1. Project Title

The Electricity Billing System

2. Introduction& Objective(s)

Introduction:-

In today's world of emerging technology, computers are playing a vital role in every walk of life. The problems due to the traditional system are overcome with the help of tasks being online. Maintenance of the data like insertion, deletion and modification is difficult with manual systems. The basic option of security is itself not provided which is of major concern. Apart from this, storage of the voluminous amounts of data is difficult. Moreover the problems of consistency, reliability, integrity also exists. Since this is a manual system there is always a probability that there is loss of data, resulting in less durability. As these issues are of major concern, we developed an application were in all the above factors are achieved.

To overcome the manual usage of data, A.P.S.E.B. used the concept of single tier architecture which could solve only few problems. As these issues are of major concern, we developed an application to A.P.S.E.B. were in all the above factors are achieved. Addressing these issues, we develop a web application "EBS" (Electronic Billing System) which provides a service to all the customers and employees of A.P.S.E.B to deal with the transactions online.

Energy Billing System is an Executive Information System that could be used for entering, calculating and monitoring the Billing details of the Electricity Consumers. It provides environment to maintain the consumer details starting from getting new connection, receiving bill, payments etc., and performance information to the management. It would be an Intranet and Internet based software solution that would ensure timely availability of status parameters. The ability to view the reports online ensure access to these reports from any machine on the ex LAN and WAN network.

Objective(s):-

- The project basically deals with the billing system. Since it's a web application the problems of single tier could be solved using this application. Customers can lodge a complaint or deal with new connections just by logging into the system.
- The application basically starts by asking the user to sign in by choosing the CIRCLE ID and ERO ID. Later username and password of the employee option is provided. Validating the username and password, the user is directed to the homepage were in he has various options like consumer management, revenue collection, billing and accounting, generating the report.

- Regarding the modification, constraint is provided wherein the access is limited to the administrator. The statuses of the requests are updated at the earliest. The rectification information will be again updated for the knowledge of the employee. The employee can check the status of the requests before accessing the computer, which will speed up the disposal of the request. Thus, improving the overall efficiency of the organization.
- The system captures data related to Consumers and presents them in the form of reports. These reports are meant for the ERO officers and top management to view details for track performance, generating D-List, were payments are not done. The System tracks the performance on a daily basis as well as cumulatively over a period of time. The System captures Information related to actual demand, energy using, payments, exceptions, and etc. from various levels of organization with in the aim of capturing it from as close to the source as possible.
- The system helps the user to communicate with the administrator directly which is always expected for establishing a user-friendly environment. It can be used with existing software, so there is no need for any additional software. Thus, making it technically feasible.

3. Project Category

This application is developed on using three tier architecture of **Java** and **J2EE** Technologies, **Dream-Weaver** is used to front end designing but **Jsp** are used as tools and techniques and **SQL-Server** is used as a back end or database. The connection between the front-end and the back-end is established by using JDBC-ODBC Bridge. Some style sheets and scripting technologies are used to enhance the dynamisms of the project.

4. Tools/Platforms
&
Hardware/Software Requirement Specification

A. Hardware Requirements:-

Server Configuration (minimum): -

- Intel® Xenon™ 2.0 GHz Processors with 256KB cache.
- 256 MB RAM.
- 80 GB Hard Disk Drive.
- 3.5" – 1.44 MB Diskette Drive.
- 52X CD-ROM Drive.
- Intel® Pro 10/100+ LAN Card.
- Printer.

The server should have a proper backup and recovery facility.

Client Configuration (minimum): -

- Intel® Pentium® 3 1.3 GHz processor with 256 KB Cache.
- 128 MB RAM.
- Intel® Pro 10/100+ LAN Card.
- Connection to the LAN.

The clients should have a good rate of data transfer with the server for quick performance.

B. Software Requirements:-

Server Side:

- Windows 2003 Server
- SQL-Server
- Apache Tomcat [for Java Server Pages (JSP)]

Client Side:

- Windows 2003 onwards
- SQL-Server
- Apache Tomcat [for Java Server Pages (JSP)]

Characteristics of Back-end…

- Queries against the shared resources
- Management (Application and data)
- Transaction and processing
- Centralized application logic
- Communication and computation

Characteristics of Front-end…

- Pallet of visual tools for designing screens allows the programmers to create sophisticated multiple window user interfaces without writing any code.
- Graphical elements you create on the screen are displayed just as they will appear to the end user.
- The application can be created, designed and run in any web browser.
- The Visual system has a general purpose programming language.
- Fully supports Event Driven programming.
- Incremental compilation reduces development time.
- Debugging tools provide powerful development support.
- Support for dynamic data Exchange allows interoperability with others Applications.
- Fully supports Object linking and Embedding (OLE).

Peripherals…

The following peripherals are used

- Printer
- Scanner
- Digital camera.

5. Problem Definition, Requirements Specifications, Project Planning & Scheduling

Problem Definition: -

Actually the study phase is considered as the requirement analysis, which is the most vital part of the software development life cycle (SDLC). Without proper analysis something will remain hidden from the developer may generate certain fatality in near future even in after the implementation, too. Analysis is a software engineering task that bridges the gap between system level requirements engineering and system design. This phase consists of…

- System Engineering
- Software Requirement Analysis
- Software Design

Problem Recognition…

In this phase the analyst should clarify –

- Who is behind the request for this work?
- Who will use the solution?
- What will be the economic benefit of the successful solution?
- Is there any other source for the solution that the organization needs?

Getting answers all those questions by himself/herself, the analyst starts working and he issues some questionnaires to the future users for gathering information and then after that concentrates on the feasibility studies.

Preliminary Investigations…

The purpose of the preliminary investigation is to collect information for developing broad solutions for the purpose of feasibility study. Material i.e. information and facts to be collected in the preliminary investigation not only act as a basis for forming the several board solutions of proposed system but it also provides the much needed feedback for selection of the final candidates system among the solutions suggested in the course of feasibility study. Actually it means to be find out the way that how the proposed site will be developed containing which facts and figures. Following the four broad methodologies, which are described as follows:-

- Interview.
- Questionnaire.
- Fact finding studies, etc.

After the verbal interview session is over, it was very clear that the team requires to Requirements Specifications.

Requirements Specifications:-

In the traditional system files were used to maintain the database which was done manually. This existing system consumes a lot of time. This time consuming evaluation coupled by the huge maintenance problem and may also lead to erroneous results. The various operations performed on these files like sorting, adding, modifying and deletion of the records are very tedious. Moreover these manually maintained files have the possibility of getting worn out. Thus, less durability is achieved.

Thus the demerits of the existing system can be summarized as follows…

- There is no consistency as the data may not be updated on time.
- Feasibility is reduced
- Less reliability
- Security is not provided and any one can access
- Prioritization of records is difficult.
- More erroneous
- Difficult to maintain
- As everything is done manually its slow process
- No timely acknowledgement service

Taking the demerits into consideration, an alternative system which uses Oracle as both front end and back end was used. In front end, retrieval of the data from the database is done through SQL queries i.e. using D2K forms. This is not a web application and the data is not distributed as only a single system is used. As it is confined only to a particular system, scope is limited and there is a hindrance to the reliability if the system fails.

The demerits of this alternate system are…

- Only single system used.
- If the system crashes then the data is lost
- too overburdened
- not reliable
- slow processing
- less flexible
- not so user friendly

Proposed system:-

The proposed system is developed based on the client server architecture, a request-response paradigm and is implemented with the help of advanced java using the tomcat web container. The employees can maintain and do the transactions online.

The application starts by asking for user name and password which provides authentication. This system provides high security where the unauthorized users cannot access the data.

Later we have different options for the employee like

- Consumer Management
- Revenue Collection
- Billing and Accounting
- Reports
- Meter Details
- Ledger Process
- Journal Details

The objectives of the proposed system are as follows:

- Easy to use, effective and efficient
- Accurate results.
- Easy maintenance.
- Fast access
- More feasibility
- More secure.
- Provides high consistency.
- More reliable

Feasibility Study…

Feasibilities are studied from Economical, technical, operational and legal point of view and hence found no obstacles to continue with our proposed project to be developed. So, the feasibility studies are undergone as follows:

- **Economic Feasibility:** More commonly known as Cost/Benefit Analysis. The procedure is to determine the benefits and savings that are expected from a candidate system and compare them with costs. If the benefits outweigh costs, then decision is made to design and implement the system. Considering the facts it is becoming evident that the system will be economically feasible both for developer as well as for client's respect.
- **Technical Feasibility:** Technical feasibility centers on the existing computer system (hardware, software, etc.) and to what extent it can support the proposed addition. If the

budget is a serious constraint, then the project is judged not feasible. In our case this does not become an obstacle.

- **Behavioral Feasibility:** People are inherently resistant to change, and computers have been known to facilitate change. An estimate should be made of how strong a reaction the user staff is likely to have toward the development of a computerized system. This was not such a problem in our mentioned project.
- **Legal Feasibility:** A determination of any infringement, violation or liability that could result from the development of the system. But the system to be developed will be 100% legal.
- **Operational Feasibility:** The management & operators desire to be well acquainted with the requisite skill needed. Here most of the members in development team having technical expertise.
- **Time Feasibility:** The management & operators here concern about whether the project will completed timely or not. But considering the facts and figures collected by us regarding our project it can be easily assumed that the project will be completed within the specified time frame

Cost and Benefit Analysis…

In developing the cost estimates for this system several cost elements were taken into consideration. Among them was hardware, software, facility, operating and supply costs. Hardware costs related to the actual purchase of the computer and peripherals (for example, printer, disk drive, tape unit). Determining the actual cost of hardware is generally more difficult when various users than for dedicated stand-alone system share the system. Software costs relate to the buying of the software required to develop the project as well as the software required to run the application in the organization.

Functional Requirements:-

In software engineering, a functional requirement defines a function of a software system or its component. A function is described as a set of inputs, the behavior, and outputs. Functional requirements may be calculations, technical details, data manipulation and processing and other specific functionality that show how a use case is to be fulfilled. They are supported by non-functional requirements, which impose constraints on the design or implementation (such as performance requirements, security, or reliability).As defined in requirements engineering, functional requirements specify particular behaviors of a system. This should be contrasted with non-functional requirements which specify overall characteristics such as cost and reliability.

Technical Requirements:-

- Performance Requirements

- Safety Requirements
- Security Requirements
- Hardware Constraints
- Software Constraints
- Design Constraints

Nonfunctional Requirements:-

In systems engineering and requirements engineering, non-functional requirements are requirements which specify criteria that can be used to judge the operation of a system, rather than specific behaviors. This should be contrasted with functional requirements that specify specific behavior or functions. Non-functional requirements are often called qualities of a system. Other terms for non-functional requirements are "constraints", "quality attributes", "quality goals" and "quality of service requirements". Qualities, of Non-functional requirements can be divided into two main categories. Execution qualities, such as security and usability, are observable at run time. Evolution qualities, such as extensibility and scalability, embody in the static structure of the software system.

Software Quality Attribute-

- **Reliability:** Reliability will mostly depend on the client's connection status. The reliability holds as long as clients are provided support to JDK 1.5 or later.
- **Availability:** The server on which this system will be running is expected to be available at all hours of the day to provide worldwide accessibility. A graphical user interface (GUI) is provided to have online interaction with the user.
- **Maintainability:** The business logic here is that there can be accounting feature in the future development of the product.. All development will be provided with good documentation.
- **Portability:** As the system is designed using Java, it can work on any platform or architecture

Project Planning & Scheduling:-

PERT Chart/ Task Network Chart:-

The Program Evaluation Review Technique (PERT) is the cost and time management system. PERT organizes that project is complex that some task must be completed before other can be stated and that the appropriate way to manage a project is to define and control each task. Because projects often fall behind schedules, PERT is designed to facilitate getting a project back on schedule. The PERT chart gives a graphical representation of this information.

Depending on the working priorities, the entire project can be subdivided into the following main modules, those are:-

- Login Module
- Consumer Management Module
- Meter Change Module
- Revenue Collection Module
- Billing and Accounting Module
- Change Password Module.

We can construct our activities plain as follows:-

Activity	**Activity Name**
A	Login
B	Consumer Management
C	Meter Change
D	Revenue Collection
E	Billing and accounting
F	Change Password

Chart:-

Activity	Predecessor Activity	Time Estimated Weeks (Individual)
A	……	4
B	A	4
C	B	2
D,E	C	5
F	D,E	2

Critical Path Method (CPM): -

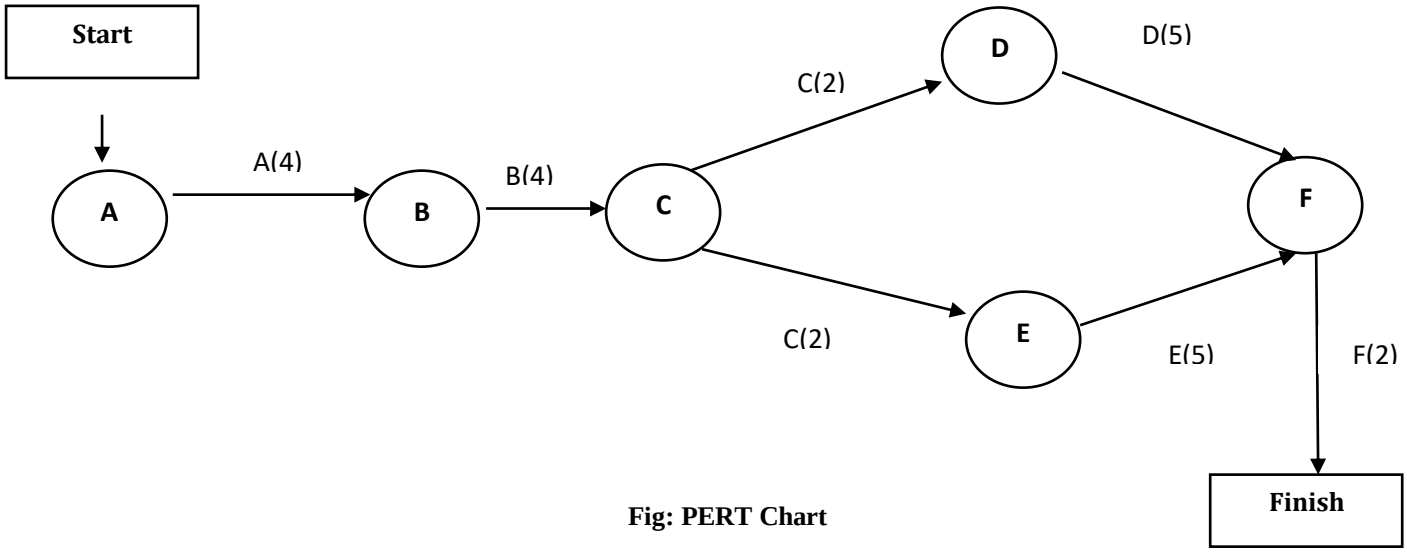


Fig: PERT Chart

Time Line Path: -

Path	Length Of Time
Start-A-B-C-D-F-Finish	4+4+2+5+2= 17WEEKS
Start-A-B-C-E-F-Finish	4+4+2+5+2= 17 WEEKS

GANTT Chart:-

A Gantt chart is a popular type of bar chart that illustrates a project schedule. Gantt charts illustrate the start and finish dates of the terminal elements and summary elements of a project. Terminal elements and summary elements comprise the work breakdown structure of the project.

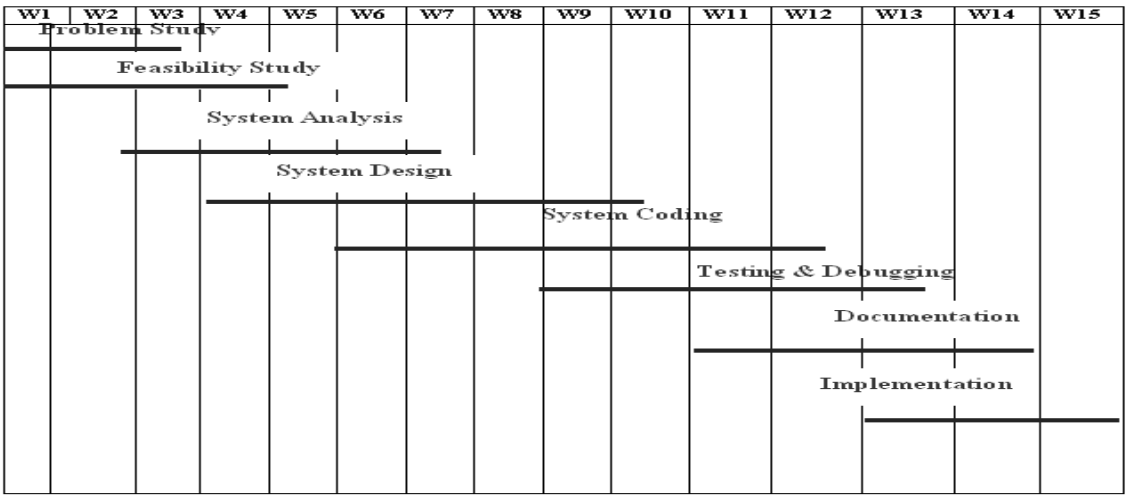


Fig: GANTT Chart

6. Scope of the Solution

This application is basically written as a solution to the drawbacks of existing system. This application can be used as a real world application and by any organization. It's could be used as a general application with few minor modifications.

The purpose of this application is to develop **The Energy Billing System**, which is a web application which provides a service to all the customers and employees of an existing company to deal with the transactions online.

The company is presently dealing with the transactions using Ms-SQL Server. The problem with D2K is that there exists heavy network traffic either in two tier or three tier architecture. Here the cost to develop the project will be less but the reliability will be degraded. Thus this application provides a solution to problems of single tier. Customers can lodge a complaint or deal with new connections just by logging into the system and do the transactions online.

7. Analysis (DFDs, ER Diagrams/ Class Diagrams etc.)

The whole approach of analysis of problem should however be based around critical factors like the availability of information for making the decision, the time available for processing the data i.e. the realism. System Requirement Specification or SRS had been prepared after proper discussion with the persons attached with the mentioned "**OSCM**". Software project management begins with a set of activities collectively called PROJECT PLANNING. Software project planning actually encompasses all of the activities. Planning involves estimation- to determine how much money, how much effort, how many resources, and how much time it will take to build a specific software-based system or product.

Phases Cover:-

- Pre–Analysis Studies
- System Analysis
- System Design
- Project Coding
- Project Testing
- Implementation & Documentation

- **Pre–Analysis Phase:** In this phase problems with existing system are to be determined and do the investigation to make the solutions.
- **System Analysis Phase:** In this phase system analysis is done by preparation of Software Requirement Specification.
- **System Design Phase:** The purpose of the design phase is to plan a solution for the problem specified in the requirements documents.
- **Project Coding Phase:** The goal of the coding phase is to translate the design of the system into a program code by help of a programming language like Visual Studio, Java, etc.
- **Project Testing Phase:** Testing concerned with the elimination of errors introduced during coding phase.
- **Implementation & Documentation Phase: -** This phase includes all the activities performed to keep the system operational after the installation of the software.

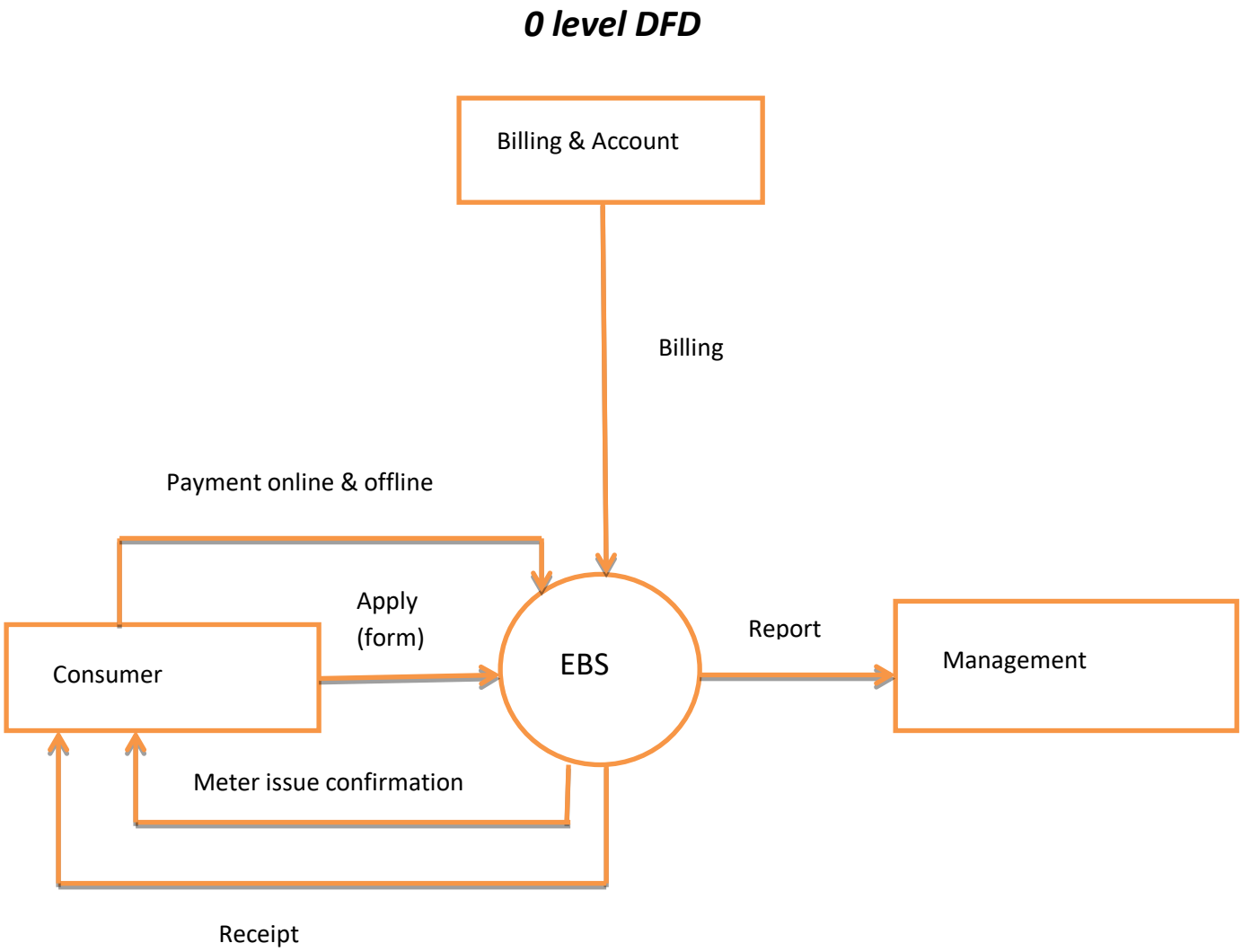
Data Flow Diagram (DFDs):-

Data flow diagrams models the passage of data in the system and are represented by lines joining system components. Flows of data in the system can take place between:-

- Between two processes,
- From a data store to a process,
- From a process to data store,
- From a source to process and
- From a process to a sink.

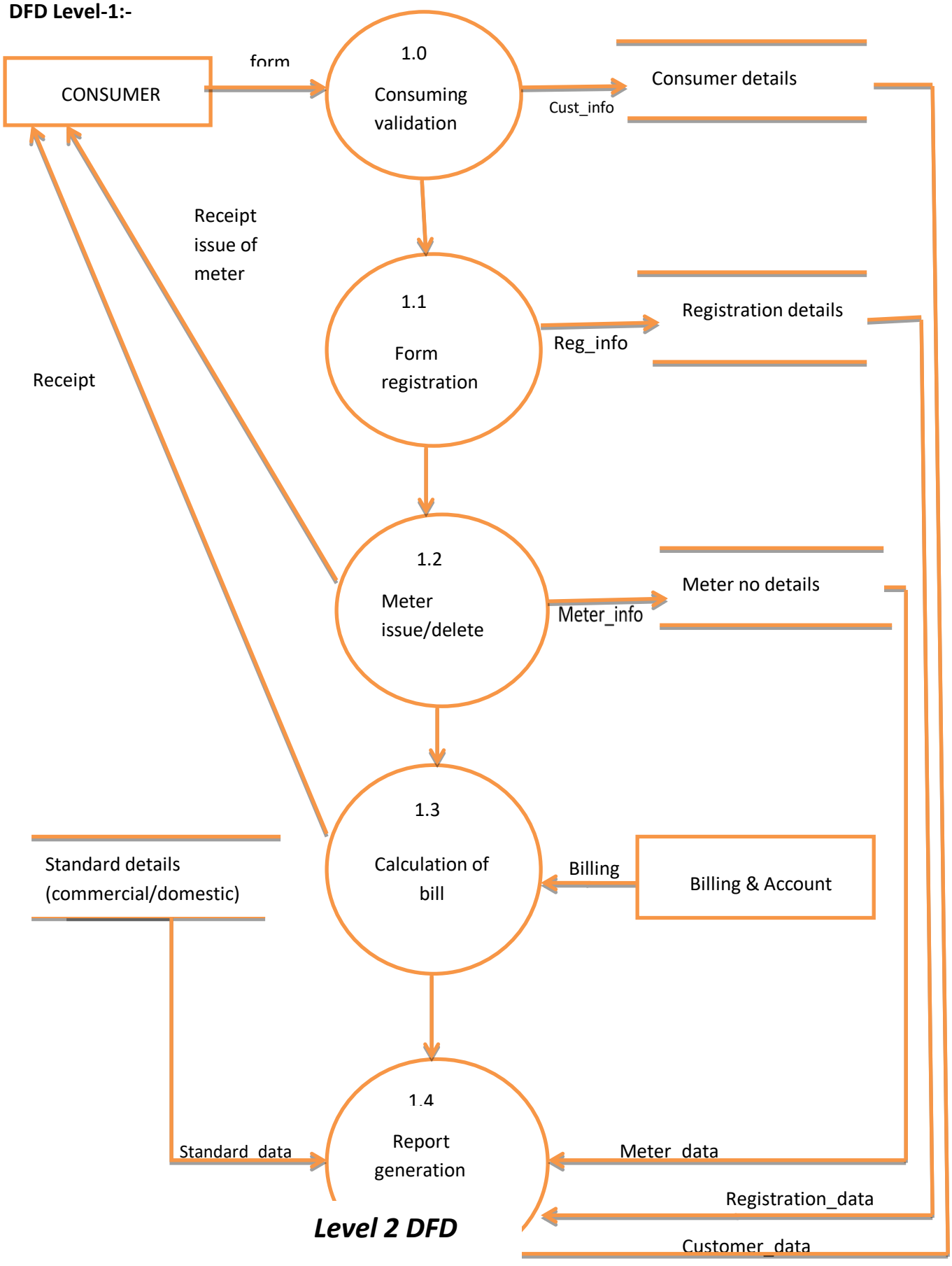
Though the system mainly consists of two parts viz. online admission and online examination and other parts are going to be automated gradually…, so DFD is also, illustrated in two parts, respectively…

Context Level Diagram:-

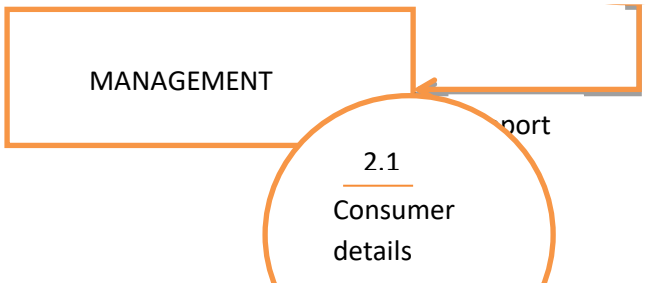


Level 1 DFD

DFD Level-1:-

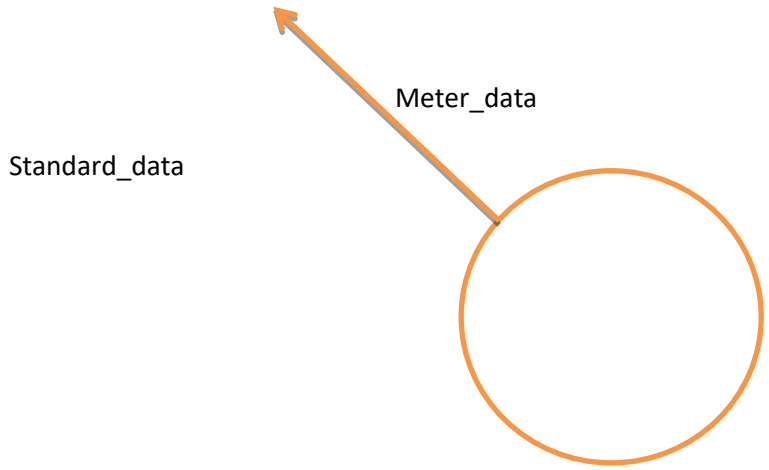


Level 2 DFD



Cust_data

reg_data



Class Diagram:-

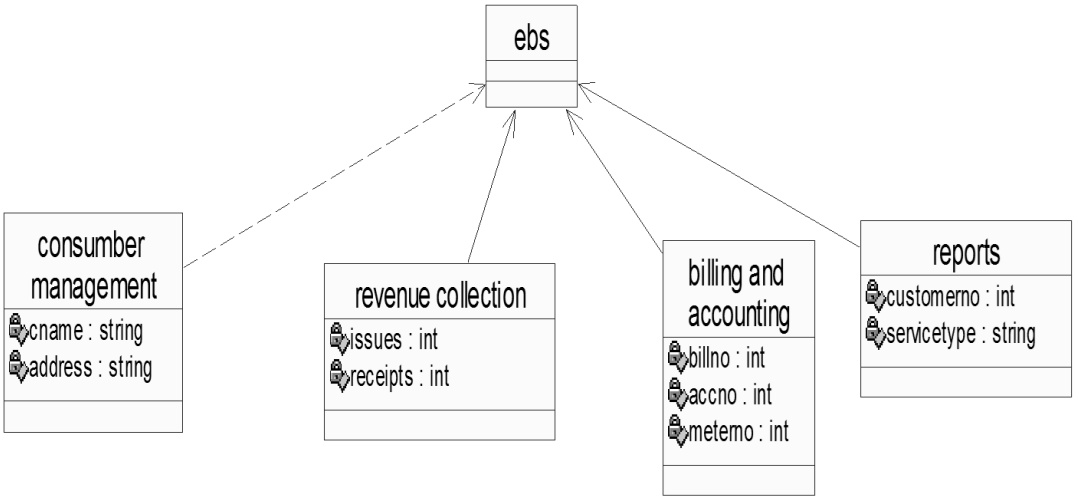


Fig: Class Diagram of the entire system

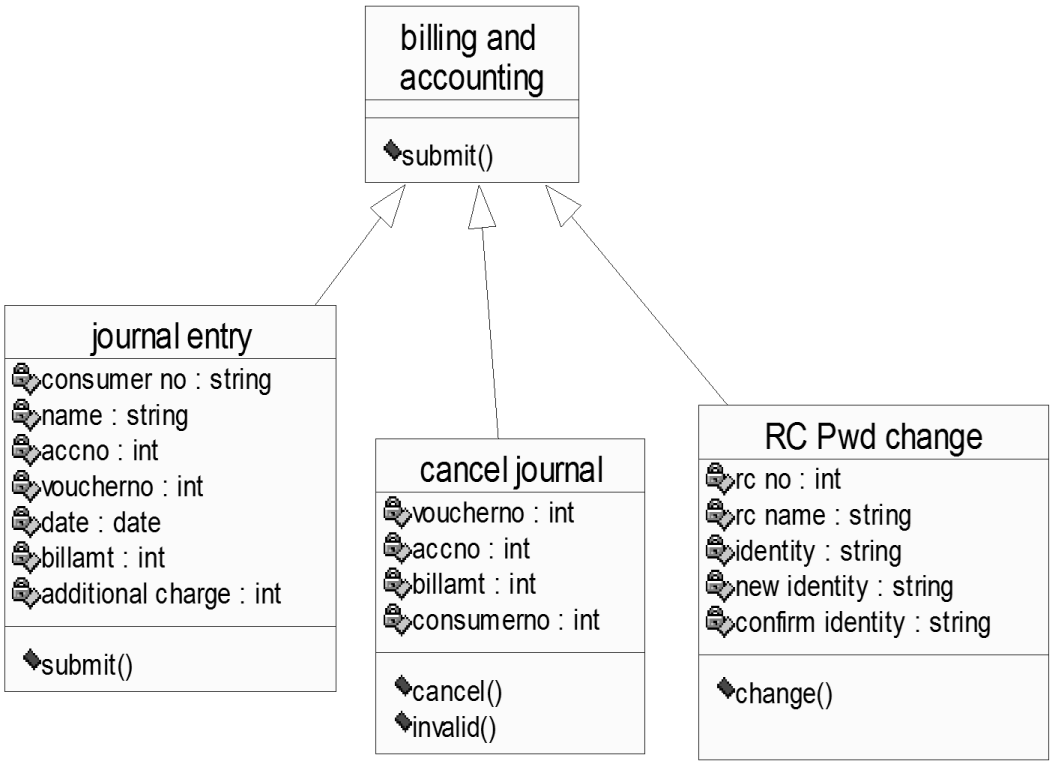


Fig: Class Diagram of the Billing and Accounting System

Entity Relationship Diagram (ERD):-

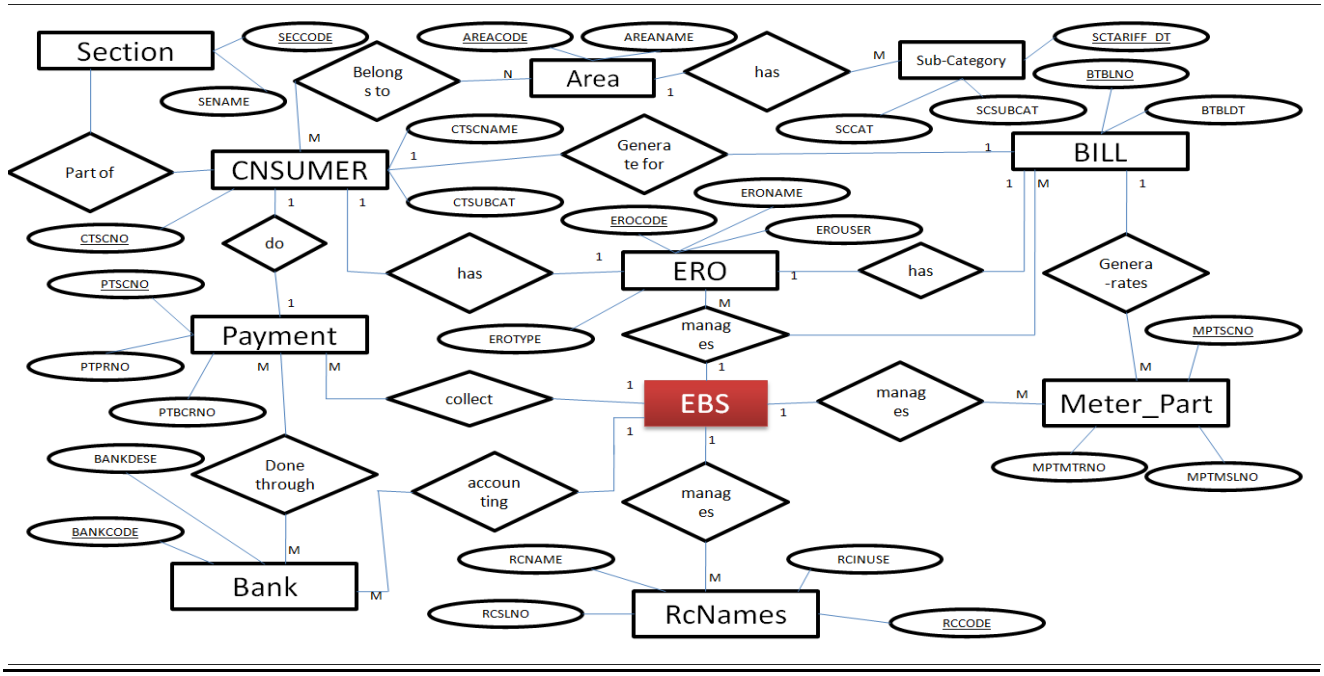


Fig: Entity Relationship Diagram (ERD)

8. A Complete Database & Tables

This is a large enough application, and for building such a type numbers of tables are required. The number of tables is gradually increasing in course of development, as well as with the application of Normalization. Here only a few of those are mentioned, mainly the masters one, just to clear an overview of the application.

Table-CONS:- to store consumer details

Column Name	Data Type(size)	Constraint
CTSCNO	CHAR(8)	NOT NULL
CTNAME	VARCHAR2(30)	
CTADD1	VARCHAR2(30)	
CTADD2	VARCHAR2(30)	
CTADD3	VARCHAR2(30)	
CTADD4	VARCHAR2(30)	
CTPINCODE	NUMBER(6)	
CTCAT	NUMBER(1)	
CTSUBCAT	NUMBER(1)	
CTDISCD	CHAR(3)	
CTAREACD	VARCHAR2(6)	
CTEROCD	NUMBER(3)	
CTSUBDIVCD	CHAR(2)	
CTSECCD	CHAR(2)	
CTGROUP	CHAR(1)	
CTLCNO	CHAR(2)	
CTBILLMODE	NUMBER(1)	
CTSUPCONDT	DATE	
CTCNVTDT	DATE	
CTSERVTYPE	CHAR(2)	
CTCONLD	NUMBER(8,3)	
CTCTRLD	NUMBER(8,3)	
CTMRBNO	VARCHAR2(3)	
CTMRBPAGE	NUMBER(3)	
CTCONSTAT	NUMBER(1)	
CTDATASTAT	CHAR(1)	

Column Name	Data Type(size)	Constraint
CTCAPAVAIL	NUMBER(3,1)	
CTCAPREQ	NUMBER(3,1)	
CTAGRMTDT	DATE	
CTCAPSURCHGPER	NUMBER(3,2)	
CTAGRMTEXPDT	DATE	
CTENTDT	DATE	
CTBLSTDT	DATE	
CTSDINTDT	DATE	
CTSDTOTAMT	NUMBER(9,2)	
CTSDREQ	NUMBER(11,2)	
CTSDINTAMT	NUMBER(9,2)	
CTSDONINTDT	NUMBER(11,2)	
CTAMGAMT	NUMBER(9,2)	
CTAMGYR	NUMBER(2)	
CTAMGEXPR	DATE	
CTMETSINSERV	NUMBER(1)	
CTBLNOTPREPMN	NUMBER(2)	
CTPENINTIND	NUMBER(1)	
CTREBATEIND	NUMBER(1)	
CTINSTMTIND	NUMBER(1)	
CTBLISSUEID	NUMBER(1)	
CTMTRCHGIND	NUMBER(1)	
CTOTHERREV	NUMBER(9,2)	
CTPHONE	NUMBER(8)	
CTELDTYIND	NUMBER(1)	
CTTYPE	CHAR(1)	
CTTRCODE	VARCHAR2(8)	
CTDEFAMT	NUMBER(9,2)	
CTNEWSCNO	CHAR(11)	
CTCYCLE	CHAR(2)	
CTFEEDERCD	VARCHAR2(12)	

Column Name	Data Type(size)	Constraint
CTDLISTFLG	NUMBER(3)	
CTDLSTFLG	NUMBER(3)	
CTAUTOPAY	VARCHAR2(20)	
CTSDBALAMT	NUMBER(9,2)	
CTACDSURCHG	NUMBER(9,2)	

Table-Meter_Part:- to store meter details

Column Name	Data Type(size)	Constraints
MPTSCNO	CHAR(8)	NOT NULL
MPTMSLNO	NUMBER(1)	
M PTMTRNO	VARCHAR2(12)	
MPTMTRPHASE	NUMBER(1)	
MPTMTRMF	NUMBER(5,2)	
MPTMTRDIGIT	NUMBER(1)	
MPTMTRCAP	VARCHAR2(8)	
MPTMTROPNRDG	NUMBER(6)	
MPTMTRCLRDG	NUMBER(6)	
MPTMTROPNRDGDT	DATE	
MPTMTRCLRDGDT	DATE	
MPTMTRPREVSTAT	CHAR(2)	
MPTMTRCURRENTSTAT	CHAR(2)	
MPTMTRCHNGDT	DATE	
MPTMTRMAKE	VARCHAR2(10)	
MPTMTRSEALNO	VARCHAR2(8)	
MPTEXCEPDT	DATE	

Table-BILL:- to store bill details.

Column Name	Data Type(size)	Constraints
BTBLNO	VARCHAR2(7)	
BTBLDT	DATE	
BTDUEDT	DATE	
BTDISCDT	DATE	
BTBLMTH1	DATE	

Column Name	Data Type(size)	Constraints
BTBLMTH2	DATE	
BTENGCHG	NUMBER(9,2)	
BTCAPSURCHG	NUMBER(8,2)	
BTFIXCHG	NUMBER(7,2)	
BTFUELCHG	NUMBER(8,2)	
BTCUSTCHG	NUMBER(9,2)	
BTADLCHG	NUMBER(9,2)	
BTOTHRCHG	NUMBER(9,2)	
BTARRAMT	NUMBER(9,2)	
BTADLARRAMT	NUMBER(9,2)	
BTADLCHGARR	NUMBER(9,2)	
BTADJAMT	NUMBER(9,2)	
BTCURBAL	NUMBER(9,2)	
BTOLDCURBAL	NUMBER(9,2)	
BTPENINT	NUMBER(9,2)	
BTINSTALAMT	NUMBER(9,2)	
BTREBATEAMT	NUMBER(9,2)	
BTROUNDAMT	NUMBER(9,2)	
BTBLDUNITS	NUMBER(6)	
BTELDTY	NUMBER(9,2)	
BTELDTYARR	NUMBER(9,2)	
BTELDTYINT	NUMBER(9,2)	
BTELDTYINTARR	NUMBER(9,2)	
BTEDADJAMT	NUMBER(9,2)	
BTAMTPAID	NUMBER(9,2)	
BTDEFFEE	NUMBER(9,2)	
BTDEFARR	NUMBER(9,2)	
BTCONCESS	NUMBER(9,2)	
BTAPRARR	NUMBER(9,2)	
BTARRCURR	NUMBER(9,2)	
BTAPRARR1	NUMBER(9,2)	
BTARRCURR1	NUMBER(9,2)	

Column Name	Data Type(size)	Constraints
BTSUBSIDYAMT	NUMBER(8,2)	
BTACDSURCHG	NUMBER(8,2)	
BTSCNO	CHAR(8)	NOT NULL

Table-Payment:- to store Payment details

Column Name	Data Type(size)	Constraints
PTSCNO	CHAR(8)	**NOT NULL**
PTBCRNO	CHAR(8)	
PTPRNO	NUMBER(10)	
PTPRDT	DATE	
PTRCCD	CHAR(2)	
PTCOUNTER	NUMBER(3)	
PTONOROFF	CHAR(1)	
PTPAYMETH	CHAR(1)	
PTCHKNO	CHAR(7)	
PTCHKDT	DATE	
PTBNKCD	CHAR(3)	
PTBLAMT	NUMBER(9,2)	
PTMISAMT	NUMBER(9,2)	
PTRECONCHG	NUMBER(5,2)	
PTCANCELID	CHAR(1)	
PTBRNNAME	VARCHAR2(40)	
PTMISAMTCD	CHAR(2)	
PTELDTY	NUMBER(9,2)	
PTELDTYINT	NUMBER(9,2)	
PTADLAMT	NUMBER(9,2)	
PTDEFAMT	NUMBER(9,2)	
PTTOTARR	NUMBER(11,2)	
PTTOTCUR	NUMBER(11,2)	

Table-RcNames:- to store Regional Code details

Column Name	Data Type(size)	Constraints
RCCODE	CHAR(2)	**NOT NULL**
RCINUSE	NUMBER(1)	

RCSLNO	NUMBER(4)	
RCPASS	VARCHAR2(8)	
RCNAME	VARCHAR2(30)	
RCTRY	NUMBER(1)	
RCMAXDATE	DATE	

Table-ERO:- to store ERO details

Column Name	Data Type(size)	Constraints
EROCODE	NUMBER(3)	
ERONAME	VARCHAR2(30)	
EROUSER	VARCHAR2(20)	
EROTYPE	NUMBER(1)	

Table-Section:- to store sectional details

Column Name	Data Type(size)	Constraints
SECCODE	CHAR(2)	
SECNAME	VARCHAR2(30)	

Table-Sub_Div:- to store sub division details

Column Name	Data Type(size)	Constraints
SDCODE	CHAR(2)	
SDNAME	VARCHAR2(30)	

Table-Area:- to store area details

Column Name	Data Type(size)	Constraints
AREACODE	VARCHAR2(6)	**NOT NULL**
AREANAME	VARCHAR2(30)	

Table-Area_Name:- to store area name details

Column Name	Data Type(size)	Constraints
AREACODE	VARCHAR2(6)	**NOT NULL**
AREANAME	VARCHAR2(30)	
AREAMR	VARCHAR2(20)	
AREALI	VARCHAR2(20)	
PVTMR	VARCHAR2(20)	

Table-Bank:- to store bank details

Column Name	Data Type(size)	Constraints
BANKCODE	CHAR(2)	

BANKDESC	VARCHAR2(35)	

Table- Sub Category: - to store sub categorical details

Column Name	Data Type(size)	Constraints
SCCAT	NUMBER(1)	
SCSUBCAT	NUMBER(2)	
SCDESC	VARCHAR2(45)	
SCBILL_TYPE	NUMBER(1)	
SCREAD_YN	NUMBER(1)	
SCMAX_LOAD	NUMBER(8,3)	
SCLOAD_HP_KW	VARCHAR2(10)	
SCLOAD_UNITS	NUMBER(6)	
SCREBATE_YN	NUMBER(1)	
SCAMG_YN	NUMBER(1)	
SCTARIFF_DT	DATE	**NOT NULL**
SCBILL_FACTOR	NUMBER(6,4)	
SC_CONCESSION_UNITS	NUMBER(4)	

9. A Complete Structure

Number of Modules & Their Description:-

The application consists of number of modules and sub modules, of which, the most important are discussed briefly…

The system onsists of three main modules. Those are…

1. Login Module
2. Consumer Management Module
3. Meter Change Module

4. Revenue Collection Module
5. Billing and Accounting Module
6. Change Password Module.

- **Login Module:-**

This module is considered only when there is a requirement of safety and security by the customer. Only after the login process, the rest of the application is made available to the user. In order to login, user has to first register by providing desired user-ID and password. Provided user-IDs and passwords by the users are maintained in a database. Oracle database is used to maintain a database. Then the user logins in to the application by giving user-ID and password provided during registration process. JDBC is used to connect the application with the database.

- **Consumer Management Module:-**

To design front-end forms according to consumer specifications it was like Addition of new consumer, deletion, modification of consumer, processing bills, journals, debit respectively. This module deals with consumer information details. This module is further subdivided as:-

- New Consumer Acquisition
- Modification of Consumer
- Deletion of consumer
- Query Consumer

- **Meter Change Module:-**

Every consumer is having meter for reading details. If meter will change then the meter details will be change in database. This sub module is used to update meter details. It having a subpart namely-

- Meter part Change

- **Revenue Collection Module:-**

Billing is done by spot billing machines and updated to billing database. This module deals with collection of payments through collection centers by online or offline each consumer wise. This module having a number of subparts namely-

- Online Receipt
- Offline Receipt
- Receipt Cancel

- **Billing and Accounting Module:-**

This module having a number of subparts namely-

- Journal Entry

- Cancellation of Journal

- **Change Password Module:-**

Every organization should have its counters to receive online payments. Each Counter is having User Code and Password. This module is allows the user to change this Password for security purpose.

Data Structures as per the project requirements:-

- Class
- List
- Tables
- Java Scripts
- Different Reports, etc.

Process Logic of Each Module:-

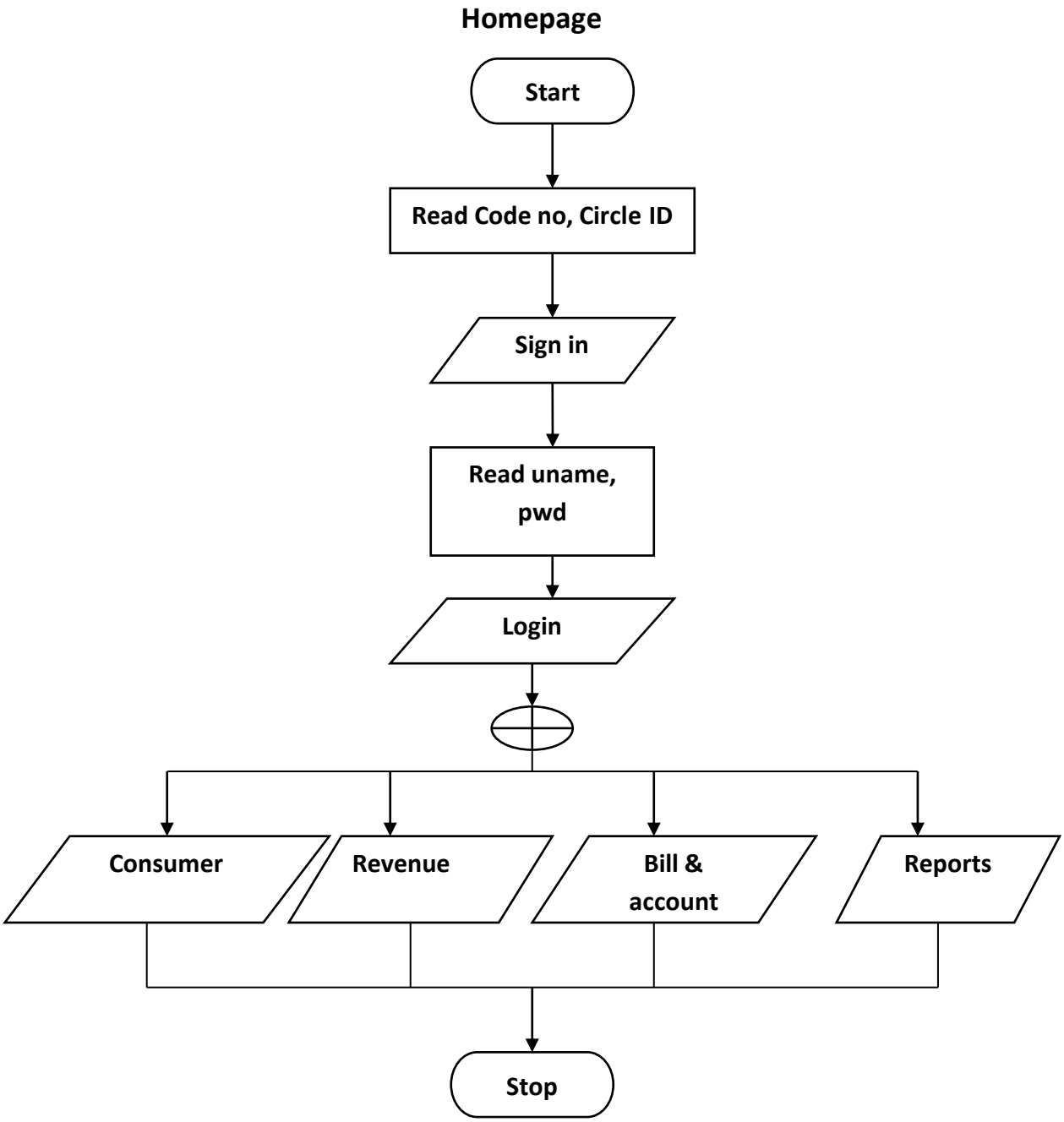


Figure: Process Logic of Home Page

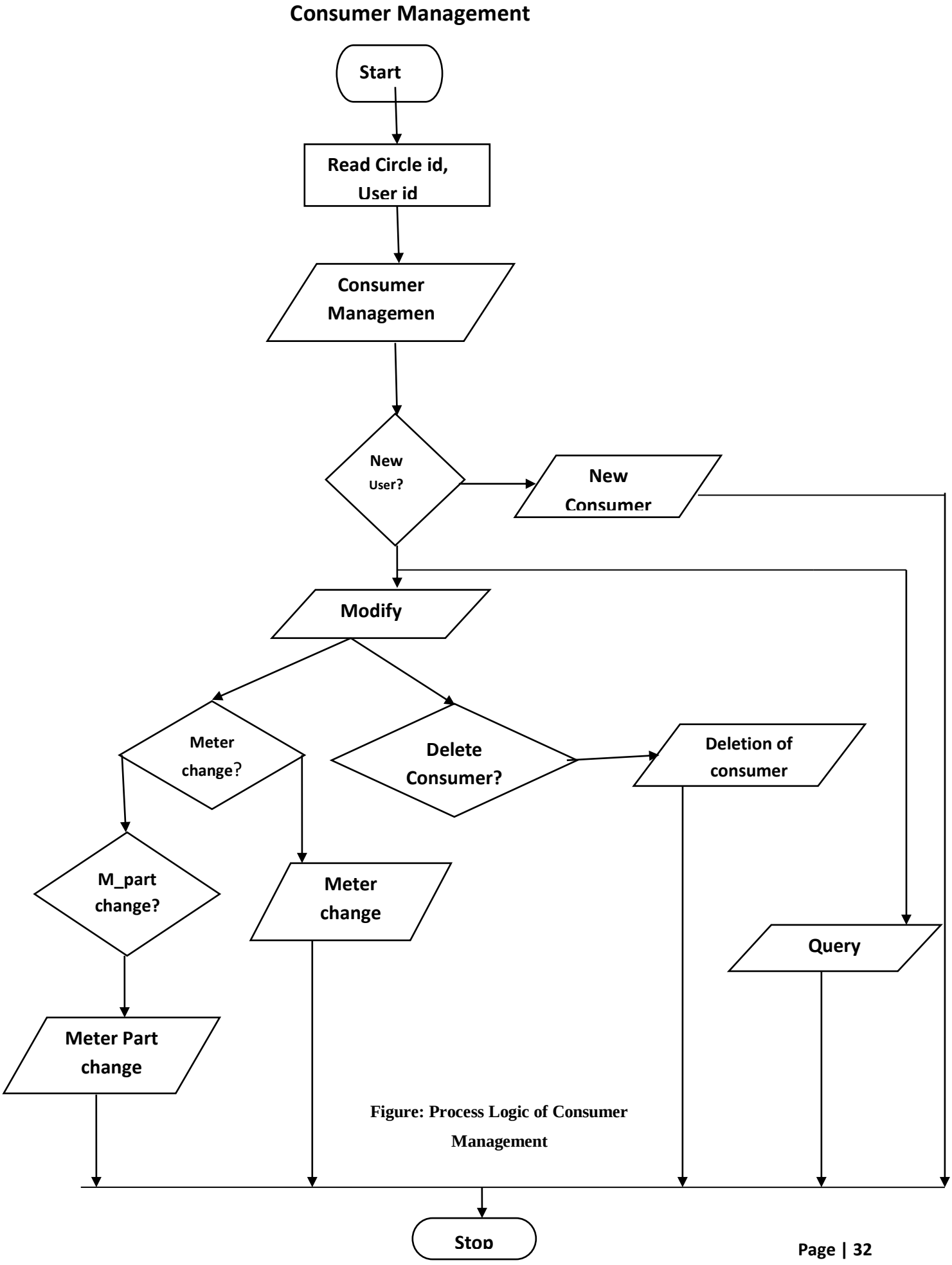


Figure: Process Logic of Consumer Management

Implementation Methodology:-

After the implementation of the demo of the package, the users are asked to use the package in the way they want it without hesitation to test the robustness of the package. Any discrepancies identified during this time are to be fixed before the original implementation. While testing, the more common errors in computation are…

- Misunderstood or incorrect arithmetic precedence.
- Mixed mode operations.
- Incorrect initialization.
- Precision inaccuracy
- Incorrect symbolic
- Representation of an expression
- Test cases should uncover errors such as: -
- Comparison of different data types
- Incorrect logical operators or precedence
- Expectation of equality when precision error makes equality unlikely.
- Incorrect comparison of variables.
- Improper or nonexistent loop termination.
- Failure to exit when divergent iteration is encountered. Improperly modified loop variables.

Among the potential errors that should be tested when error handling is evaluated are-

- Error description is unintelligible.
- Error noted does not correspond to error encountered.
- Error condition causes system intervention prior to error handling.
- Exception-condition processing is incorrect.
- Error description does not provide enough information to assist in the location of the cause of the error.

List of Reports that are Likely to be Generated:-

- Consumer Management
- Revenue Collection
- Billing and Accounting
- Meter Details
- Ledger Process
- Journal Details, etc.

10. Overall Network Architecture

Technical Architecture:-

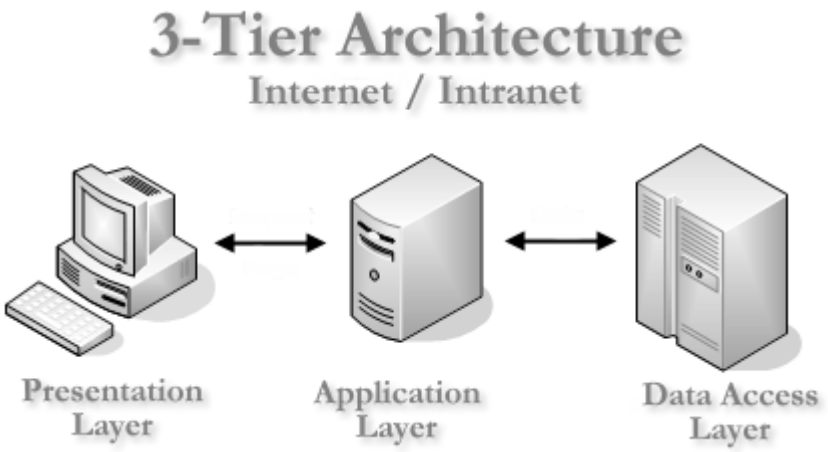


Fig: Three-Tier Architecture

Three tier:-

Three-tier is a client-server architecture in which the user interface, functional process logic, computer data storage and data access are developed and maintained as independent modules, most often on separate platforms. The 3-Tier architecture has the following three tiers:

- **Presentation Tier-**

  This is the topmost level of the application. The presentation tier displays information related to such services as browsing merchandise, purchasing, and shopping cart contents. It communicates with other tiers by outputting results to the browser/client tier and all other tiers in the network.

- **Application Tier (Business Logic/Logic Tier)-**

  The logic tier is pulled out from the presentation tier and, as its own layer, it controls an application's functionality by performing detailed processing.

- **Data Tier-**

  This tier consists of Database Servers. Here information is stored and retrieved. This tier keeps data neutral and independent from application servers or business logic. Giving data its own tier also improves scalability and performance.

Figure: 3-tier Architecture (Illustrative View)

11. Implementation of Security Mechanisms at Various Levels

Regarding security a project it is very important matter to having proper protection mechanism from unauthorized users. So, here is also introduced some of the security measures which will be enhanced much in later versions. Some of the security measures are as follows:-

Entry-level password and user name for both administrator and general users:-

- Try to prevent the entry of an unauthenticated user.
- More than three times attempt to login as an intruder is prohibited.
- Administrator's level security again applicable for bill generation.

Those are some of the important measures for security maintenance of this Hospital management package, which is also having LAN facilities, too.

A. System Security:-

a. Access Control:

Individual users shall be allowed access into the system by including their names, authorized points of access and log-in ID in the user database. This table shall be accessible to the system administrator only.

Controlling access to the computer facility is secured through the following steps: -

- The system needs administrative privilege to operate through round the clock.
- The software supports/enforces that there will be very strict checking in case of user id & password. The system is totally password protected that no unauthorized user may get any information about the system.

b. Authorization:

Authorization is very important for software. Authorization is the first step of software entrance means without valid user id and password no one can get information about this project.

c. Integrity:

Integrity constraints implemented here ensure that any properly authorized access; alteration network node IP address doesn't change the consistency and validity of the configuration and discovery.

d. Identification:

It is a scheme for identifying the valid user of the system through the following mechanisms:

- Authentication of user Id and password.
- Validation of user name

B. Database Security:-

- In case of database each user needs to gain access to Microsoft SQL Server through a login account that establishes the ability to connect (authentication).
- This login then has to be mapped to a SQL Server user account used to control activities performed in the database (permissions validation).

Besides the security measures inherent to the OS and the database manager, the following additional security measures will be adopted:-

C. Hierarchical Security:-

The security environment in Microsoft SQL Server is stored, managed, and enforced through a hierarchical system of users. To simplify the administration of many users, SQL Server uses groups and roles:-

- A group is an administrative unit within Microsoft Windows NT 4.0 and Windows 2000 that contains Windows NT 4.0 and Windows 2000 users or other groups.
- A role is an administrative unit within SQL Server that contains SQL Server logins, Windows NT 4.0 and Windows 2000 logins, groups, or other roles.

Arranging users into groups and roles makes it easier to grant or deny permissions to many users at once. The security settings defined for groups are applied to all members of that group. When a group is a member of a higher-level group, all members of the group inherit the security settings of the higher-level group, in addition to the security settings defined for the group itself or user accounts.

The requirements of a database security system go beyond this one-manager limitation; employees belong to security groups that do not fall within the strict organizational plan of the company. For example, administrative staff exists in every branch of the company and require security permissions regardless of their organizational branch. To support this broader model, the security system in Windows NT 4.0, Windows 2000, and SQL Server allows groups to be defined across a hierarchy. This hierarchical system of security groups simplifies management of security settings. It allows security settings to be applied collectively to all group members, without having to be defined redundantly for each person. The hierarchical model also accommodates security settings applied only to a single user.

D. System Failures and Recovery:-

System security is closely linked with system failures and recovery. Possible failures and recovery mechanisms are incorporated within this system are mentioned as follows:

- **Catastrophic Failures:**

  Are restored using the roll forward method of recovery.

- **Logical Failures:**

  The system developed is an interactive system and it provides automatic recovery.

- **Structural Failure:**

  If this fault occurs then the systems will automatically the log file is stored up till how much it is captured.

- **Consistency Error:**

  The system includes routines that check the consistency of information entered in the configuration and possessed discovery.

E. Data Security:-

One of the functions of a database is to protect the data by preventing certain users from seeing or changing highly sensitive data and preventing all users from making costly mistakes. The security system in Microsoft SQL Server 7 controls user- access to the data, and user-permissions to perform activities.

12. TESTING

- **BLACK BOX TESTING**

In clearing house across various modules this testing was performed to check the following.

a) Establishing communication with the database for handling request and response.
b) Verification of OLE-DB providers(ADO) in functionality
c) Parameters passing and report generation used from the application with crystal report.

- **WHITE BOX TESTING**

All the statements included in the code across various modules were tested to find none of the statements where overlooked or skipped from execution. This enabled isolating of errors that would have otherwise occurred and would have resulted in abnormal terminal or exceptions thrown. The test was corely tested in patient and responsibility, Insured party, ailments, procedures and applied payment modules.

- **STRING TESTING**

The applications was tested for inputs pertaining to patient data, responsible party, insured party for strings such as name, relation, employ information, policy details, insurance company details, claim centre information and attorney data physician, reference physician information were tested for the following

a. null data

b. string length

c. data format

d. alpha numeric characters

In addition, numeric inputs were tested for invalid characters, invalid data format, size of the input data and the data type being handled.

UNIT TESTING

Module pertaining to patient, responsible party, and soon were tested individually to check if the system performed the business logic or processors for the inputs provided and effective communication with the data base, the units were tested to check whether the data were reflected and updated across other tables that were used by other modules. The core modules

1. Responsible party and patient

2. Insured party

3. Ailments

4. Procedures

5. Applied payments

Were tested for the availability of data from other modules.

All the units were found to execute independently and had appropriate communication with the data base. Dependent modules were tested with static data and were found to execute as per SRS.

INTEGRATED TESTING

All the units were combined from a menu driven application which then provided for integration with other modules the following well tested.

1. Message passing and communication between the modules

2. Data usage and synchronization

3. Flow of control using top-down testing confirming appropriate return of control as well as associated usability features.

SYSTEM TESTING

The system as a whole along with required external resources was executed to check the dependencies, exception across the unavailability of the resources pertaining to the network connection, OLEDB providers, authentication of database and database it self.

DSN less connection and its effective communication for database was found to be as per their SRS.

- **MUTATION TESTING**

All fields across every module were tested rigorously with inputs that were intentionally provided with wrong data. This testing resolves bugs and errors through exception handling. That was a result of any kind of invalid data.

12. Future Scope & Further Enhancement

Further Enhancements:-

- This project has more scope in future and it can be integrated further
- This project is successfully implemented with all the features mentioned earlier.
- This project is designed keeping in view the needs of the common user and satisfying the user up to the maximum extent possible.
- Deployment of our application will help the user to reduce the unnecessary wastage of time in going and ordering the product manually.
- Therefore we are successfully able to reach the goals and target of the project.

Conclusion:-

We have been given the problem of Billing of Electricity Consumers. Earlier the Billing process was being done manually calculated by using the database small tolls and small scale packages at their desktop. In our project **The Energy Billing System** we have automated the entire billing system is Online and centralized with all offices which they have in the central power distribution company limited.

In Consumer Management, I have tracked all the information of the consumer and have given the privileged modifications, changes and deletion. This information can be easily made available to all the stores throughout the offices through intranet/ Internet.

As a result of this automation, manual workload is reduced and data retrieval becomes easy. This application can be helpful for centralization of information regarding the stores.

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The End