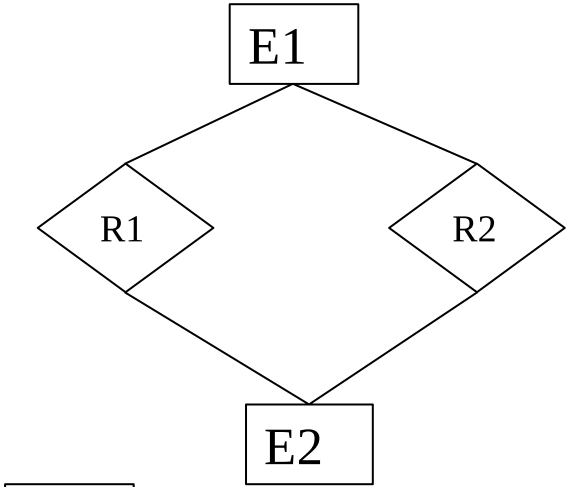
Lecture 10

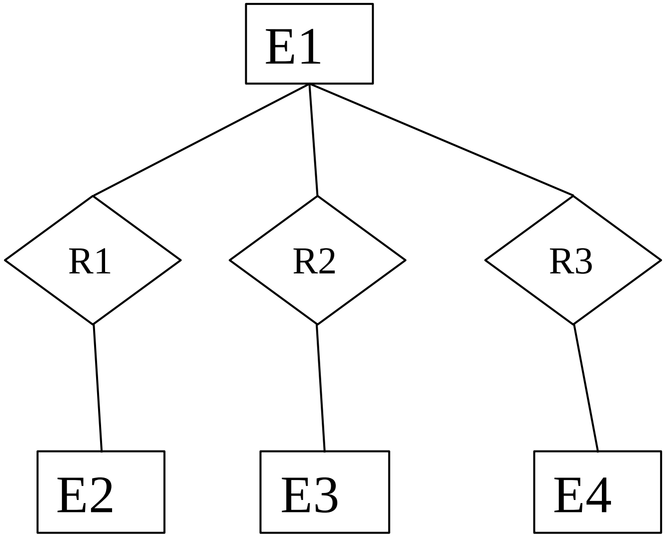
Entity Relationship Diagram(E-RD) and DFD

E-RD

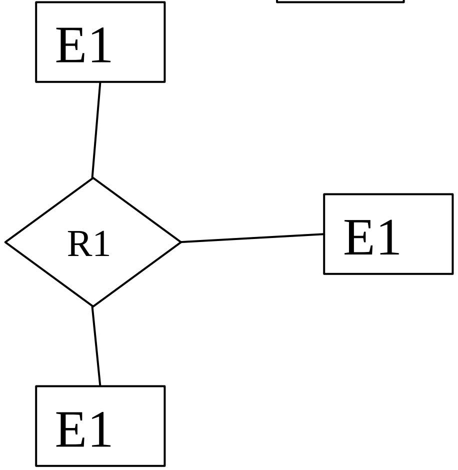
- Proposed by Chen 1976
  - Analysis of system static data
  - Data modeling
  - Represent major data objects and relationship between them
  - Removing redundancies
- Major abstraction to represent data are :
  1. Entity (each individual objects, noun)
  2. Relationship(verb, preposition)
  3. Attribute

E-RD

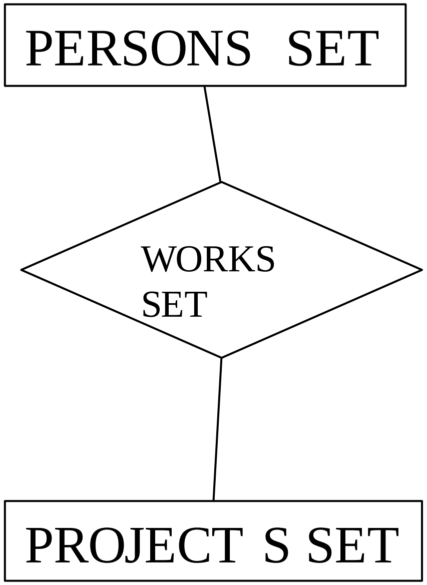




Binary relationship



N-array



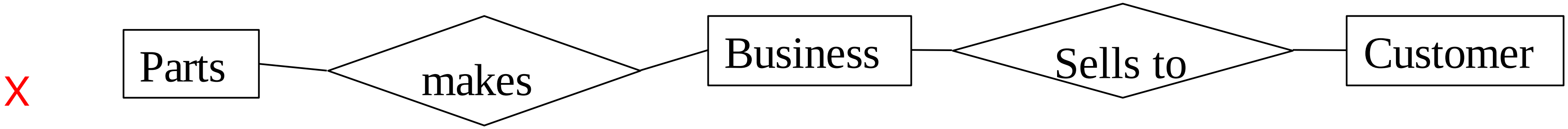
Occurrence diagram

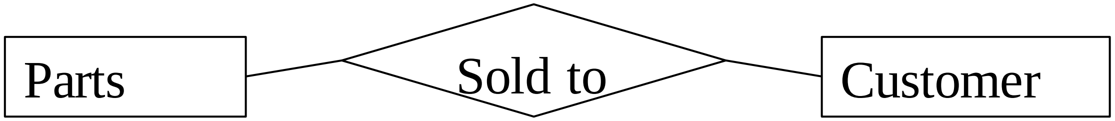
E-RD

- N-array relationship should be avoided because they include more than one concept

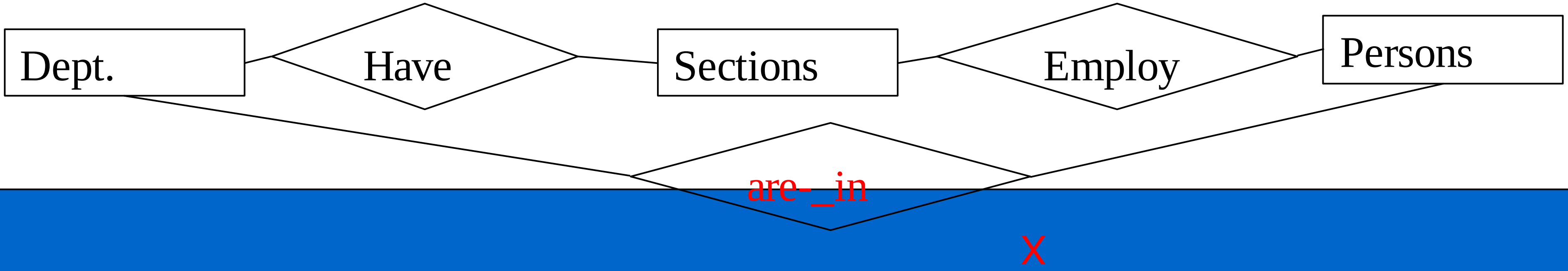
- Avoid :

1. System itself should not appear



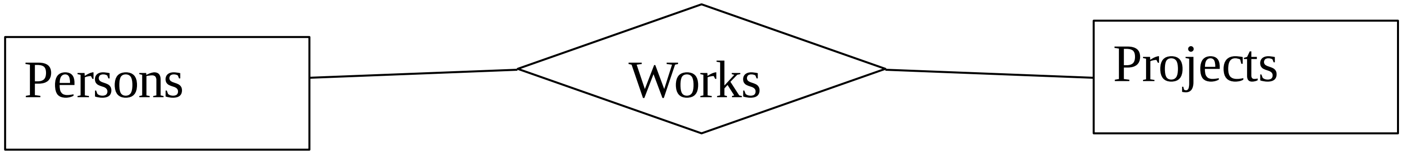


2. Derived relationship sets



E-RD

- Attributes :



Persons

Works

Projects

Persion_id

Name

Persion_id

Project_id

Project_id

Start_date

- Cardinality : Number of relationships in which an entity can appear (i) 1:1, (ii) 1:N (iii) N:M

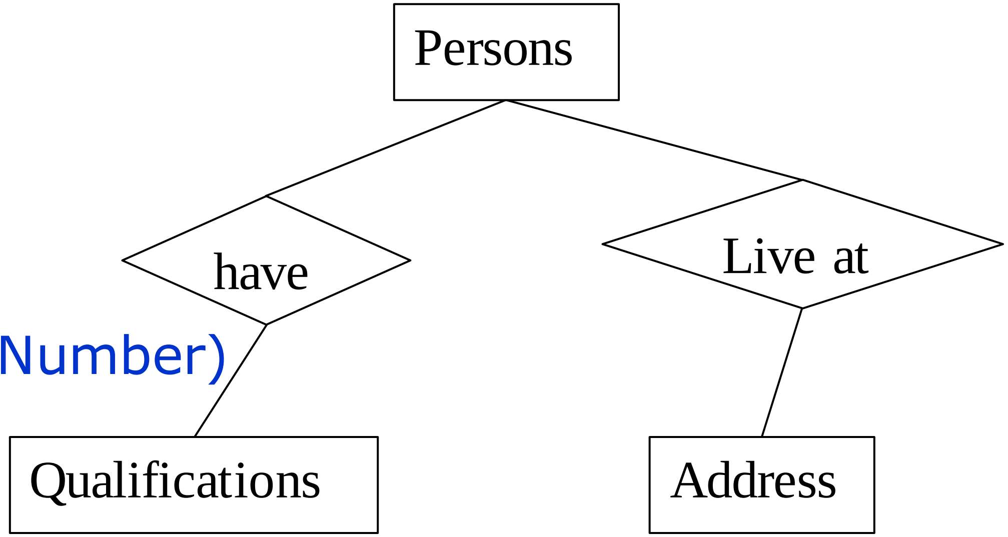
- Participation : Participation of entities in a relationship set can be (i) Mandatory, (ii) Optional, (iii) Conditional

E-RD

- Mandatory : All persons work on project
- Optional : one person need not work on project (represented by ○)
- Conditional : Depending upon condition(s)
- Avoid relationship can be multivalued and structured

Persons

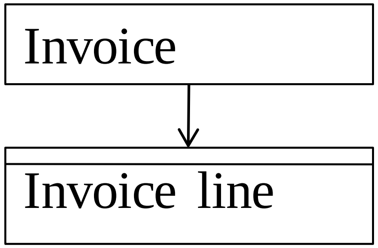
Person_id
Date_of_Birth
Qualification
Address(City, Street, House Number)



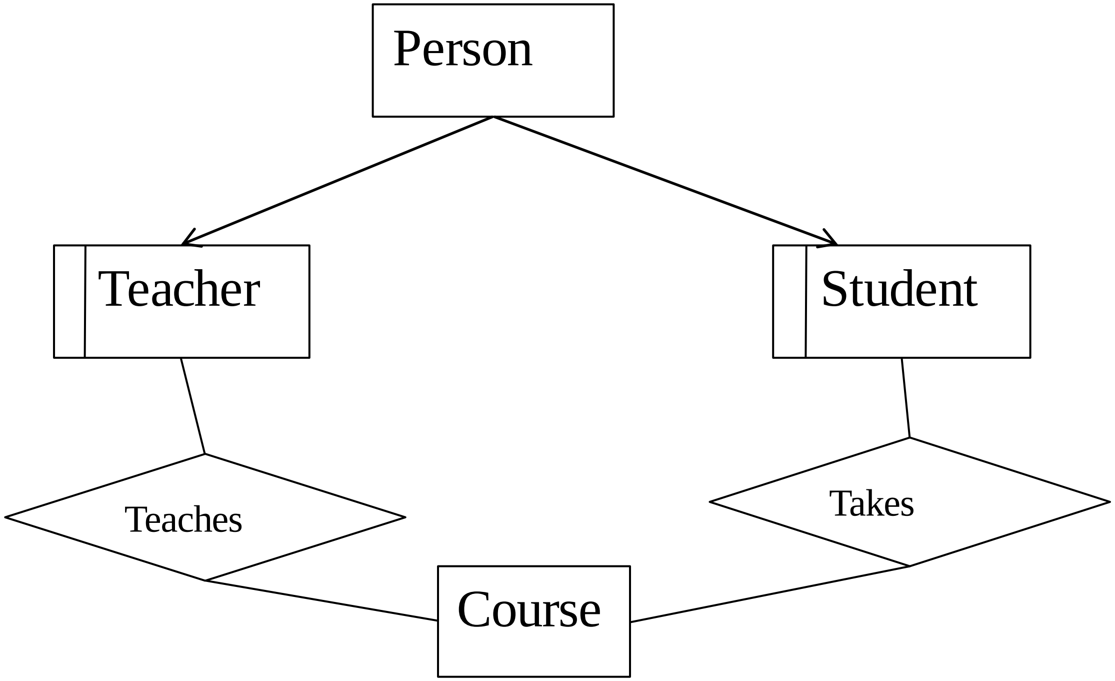
» Qualification

E-RD

- Dependent Entity Set (weak entity set) :



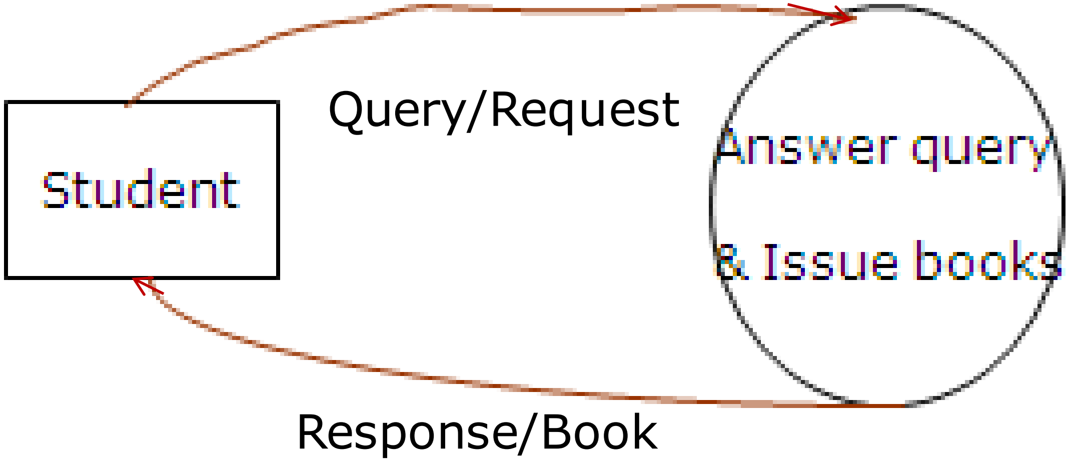
- Subsets:



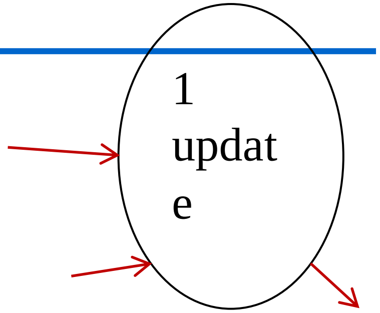
DFD (Data Flow Diagram)

- Both analysis and design tool for dynamic data of the system
- Popularized by DeMacro (1978), Yourdon, Gane & Sarson (1979)
- Definition : A DFD shows the flow of data through a system (a system may be an organization, a manual procedure, a s/w system, a mechanical system, a h/w system or any combination of these

Library System



DFD



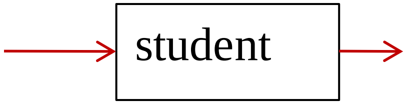
- System components : four kind

1. Process (bubble) : What system do

   Each process has a unique name and number

2. External Entities (box) : Input data into the system or use system output.

   Source and sink



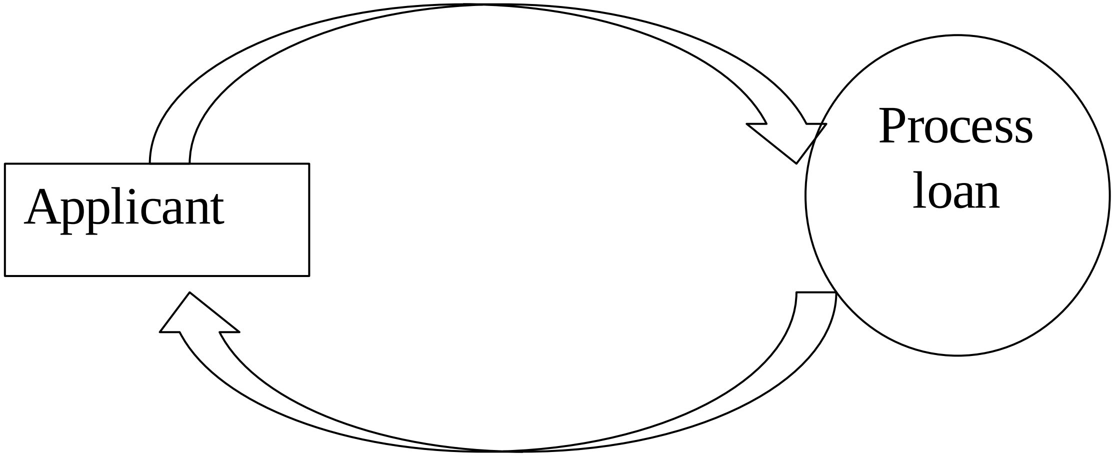
3. Data store (//) : repository of data, unique name

1. Data flows (→): arrows

DFD

- Example : Top level DFD

Query/Application

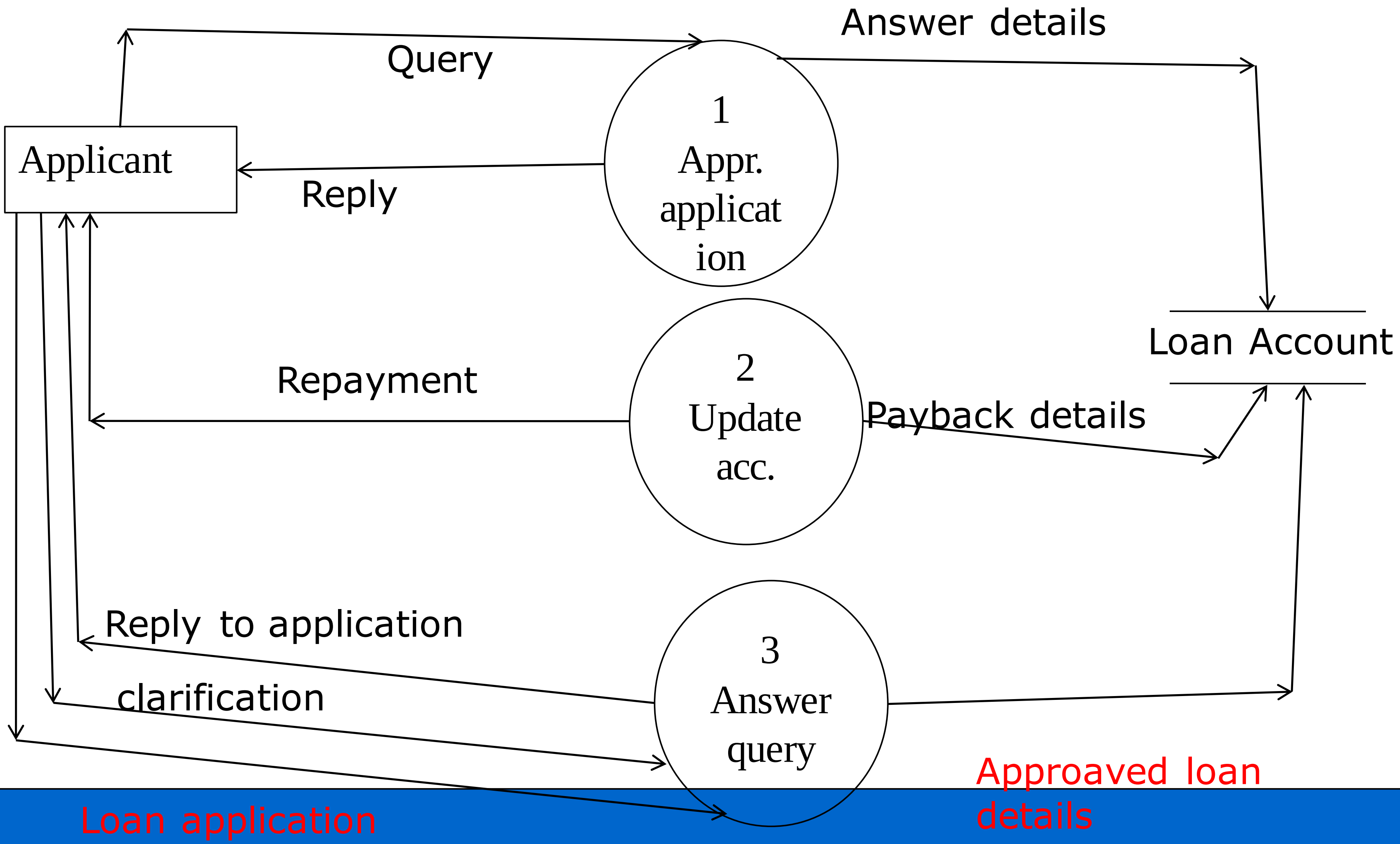


Query/Application

Context diagram (level 0)

DFD

- Example : level 1 DFD



DFD

- Process #

Level 0	context diagram
Level 1	1, 2, 3
Level 2	1.1, 2.1, 3.1 1.2, 2.2, 3.2 1.3, 2.3, 3.3 …………………. ………………….
Level 3	1.1.1 1.1.2 1.1.3 ……… ………

DFD

- DFD vs. Flowchart

- Some common errors should be avoided :
  1. No process can acts as sink or a source
  2. Information required by a process is not available
  3. Some information is not being used in the process
  4. Missing process
  5. No unlabeled data flow
  6. Avoid criss-crossing flow
  7. Missing data flow
  8. Extraneous data flow
  9. Contain some control information, looping and decision
  10. Consistency not maintained during refinement

DFD

- Criteria of a good DFD :
  - Self explanatory, Complete and Unambiguous

- Features :

  I. Absence of flowchart structures

  II. Conservation of data

  III. Good naming conventions

Absence of flowchart structures

1. No splitting of data flows
2. No crossing lines
3. No control signal from a process
4. No looping
5. No input signals
6. Decision and iteration must be avoided

Conservation of data and Good naming conventions

- Conservation of data :
  - What comes out of the data store must first go in
  - It is not possible for data store to create new data elements
  - It is true for process also
- Good naming conventions :
  - Process :readable, avoid meaningless names. Single phrase/ describe a process in one sentence
  - Data store :
  - Data flow :one word (invoice, check) avoid

PDFD vs. LDFD

Physical DFD

1. During analysis
2. Use of physical agent/devices
3. How, by whom, when
4. Specific name of data flow and process
5. Objective world

Logical DFD

1. During design
2. Logical entity/ operation name
3. What uspects
4. Names of data flow and process by a sentence or a phrase
5. Subjective world

DFD

- E-RD vs. DFD
- Convert DFD to structure Chart
  - Transformed centered analysis
  - Transaction centered analysis

Data Dictionary

- Structured repository of data about data
- Information about different data elements and different layers
- Smallest element is fields/data elements, can’t be further decomposed.
  - Ex. emp_no., emp_type
- Repository of various data flow in the system
- Define data structure of data in DFD : Notations
  1. Sequence or Composition (+)
     - Ex. Weekly timesheet = emp_name + emp_id
  2. Selection (|)
     - Pay rate = Hourly | Daily | Weekly

Data Dictionary

3. Repetition (*) (one or more)
   - Hour = [regular_hours + Overtime_hours]*

Process Specifications (Pspecs)

1. N_S (Nassi_Shneiderman) Diagram
   1. Sequence
   2. Decision
   3. Looping
2. Structured English
   - Arithmetic operators : *, /, +, -, **
   - Relational operators : >, <, >=, <=, ∏
   - Boolean operators: and , or, not
   - Keywords : BEGIN END, REPEAT UNTIL, IF THEN ELSE, CASE OF, WHILE DO, FOR
3. Decision Tree
4. Decision Table

Process Specifications (Pspecs)

- Example : Conditions :
  1. Credit limit exceeded
  2. Good payment history
  3. Purchase above Rs. 200

  Structured English :

```
If credit limit exceeded
    THEN  IF  customer has bad payment history
                  THEN refuse credit
                       ELSE IF Purchase is above Rs. 200
                             THEN Refuse credit
                                ELSE refer to manager
  ELSE Allow credit
```

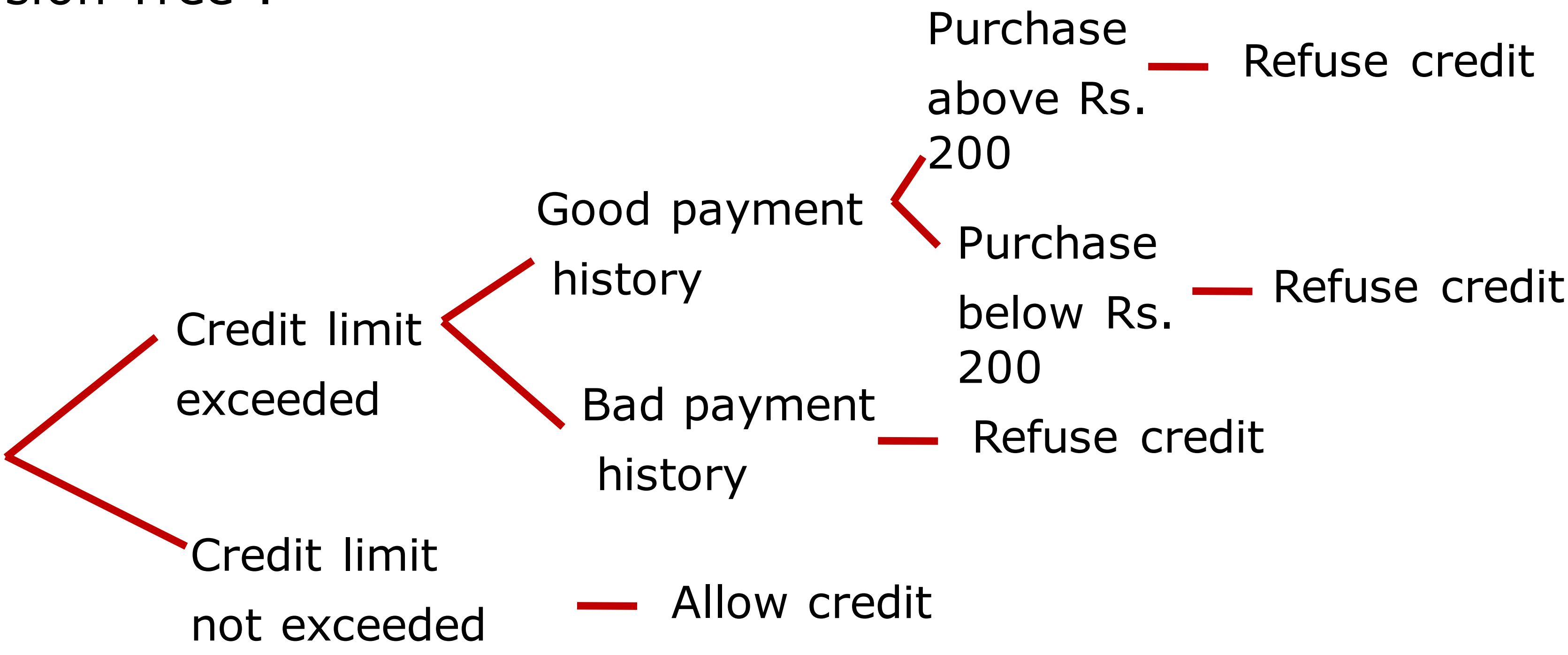
Process Specifications (Pspecs)

- Decision Table :

Condition	**Credit Limit exceeded**	**Y**	**Y**	**Y**	**Y**	**N**	**N**	**N**	**N**
	Customer good payment history	Y	Y	N	N	Y	Y	N	N
	Purchase above Rs.200	Y	N	Y	N	Y	N	Y	N
Action	Allow credit					X	X	X	X
	Refuse credit	X		X	X				
	Refer to manager		X						

Process Specifications (Pspecs)

- Decision Tree :



Credit limit exceeded

Good payment history

Purchase above Rs. 200 — Refuse credit

Purchase below Rs. 200 — Refuse credit

Bad payment history — Refuse credit

Credit limit not exceeded — Allow credit