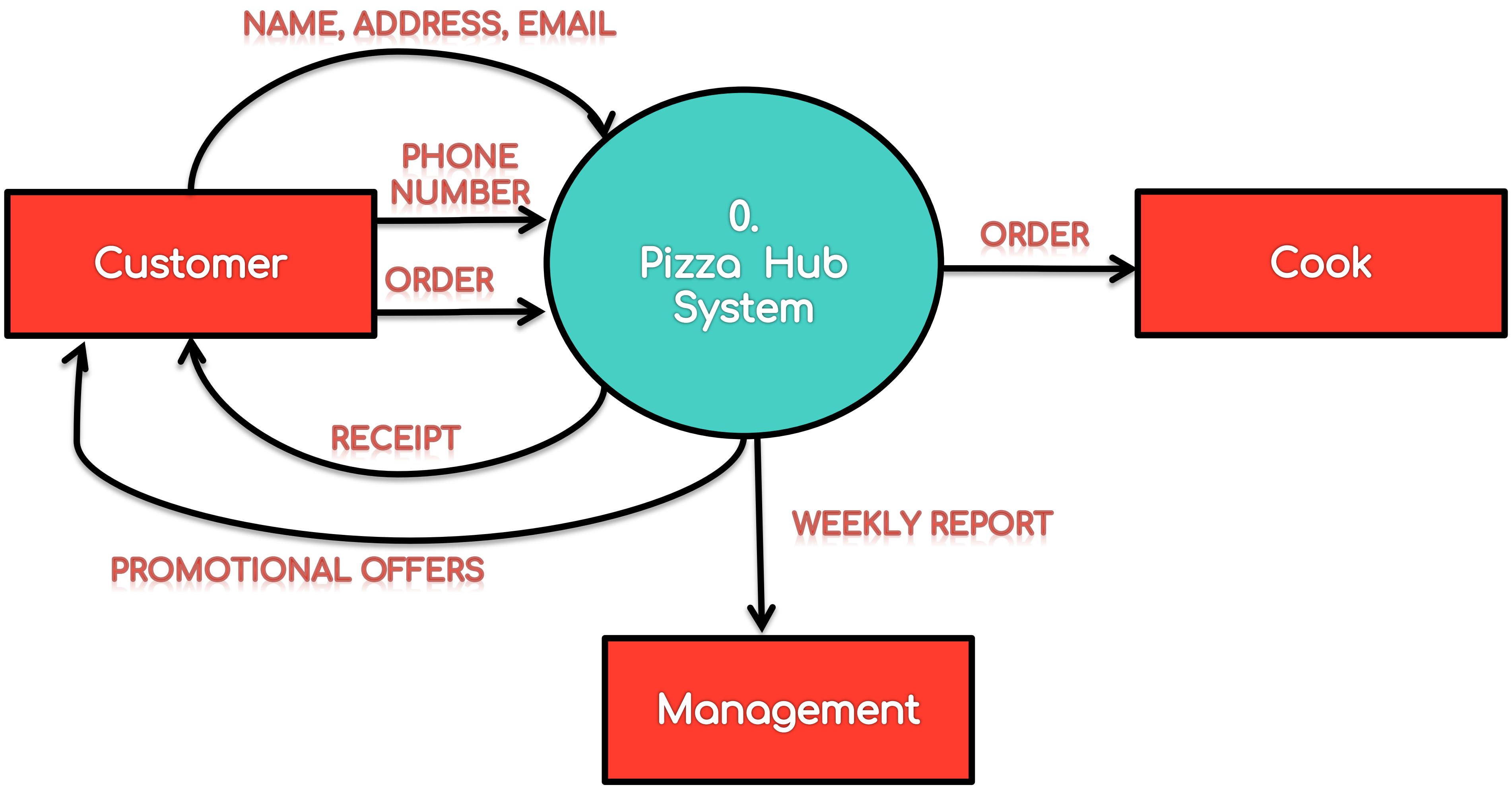
Activity 2 : Order Processing System

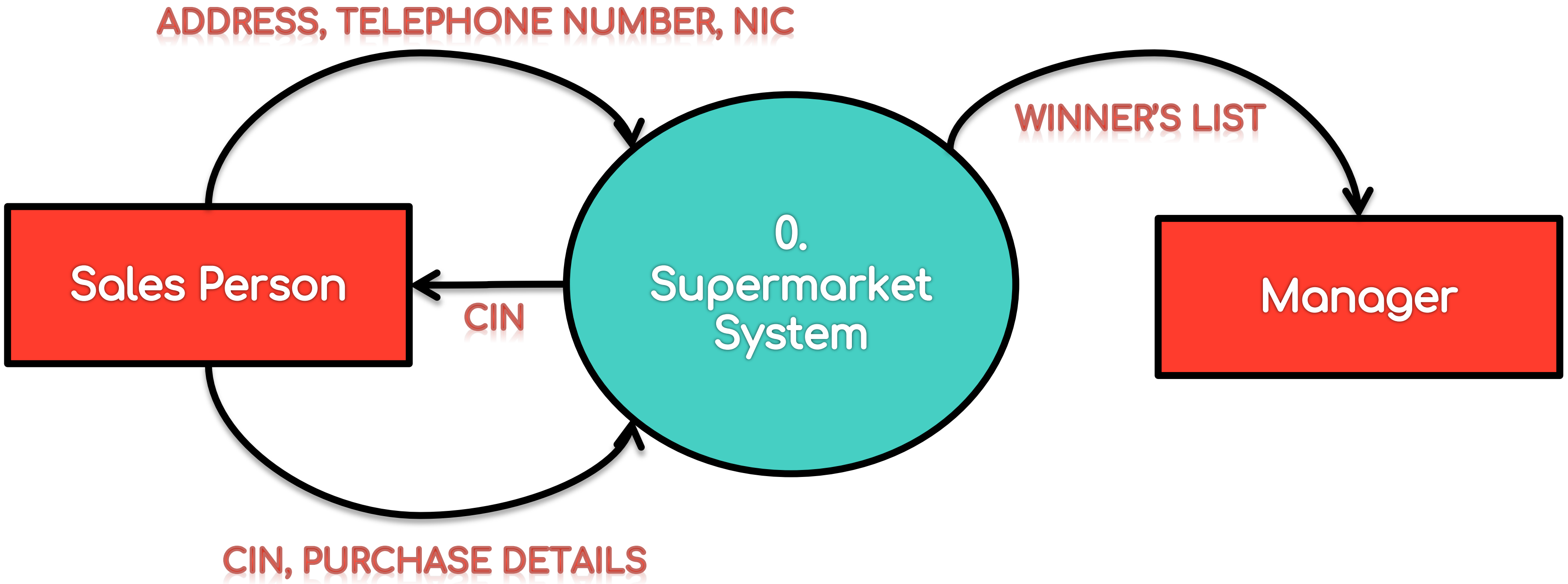
- Draw a context level DFD to automate the following manual process done by the clerk;
- When an order processing clerk receives an order (online / email), she verifies that the sender is a club member by checking the member file.
- If the sender is not a member, the clerk returns the order along with a membership application form. If the customer is a member, the clerk verifies the items ordered by checking the item file.
- Then the clerk saves the order in the daily orders file. At the same time the clerk prepares the invoice and forward to Order Fulfilment Department for further processing.

Context Diagram – Online Student Registration System




APPLICATION FORM
Student
0.
Student
administration
System
CONFIRMATION/
REJECTION LETTER


NAME, ADDRESS, EMAIL
PHONE NUMBER
ORDER
Customer
0.
Pizza Hub System
ORDER
Cook
RECEIPT
PROMOTIONAL OFFERS
WEEKLY REPORT
Management


ADDRESS, TELEPHONE NUMBER, NIC
WINNER'S LIST
Sales Person
CIN
0.
Supermarket
System
Manager
CIN, PURCHASE DETAILS

Your turn -> Order Processing System

Draw a context level DFD to automate the following manual process done by the clerk;

- When an order processing clerk receives an order (online / email), she verifies that the sender is a club member by checking the member file.
- If the sender is not a member, the clerk returns the order along with a membership application form. If the customer is a member, the clerk verifies the items ordered by checking the item file.
- Then the clerk saves the order in the daily orders file. At the same time the clerk prepares the invoice and forward to Order Fulfilment Department for further processing.

Summary of Context Diagram

- Shows the boundaries of the system
- Shows the overall business process as just ONE process
- Shows all the outside entities that receive information from or contribute information to the system
- No Data store

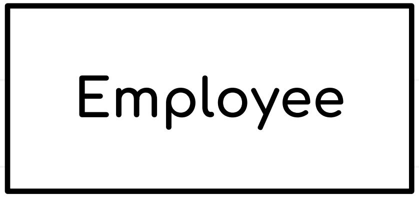
DATA MODELING

Data Modeling

- Entity relationship (ER) diagram is used in modeling data to be used in the system.
- Proposed by Peter P. Chen in 1976.
- It is a conceptual data model that views the real world as a construct of entities and associations or relationships between entities.
- Easy to understand.
- ER model is used to construct the database for the system.

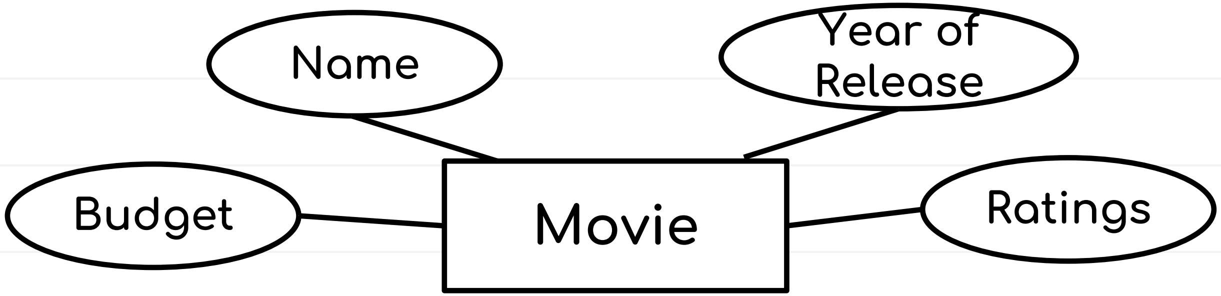
Elements : Entity

- Entity is an object in the real world that is distinguishable from other objects
- Used to identify a collection of similar entities
- Example: Employee, member, actor, movie etc.
- Symbol : Rectangle



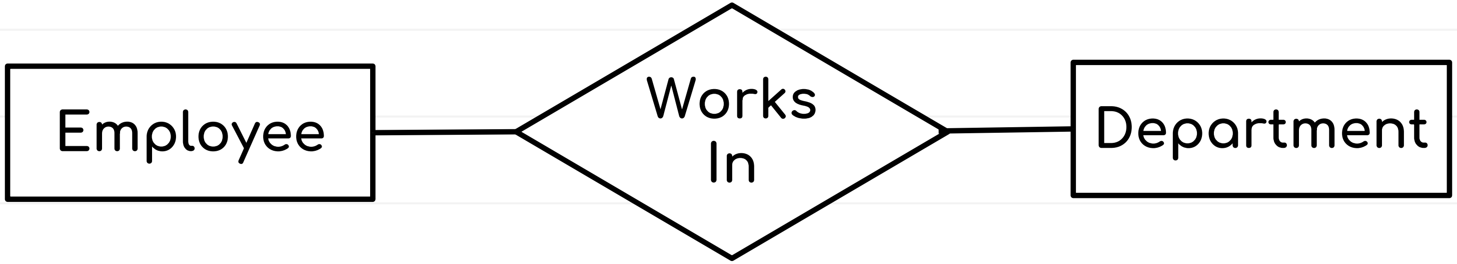
Elements : Attributes

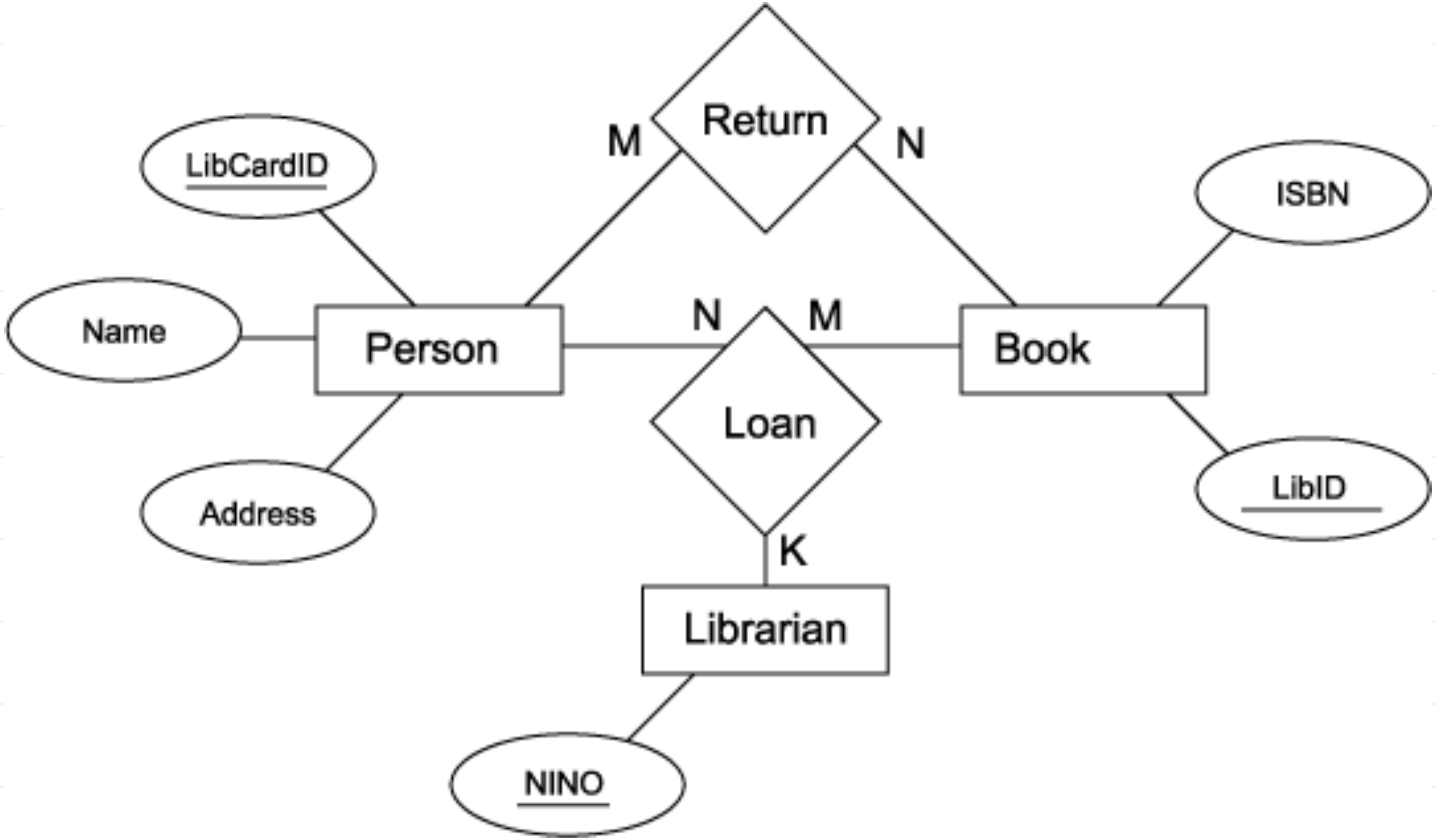
- Attributes is used to describe an entity
- E.g. A movie can be described using the name, year of release, budget, ratings etc
- Symbol : Oval



Elements : Relationship

- A Is an association among two or more entities.
    - E.g. a student is enrolled to many courses
    - Tom cruise acts in many movies
- Symbol : Diamond

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Program Design

- Once the conceptual models are completed the basic structure of the program is prepared.
- The program design is prepared in the form of a Structure Chart.
- Structure chart is an important program design technique.
- The system is coded as small independent interacting modules where each one is responsible for a particular task.
- Structure chart shows all components of code in a hierarchical format.
- Illustrates the organization and interactions of the different program modules .

THANK YOU