Process Modeling

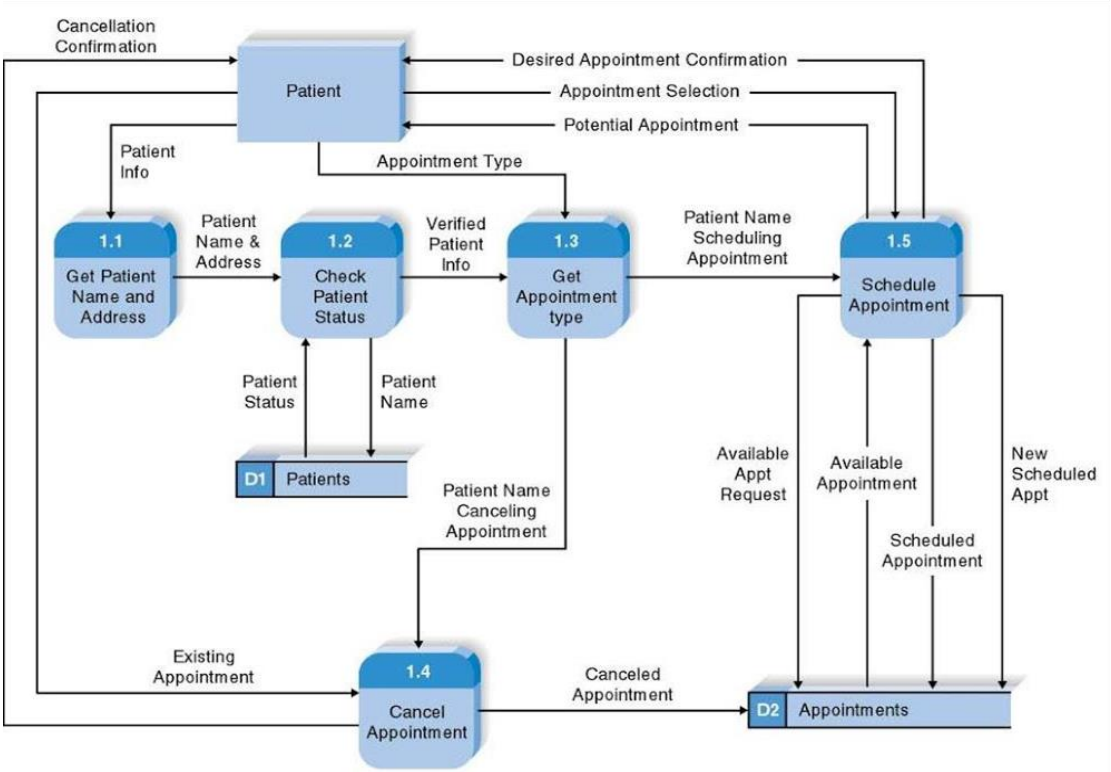
Chapter 5

Key Definitions

- ***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 diagramming***
  - A common technique for creating process models
- ***Logical*** process models describe processes without suggesting how they are conducted
- ***Physical*** process models provide information that is needed to build the system

DATA FLOW DIAGRAMS (DFD)

Reading a DFD



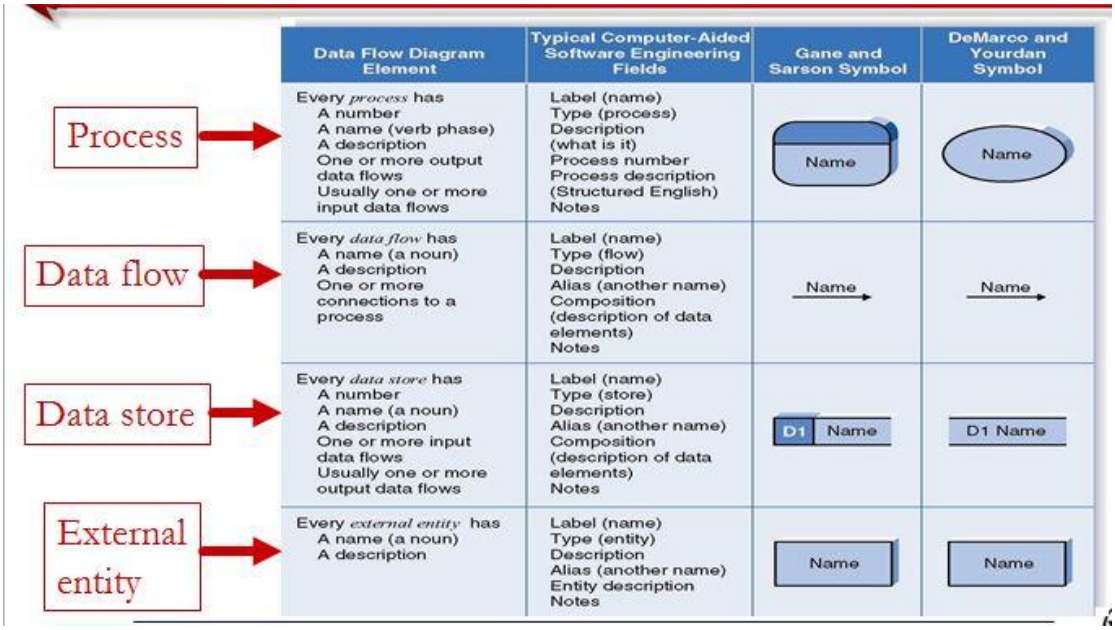
Elements of a DFD

- Process
  - An activity or function performed for a specific business reason
  - Manual or computerized
- Data flow
  - A single piece of data or a logical collection of data
  - Always starts or ends at a process

DFD Elements

- Data Store
  - A collection of data that is stored in some way
  - Data flowing out is retrieved from the data store
  - Data flowing in updates or is added to the data store
- External entity
  - A person, organization, or system that is **external** to the system but interacts with it.

Naming and Drawing DFD Elements



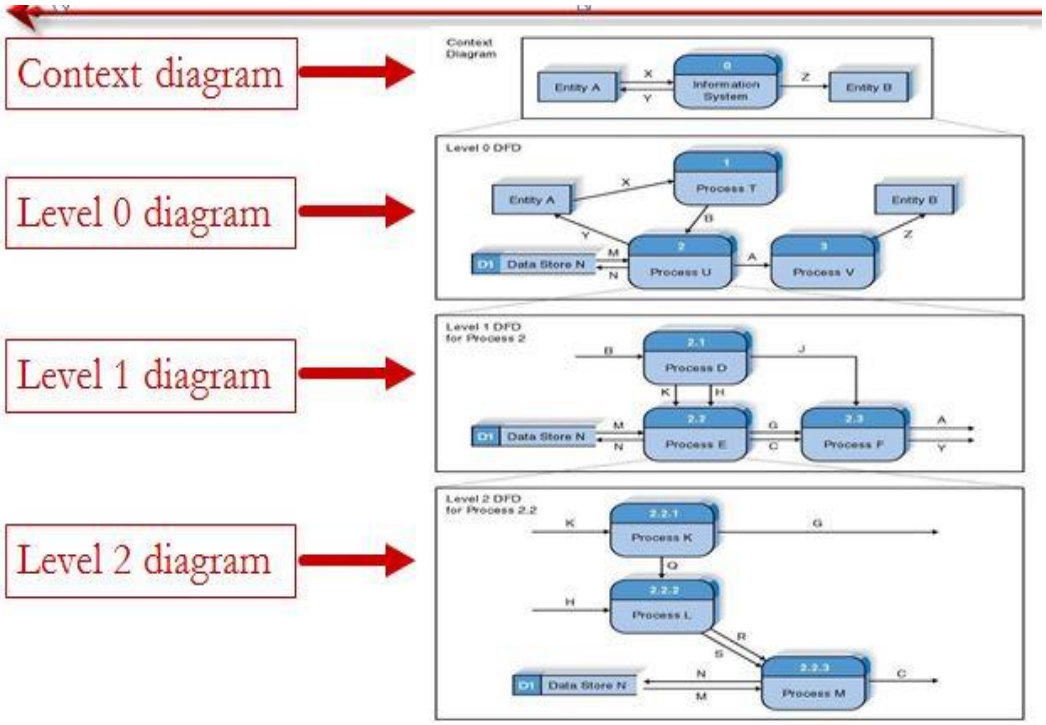
Using a DFD to Define Business Processes

- Business processes are too complex to be shown on a single DFD
- *Decomposition* is the process of representing the system in a hierarchy of DFD diagrams
  - Child diagrams show a portion of the parent diagram in greater detail

Key Definition

- *Balancing* involves insuring that information presented at one level of a DFD is accurately represented in the next level DFD.

Relationship among Levels of DFDs



Context Diagram

- First DFD in every business process
- Shows the context into which the business process fits
- Shows the overall business process as just ***one*** process (process 0)
- Shows all the external entities that receive information from or contribute information to the system

Level 0 Diagram

- Shows all the major processes that comprise the overall system – the internal components of process 0
- Shows how the major processes are interrelated by data flows
- Shows external entities and the major processes with which they interact
- Adds data stores

Level 1 Diagrams

- Generally, one level 1 diagram is created for every major process on the level 0 diagram
- Shows all the internal processes that comprise a single process on the level 0 diagram
- Shows how information moves from and to each of these processes
- If a parent process is decomposed into, for example, three child processes, these three child processes wholly and completely make up the parent process

Level 2 Diagrams

- Shows all processes that comprise a single process on the level 1 diagram
- Shows how information moves from and to each of these processes
- Level 2 diagrams may not be needed for all level 1 processes
- Correctly numbering each process helps the user understand where the process fits into the overall system

Alternative Data Flows

- Where a process can produce different data flows given different conditions
- We show both data flows and use the process description to explain why they are alternatives

Tip -- alternative data flows often accompany processes with IF statements

Your Turn

- At this point in the process it is easy to lose track of the "big picture".
- Describe the difference between data flows, data stores, and processes.

Describe in your own words the relationship between the DFD and the ultimate new application being developed

Process Descriptions

- Text-based process descriptions provide more information about the process than the DFD alone
- If the logic underlying the process is quite complex, more detail may be needed in the form of
  - Structured English
  - Decision trees
  - Decision tables

CREATING DATA FLOW DIAGRAMS

Integrating Scenario Descriptions

- DFDs start with the use cases and requirements definition
- Generally, the DFDs integrate the use cases
- Names of use cases become processes
- Inputs and outputs become data flows
- "Small" data inputs and outputs are combined into a single flow

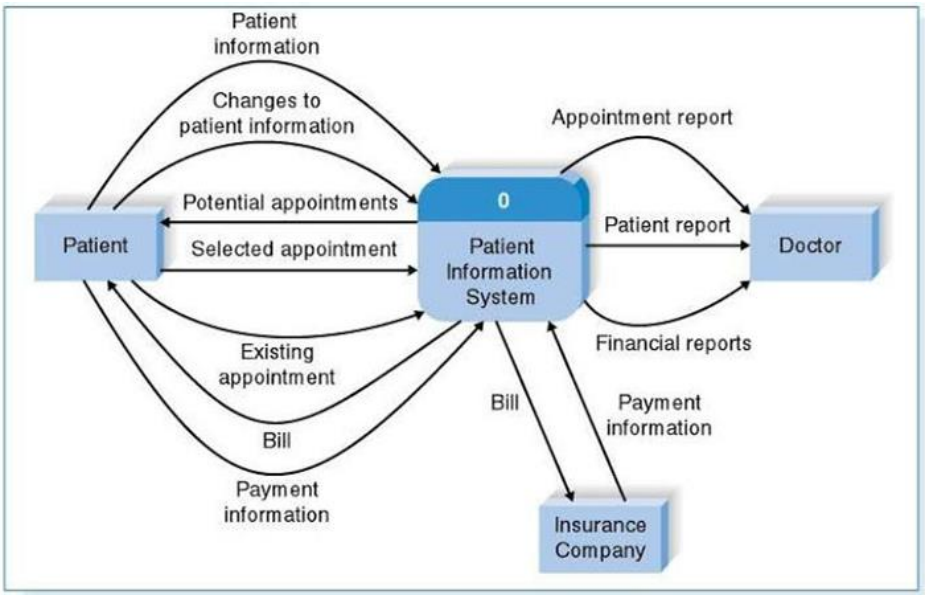
Steps in Building DFDs

- Build the context diagram
- Create DFD fragments for each use case
- Organize DFD fragments into level 0 diagram
- Decompose level 0 processes into level 1 diagrams as needed; decompose level 1 processes into level 2 diagrams as needed; etc.
- Validate DFDs with user to ensure completeness and correctness

Creating the Context Diagram

- Draw one process representing the entire system (process 0)
- Find all inputs and outputs listed at the top of the use cases that come from or go to external entities; draw as data flows
- Draw in external entities as the source or destination of the data flows

A Context Diagram Example



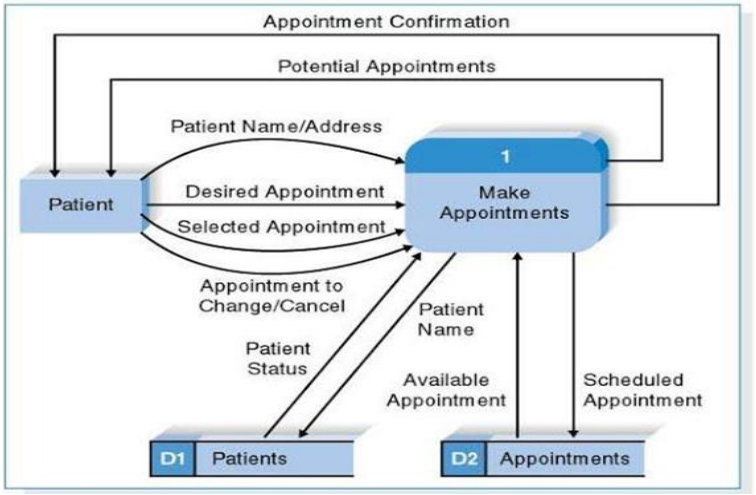
Creating DFD Fragments

- Each use case is converted into one DFD fragment
- Number the process the same as the use case number
- Change process name into verb phrase
- Design the processes from the viewpoint of the organization running the system

Creating DFD Fragments

- Add data flows to show use of data stores as sources and destinations of data
- Layouts typically place
  - processes in the center
  - inputs from the left
  - outputs to the right
  - stores beneath the processes

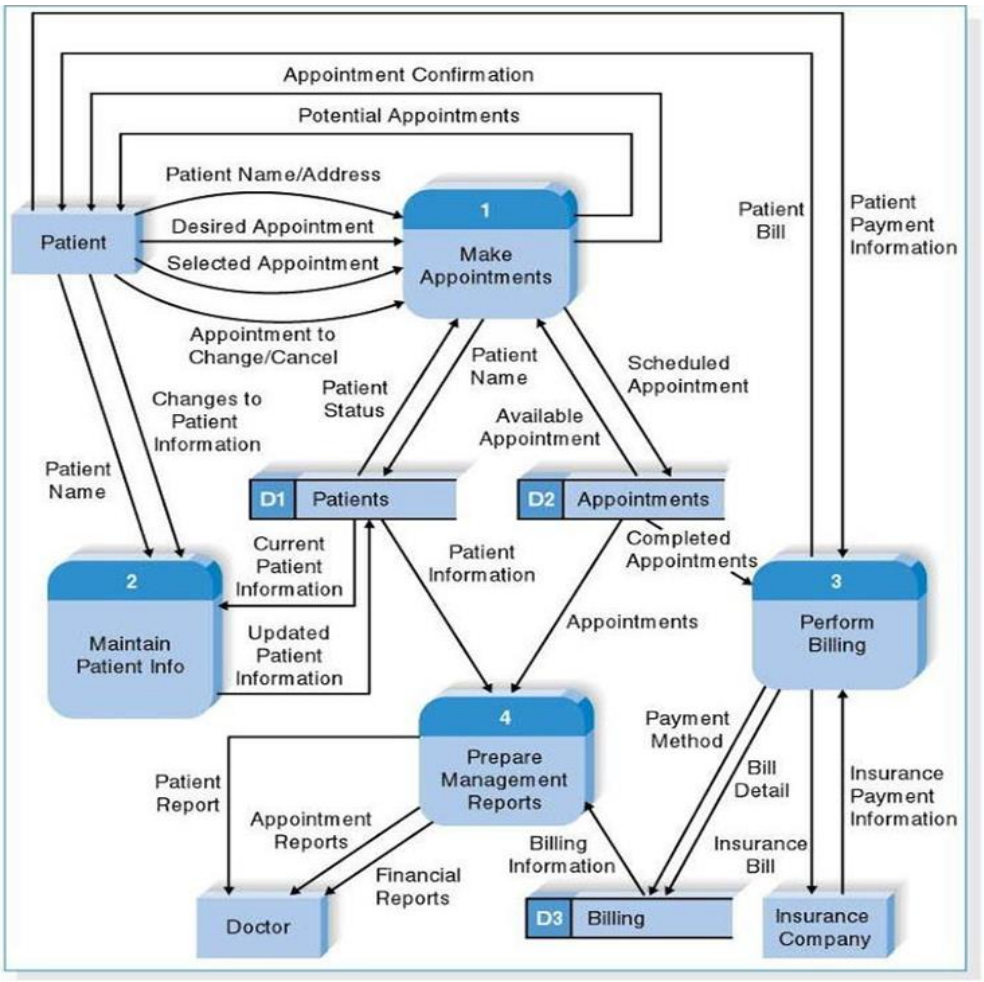
A DFD Fragment Example



Creating the Level 0 Diagram

- Combine the set of DFD fragments into one diagram
- Generally move from top to bottom, left to right
- Minimize crossed lines
- Iterate as needed
  - ***DFDs are often drawn many times before being finished, even with very experienced systems analysts***

A Level 0 DFD Example



Creating Level 1 Diagrams (and Below)

- **Each use case is turned into its own DFD**
- **Take the steps listed on the use case and depict each as a process on the level 1 DFD**
- **Inputs and outputs listed on use case become data flows on DFD**
- **Include sources and destinations of data flows to processes and stores within the DFD**
- **May also include external entities for clarity**

Creating Level 1 Diagrams (and Below)

- When to stop decomposing DFDs?
  - Ideally, a DFD has at least three processes and no more than seven to nine.

Validating the DFD

- Syntax errors – diagram follows the rules
  - Assure correct DFD structure

For each DFD:
Check each **process** for:
A unique name: action verb phrase; number; description
At least one input data flow
At least one output data flow
Output data flow names usually different than input data flow names
Between 3 and 7 processes per DFD

Validating the DFD

For each DFD:Check each **data flow** for: A unique name: noun; description
Connects to at least one process
Shown in only one direction (no two-headed arrows)
A minimum number of crossed lines
Check each **data store** for:
A unique name: noun; description
At least one input data flow
At least one output data flow
Check each **external entity** for:
A unique name: noun; description
At least one input or output data flow

Validating the DFD

Across DFDs:
Context Diagram: Every set of DFDs must have one Context Diagram
Viewpoint:
There is a consistent viewpoint for the entire set of DFDs

Decomposition:
Every process is wholly and complete described by the processes on its children DFDs

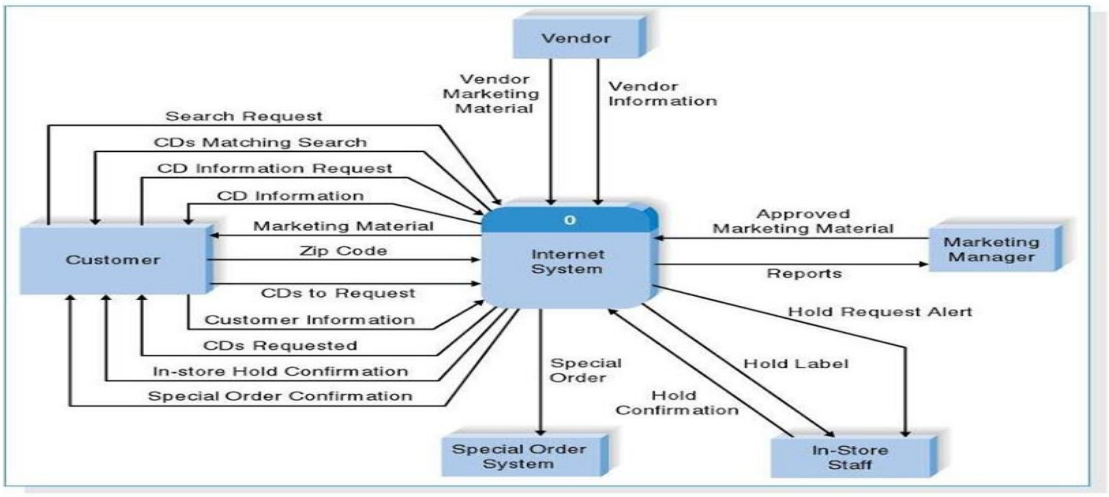
Balance:
Every data flow, data store, and external entity on a higher level DFD is shown on the lower level DFD that decomposes it
No data stores or data flows appear on lower-lever DFDs that do not appear on their parent DFD

Validating the DFD

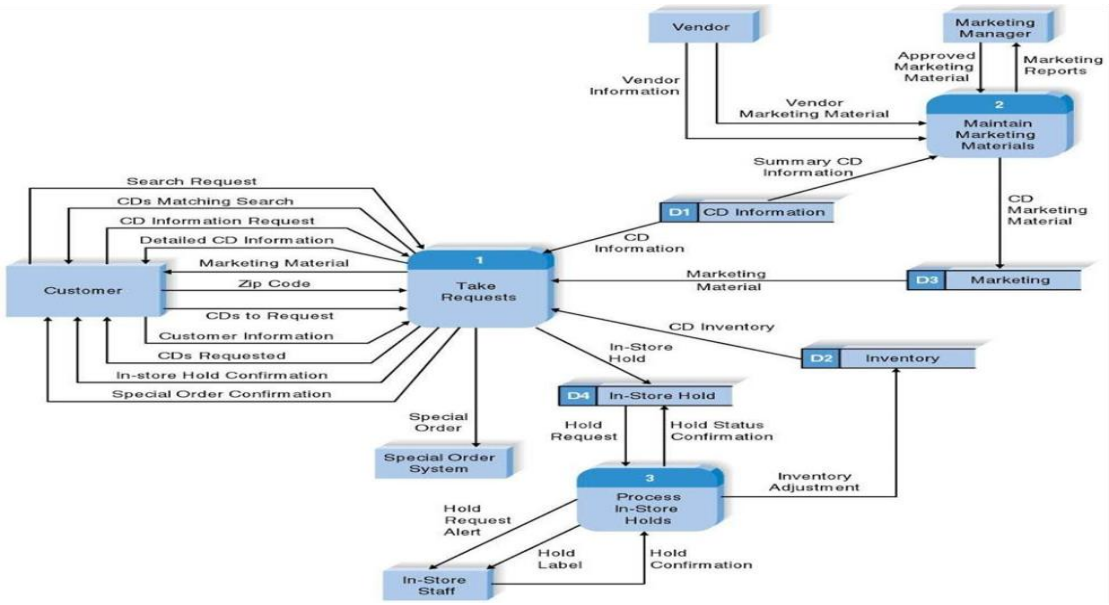
- Semantics errors – diagram conveys correct meaning
  - Assure accuracy of DFD relative to actual/desired business processes
- To verify correct representation, use
  - User walkthroughs
  - Role-play processes
- Examine lowest level DFDs to ensure consistent decomposition
- Examine names carefully to ensure consistent use of terms

A Quick Review of Decomposition for CD Selections

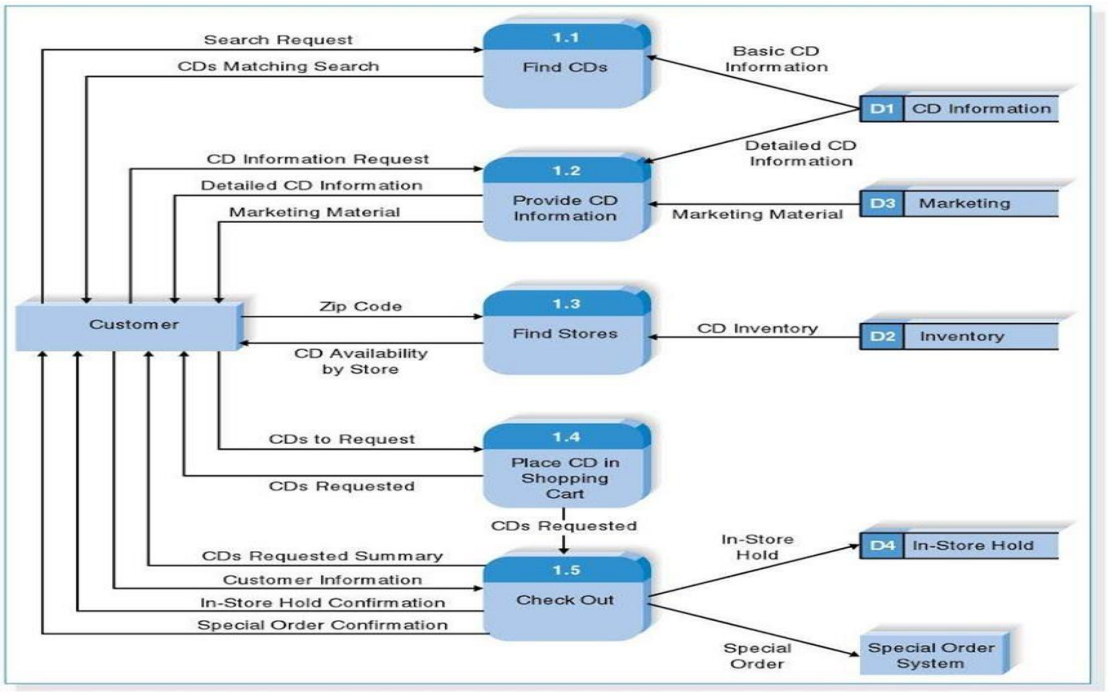
Context Diagram for CD Selections Internet Sales System



Level 0 DFD for CD Selections Internet System



Level 1 DFD for CD Selections Process 1: Take Requests



Summary

- The Data Flow Diagram (DFD) is an essential tool for creating formal descriptions of business processes.
- Use cases record the input, transformation, and output of business processes and are the basis for process models.

Eliciting use cases and modeling business processes are critically important skills for the systems analyst to master