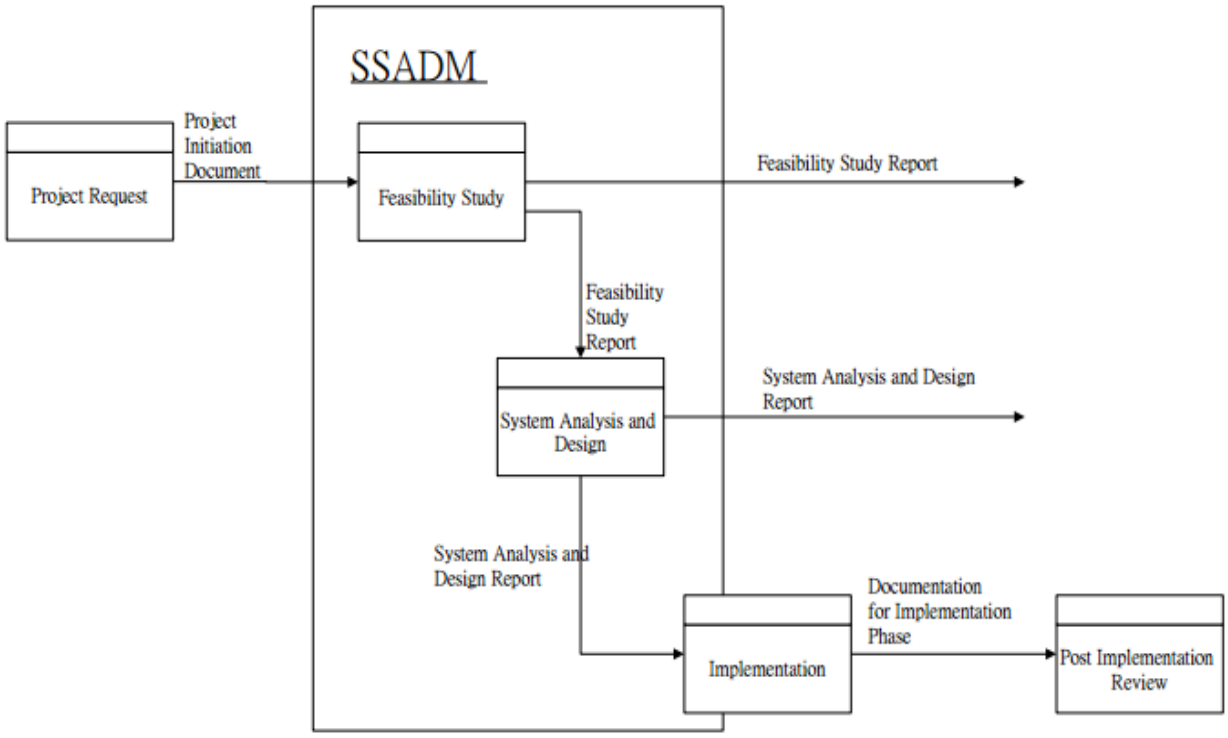
Chapter III

Structured Methodologies

3.1 The Need for a Structured Methodology

- SSADM was sought to help reduce the lifecycle development costs through improved and enhanced design and development.
- SSADM follows the waterfall life cycle model starting from the feasibility study to the physical design stage of development.
- SSADM was also believed to improve the quality of the systems it delivered.



SSADM techniques

- **Logical Data Modeling** The data requirements of the system being designed are identified, modeled and documented. This data is separated into entities and relationships between these entities identified.

- **Data Flow Modeling** Concerned with how the data moves around the information system. Examines processes, data stores, external entities and data flows.
- ***Entity Behavior Modeling*** which is the process of identifying, modeling and documenting the events that affect each entity and the sequence in which these events occur.

Steps used in SSADM

- SSADM is a waterfall view approach whereby there are sequences of events that run in series and each step leads on from the last.
- There are five steps in total, and each step can be broken down further.

1. **Feasibility study** to determine whether it is cost effective to go ahead with the system and whether it is actually possible.
2. **Requirements Analysis** Identifying of the requirements and needs of the system and modeling these needs in terms of the processes carried out.
3. **Requirements Specification** The functional and non-functional requirements are identified in detail.
4. **Logical System Specification** Technical systems options are created and the logical design of the system created.
5. **Physical Design** the logical system specification and technical system specification is used to design a physical database and set of program specifications.

Advantages of SSAD

- **Timelines:** Theoretically, SSADM allows one to plan, manage and control a project well. These points are essential to deliver the product on time.
- **Improvement of productivity:** By encouraging on-time delivery, meeting business requirements, ensuring better quality, using human resources effectively as well as trying to avoid bureaucracy, SSADM improves the overall productivity of the specific project and the company.
- **Better quality:** SSADM reduces the error rate of IS by defining a certain quality level in the beginning and constantly checking the system.
- **Effective use of skills:** Normally, common modeling and diagramming tools are used. Commercial CASE tools are also offered in order to be able to set up SSADM easily.

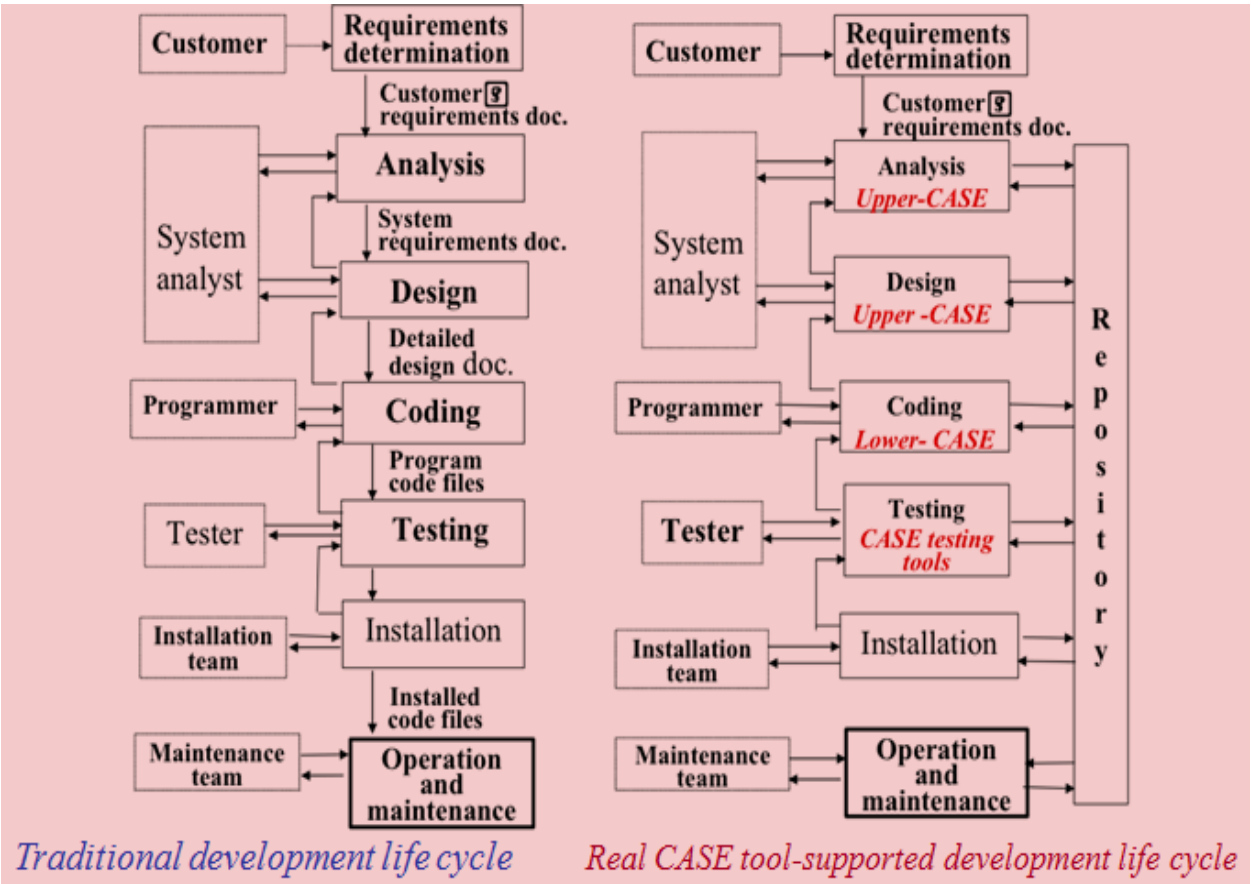
- **Usability:** Within SSADM special emphasis is put on the analysis of user needs. Simultaneously, the systems model is developed and a comprehensive demand analysis is carried out. Both are tried to see if they are well suited to each other. .

Disadvantages of SSAD:

- SSADM puts special emphasis on the analysis of the system and its documentation. This causes the danger of over analyzing, which can be very time and cost consuming.
- Especially with large systems, the outline diagram can become very unclear, because all relevant data flows have to be included.

3.2 Data Dictionary

- A data dictionary, or data repository, is a central storehouse of information about the system's data
- Data dictionary is a catalogue of all data used in an application, their names, type and their origin.
- The data dictionary is a reference work of data about data (metadata)



- A data dictionary is created when the system is developed, and is updated constantly as the system is implemented, operated, and maintained
- An analyst uses the data dictionary to collect, document, and organize specific facts about the system
- Without a data dictionary the development of large systems becomes difficult.
- The data dictionary is an effective solution to the problem of complicated nature.
- The main purpose of a data dictionary is to provide a source of reference in which the analyst, the user, the designer can look up & find out its content and any other relevant information.
- Data dictionary gives a single point reference of data repository of an organization

Advantages

- Support management and avoid duplication;
- Store of organisational knowledge linking analysis, design and implementation;
- CASE tools can sometimes automatically generate data dictionaries from system models.

3.3 Logic Modeling

- Data flow diagrams do not show
    - the **logic** inside the processes
    - What occurs within a process?
    - how input data is converted into output information
- It involves the representation of the internal structure and functionality of the processes on data flow diagrams
- It is effective for communicating with users (who provide the business logic) and the programmers (who implement this logic into a programming language)

Modeling Tools or Logic Modeling Approaches

- Structured English
- Decision Tables
- Decision Trees

3.3.1 Modeling Logic with Structured English

- **Structured English** is a modified form of English used to specify the **logic** of information processes.
- No specific standards – each analyst will have his own way

Basic logic (programming) structures:

• **Sequence is** represented by no special structure but one statement following another.

• **Conditional statements** are represented by **IF THEN ELSE** statement; BEGIN IF and END IF statement; **CASE** statement.

• **Repetition** is represented by DO ... UNTIL and DO…WHILE statements.

• Action verbs represent main functions such as DO, BEGIN, READ, WRITE, PRINT, SORT, MOVE, MERGE, ADD , SUBTRACT, MULTIPLY and DIVIDE.

•Unlike regular English, Structured English does not use adjectives or adverbs.

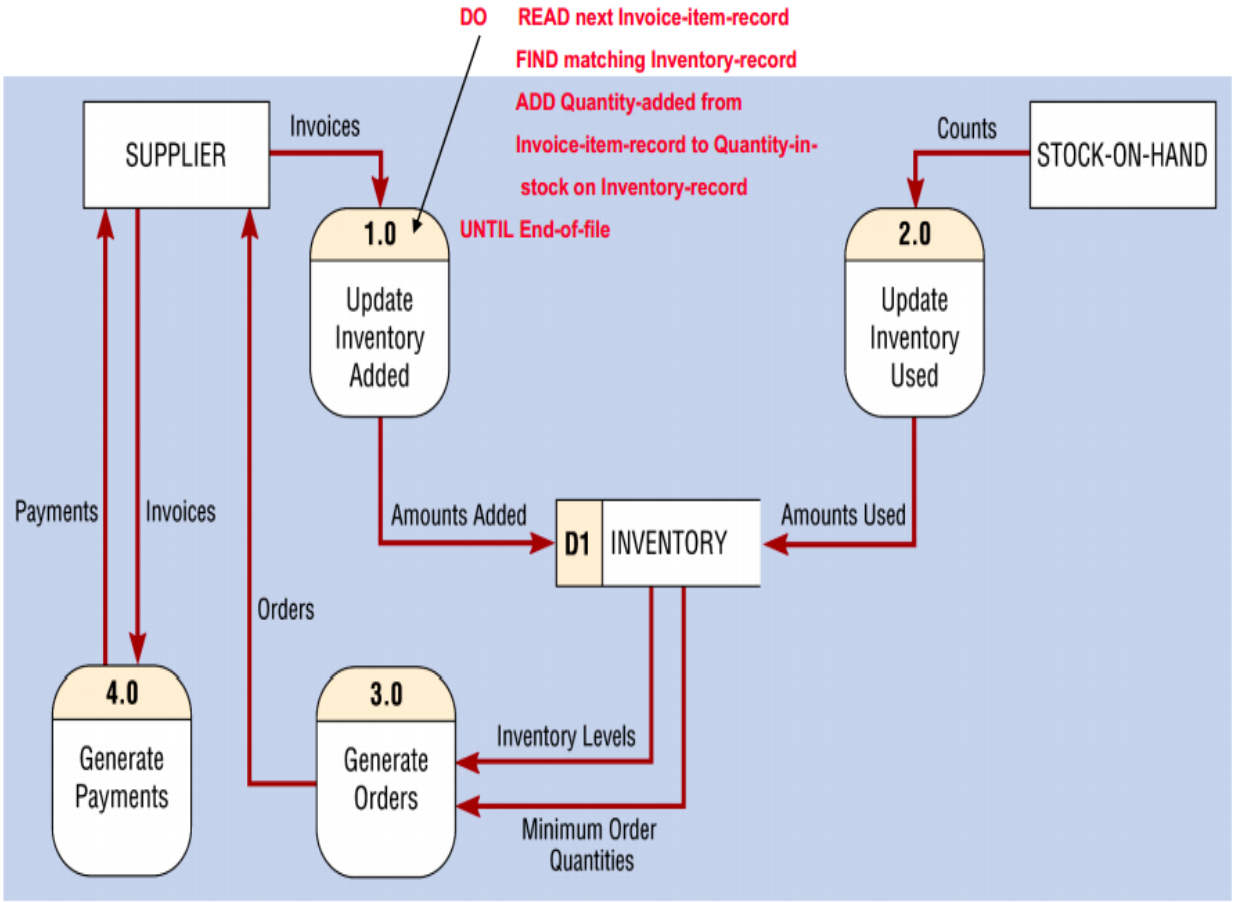
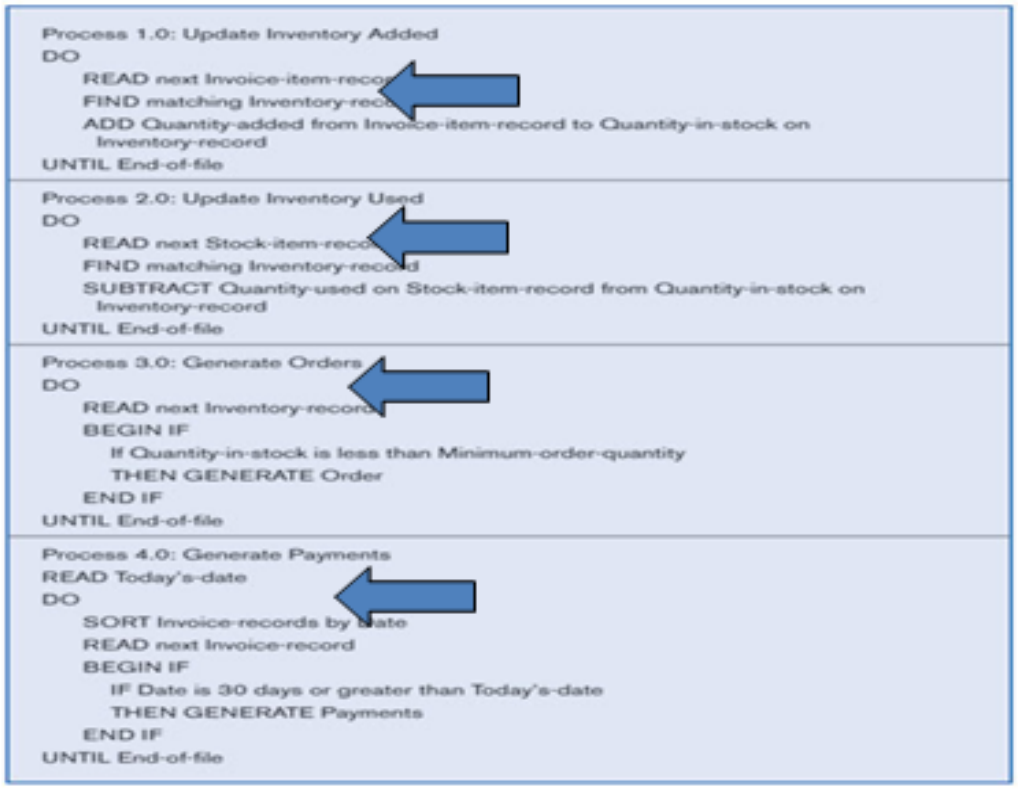
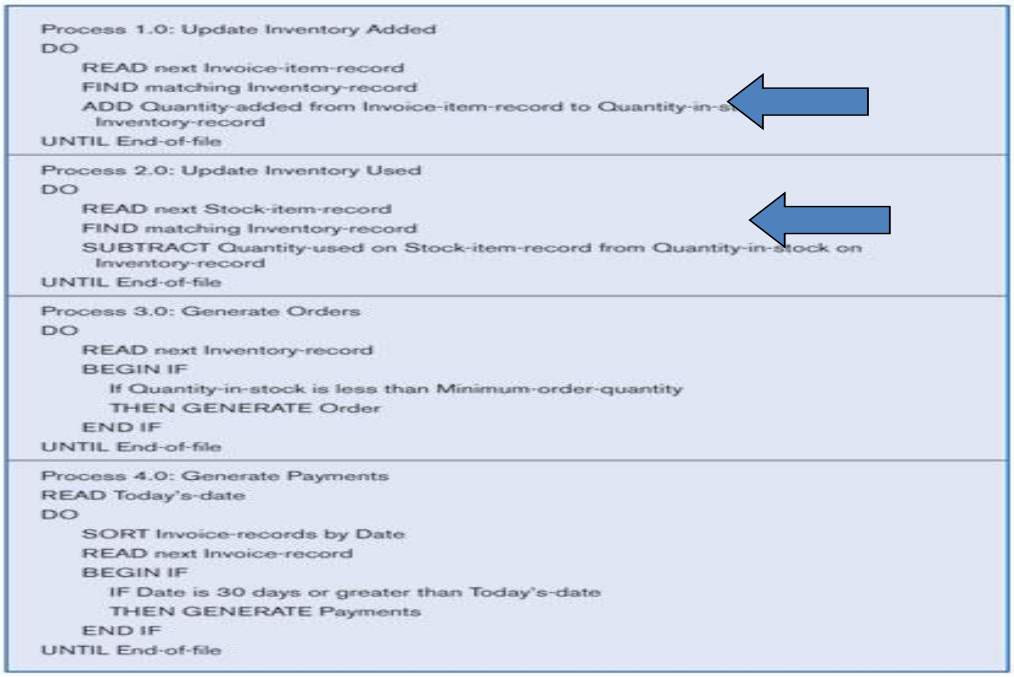


Figure 8-3
Structured English representations of the four processes depicted in Figure 8-2



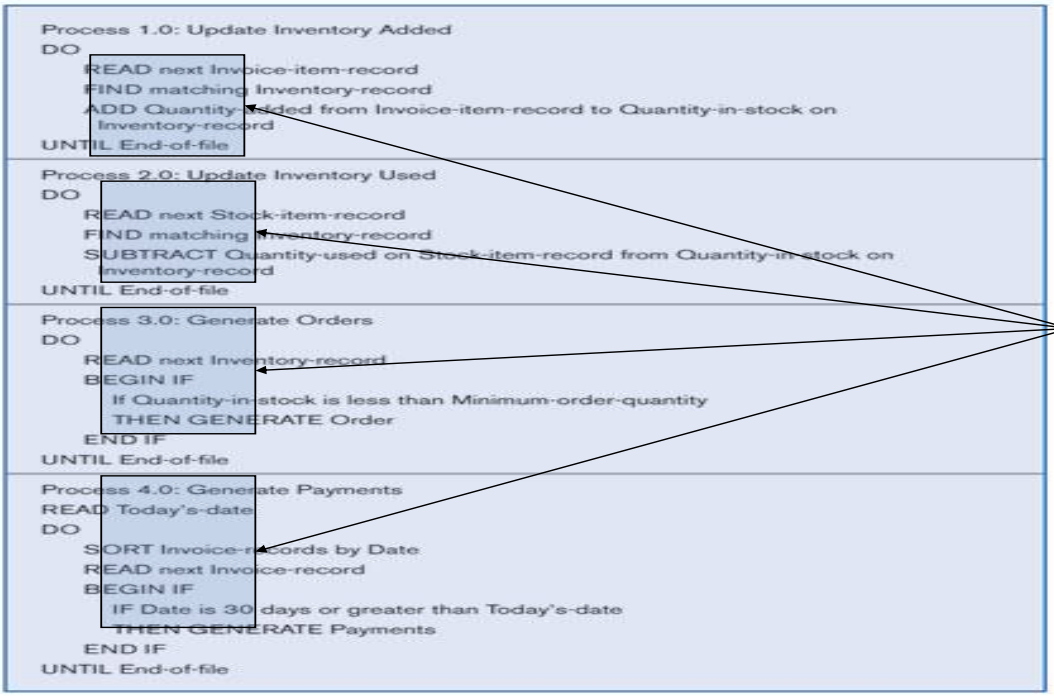
Structured English is used here to describe input and output.

Figure 8-3
Structured English representations of the four processes depicted in Figure 8-2



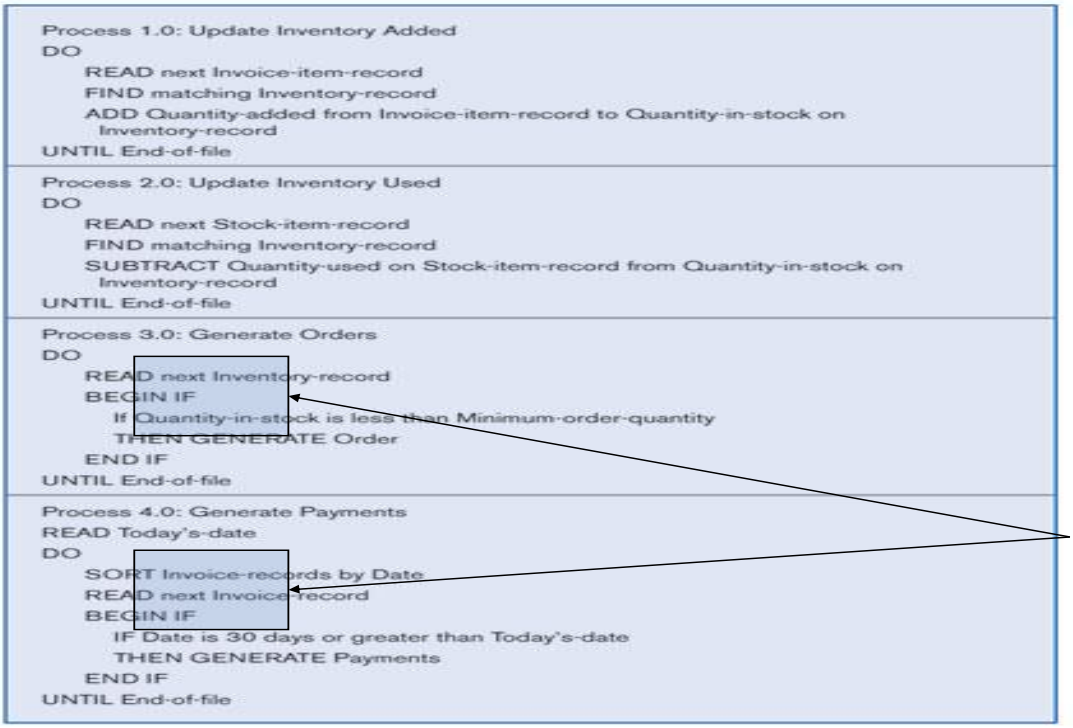
Structured English is used here to describe arithmetic operations.

Figure 8-3
Structured English representations of the four processes depicted in Figure 8-2



Structured English is used here to describe repetition.

Figure 8-3
Structured English representations of the four processes depicted in Figure 8-2



Structured English is used here to describe decisions.

Figure 8-3
Structured English representations of the four processes depicted in Figure 8-2

```
Process 1.0: Update Inventory Added
DO
    READ next Invoice-item-record
    FIND matching Inventory-record
    ADD Quantity-added from Invoice-item-record to Quantity-in-stock on
      Inventory-record
UNTIL End-of-file

Process 2.0: Update Inventory Used
DO
    READ next Stock-item-record
    FIND matching Inventory-record
    SUBTRACT Quantity-used on Stock-item-record from Quantity-in-stock on
      Inventory-record
UNTIL End-of-file

Process 3.0: Generate Orders
DO
    READ next Inventory-record
    BEGIN IF
      If Quantity-in-stock is                imum-order-quantity
      THEN GENERATE Order
    END IF
UNTIL End-of-file

Process 4.0: Generate Payme
READ Today's-date
DO
    SORT Invoice-records by Date
    READ next Invoice-record
    BEGIN IF
      IF Date is 30 days or greater than Today's-date
      THEN GENERATE Payments
    END IF
UNTIL End-of-file
```

Structured English is used here to describe invoking other processes.

3.3.2 Modeling Logic with Decision Tables

- Structured English is not good to represent *complicated logic* (having several different conditions) as it becomes difficult to understand
- **A decision table** is a matrix representation of the logic of a decision, which specifies the possible conditions for the decision and the resulting actions.
- Best used for complicated decision logic

3 Parts of a Decision Table

Condition stubs: Lists condition relevant to decision

Action stubs: Actions that result from a given set of conditions

Rules: Specify which actions are to be followed for a given set of conditions

Indifferent Condition: Condition whose value *does not affect* which action is taken for two or more rules

Procedure for Creating Decision Tables or The steps for creating a decision table

1. Name conditions and values each condition can assume

2. Name all possible actions that can occur

3. List all possible rules

4. Define the actions for each rule

5. Simplify the table

Decision Table

Figure 8-4 Complete decision table for payroll system example

	Conditions/ Courses of Action	Rules					
		1	2	3	4	5	6
Condition Stubs	Employee type	S	H	S	H	S	H
	Hours worked	<40	<40	40	40	>40	>40
Action Stubs	Pay base salary	X		X		X	
	Calculate hourly wage		X		X		X
	Calculate overtime						X
	Produce Absence Report		X				

Note: for salaried employees the action stub chosen will always be the same…therefore hours worked is an *indifferent condition*

Reduced Decision Table

Figure 8-5 Reduced decision table for payroll system example

Conditions/ Courses of Action	Rules			
	1	2	3	4
Employee type	S	H	H	H
Hours worked	–	<40	40	>40
Pay base salary	X			
Calculate hourly wage		X	X	X
Calculate overtime				X
Produce Absence Report		X		

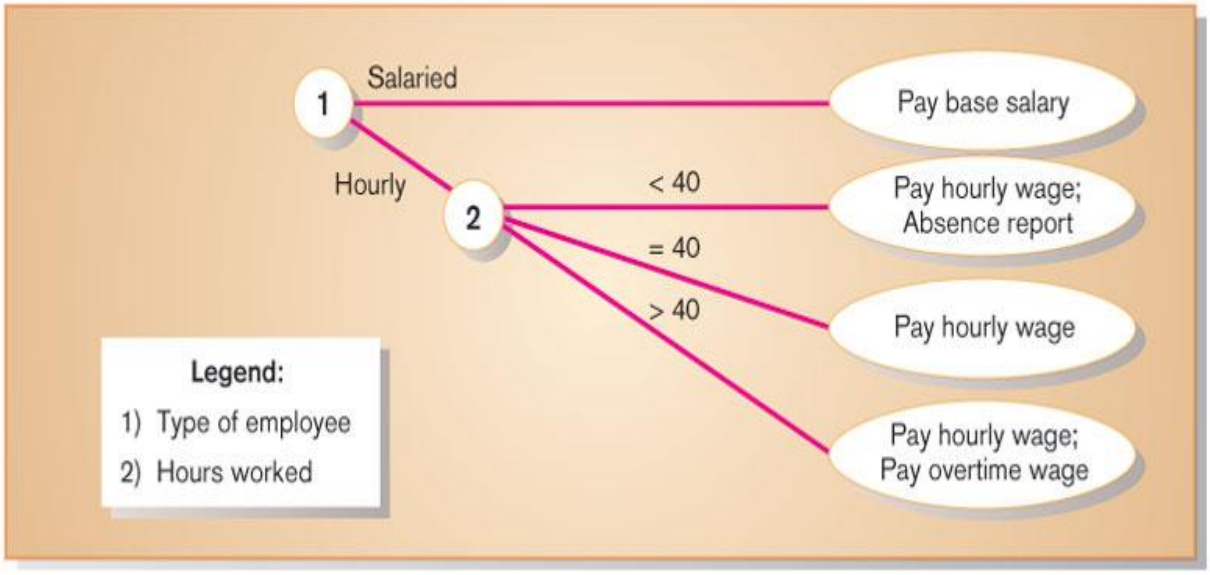
Because of indifferent condition, the complete decision table can be reduced to one with fewer rules

Modeling Logic with Decision Trees

- A decision tree is a graphical representation of a decision situation in which decision points (nodes)are connected together by arcs (one for each alternative on a decision) and terminate in ovals (the action which is the result of all of the decisions made on the path that leads to that oval).
- Main components
    - **Decision points** represented by **nodes**
    - **Actions** represented by **ovals**
    - Particular choices from a decision point represented by **arcs**
- Decision trees are organized in a hierarchical fashion, starting with the root node on the far left, and proceeding to subsequent decision nodes. All possible actions are listed in leaf nodes on the far right. reached

Decision tree representation of salary decision

Figure 8-10 Decision tree representation of the decision logic in the decision tables in Figure 8-4 and 8-5, with multiple choices per decision point



Assignment III

1. Explain the data dictionaries with example

2. Explain modeling tools?

3. Explain the steps of creating a decision table. How can you reduce the size and complexity of a decision table? Explain with example.

4. An individual wishes to withdraw cash from an ATM machine. Prepare a decision table to represent this situation. Please note any assumptions that you make. An individual wishes to withdraw cash from an ATM machine. Prepare a decision table to represent this situation. Please note any assumptions that you make.

5. A computer supplies firm called True Disk has set up accounts for countless businesses in Dosville. True Disk sends out invoices monthly and will give discounts if payments are made within 10 days. The discounting policy is as follows: If the amount of the order for computer supplies is greater than $1,000, subtract 4 percent for the order; if the amount is between $500 and $1,000, subtract a 2 percent discount; if the amount is less than $500, do not apply any discount. All orders made via the Web automatically receive an extra 5 percent discount. Any special order (computer furniture, for example) is exempt from all discounting. Develop a decision table for True Disk discounting decisions, for which the condition alternatives are limited to Y and N.
6. Develop a decision tree and a decision table for the following:
   The gatekeeper at ABC park is given the following instructions for admitting persons to the park:
   - If the person is under three years of age, there is no admission fee.
   - If a person is under 16, half the full admission is charged and this admission is reduced to a quarter of full admission if the person is accompanied by an adult (the reduction applies only if the person is under 12).
   - Between 16 and 18, half the full admission fee is charged if the person is a student; otherwise the full admission is charged.
   - Over 18, the full admission fee is charged.
   - A discount of 10 percent is allowed for a person over 16 if they are in a group of 10 or more.
   - There are no student concessions during weekends. On weekdays under – 12s get one free ride.