RAISONI GROUP OF INSTITUTIONS
G. H. RAISONI INSTITUTE OF ENGINEERING & TECHNOLOGY, WAGHOLI, PUNE-412207

A
PROJECT REPORT
ON

"Improvised Restaurant Chain Management System"

**In Partial fulfillment of Requirement
For the award of**

**DEGREE IN COMPUTER ENGINEERING
OF
UNIVERSITY OF PUNE**

Submitted by

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Under the Guidance of

Mrs. Deeksha Bhardwaj

DEPARTMENT OF COMPUTER ENGINEERING
YEAR 2013-2014

G. H. RAISONI INSTITUTE OF ENGINEERING & TECHNOLOGY, WAGHOLI, PUNE-412207

CERTIFICATE

This is to certify that

The Project Report entitled

"Improvised Restaurant Chain Management System"

Has been delivered by

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In partial fulfillment of the requirement of

Bachelor Engineering

In

Computer Engineering

As laid down by the

University of Pune, Pune

(Mrs.Deeksha Bhardwaj)   **(Head Of Department)**
Guide

(Dr.R.D.Kharadkar)
Principal

PROJECT APPROVAL SHEET

Project work related to " Student Rating System for Uniform Campus Placements " in partial fulfillment for award of bachelor of engineering in Computer Engineering Degree from University of Pune, Pune (M.S) and is being submitted to G.H. Raisoni Institute of Engineering and Technology, Wagholi, Pune

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External Examiner: Sign:

Date:

Place: G.H. Raisoni Institute of Engineering and Technology, Pune

Acknowledgement

It gives us immense pleasure to present this project report on "**Improvised restaurant Chain Management System**". We are deeply indebted to a large number of individuals who have in several ways made their contribution.

It is only the precious guidance, encouragement and inspiration provided by our honorable guide **Mrs. Deeksha Bharadwaj** who gave us proper direction and boosted our moral to complete the Project successfully.

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Last but not least, we are thankful to the almighty. It was his blessings that saw us till the end.

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ABSTRACT

The Improvised Restaurant Chain Management is a concept whose main objective is to change passive data into interactive data to enhance customer relationship management (CRM) while improving profitability. Data Mining Based Improvised Restaurant Chain Management System is basically android application that impersonates all the operations of the restaurant. Customer attraction, retention and prediction are important marketing concepts in industrial & central components of data mining.In addition, the rapid growth of the Internet and its associated technologies has greatly increased the opportunities for marketing and has transformed the way relationships between companies and their customers are managed. In an effort to help enterprises understand their customers' shopping behavior and the ways to retain valued customers, we propose data mining techniques. As a rising subject, data mining is playing an increasingly important role in the decision support activity of every walk of life. By segmenting customers based on their behavior, we can better target their actions, such as launching tailored products, target one-to-one marketing and to meet the customer expectations.

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CHAPTER 1

INTRODUCTION

1.1 Overview

In today's competitive environment, understanding the customers better, especially, most profitable customer groups and the groups that have the biggest potential is the biggest challenge. With the rampant competition in the domestic and international business, the Customer Relationship Management (CRM) has become one of matters of concern to the enterprise. In an effort to help enterprises understand their customers' shopping behaviour and the ways to retain valued customers, we propose data mining techniques. It helps keep track of the customers and their ordering history which when analysed is useful in generating customised menu.

1.2 Brief Description

.   It is an Android application being developed with main focus on restaurant chains. With this application we can run payroll, generate reports, view order history generate customised menu for each customer and take decisions based on customer profile. For instance, if the customer goes to restaurant then he doesn't have to wait for the attendant to come and take the order. He will be having the tablet on the table via which he can place order. This is one of the easiest approaches for ordering and easy. Allows staff to be more efficient. It will reduce errors in ordering Process. Affordable one time price for an unlimited number of devices. Discounts and other incentives can be provided by profiling customers to improve relationship with the customer.

1.3 Problem Definition

The objective is to change passive data into interactive data to enhance customer relationship management (CRM) while improving profitability. Data Mining Based Improvised Restaurant System is basically android application that impersonates all the operations of the restaurant. The project describes use of Data mining to track the orders and provide suggestions to both Customer and Manager. It also allows customers to place order and get the bill.

1

1.4 Applying software engineering approach
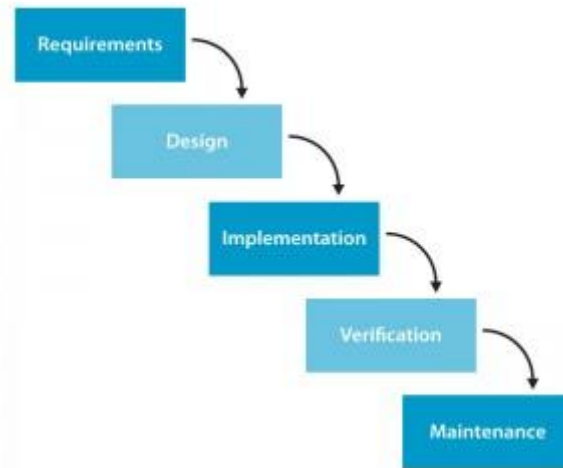
Executing Android and Maintaining Customer Database using Wi-Fi and controlling software project require skills in two key dimensions engineering and project management. While engineering deals with issues of architecture design, coding, testing etc., project management deals with planning, monitoring, risk management etc. Risk analysis and management are series of steps that help a software term to understand and manage uncertainty. Many problems can plague a software project. A risk is potential problem-it might happen, it might not. But, regardless of the outcome, it's a really good idea to identify it, access its probability of occurrence, estimate its impact, and establish a contingency plan should the problem actually occur.

CHAPTER 2

LITERATURE SURVEY

With the rampant competition in the domestic and international business, the Customer Relationship Management (CRM) has become one of matters of concern to the enterprise. CRM takes the customers as the centre; it gives a new life to the enterprise organization system and optimizes the business process. In an effort to help enterprises understand their customers' shopping behaviour and the ways to retain valued customers, we propose data mining techniques. As a rising subject, data mining is playing an increasingly important role in the decision support activity of every walk of life [1].

During the past decade, there have been a variety of significant developments in data mining techniques. Some of these developments are implemented in customized service to develop customer relationship. Customized service is actually crucial in retail markets. Marketing Managers can develop long-term and pleasant relationships with customers if they can detect and predict changes in customer behaviour. In the dynamic retail market, understanding changes in customer behaviour can help managers to establish effective promotion campaigns. This study integrates customer behavioural variables, demographic variables, and transaction database to establish a method of mining changes in customer behaviour. For mining change patterns, two extended measures of similarity and unexpectedness are designed to analyse the degree of resemblance between patterns at different time periods. The proposed approach for mining changes in customer behaviour can assist managers in developing better marketing strategies [6]. Contemporary marketing strategies perceive customers as important resources to an enterprise. Therefore, it is essential to enterprises to successfully acquire new customers and retain high value customers. To achieve these aims, many enterprises have gathered significant numbers of large databases, which then can be analysed and applied to develop new business strategies and opportunities [2].

Following were the parameters that were kept in mind which contributed to formulation of the Implementation:

1. Effective Data Mining
2. Business Value
3. Customer relationship management

The objective of the project is to present the effect of clustering the data onto the association rules. Hence, we have compared the results of two different approaches: Finding association rules without consumer segmentation, and with consumer segmentation [7].

CHAPTER 3

SOFTWARE REQUIREMENTS SPECIFICATION.

3.1   INTRODUCTION

3.1.1 Purpose

- It is an Android application being developed with main focus on restaurant chains.

- With this application we can track order history, generate customised menu for each customer and take decisions based on customer profile.

- Customer attraction, retention and prediction are important marketing concepts in the restaurant industry and central components of data mining.

3.1.2 Intended audience and reading suggestion

3.1.3 Project Scope

Today, the world is rapidly changing the statement "We are in the world" to "World is in our hands". The main aim of our project is to change passive data into interactive data to enhance customer relationship management (CRM) while improving profitability. Customer attraction, retention and prediction are important marketing concepts in Industrial & central components of data mining.

- For instance, if the customer goes to restaurant then he doesn't have to wait for the attendant to come and take the order. He will be having the tablet on the table via which he can place order.

- Data Mining Based Improvised Restaurant System is basically android application that impersonates all the operations of the restaurant.

- While once we had to wait for the waiter to come and take our order, it was very time consuming but now when we have such systems and applications where we can directly place an order and enjoy the services more efficiently. Also we can get the various benefits and discounts due to data mining.

3.1.4 Design and Implementation Constraints

Design Constraints

a. Error Recognition: Error should be easily recognized and get solved out.

b. Screen resolution: Screen should be visible enough.

c. Exception: All kind of exception should be handling properly.

General Constraints

a. Network Stability –As number of Tablets increases in the network, it introduces an additional overhead on network bandwidth.

b. Processing speed - Processing speed depends on the network connection

User Documentation

a. Currently we will be using, android for developing program.
b. Developing tool to be used Eclipse and Net Beans.

3.1.5 Assumptions and Dependencies

Assumptions:

- Application to personate all Restaurant Activity.

- Application should be made in Android and should be compatible with the Tablet.

- Menus in application should appear as it appears in Menu book in real time.

- Menu list should be easy to use and understand.

Dependencies:

- Speed of the recognition may be depending upon the network traffic.
- Screen resolution depend totally depends upon hardware.
- Administrator Tablet should be WI-FI enable.
- Tablet should be compatible with Android.

3.2 SYSTEM FEATURES

Functional Requirements

- Also User should be able to do perform task.
- Response speed should be good enough.
- Administrator doesn't have to wait for response from the client.

3.3 EXTERNAL INTERFACE REQUIREMENT

3.3.1 User Interfaces

- User interface screen will be log in screen first.
- Then it will provide access to admin. It will allow admin to perform required task.
- User interface will provide good look and feel effect so that it will user friendly.
- And he or she can operate system very efficiently

3.3.2 Hardware Interfaces

- Server side System will be windows based supporting versions windows XP onwards.
- The minimum configuration required on server platform
  - 2.4 GHZ Processor.
  - 512 MB memory.
  - LAN
  - PCs (At least two).
  - Network Cards.
  - Android Device.

3.3.3 Software Interfaces

Tools used for development :

Eclipse:

- Eclipse is an open source community whose projects building tools and frameworks are used for creating general purpose application. The most popular usage of Eclipse is as a Java development environment.

- Eclipse is an open source community, whose projects are focused on building an open development platform comprised of extensible frameworks, tools and runtimes for building, deploying and managing software across the lifecycle. The Eclipse Foundation is a not-for-profit, member supported corporation that hosts the Eclipse projects and helps cultivate both an open source community and an ecosystem of complementary products and services.

- The Eclipse Project was originally created by IBM in November 2001 and supported by a consortium of software vendors. The Eclipse Foundation was created in January 2004 as an independent not-for-profit corporation to act as the steward of the Eclipse community. The independent not-for-profit corporation was created to allow a vendor neutral and open, transparent community to be established around Eclipse. Today, the Eclipse community consists of individuals and organizations from a cross section of the software industry.

- The Eclipse Foundation is funded by annual dues from our members and governed by aboard. Strategic Developers and Strategic Consumers hold seats on this Board, as do representatives elected by Add-in Providers and Open Source committers. The Foundation employs a full-time professional staff to provide services to the community but does not employ the open source developers, called committers, which actually work on the Eclipse projects. Eclipse committers are typically employed by organizations or are independent developers that volunteer their time to work on an open source project.

- In general, the Eclipse Foundation provides four services to the Eclipse community: 1) IT Infrastructure, 2) IP Management,3) Development Process, and 4) Ecosystem

Development. Full-time staff is associated with each of these areas and work with the greater Eclipse community to assist in meeting the needs of the stakeholders.

Feature Highlights

JDK 7

- Project Coin support
- Editor enhancements: Code completion, hints

MYSQL Database

- Simplified connection wizard
- Guided installation to JDBC driver
- Editing and deployment of stored procedures

3.3.4 Communication Interfaces

The major issue is of communication between the phone and the server and also between the server and the clients.

The phone and Server can communicate over Wi-Fi and also we can the GSM modem or a service provider using a static IP address for long distance coverage.

The server and tablet can communicate among themselves over the Wi-Fi.

3.4 NON FUNCTIONAL REQUIREMENTS

1. Secure access of confidential data (user's details).
2. High Scalability. The solution should be able to accommodate high number of customers and brokers. Both may be geographically distributed
3. Flexible service based architecture will be highly desirable for future extension
4. Better component design to get better performance at peak time

3.4.1 Performance Requirement

- High Speed:

    System should process requested task in parallel for various action to give quick response then system must wait for process completion.

- Accuracy:

    System should correctly execute process, display the result accordingly.

    System output should be in user required format.

3.4.2 Safety Requirement

The data safety must be ensured by arranging for a secure and reliable transmission media. The source and destination information must be entered correctly to avoid any misuse or malfunctioning.

3.4.3 Security Requirement

1. Secure access of confidential data (user's details).
2. User password must be stored in encrypted form for the security reason
3. All the user details shall be accessible to only high authority persons.
4. Access will be controlled with usernames and passwords.

3.4.4 Software Quality Attributes

Maintainable software should have

1. Encourage in-code documentation (XML docs in javadoc, etc.)

2. use a wiki to maintain the documentation

3. Unit Tests = Good for documenting specifications

4. Comments = Good for documenting design decisions.

5. Unit Tests + Comments = Good for documenting specifications and design decisions. = Easily maintainable software.

6. Faster feedback from any changes made to the system.

7. Providing better transparency into the changes happening to the system.

8. Propagating environmental changes and code changes more rapidly while maintaining control.

9. Ease integration issues by dealing with them earlier in smaller chunks.

3.5 OTHER REQUIREMENTS

3.5.1 Database Requirement

The database used by our system will be a light weight, single file database which can be used in an Android phone like My SQLite.

3.6 ANALYSIS MODEL

3.6.1 Data Flow Diagram

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3.6.2 Class diagram

Manager

-ManName

+ReceiveOrder()
+ProcessOrder()
+GenerateBill()
+ReceivePayment()
+SuggestedMenu()
+AddMenu()
+checkOrderStatus()

Waiter

+WaiterID

+ProcessPayment()
+Servefood()

Chef

+ChefID

+Orderfood()
+Cookfood()
+AddMenu()

Customer

+Name
+Address
+DOB
+PhoneNo
+Email
+MaritialStatus

+PlaceOrder()
+MakePayment()
+ProvideInfo()
+seemenu()
+Orderfood()
+Eatfood()
+CheckOrderStatus()

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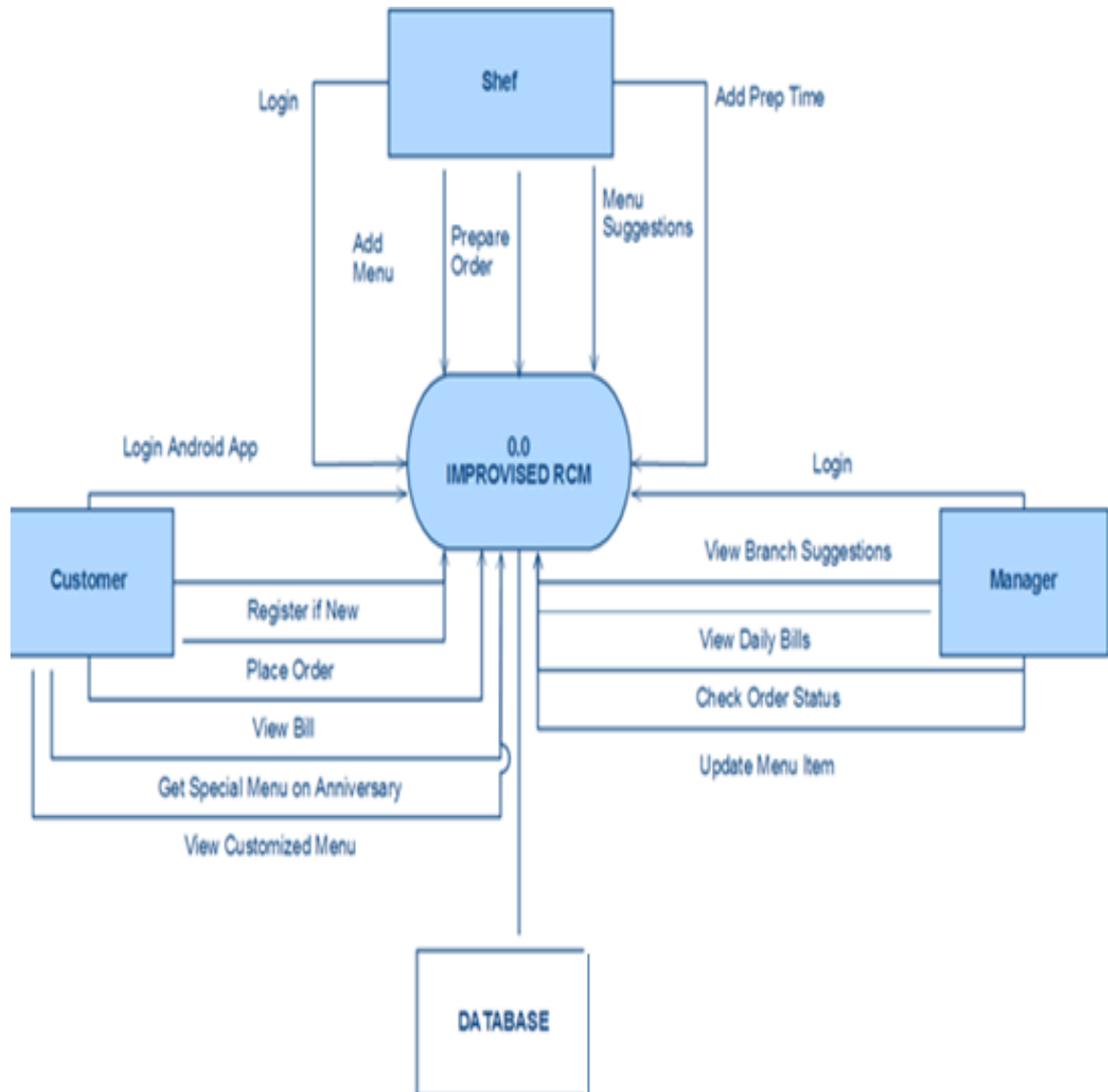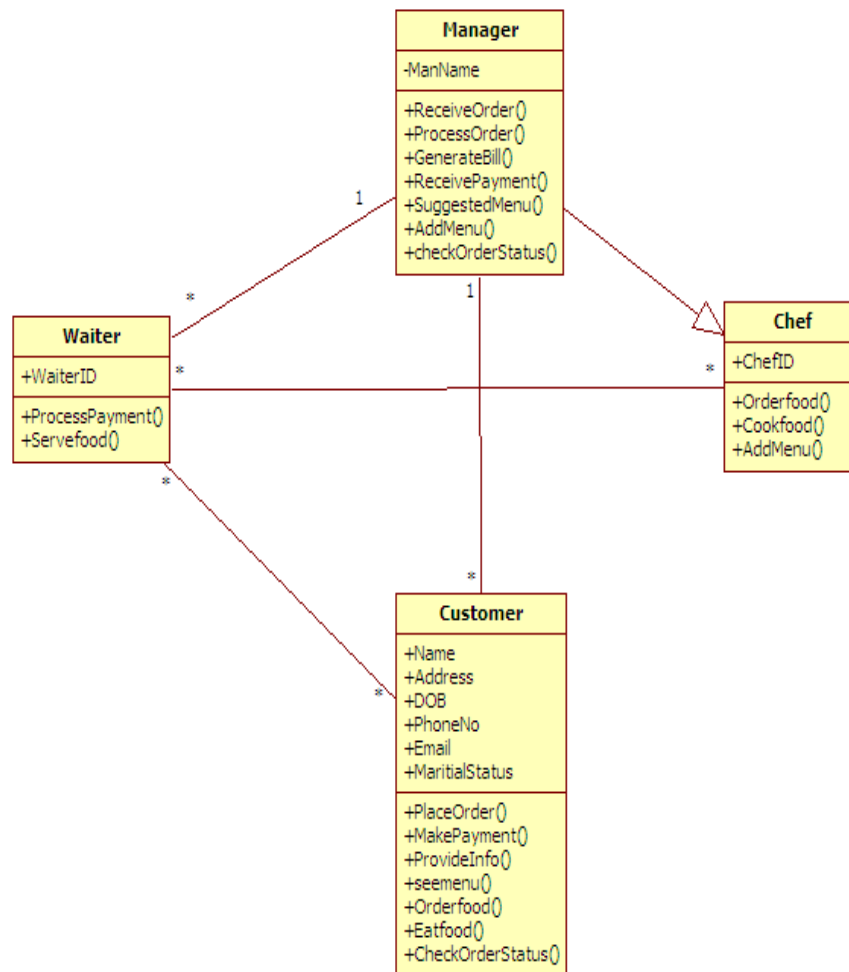
3.6.3 Entity-Relationship Diagram
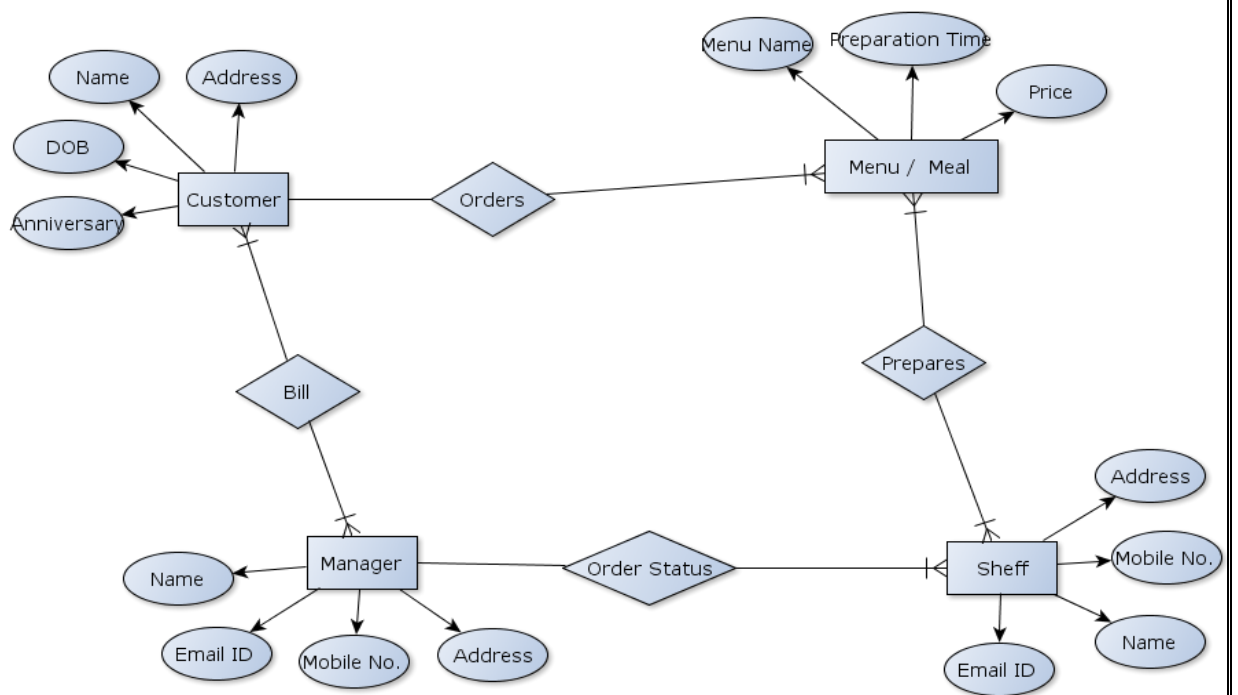
3.7   SYSTEM IMPLEMENTATION PLAN

August	7-08-13	Topic Discussion
	14-08-13	IEEE Paper Submission
	21-08-13	Synopsis Submission
	24-08-13	Synopsis Presentation
September	18-09-13	SRS and PPT Submission
	22-09-13	SRS Presentation
October	5-10-13	Mathematical Model Meet
	13-10-13	Mathematical Model Submitted with UML Diagrams
	30-10-13	Given Final Presentation to Guide with Reviews
November	27-11-13	Final Mock Presentation
	28-11-13	Submission-Prelim Report of the Project
	08-12-13	University Exam on Preliminary Report
January	08-01-14	Coding started
	26-01-14	Two modules should finish (45%)
February	27-01-14	First Demonstration on Project work expected(45%) of total Work
March	15-02-14	Test plan: Design and installation
	18-03-14	Final Project demonstration
	29-03-14	Preparation of project Report, preparation of installable Project Manual
April	30-05-14	Submission of Report(Final Submission)
May	2nd week of June	Final University Examination

CHAPTER 4

SYSTEM DESIGN

4.1 SYSTEM ARCHITECTURE
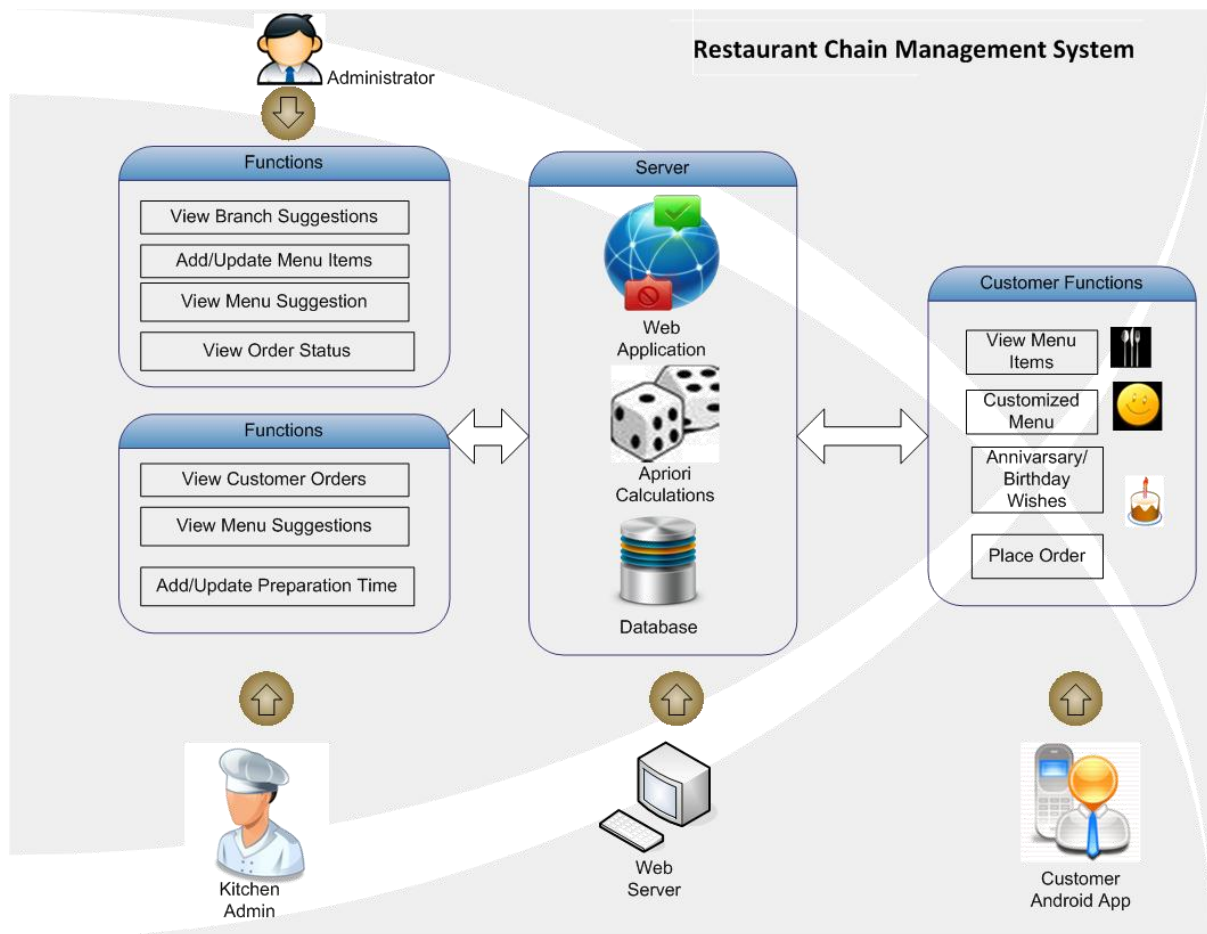
4.2 UML DIAGRAMS

USE CASE DIAGRAM
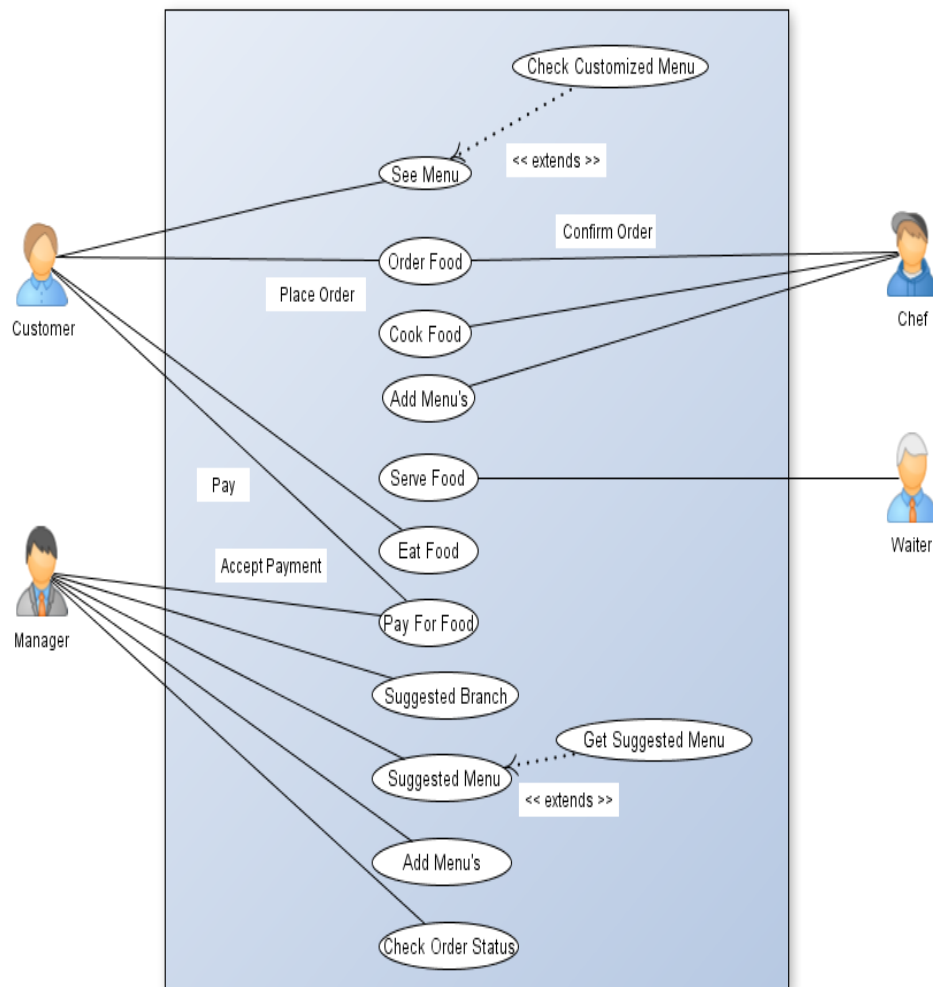
SEQUENCE DIAGRAM

COLLABORATION DIAGRAM

15 : Check_Order_Status()
10 : Make_Payement()
2 : See_menu()
1 : login()

Customer

7 : Cook_food()
6 : Order_food()

Chef

16 : Check_order_status()

3 : Place_Order()

8 : Serve_food()

11 : process_payment()

14 : Add_menu()

13 : Add_menu()
9 : Generate_bill()
5 : Process_order()
4 : Recieve_order()

12 : Recieve_order()

Manager

Waiter

18
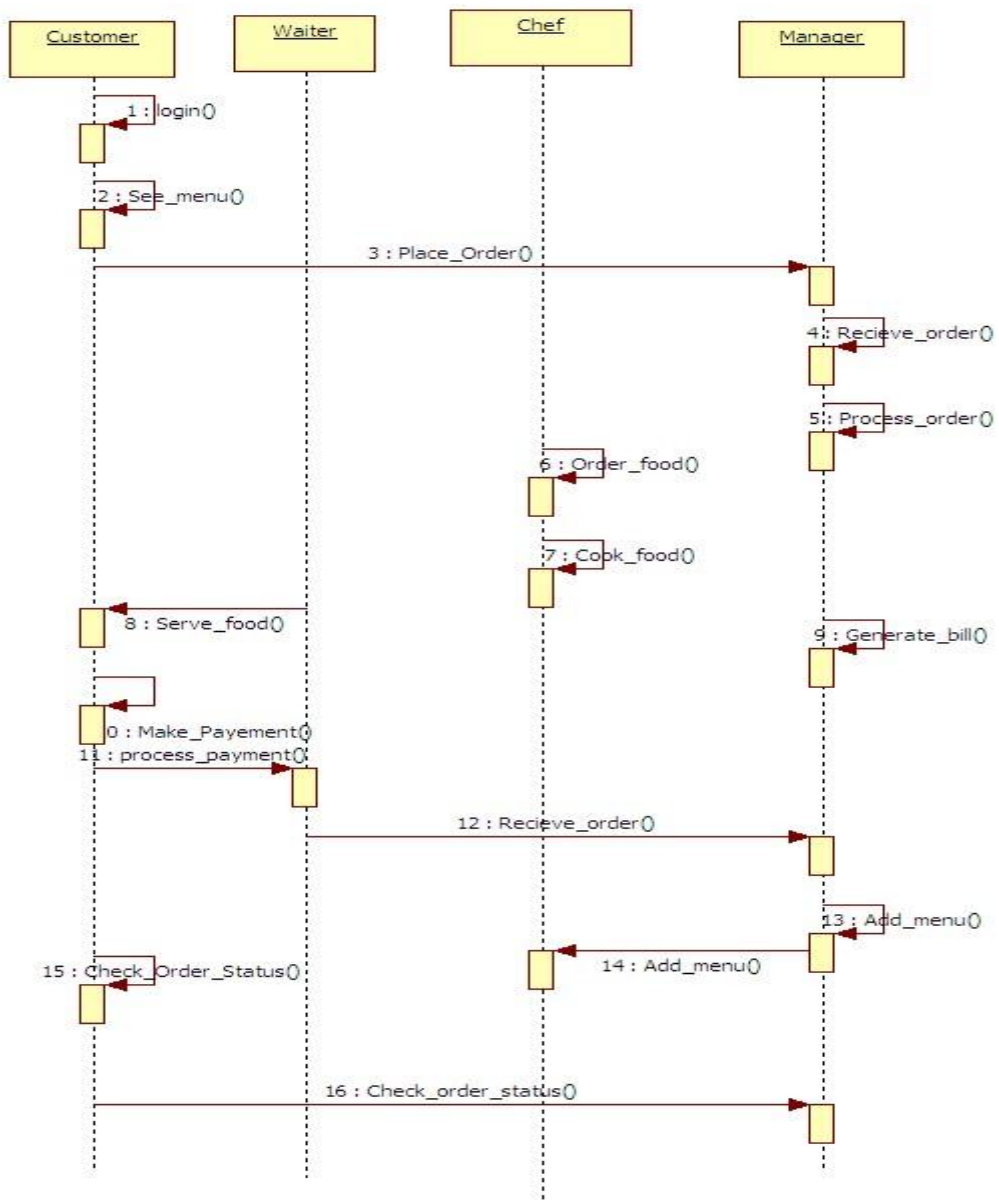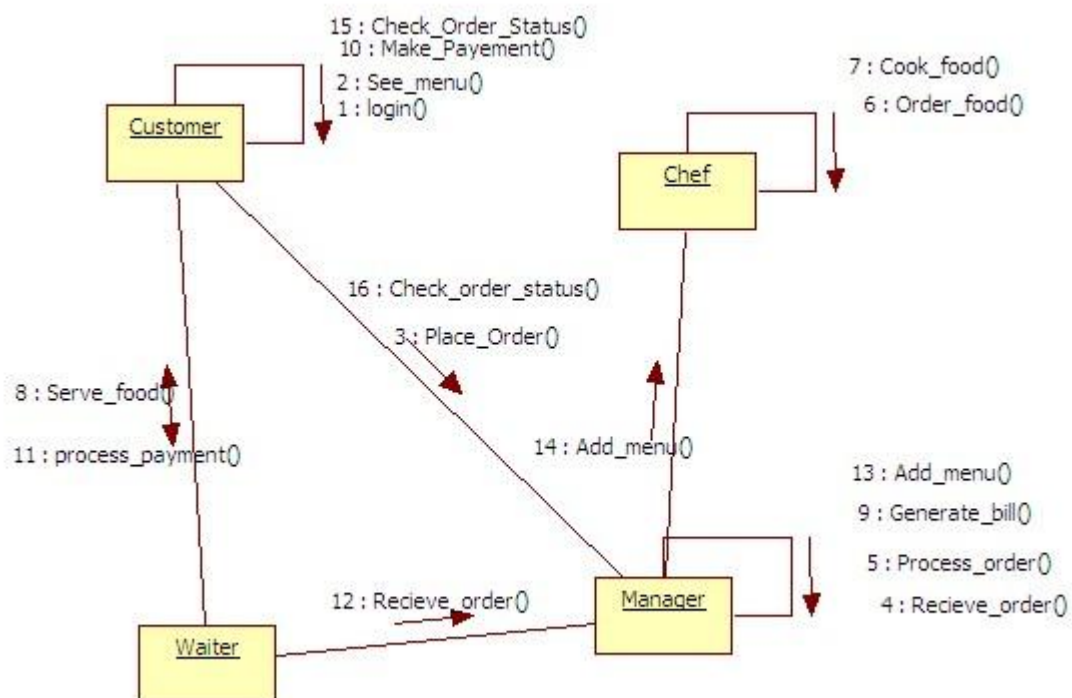
ACTIVITY DIAGRAM
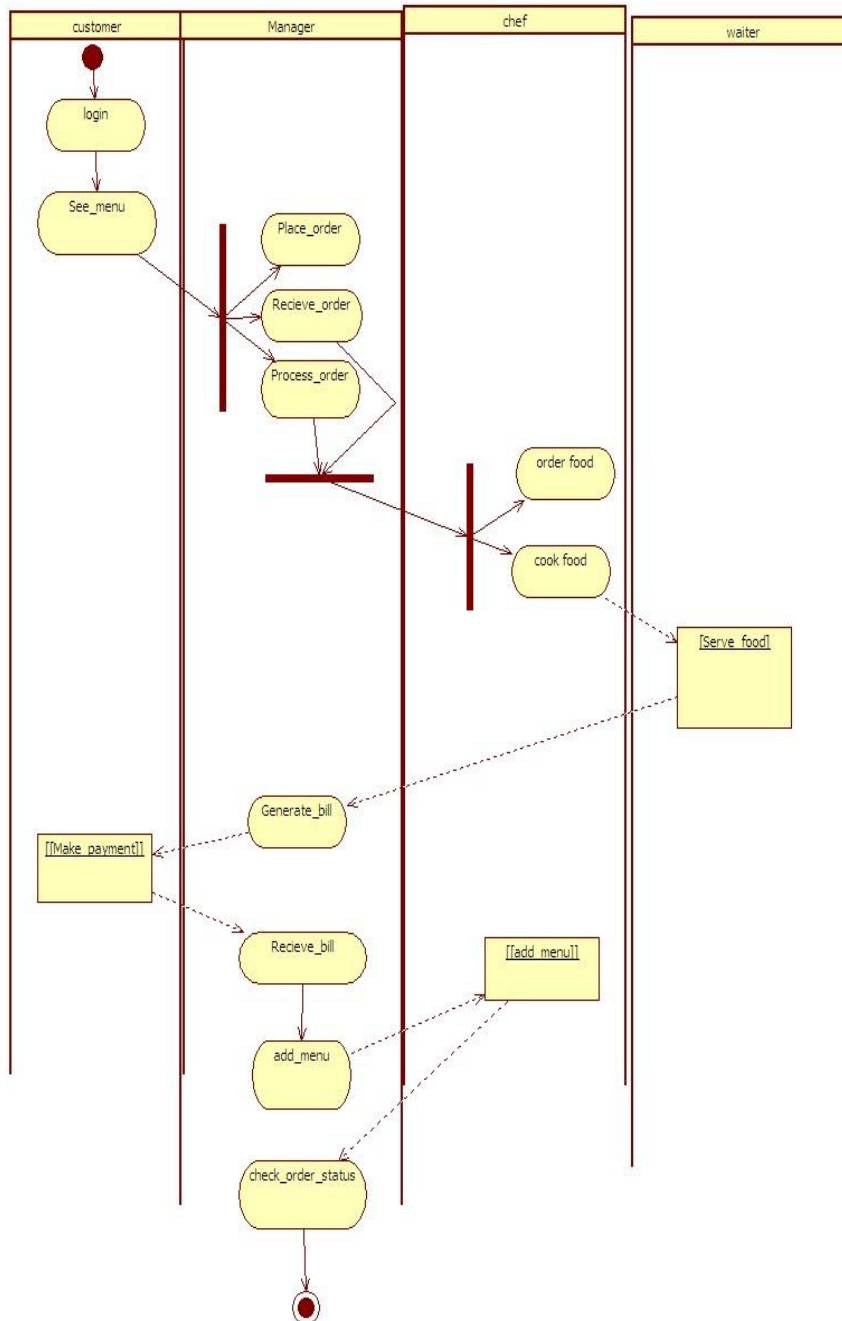
COMPONENT DIAGRAM

DEPLYOMENT DIAGRAM
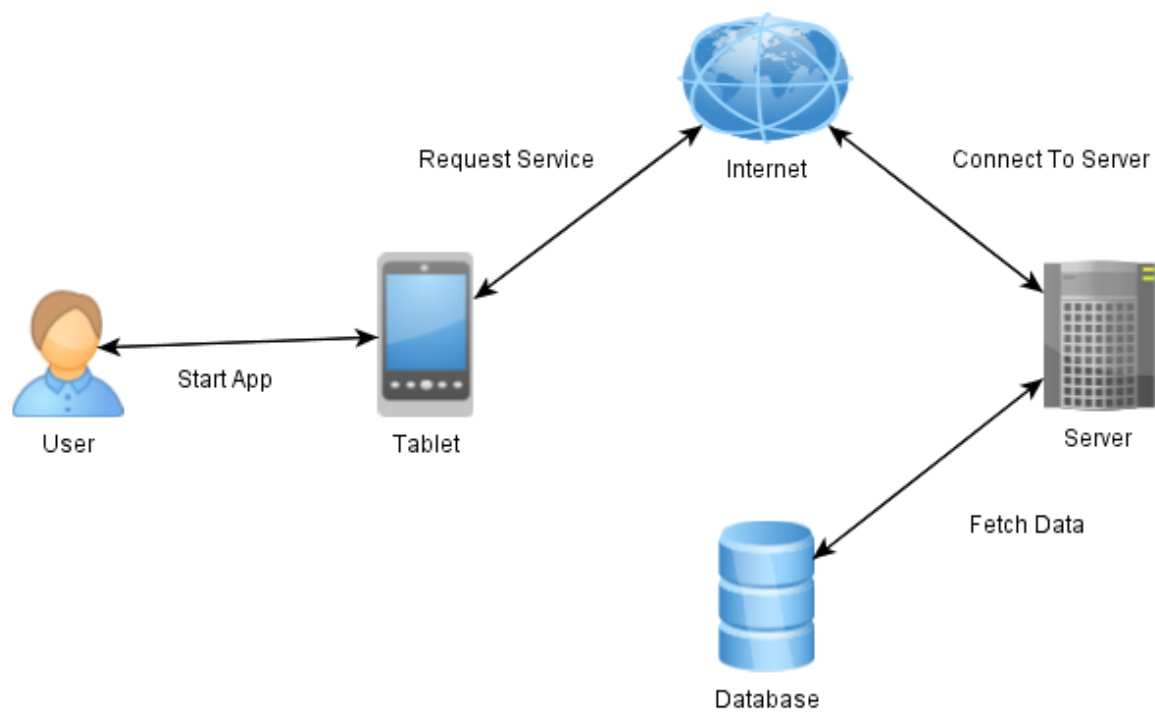
CHAPTER 5

TECHNICAL SPECIFICATION

5.1 TECHNOLOGY DETAILS USED IN THE PROJECT

There are two different technologies used in the project.

One is used to develop java programs for communication using socket programming.

Other used to develop the Android Application.

For java programs:

JDK 7(java development kit): A toolkit for a java developer.

Eclipse indigo: A platform for creating java program.

For Android Application:

3Android SDK (Software development kit): It provide over all environment of Android   application.

5.2 REFERENCES TO TECHNOLOGY

[1]. "The History of Java Technology". Retrieved October 6, 2012.

[2]. Java 5.0 added several new language features (the enhanced for loop, autoboxing, varargs and annotations), after they were introduced in the similar (and competing) C# language.
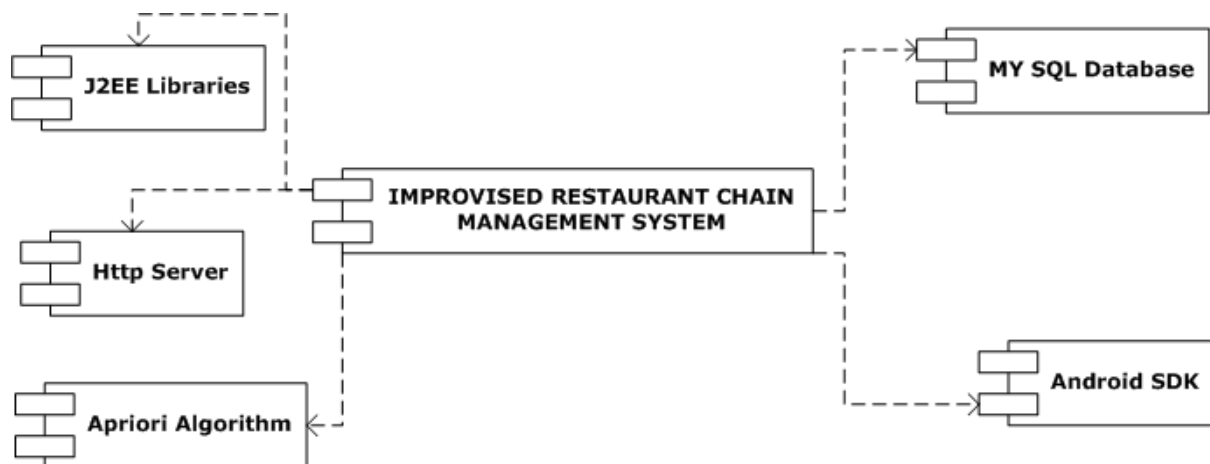
[3].Gosling, James; and McGilton, Henry (May 1996). "The Java Language Environment".

[4].Gosling, James; Joy, Bill; Steele, Guy; and Bracha, Gilad. "The Java Language Specification, 2nd Edition".

[5]."The Android mascot was not always a little green guy". NBC News, Rosa Golijan.

[6]."Original Android Logo Was A Truly Frightening Robot". Huffington Post, Betsy Isaacsen, January 4, 2013.

CHAPTER 6

PROJECT ESTIMATE, SCHEDULE, TEAM STRUCTURE

PROJECT ESTIMATE:

Use Function point calculation method to calculate the size of the project.

The function point method was originally developed by Bij Albrecht. A function point is a rough estimate of a unit of delivered functionality of a software project. Function points (FP) measure size in terms of the amount of functionality in a system. Function points are computed by first calculating an unadjusted function point count (UFC). Counts are made for the following categories

1. Number of user inputs

2. Each user input that provides distinct application oriented data to the software is counted. Number of user outputs

3. Each user output that provides application oriented information to the user is counted. In this context "output" refers to reports, screens, error messages, etc. Individual data items within a report are not counted separately. Number of user inquiries

4. An inquiry is defined as an on-line input that results in the generation of some immediate software response in the form of an on-line output. Each distinct inquiry is counted. Number of files

5. Each logical master file is counted. Number of external interfaces

6. All machine-readable interfaces that are used to transmit information to another system are counted.

7. Once this data has been collected, a complexity rating is associated with each count according to Table

TABLE 1: Function point complexity weights.

Measurement parameter	Weighting factor		
	Simple	Average	Complex
Number of user inputs	8	4	6
Number of user outputs	4	5	7
Number of user inquiries	3	4	6
Number of files	7	35	15
Number of external interfaces	5	2	10

Each count is multiplied by its corresponding complexity weight and the results are summed to provide the UFC. The adjusted function point count (FP) is calculated by multiplying the UFC by a technical complexity factor (TCF) also referred to as Value Adjustment Factor (VAF). Components of the TCF are listed in Table 2.

Table 2. Components of the technical complexity factor.

F1	Reliable back-up and recovery	F2	Data communications
F3	Distributed functions	F4	Performance
F5	Heavily used configuration	F6	Online data entry
F7	Operational ease	F8	Online update
F9	Complex interface	F10	Complex processing
F11	Reusability	F12	Installation ease
F13	Multiple sites	F14	Facilitate change

Alternatively the following questionnaire could be utilized

Tasks	Rate
1. Does the system require reliable backup and recovery?	3
2. Are data communications required?	3
3. Are there distributed processing functions?	3
4. Is performance critical?	2
5. Will the system run in an existing, heavily utilized operational environment?	1
9. Are the input, outputs, files or inquiries complex?	0
10. Is the internal processing complex?	0
11. Is the code designed to be reusable?	2
12. Are conversions and installation included in the design?	5
13. Is the system designed for multiple installations in different organizations?	1
14. Is the applications designed to facilitate change and ease of use?	3
Degree of Influence (TDI)	**20**

Value Adjustment Factor (VAF [TDI*0.01+0.65])	0.85

Function Type	Functional Complexity	Count	Weight	FPs	FP%
Internal Logical Files	Low	0	7	0	26
	Medium	3	10	30	
	High	0	15	0	
Extenal Interface Files	Low	0	5	0	12
	Medium	2	7	14	
	High	0	10	0	
External Inputs	Low	0	3	0	31
	Medium	9	4	36	
	High	0	6	0	
External Outputs	Low	0	4	0	13
	Medium	3	5	15	

	High	0	7	0	
External Inquiries	Low	0	3	0	18
	Medium	5	4	20	
	High	0	6	0	
Total Unadjusted Function Point (UFP)				**115**	100

Final Adjusted **FP = UFP x VAF**

$$= 115 * 0.85$$

=97.75

For Java, 1 person can complete 17 FP per person per month.

Total Effort = FAP/17 FP

$$= 97.75 / 17 \text{ per person per month}$$
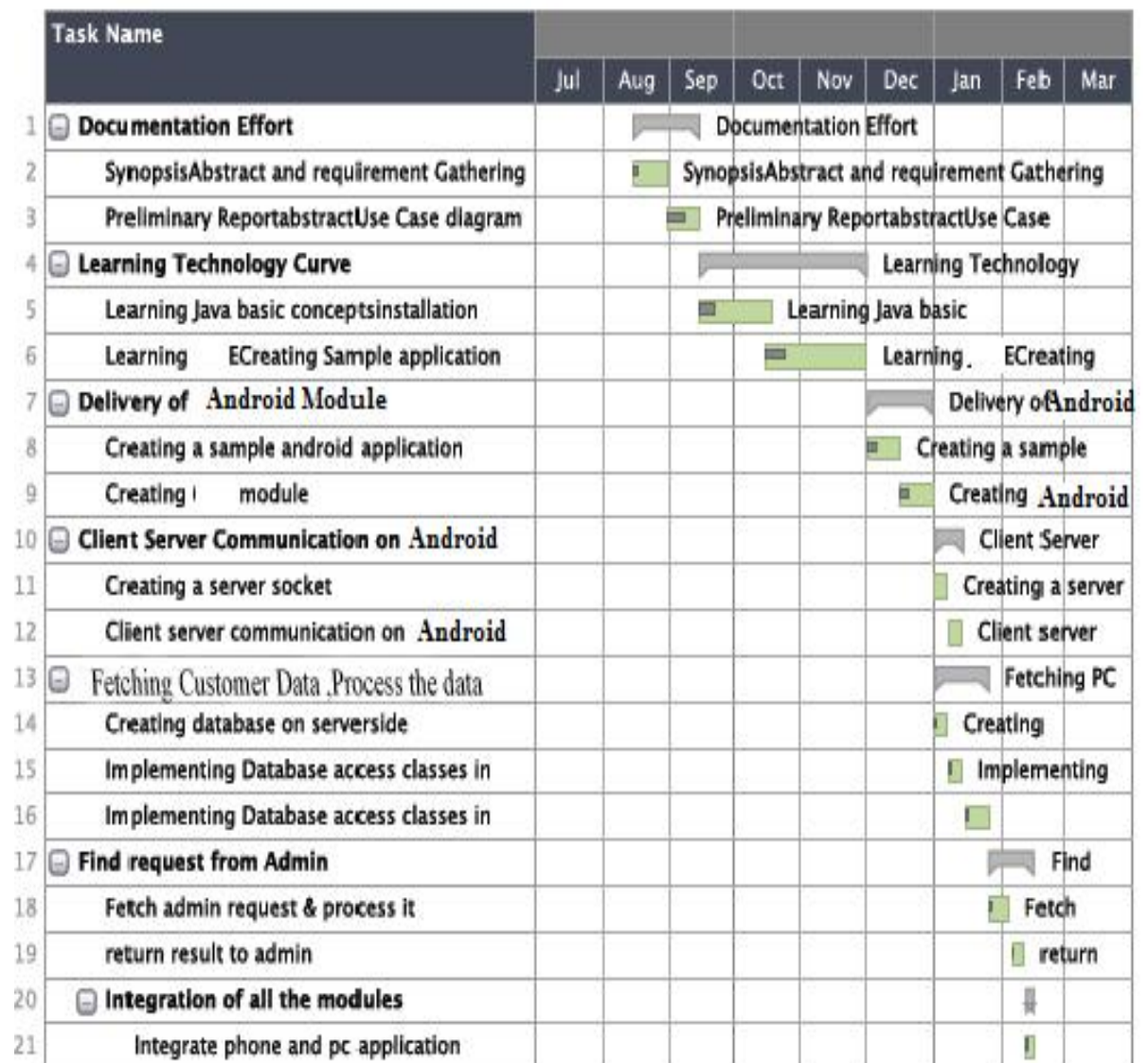
$$= \textbf{5.75} \text{ months}$$

SCHEDULE

The following table illustrates the table that was chalked out by us in order to make this project a success.

Task Name	Start Date	End Date	Duration	% Complete
Documentation Effort	**08-15-13**	**09-14-13**	**23**	**30%**
Synopsis, Abstract and requirement Gathering	08-15-13	08-30-13	12	12%
Preliminary Report, abstract, Use Case diagram	08-31-13	09-14-13	12	50%
Learning Technology Curve	**09-15-13**	**12-30-13**	**55**	**20%**
Learning Java basic concepts, installation setup	09-15-13	10-17-13	23	20%
Learning Android, Creating Sample application Installation and Setup	10-16-13	12-30-13	34	20%
Delivery of Android module	12-01-13	12-30-13	22	**20%**
Creating a sample android application	12-01-13	12-15-13	12	20%
Creating Android module	12-16-13	12-30-13	12	20%
Client Server Communication on Android	01-01-14	01-13-14	11	**5%**
Creating a server socket	01-01-14	01-06-14	6	5%
Client server communication on Android	01-08-14	01-13-14	6	5%
Fetching Customer Data, Process the data.	01-01-14	01-25-14	19	**8%**
Creating database on server side	01-01-14	01-06-14	6	10%

Implementing Database access classes in java	01-08-14	01-13-14	6	8%
Implementing Database access classes in java	01-15-14	01-25-14	9	6%
Find request from Admin	01-26-14	02-15-14`	15	**17%**
Fetch admin request & process it	01-26-14	02-03-14	7	20%
return result to admin	02-06-14	02-10-14	5	12%
Integration of all the modules	02-13-14	02-15-14	3	20%
Integrate phone and pc application	02-13-14	02-15-14	3	20%

Gantt Chart:

	Task Name	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1	Documentation Effort			Documentation Effort						
2	SynopsisAbstract and requirement Gathering			SynopsisAbstract and requirement Gathering						
3	Preliminary ReportabstractUse Case diagram			Preliminary ReportabstractUse Case						
4	Learning Technology Curve				Learning Technology					
5	Learning Java basic conceptsinstallation			Learning Java basic						
6	Learning ECreating Sample application				Learning . ECreating					
7	Delivery of Android Module						Delivery of Android			
8	Creating a sample android application						Creating a sample			
9	Creating i module						Creating Android			
10	Client Server Communication on Android							Client Server		
11	Creating a server socket							Creating a server		
12	Client server communication on Android							Client server		
13	Fetching Customer Data ,Process the data							Fetching PC		
14	Creating database on serverside							Creating		
15	Implementing Database access classes in							Implementing		
16	Implementing Database access classes in									
17	Find request from Admin								Find	
18	Fetch admin request & process it								Fetch	
19	return result to admin								return	
20	Integration of all the modules									
21	Integrate phone and pc application									

TEAM STRUCTURE:

Our team consist of four people:

Team Member	Modules Worked On
Pandya Dhruv	Activate a new process module, Registration and Raw Data Fetching, Database Designing, Application Functional Modules, Done the documentation work.
Patel Darshan	Active Operational Modules, Socket Module, Partial Server Module, and also done presentation work.
Anjali Kumari	Android Application UI Designing, Project Cost Estimation, Project Testing, Done the documentation work.
Navjot Kour	Algorithmic Calculations for the Applications, Server Side Web Interface UI designing, and also done presentation work.

CHAPTER 7

SOFTWARE IMPLEMENTATION

7.1 INTRODUCTION

Software implementation in this project is done with the help of various tools and techniques. Such that eclipse indigo is used in which java programs are to be created, JDK (Java development kit) which provide java environment for java developer and Android SDK (software development kit) used for providing environment, android software functions, android features to the Android developer.

7.2 DATABASES

The database used by our system will be a light weight, single file database which can be used in an Android phone like My SQL Lite. Hence we are using My SQLite which is easily installable in the android phone and has single file database.

7.3 IMPORTANT MODULES AND ALGORITHM

The important modules in our system are:

1. Register Module: Registering a new customer and forming a customer profile.
2. Login and Authentication Module: Used for Authenticating the user based on the roles specified.
3. Restaurant Menu Module: List of all the items as entered in the database which are categorically arranged.
4. Customer Menu: Used to confirm order, generate the list of ordered items and view the bill.
5. Admin/Manager Module: Used for generation of different customer relationship management based calculations.
6. Kitchen Window Module: Used to view the ordered items and confirm the delivery.

7.   Apriori Algorithm Implementation: It is used to generate customized menu for the customer and different branch suggestion techniques for the manager.

7.4 BUSINESS LOGIC AND ARCHITECTURE

Business logic layer is used for Data validation Purpose and also for the security purpose of the system.

    Our system also does validations on the server side of the system where the IMEI number of the user's phone is checked in the database stored in the server side. We also provide the role to each and every user based on functionality assigned.

    If the user's data is valid then only he is allowed to use the application.

CHAPTER 8

SOFTWARE TESTING

8.1 INTRODUCTION

A formal test plan is a document that provides and records important information about a test project, for example:

- Project and quality assumptions
- Project background information
- Resources
- Schedule & timeline
- Entry and exit criteria
- Test milestones
- Tests to be performed

8.2 Test Procedures and Implementation

- Test Case for Login GUI Testing

Project: Improvised Restaurant Chain Management System

Objective: To get Proper GUI Alignment with proper Validation

Sr. No	Description	Result Expected	Actual Result	Pass / Fail
1.	Run Homepage on Mozilla Firefox	Homepage should be displayed.	Pass	Pass
2.	Description of Screen	1) The Login screen with the Proper Title. 2) Login window with two textbox should be displayed at right column of website 3) There should be one button with labels Login. 4) Registration link should be	Pass	Pass

		below the Login button		
3.	Entry Fields condition	1) Both the Textbox must be editable. 2) If the text boxes are empty then on press of Login button alert should be displayed that fields are empty.	Pass	Pass
4.	Registration Form Web	1) All the textboxes should be placed adjacent to their respective labels. 2) Its should not accept invalid or blank fields.	Pass	Pass
5.	Registration Form Android	1) All the textboxes should be placed adjacent to their respective labels in the proper layout. 2) Its should not accept invalid or blank fields. 3) Both radio buttons can't be selected at the same time.	Pass	Pass
6.	Menu Of Android	1) Expandable list should show all categories and menu's inside it should be visible properly. 2) Check box should be placed properly adjacent to menu item	Pass	Pass
7.	Place Order of Android	1) All the ordered Menu's with price and quantity should be displayed properly in proper alignment with total in bottom 2) Quantity textbox should be editable	pass	Pass
8.	Kitchen Window	1) All the Customer Orders should be visible in proper tabular format on Kitchen Window 2) Check in button should be right aligned to orders	Pass	Pass

- Test Case for System Testing

  Project: Improvised Restaurant Chain Management System

  Objective: To get Proper Redirection with proper Messages

Status :	System				
Type :	Manual				
Sr. No	Description	Input Value	Result Expected	Actual Result	Pass / Fail
1	Login	1) Username, 2) Password	1) If Username and Password then it should redirect to Homepage	If Username and Password then it should redirect to Homepage	Pass
2	Registration	1) Name, 2) Mobile No, 3) Date Of Birth, 4) Address, 5) Martial Status	1) If User Registered Successfully then alert should be generated	If User registered Successfully then alert should be generated	Pass
3	Add Category	1) Category Name	1) If Category added Successfully then user should get alert	If Category added Successfully then user should get alert	Pass
4	Add Menu Item	1) Menu item Name	1) If Menu item added Successfully then user should get alert	If Menu item added Successfully then user should get alert	Pass
5	Place Order	1) Menu's List, 2) Quantity	1) Customer should get the alert after placing order with waiting time	Customer should get the alert after placing order with waiting time	Pass
6	Logout		1) User should Logout	User should Logout	Pass

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8.3 SNAPSHOTS OF THE TEST CASES AND TEST PLAN

Testing will be done using

1. Unit testing will be done manually at the end of completion of each module.
2. Functional Testing of part module will be done using Selenium Test Cases
   As we are applying unit testing the snapshots of the testing results are shown in the next chapter.

CHAPTER 9

TESTING RESULTS

Javascript Alert Box Selenium Unsupported type

Login

Add Category

ADD MENU

Delete Menu Items

Index Page

Login verification Credentials

Successful Login
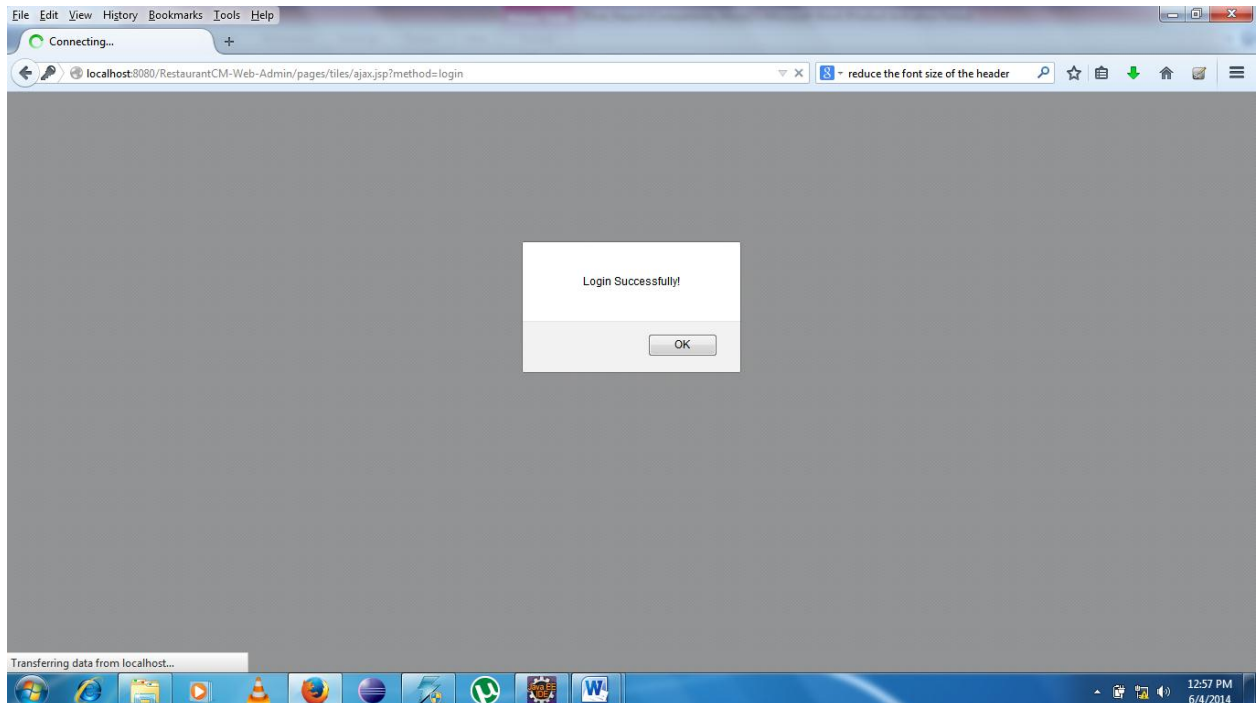
Android Application

Splash Screen Application

Login Screen

Menu Page

Ordering Menu
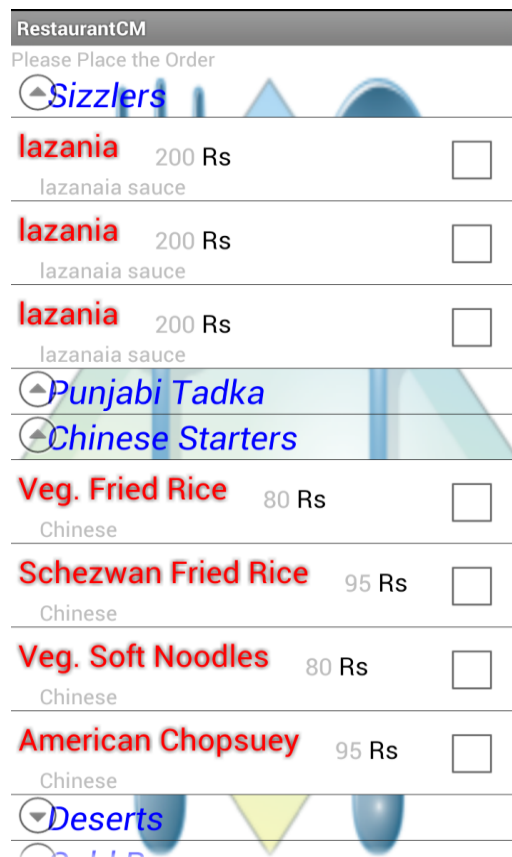
User Functionality
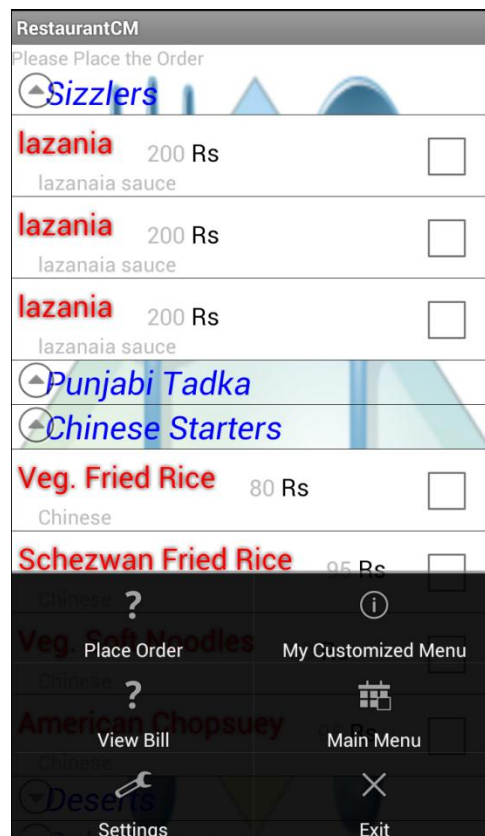
Administrator View
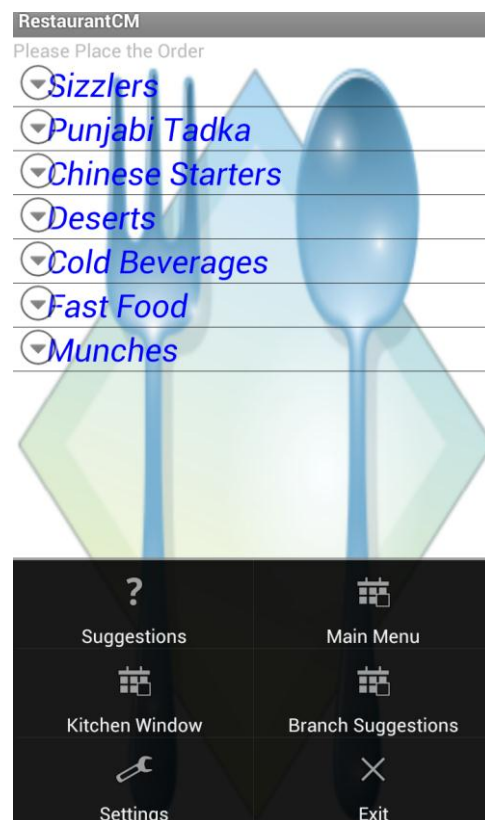
Kitchen Window View:

CHAPTER 10

DEPLOYMENT AND MAINTAINANCE

10.1 INSTALLATION AND UN-INSTALLATION

_Step 1: Install Eclipse.

_ Step 2: Install Android SDK.

_ Step 3: Install JDK and JRE.

_ Step 4: Addrequired libraries.

_ Step 5: Run the EXE of project.

10.2 USER HELP

_Step 1: Enter Server IP and Port number for Communication.

_ Step 2: Login Based on the role will be done.

_ Step 3: You will get the menu List on the phone.

_ Step 4: Select menu and order.

_ Step 5: Click Exit to terminate the Application.

CHAPTER 11

CONCLUSION AND FUTURE SCOPE

11.1 CONCLUSION

- Using Android tablet has got clear advantage over the manual system. The computerized system is more reliable and efficient.

- The proposed system has lots of functionality such as :

    1. Customer Order Tracking

    2. Suggested Menu for Restaurant

    3. Customized Menu for Customer

    4. Branch Suggestion for Restaurant

    5. Get Anniversary Wishes

- Manager and Chef can add, edit and delete the categories and menu items to the restaurant menu.

11.2 FUTURE SCOPE

- This application can be extended to use on the mobile phone.

- We can analyse data on a global level.

- Deals of the Day.

- Payment of Bill via Credit Card.

- Preference Based Customized Menu

REFERENCES

[1] GaoHua (2011),Customer Relationship Management Based on Data Mining Techniq IEEE, School of Economic and Management, Wuhan University, Wuhan, 430072, Hubei. China,2011 IEEE.

[2] Mu-Chen Chen, Ai-Lun Chiu, Hsu-Hwa Chang (2005), Mining changes in customer behavior in retail marketing, Department of Business Management, National Taipei University of Technology, No. 1, Section 3, Chung-Hsiao E. Road, Taipei 106, Taiwan, ROCbSAS, Taipei, Taiwan, ROC, Department of Business Administration, National Taipei College of Business, Taipei, Taiwan, ROC.

[3]   Nan-Chen Hsieh (2004), An integrated data mining and behavioral scoring model for analyzing bank customers, Department of Information Management, National Taipei College of Nursing, No. 365, Min Te Road 11257, Taipei, Taiwan, ROC.

[4] NergisYılmaz and GülfemIşıklarAlptekin,(2013), The Effect of Clustering in the Apriori Data Mining Algorithm: A Case Study, Proceedings of the World Congress on Engineering 2013 Vol III, WCE 2013, July 3 - 5, 2013, London, U.K.

[5] Knowledge Management In CRM using Data Mining Techniques, Sunil yadav,AadityaDesai,VandanaYadav,International Journal Of Scientific & Engineering Research, Volume 4,Issue &, July-2013.

[6] Data Mining: An Overview from a Database Perspective Ming-SyanChen,SeniorMember,IEEE,JiaweiHan,SeniorMember,IEEE,and Philip S. Yu,Fellow,IEEE, IEEE transaction On Knowledge And Data Engineering,Vol.8,No.8,No. 6,December 1996 .

[7] E.W.T. Ngai , Li Xiu , D.C.K. Chau (2008), Application of data mining techniques in customer relationship management:A literature review and classification, Department of Management and Marketing, The Hong Kong Polytechnic University, Hong Kong, PR China Department of Automation, Tsinghua University, Beijing, PR China.

[8] Chris Rygielski , Jyun-Cheng Wang , David C. Yen (2002), Data mining techniques for customerrelationship management,Department of DSC & MIS, Miami University, Oxford, OH, USADepartment of Information Management, National Chung-Cheng University, Taiwan, ROC.

[9] G. Babu and T. Bhuvaneswari (2012), A Data Mining Technique to Find Optimal Customers for Beneficial Customer Relationship Management,Bharathiar University, Coimbatore, Tamilnadu, India,2MGR University, Chennai, Tamilnadu, India, Journal of Computer Science 8 (1): 89-98, 2012.

APPENDIX A

PAPERS PUBLISHED IN CONFERENCE /JOURNAL WITH

ISSN/ISBN NUMBER

Based on the recommendations from the peer review board, our three papers areaccepted in:

International Journal of Innovations in Engineering and Technology (IJIET),ISSN: 2319 – 1058,in the current Issue of 1 October 2013.

Title: Decision Support in Customer Relationship Management Using Data Mining

Authors: DeekshaBhardwaj, DhruvPandya, Darshan Patel

Status: Accepted

International Journal of Latest Trends in Engineering and Technology (IJLTET), ISSN: 2278-621X,in the current Issue of 1 September 2013

Title: Building Data Mining Application for Customer Relationship Management

Authors: DeekshaBhardwaj, Anjali Kumari, Navjotkour

Status: Accepted

International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181,in the current Issue of 1 January 2014

Title: Implementing N-Tier Architecture for Improvement in Customer Relationship Management "CRM"

Authors: DeekshaBhardwaj, ,DhruvPandya, Darshan Patel

Status: Accepted

APPENDIX B

GLOSSARY [Define terms, acronyms, and

abbreviations used in the FRD]

SR.NO	Abbreviation/Acronym	Full Form
1	CRM	Customer Relationship Management
2	RCM	Restaurant Chain Management
3	JDK	Java Development Kit
4	IP	Internet Protocol
5	SDK	Software Development Kit

Decision Support in Customer Relationship Management Using Data Mining Techniques

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Abstract-With a unbridled increase in international and domestic forms of business, Customer Relationship Management (CRM) has become one of the matters of concern to the enterprise and the entrepreneurs. CRM takes customer as the center and it enchants a new life to the organization system and optimizes its business process increasing its profitability. In order to help enterprises understand the "Product Purchasing Psychology (PPP)" and ways to retain the valued customers we propose data mining techniques. Clustering of customers provide in depth knowledge of their behavior. Clustering is one of the most useful and traditional technique used in data mining. The scope of this paper is to understand and predict the behaviors of the customer with behavior segmentation methodology. The result of the analysis results into enhancing of the customer support and targeting sales of the right product to the customers with better concentration on campaigning product promotion. The policy holders claim dataset for the health insurance company is taken for consideration. This behavior segmentation methodology with clustering is applied here to predict distinct customer segments which help in the production of customized products which takes care of the priorities and preferences of the customers. Apriori association rule which is performed on clusters of claim dataset gives the association amongst the attributes. It is derived from Clustering Based Association Rule Mining (CBARM) model. Association rule is applied on claim dataset which predicts the claim cost and association amongst the attributes that influences the claim cost of the policy holder.

Keywords –Customer Relationship Management (CRM), Public Purchasing Psychology (PPP), Clustering Association Based Association Rule Mining (CBARM).

I. INTRODUCTION

With a Rampant competition in international and domestic business the customer relationship management has become one of the matters of concern for the enterprise and entrepreneurs. CRM can be defined as the method for predicting the customer behavior and selecting appropriate behavior to benefit the company. This concept has been given new lease of life because of the development of the Internet and E-Business. Due to CRM the customer satisfaction also increases and helps in marketing strategy. But one of the important issues in Customer Relationship Management is the customer segmentation and prediction by which the company classifies its customer into pre-defined groups with similar behavioral patterns. Usually company builds a prediction model to find the prospects for the similar products. As a rising subject data mining is playing an important role in decision support models of every walk of life. Data mining uses sophisticated statistical processing of data or artificial intelligence algorithms for discovery of useful trends and patterns from the raw data extracted so that it can yield important insights including prediction model and association rules by which the company can understand the customer in a better way. Customer classification and prediction is the base of implementing CRM. It's the pre-condition to analyze the customer's pattern of consumption and the premise of the personalized marketing and services.

II. PLATFORM BASICS

A) Understanding The Clustering Phenomenon:-

Clustering can be defined as the process of grouping the similar type of physical or abstract objects into classes. Clustering can also be defined as unsupervised classification, because the classification is not dictated/ordered by given class labels. There are many clustering approaches, all based on the principle of maximizing the similarity between objects in the same classes(intra class similarity) and minimizing the similarity between objects of different classes(inter class similarity).this chapter identified extensive work on customer segmentation and data mining techniques and elaborates as follows:

Samira etal. (2007) applied segmentation of customers of trade promotion organization of Iran using a proposed distance function which measures dissimilarities among export basket of different countries based on association rules of concepts. Later, in order to suggest the best strategy for promoting each segment, each cluster is analyzed using RFM model. Variables used for segmentation criteria are "The Value of Group Commodities", "The Type of Group Commodities" and "the correlation between export group commodities".

Huang, Chang, and Wu (2009) applied K-means method, Fuzzy C-means clustering method and bagged clustering algorithm to analyze customer value for hunting store in Taiwan and finally concluded that bagged clustering algorithm outcomes the two other method.

Pramod et al. (2011) elaborates the use of clustering to segment customer profiles of a retail store .The study concluded that the k means clustering allows retailers to increase customer understanding and make knowledge – driven decisions in order to provide personalized and efficient customer service.

The main theme of our paper issues clustering technique which predicts the customer behavior for the claim dataset of health insurance claims and the health risks.

III. STRATEGY FOR SEGMENTATION

The main aim of the customer segmentation is indentifying and achieving the profitable sectors and provides products and services that are customer's common need. Sophist acted customer segmentation give the companies the ability to target more profitable customers, understand the customer's demands, allocation of the resources and to compete with the rivals. The proposed segmentation framework in given figure 1.

The Main Three Phases of the framework proposed are as follows:

1. Data Preparation Phase
2. Data Clustering Phase
3. Customer Preferences Analyses

A part of the first phase includes collection of data from data store and subsequent data cleansing. Second phase generates Behavioral Segmentation based clusters and profiles of the clusters. Third phase is concerned with identification of customers preferences over products and the risks levels for disease diagnosed, treated and subsequent process of clam settlement.

1. Data Preparation :-

The Database source is the Insurance regulatory Authority Of India's Database for health insurance claim dataset .The dataset has 16000 customer claim information for period of one year 2011-2012. The initial dataset contains 36 attributes. The attributes relevant are only taken for analysis. After preprocessing only 21 attributes relevant for analysis are taken into consideration. Health insurance dataset has policy holder whose type of covers is one among the four types such as individual, individual floater, group and group floater.

2. Behavior Analysis:-

In order to describe customer behavior, several attributes can be identified format the policy holders transactions. The policy holders can be characterized by kind of policies opted and with what kind of products the avail. Additionally usage based factors such as how many customers use different policies, during which occasions and how much they tend to avail claim for the health insurance policy opted. The risk associated with each policy holder decides the claim cost. The risk of the policy holders depends on healthy behavior. The diseases diagnosed. Medical history, treatment undergone for recovery process influences the total claim of the policy.

3. Clustering Strategy:-

Customers are divided by use of the cluster analysis. We then form the clusters for the customers divided. The component scores are fed as an input to a cluster model which then assess the similarities between the records/customers and suggests an efficient way of grouping them. Customers claim information's is based on health risk. The cluster is then formed in such a manner as to reveal significant areas of risk within the insurance profile. The framework of the behavioral is used to predict the expected claim costs for different health risks diagnosed and

treatment undergone. K-means is one of the unsupervised learning algorithms that solve the well known clustering problem. The procedure to classify the given dataset through a certain number of clusters is through A priori. The main o objective is to be to define the k centroids, one for each cluster. The cencroids should be placed in a cunning way because different locations cause different results.

4.   Association rule based analysis:-

The Analysis of claims data in our health insurance claim dataset is performed using Apriori association algorithm. Associations rule based analysis helps in identifying and establishing claiming patterned and relationships which represents appropriate Utilizations of services.
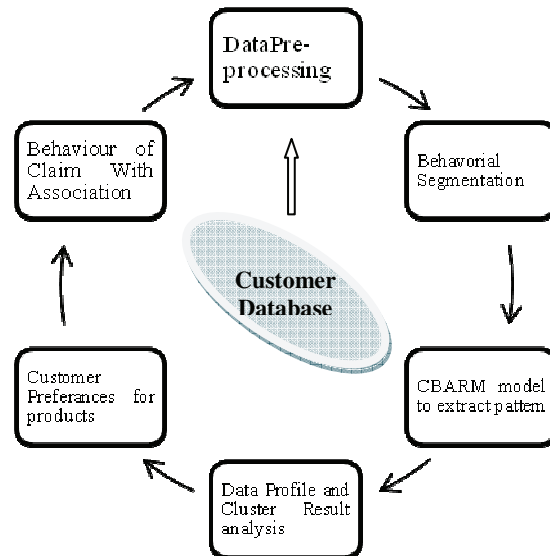
Figure1. Classification Framework for Different Techniques in data mining in CRM.

IV. EXPERIMENTAL METHODOLOGY AND RESULTS

Clustering an unsupervised learning technique is applied to form cluster of customers based on claim behavior of health insurance customer. The health risk of the customer has significant impact on insurance claim. The WEKA ("Waikato Environment for knowledge analysis") machine learning work bench 3.7.5 has been considered for the purpose of analysis and test result.

A.   Clusters for analyzing customer data.
   The formation of the clusters and evaluation under the classes to clusters mode in WEKA is implemented for policy type class attribute. Each cluster shows ser a peculiar type of behavior in customers, from which conclusions are drawn. WEKAfirst ignores the class attribute and generates the clustering. Then during test phase, it assigns classes to the clusters, based on the majority value of the class attribute within each cluster. The total numbers of instances were not fairly distributed if the default seed size is 10 and number of clusters is set to four. It means the sum of the whole clusters was 90%. The distributions of instances were significantly improved, when the seed number was set 100. When the seed size is 10, the number of iterations and sum of squared errors were 10 and 22193.62 respectively. However, if the seed size is set to 100, the number of iteration was 10 and sum of squared errors was 14864.65.

   Cluster A- This group is mostly dominated by policy class of group policy holders who may be working in a company or members of co-operative society and so on. The policy holders availed the high claim value compared to others group. Female gender is dominated is the group and claims comes are being mostly diagnosed with pregnancy, childbirth and the puerperium related. Nearly 30% of total claims come from medicines charges. Surgical, consultation and investigation claims are highest among the cluster groups.

Cluster B-This group is having policy holders with claims of higher values. Claim were Dominated by eye and adnexa problems. This group is having policy holders of early forties and their claims are being dominated by miscellaneous expenses and also this groups dominated by individual health insurance policy holder.

Cluster C- This group has low risk customers whose claim values are lowest amongst their group. Most of the claims pertain to cases diagnosed with pain abdomen problems of medium age groups with surgical less treatment. The treatment value in all headers is low compared to other groups other than pre-hospitalization expenses.

Cluster D- This group is dominated by group floater policies. Due to minimum sum assured, total claim is second lowest amongst the group. Most of the claims are surgically in nature and the diagnosed claims are of mostly normal pregnancy related with moderate surgical expenses. The claim value is having least post and pre_hospitalization expenses.

Thus corresponding confusion matrix for the clustering model based on policy type attribute is given in Table I.

```
            -: Evaluation And Modeling On The Training Set:-

    •   Clustered  Instances
    0   3699 (25%)
    1   7109 (47%)
    2   923  (6%)
    3   3269 (22%)


Class Attribute: Txt_Type_Of_Policy

Classes to Clusters:

0       1       2       3 ← assigned to cluster

1359    2534    52      733     |       1
82      265     60      81      |       2
768     1289    62      433     |       3
1490    3021    749     2022    |       4


Cluster A ← 3
Cluster B ← 1
Cluster C ← 2
Cluster D ← 4
```

From the confusion matrix given in the table 1, it is evident that cluster 1 has policy holders mostly dominated by individual policies,follwed by cluster C,cluster A and Cluster D having policy type prefrences of individual,group and group floater policies. The tuples of clusters B with major contributions of 47% of instances follwed by Cluster A,Cluster D,and Cluster C.By consedering the above facts,each cluster is assigned ranksas cluster B ahving rank 1 followed by cluster A,Cluster D and Cluster C having ranks 2,3 and 4 respectivley.

B. Observation Based On Association Rule:-

Prediction of claim levels are based on distribution of diseases among the instances of the working set. Apriori assciation rule performed on claim dataset gives the association among attributes in the claims dataset.Different association Rule express different regularities that underlie the dataset and predict different things. The values for number of rules considerd,the decrease for minimum support (delta factor) and minimum confidence values are 3, 0.95 and 0.9 respectivley. The number of itemset and correspoding rule mapping is given in table II.

	One	Two	Three	Four	Five	Six	Seven	Eight	Nine
Rule Set Size	9	36	84	126	126	84	36	9	1

Table II Aprioi Association Rule Set On Claim Dataset

Best three rules genrated with 14490,14986 and 14983 instances associated and its description as follows:

First rule specifies it is of single rule set category and if miscellaneous expenses of range(0-285712)has the impact on post hosptalization expenses of range (0-297650) with cinfidence level of 1. In addition,lift = 1 indicates that the having miscellaneous expenses within the range increases the probabilty of producing the post-hospitalization expenses by factor of 1. Levearge is the propotion of additional examples covered by both the premise and consequence above those expected if the premise and consequence were independent of each other.

In the second rule,which is of two set category, the attribute invertigation charges and miscellaneous charges have significant impact on post hopitalization expenses of the claim. The ranges of [0-153538.66] for inverstigation charges and [0-2857]for miscellaneous have the impact on post hospital expenses within the rang [0-297650.66] with the confidence level of 1.

Third rule which is of two set category, that predicts post hospitalization expenses.It is obsevred from the third rule that if surgery charges of range(0 to 116666.67) and miscellaneous charges of range (0 to 285712) influences the post hospitalization expenses to fall within the range 0 to 297650.67.

The component lift=1 indicates that having LHS predicates increases the probability of RHS predicates by a factor of 1 in the best 10 rule sets.

As a reference to third rule the component post hospitalization of claim fall in the range (0-297650.67) is dependent on surgery charges of range (0-116666.67)and Miscellaneour charge (0-285712).

Similarly,other two item sets rule 4,rule 5 and rul 9 justifies the dependent factors(LHS) on RHS attribute Post Hospitalisation Expenses. Sixth rule is of three item set category specifies if the claim amount lies within the range 0 to 456470.67,investigation charges charges between 0 to 0-153538.67 and Miscellaneous charges between 0 yo 285712 has an significant on post hospitalisation expenses of range 0 to 297650.67. This rule has 14979 instances justifies that Similarly, rule numbers 7,8 and 10 are of three item category justifies the dependent factors (LHS) on RHS attribute post hospitalization expenses.

V. CONCLUSION

Data mining provides the technology to analyze mass volume of data and/or detect hidden patterns in data to convert raw data into valuable information. Clustering is technique applied on health insurance claim dataset to segment the customers. Clusters revealed the preferences of customers towards the products and factors that influence total claim. Association rule applied on working dataset to predict nature of the claim. The process of combining segmentation with data mining provides marketers with high quality of information on how their customers shop for and purchase their products or services. By combining the standard market with data mining techniques we can predict and model behavior of segments. Although the paper mainly focuses on the insurance industry, the issues and applications discussed are applicable to other industries, such as banking industry, retail industry, manufacture industries, and so on.

REFERENCES

[1] Pramod Prasad, Latesh G. Malik.(2011)Generating customer profiles for retail stores using clustering techniques,International Journal On Computer Science And Engineering, Vol.3,pp.2506-2510.

[2] Larose,DT(2006)Data Minings method and Models,Hoboken,New-Jersy,John Wiley & sons,Inc.

[3] Roosvelt Mosley,(2005),The Use Of Predictive Modeling in the Insurance Industry,Pinnacle actuarial resources.

[4] Westphal.Cand T.Blaxton (2005),Introduction To Data Mining and Knowledge Discovery,Two Cows Corporation,Third Edition.

[5] Kamber.M.J.Han.(2008),Data Mining : Concept And Techniques,Morgan Kaufman.

[6] Huang.S.C.Chang,&H..H. Wu(2009),A case study of applying Data Mining in outfitters's customer value analysis ,Expert Systemwith Applcations,Vol.36 Issue6,pp5909-5915.

[7] Blocker, C.P., &flint, D.J.(2007).Customr segments as moving targets:Integarting Customer Value Dynamism Into Segment Instability Logic.Industrial Marketing Management.Vol.36,pp.810-822.

[8] Kanwal Garg,Dharminder Kumar and M.C. Garg,(2008),Data Mining Techniques for Identifying The Customer Behaviourof Investment in life insurance sector india, International Journal Of Information technology and Knowledge Management,Vol.1 ,Issue.1,pp.51-56.

[9] Tsiptsis.K and A. Chorianopoulos , Data Mining Techniques In CRM ,Inside Customer Segmentation (2009).Jhon Wiley &Sons..Ltd.Second Edition.

[10] Two Crows Corporation(1998)Introduction To Data Mining And knolwedge Discovery,Second Edition Patomac,MD.

[11] Pieter Adriaans,Dolf Zantinge,(2011),Data Mining,Pearson Education Ltd,Sixth Impression,2011.

[12] Migueis,V.l.Camanho,A.S.Joao Falcao e Cunha (2012),Customer Data Mining for LifeStyle Segmentation,Expert Systems eith applications,Vol.39.3959-9366.

[13] Hosseini,M.,Anahita,M.Mohammad,R,G.(2010).Cluster Analysis using data mining approach to develop CRM methodology to assess the customer loyalty.Expert Systems With Applications,Vol.37.pp.5259-5264.

[14] Samira Malekmohammmadi Golsefid,Mehdi ghazanfari, Somayeh Alizadeh(2007),Customer Segmentation in Foreign Trade based on Clustering Algorithm,World Academy of Science,Engineering and Technology Vol.28,pp.405-4011.

[15] An integrated data minig and behavioral scoring model for analyzing bank customer, Nan-Chen Hsieh,Expert System With Applications 27 (2004),623-633.

[16] Knowledge Management In CRM using Data Mining Tchniques,Sunil yadav,Aaditya Desai,Vandana Yadav,International Journal Of Scientific & Engineering Research, Volume 4,Issue &, July-2013.

[17] The Effect Of Clustering in Apriori Data Mining Algorithm : A Case Study, Nergis Yilmaz and Gulfem Isiklar Alptekin, Proceedings of the World Congress on Engineering 2013 Vol III,WCE 2013,July 3-5,2013,London,U.K.

[18] Data Mining: An Overview from a Database Perspective Ming-Syan Chen,Senior Member,IEEE,Jiawei Han,Senior Member,IEEE,and Philip S. Yu,Fellow,IEEE, IEEE transaction On Knowledge And Data Engineering,Vol.8,No.8,No. 6,December 1996 .

[19] Mining Changes in customer behaviour in retail marketing,Mu-Chen Chen,Ai-Lun Chiu,Hsu-Hwa Chang,Expert System with Applications 28,(2005), 773-781.

[20] Data Mining By Heidi Kuzma And Sheila Vaidya.

Implementing N-Tier Architecture for Improvement in Customer Relationship Management "CRM"

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Abstract

Investing in the Customer Relationship Management (CRM) application is no different than any other business management software- weather you are looking for an enterprise level software application or department level solution we expect a quick and measurable return in our investment. To achieve such fast returns the most important aspect that matters is its underlying architecture. The implementation of a well designed architecture will accommodate future growth and adapt to business changes without affecting the performance of application or requiring the exhaustive re-implementation. The architecture we consider is an n-tier architecture used because of its flexibility, portability, scalability and extensibility. This paper describes the implementation of n-tier architecture in CRM and the benefits that the system awards.

Keywords: CRM, Extensibility, Scalability, Investing.

1. Introduction

Over last 10 years, many companies and organizations have implemented CRM systems. In most cases these system were designed to support call centre and e-mail channels, and more recently internet and mobile channels. An increasing number of companies are considering implementing CRM with advanced n-tier architecture systems to satisfy the growing expectation of customer service. These systems have unique advantage and characteristics that support customer business interaction that are linked into internal business processes and systems across different areas for operational and analytical purposes. It proposes a structure that is channel independent in sense that it uses one, company-wide set of data and one set of business rules to manage a customer interaction via any channel at any time. In practice, web technologies are used in most cases for process management and to provide representatives with information functionality. The use of n-tier architecture in CRM applications can in turn provide an overall better and more consistent customer experience, and also allows for increasing data collection and better customer personalization experiences. This in turn, all lead to increased profitability from customers and greater customer loyalty. Researchers further determine through their research that customer loyalty while partially impacted by use of n-tier architecture also is determined by a combination on online experience with things such as the quality of after sale service. The research further clarifies that the use of n-tier architecture by the business firms to build their brand identity is most. The research supports the claim that there is still ample room for companies to embrace broader CRM initiatives including a more customer-focused and useful online presence. In this architecture, the corporate data, the operations performed on that data and the user interfaces are built-in clearly defined layers that communicate using internet standards. This architecture is characterised by single server installation, thin client deployment, centralised administration, portable application, and architecture, and optimised performance on WANs. This architecture provides a superior performance over across all user deployment scenarios including disconnected access, internet access, dial-up access, and in office access. This paper indentifies the opportunities that the use of n-tier architecture in CRM applications provides to a business firm.

2. N-Tier Architecture

Definition: - N-Tier architecture is basically an industry-proved software architecture model, suitable to support enterprise-level "Client/Server" model, applications by resolving issues like scalability, security, fault tolerance etc.

In understanding the N-Tier architecture firstly we need to clarify the difference between two

terms:"Tier" and "Layer". Tier usually means the physical deployment computer. Usually an individual running server is one tier. Several servers may also be counted as tier, such server failover clustering. By contrast, layer usually means logic software component group mainly by functionality; layer is used for software development purposes. Layer software implantation has many not exactly match each other. Each layer may run in an individual tier. However, multiple layers may also be able to run in one-tier. A layer may also be able to run in multiple tiers. Let us consider the example of .NET, the persistence layer in .NET can include two parts: persistence Lib and WCF data service, the persistence lib in persistence layer always runs in the same process as business layers to adapt the business layer to the WCF data service. However, the WCF data service in persistence layer can run in a separate individual tier. Here is another example: we may extract the data validation in business layer into separate library (but still kept in business layer), which can be called by client presenter layer directly for a better client-side interactive performance. If this occurs, then data validation part of the business layer runs in the same process of the client presenter layer, the rest of the business layer runs in a separate tier.

Diagram1.N-Tier Architecture

2.1. 3- Tier Architecture

We introduce the 3-tier concept first so that we can understand other tier concepts later easily. The simplest of n tier architecture is 3-Tier which typically contains following software component layers listed from top level to low level: presentation layer, application layer and data layer, which are depicted in pictorial Diagram. This layer can access directly only the public components of its directly below layer. For example, presentation layer can only access the public components in application layer, but not in data layer. Application layer can only access the public components in data layer, but not in presentation layer. Doing so can minimize the dependencies of one layer on the other layers. This dependency minimization will bring benefits for layer development/maintenance, upgrading, scaling and etc. Doing so also makes the tier security enforcement possible. For example, the client layer cannot access the data layer directly but through the application layer, so data layer has higher security guarding. Finally, doing so can also

avoid cyclic dependencies among software components. In order to claim complete 3-Tier architecture, all three layers should be able to run in separate computers.

Diagram 2. 3-Tier Architecture

These three layers represented in the diagram are briefly described as below:

Presentation Layer: A layer that users can directly access such as desktop UI, web page and etc. It is also known as The Client Layer .

Application Layer: This layer encapsulates the business logic such as business rules and data validation), domain concept, data access logic and etc. It is also known as The Middle Layer.

Data Layer: The external data source to store the application data, such as database server, CRM system Application, ERP system, main frame or other legacy system and etc. For example we consider a database server, now for n-tier architecture, we need to use the non-embedded database server such as SQL server, Oracle, DB2, MySQL or PostgreSQL. The non-embedded database server can be run in an individual computer whereas, the embedded type databases, such as Microsoft access, dbase and etc, cannot run in an individual computer, and then cannot be used as the data layer of 3-tier architecture.

2.2. 1 and 2-Tier Architecture

1-Tier: All the layers can only run in one computer. In order to achieve 1-Tier, we need to use the embedded database system, which cannot run in an individual process. Otherwise there will be at least 2 tiers because non-embedded databases usually can run in an individual computer.
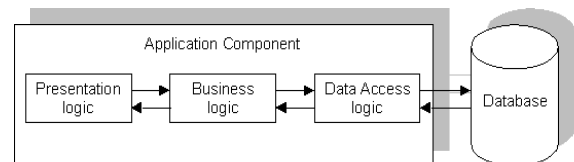

Diagram3. 1 Tier Architecture

2-Tier: Either presentation layer and application layer can only run in one computer or application layer and data layer can only run in one computer. The whole application cannot run in more than 2 computers.
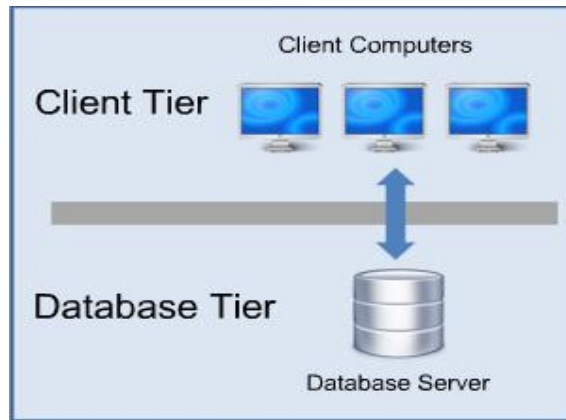

Diagram 4.2-Tier Architecture

Sometimes the number of tiers is able to be equal or more than 3, but client presenter layer, business layer and data layer cannot run in three separate computers. If we use the modem non-embedded database such as SQL server, Oracle and etc, these databases will always be able to run in an individual computer. Therefore, for this case in diagram1 the criteria of a 2-tier architecture is that presentation layer and application layer can run in only one computer; the criteria of a complete 3-tier architecture is that presentation layer and application layer can run in different computers. A complete N-Tier architecture has the same criteria as 3-tier architecture.

3. Introduction of N-Tier Architecture in Traditional CRM

The difference between traditional CRM and advanced CRM (a-CRM) are subtle, but important. They concern the underlying technology and its interfaces with users and other systems. Pourasghar(2007) did not think there are differences between CRM and a-CRM. He said considering the strategic perspective, no differences between CRM and a-CRM exist as both concepts have the overall goal of an increased Customer Lifetime Value, and aim to increase customer retention and decrease service costs but the process level, he said several distinction between the two concepts become observable. He mentioned further that while conventional communication processes are often time delayed, a-CRM allows organizations to always operate in real time and more than that interaction with customers are transparent so that organizations are able to draw conclusions on customer behaviour and measure

the success of activities. Unlike conventional CRM processes a-CRM processes imply high automation of interaction.

According to (pan et al.2003) a-CRM expands the traditional CRM techniques by integrating technologies of new electronic channels. a-CRM solutions support marketing, sales and service and with advancement of Web-based technology, market dynamics are driving companies to adopt a-CRM. a-CRM cannot be separated from CRM, it needs to be integrated and seamlessly cherished. However many organization do have specific e-CRM initiatives or staff responsible for a-CRM. Both CRM and a-CRM are not just about technology and databases, it is not just a process or a way of doing things, it requires in fact a complete customer culture. In a-CRM the application programs are written with back-end operations in mind; the emphasis is on data collection and the optimality of interface with the user pc (client).

Keywords: a-CRM (Advanced Customer Relationship Management): An architecture comprising the use of n- tier architecture in CRM.

4. a-CRM through Customer Life-Cycle

In today's world companies are encountering an increasing amount of sophisticated customers, with high level of expectations and demands for immediate service across multiple access channels. Customers feel that customer service should occur via the channel of communication that they specify to be communicated, or at least the channel through which the contact with company was initiated. Customers not only want to shop and get customer service through multiple communication channels, such as the telephone, web chat, electronic mail, and the web, they desire the ability to move seamlessly from one medium to another . a-CRM enables to serve customers online and cover the areas like content management, product and pricing models, customer service support, problem resolution and automated response agents and campaign management functions. In order for a company to provide unified customer communications at different customer interface points, it should be kept with a company through several channels. In view of multi-point contact with customers, a-CRM implementation requires organizations to have several devices and technologies in place such as e-,ail inbound/outbound support, chat/ browser control, voice-over internet protocol (VoIP), multi-language support; messaging, work-flow and web measurement devices. It embraces the front-office business functions of sales, marketing and customer services, and supports the back office

business and analysis operations spanning these functions, all in a web-centric fashion. The figure below illustrates how a-CRM functionality supports each of the five business components of marketing, sales, customer service support, e-commerce and electronic processes into the back-office analysis.
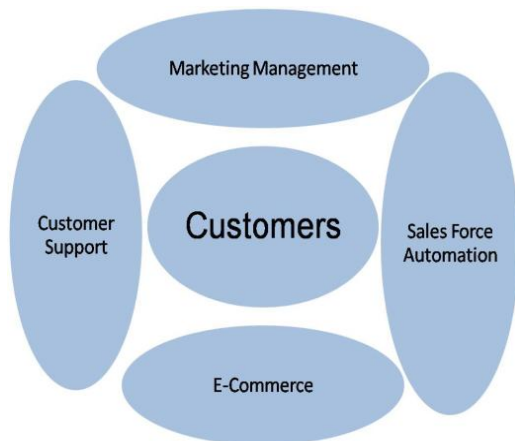

Diagram5. Customer Life Cycle

5. Benefits of Implementing N-tier Architecture in CRM (a-CRM)

Most organization invests in huge sums in defining and automating their core business process. No doubt they have benefited by standardizing the processes, yet there are several areas which remain unsolved where a-CRM can play effective role. The following benefits can be reaped by the proper implementation:

An effective a-CRM system enables a company to communicate with its customers using a single and consistent voice, regardless of the communication channel. This is because with the a-CRM software, everyone in an organization has access to the same transaction history and information about the customer. Information captured by an a-CRM system helps a company to identify the actual costs of winning and retaining the individual customers.

More effective marketing, having detailed customer information from an e-CRM system allows a company to predict the kind of products that a customer is likely to buy as well as the timing of purchases. In the short to medium term, this information helps an organization create more effective and focused marketing/sales campaigns

designed to attract the desired customer audience. a-CRM allows more targeted campaigns and tracking of campaign effectiveness. Customer data can be analysed from multiple perspectives to discover which elements of a marketing campaign ahead the greatest impact on the sales and profitability.

Automating customer data mining saves valuable human resources. Integrating customer data into single database allows marketing teams, sales forces, and other departments within a company to share information and work toward common corporate objectives using the same underling statists.

An a-CRM system provides a single repository of customer information. This enables a company to serve customer needs quickly and efficiently at all potential contact points, eliminating the customer's frustrating and time consuming process for help. a-CRM enabling technologies include search engines, lie help, multi linguistic support.

6. Conclusion

The Advanced Customer Relationship Management has evoked considerable interest about its effectiveness and risks amongst many organizations and researchers. It always remains a priority for the organizations even as economic conditions because IT budgets are to be scrutinized. This paper has show how Implementing N-Tier Architecture to traditional CRM and change trend. It is here to enhance the application CRM. This Paper mainly focuses on the technological aspects of the N-tier Architecture and Benefits of Implementing It. In addition, critical issues have been identified that companies need to consider while starting a-CRM implementation. In addition, Customer-Centric and corporate benefits of implementing the N-tier Architecture in CRM solution have been reviewed with the understating that a- CRM will only succeed when organizations make their customers win. It also offers an outstanding end to end Functionality – from lead generation to sales to support- while providing an architectural foundation unique in the industry, that add value both at installation time and for the life time of the business. Investing in an advanced CRM is a smart business decision which guarantees quick returns and future protection.

7. References

[1] F.M. Hemmer, Survey & Alignment Group Brookhaven National Laboratory, Upton, New York 11973-5000 USA.

[2] M.Thirumaran, P.Dhavachelvan and S.Subhashree, "Business Rule Management Framework for N-tier E-

Business Applications", International Journal of Managing Public sector Information & Communication Technologies(IJMPICT),Vol.1,No.1,September 2010.

[3] Bouwman, Harry, information and Communication Techology, Faculty of Technology, Policy, and Management, Delft University of Technology, PO Box 5015, 2600 GA Delft, The Netherlands, harryb@tbm.tudelft.nl.

[4] Versteeg, Gerrit, Four Points BV, Planetenbaan 114, 3606 AK Maarssen, The Netherlands, Gerrit.Versteeg@FourPoints.nl.

[5] Dru, J.M., 'Beyond Disruption: changing the Rules in Marketplace',John Wilet & Sons Inc., AdweekSeries, New York 2002.

[6] Harvey, L., (2001), Building Customer Value across the Enterprise, Patricia Seybold Group.

[7] Pan, S.l. and L:ee J.N., (2003), "Using e-CRM for a Unified View of the customer", Communications of the ACM, 46.4,pp.95-99.

[8]Technosoft.(2003).What is e-CRM? [online] Internet: http

[9] Pepe, Michele "Is there a market for hosted CRM solution?" Computer Reseller News, September 24,2010.

[10] Bednarz, Ann, "CRM Painkiller Debuts," Network World, September 24, 2011.

[11] Greenberg, P., (2002), CRM at the speed of Light: Capturing and keeping customers in Internet Real Time, New York, Mcgraw-Hill.

[12] Freeland, J. (2003), "The new CRM imperative", The ultimate CRM handbook, McGraw-Hill, New York, NY.

[13] Greenberg, P., (2001), Capturing and Keeping Customer in Internet Real Time, Mcgraw-Hill.

[14] Talisma.(2001), "Critical steps to e-CRM best Practice White Paper" [online] Internet:http://www.talisma.coim

[15] Romano, N.C. Jr., and Fjermestad, J., (2001), "Electronic Commerce Customer Relationship Management: An Assessment of research," International Journal of Electronic Commerce, 6.2, pp.61-114.

Building Data Mining Application for Customer Relationship Management

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Abstract- A customer service database usually stores two types of service information: (1) unstructured customer service reports record machine problems and its remedial actions and (2) structured data on sales, employees, and customers for day-to-day management operations. This paper investigates how to apply data mining techniques to extract knowledge from the database to support two kinds of customer service activities: decision support and machine fault diagnosis. A data mining process, based on the data mining tool DB Miner, was investigated to provide structured management data for decision support. Data warehousing implements the process to access heterogeneous data from data resources. Data mining is the process of analyzing data from different prospective and summarizing it into useful information. Data mining software is one of the numbers of analytical tools for analyzing data. Technically, data mining is the process of finding correlations or patterns among number of fields in large relational databases. Our paper focuses on need for information repositories and discovery of knowledge, working of data warehousing and data mining. The paper also focuses on how data mining can be used in conjunction with a data warehouse to help in certain types of decisions.

Keywords – Data mining, Knowledge discovery in databases, Customer service support, Decision support, Data Warehouse.

I. INTRODUCTION

The way in which companies interact with their customers has changed dramatically over the past few years. A customer's continuing business is no longer guaranteed. As a result, companies have found that they need to understand their customers better, and to quickly respond to their wants and needs. In addition, the time frame in which these responses need to be made has been shrinking. It is no longer possible to wait until the signs of customer dissatisfaction are obvious before action must be taken. To succeed, companies must be proactive and anticipate what a customer desires.

Successful companies need to react to each and every one of these demands in a timely fashion. The market will not wait for your response, and customers that you have today could vanish tomorrow. Interacting with your customers is also not as simple as it has been in the past. Customers and prospective customers want to interact on their terms, meaning that you need to look at multiple criteria when evaluating how to proceed. You will need to automate:

- The Right Offer
- To the Right Person
- At the Right Time
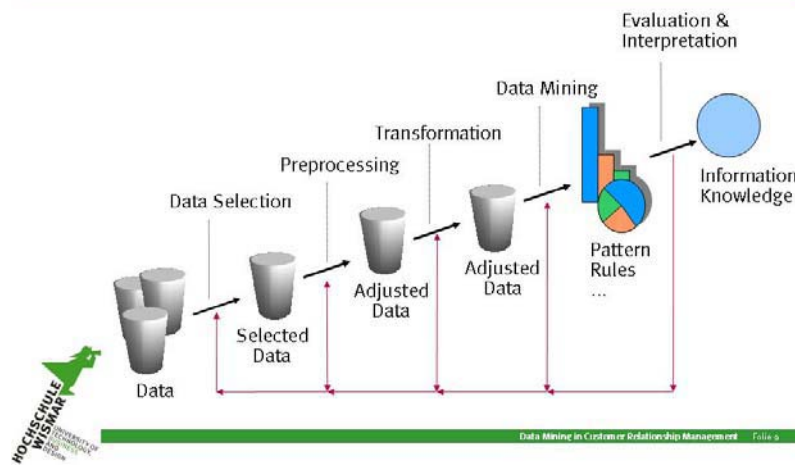- Through the Right Channel

Figure1. Data Mining Model

II. PROPOSED ALGORITHM

Apriori is a classic algorithm for frequent item set mining and association rule learning over transactional databases. It proceeds by identifying the frequent individual items in the database and extending them to larger and larger item sets as long as those item sets appear sufficiently often in the database. The frequent item sets determined by Apriori can be used to determine association rules which highlight general trends in the database: this has applications in domains such as market basket analysis.

Apriori is designed to operate on databases containing transactions (for example, collections of items bought by customers, or details of a website frequentation). Other algorithms are designed for finding association rules in data having no transactions (Winepi and Minepi), or having no timestamps (DNA sequencing). Each transaction is seen as a set of items (an *item set*). Given a threshold C, the Apriori algorithm identifies the item sets which are subsets of at least C transactions in the database.

Apriori uses a "bottom up" approach, where frequent subsets are extended one item at a time (a step known as candidate generation), and groups of candidates are tested against the data. The algorithm terminates when no further successful extensions are found.

Apriori uses breadth-first search and a Hash tree structure to count candidate item sets efficiently. It generates candidate item sets of length k from item sets of length $k-1$. Then it prunes the candidates which have an infrequent sub pattern. According to the downward closure lemma, the candidate set contains all frequent k-length item sets. After that, it scans the transaction database to determine frequent items among the candidates.

The pseudo code for the algorithm is given below for a transaction database T and a support threshold ϵ. Usual set theoretic notation is employed; though note that T is a multi set. C_k is the candidate set C for level K. Generate() algorithms is assumed to generate the candidate sets from the large item sets of the preceding level, heeding downward closure lemma. Count[c] accesses a field of a data structure that represents candidate set C, which is initially assumed to be zero. Many details are omitted below , usually the most important part of the implementation is the data structure used for storing candidate sets and counting their frequencies.

Assume that a large super markets tracks sales data by stock keeping unit(SKU) for each item , such as "butter" or "bread", is identified numerical SKU. The super market has a database of transactions where each transaction is a set of SKUs that were brought together.
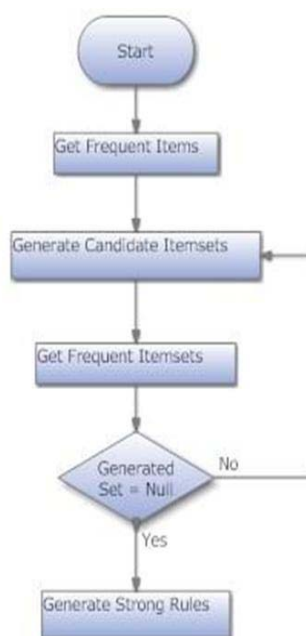
Example:

Let the database of transactions consist of the sets {1,2,3,4}, {1,2}, {2,3,4}, {2,3}, {1,2,4}, {3,4}, and {2,4}. We will use Apriori to determine the frequent item sets of this database. To do so, we will say that an item set is frequent if it appears in at least 3 transactions of the database: the value 3 is the support threshold.

The first step of Apriori is to count up the number of occurrences, called the support, of each member item separately, by scanning the database a first time. We obtain the following result

Step 1:

Item	Support
{1}	3
{2}	6
{3}	4
{4}	5

All the item sets of size 1 have a support of at least 3, so they are all frequent.

Step 2: The next step is to generate a list of all pairs of the frequent items:

Item	Support
{1,2}	3
{1,3}	1
{1,4}	2

{2,3}	3
{2,4}	4
{3,4}	3

The pairs {1, 2}, {2,3}, {2,4}, and {3,4} all meet or exceed the minimum support of 3, so they are frequent. The pairs {1,3} and {1,4} are not. Now, because {1, 3} and {1,4} are not frequent, any larger set which contains {1,3} or {1,4} cannot be frequent. In this way, we can prune sets: we will now look for frequent triples in the database, but we can already exclude all the triples that contain one of these two pairs:
Step 3:

Item	Support
{2,3,4}	2

In the example, there are no frequent triplets -- {2, 3, 4} is below the minimal threshold, and the other triplets were excluded because they were super sets of pairs that were already below the threshold.
We have thus determined the frequent sets of items in the database, and illustrated how some items were not counted because one of their subsets was already known to be below the threshold.

III. EXPERIMENT AND RESULT

For this study, the transaction of data of our organization retails smart store has been taken. Using these data, customers have been clustered using IBM Intelligent Miner tool. The first steps in the clustering process involve selecting the data set and the algorithm. There are two types of algorithms available in I-Miner Process.
    i. Demographic Clustering process
    ii. Neural Clustering process
In this exercise, the demographic Clustering process has been chosen, since it works best for the continuous data types.
The data set has all the data types are continuous. The next step in the process is to choose the basic run parameters for the process. The basic parameters available for demographic clustering process include are;
- Maximum number of clusters
- Maximum number of passes through the data
- Accuracy
- Similarity Threshold

For this assignment , maximum number of cluster is 4, maximum number of passes through the data is 3 and the accuracy is 0.5 has been chosen. The input parameters for the customer's clustering are;
1. Recency
2. Totally customer profit
3. Total customer revenue
4. Top revenue department

The top revenue department variable has been chosen as supplementary variable and rest of the variables have been chosen as active variables. The supplementary are used to profile the clusters and not to define them. The ability to add supplementary variables at the outset of clustering is a very useful feature of intelligent Miner that allows easy interpretation of clusters using data other than the input variables. The input and the output fields width are defined and the input data in mining is the production data of our organization retail smart store. The data is first extracted from the oracle databases and flat files and converted into flat files. Subsequently the I Miner process picks up the file and processed. The entire output dataset would have customer information appended to the end of each record. The clusters are ordered from top to bottom in order of size with a number of penalty made left indicate the size of a cluster as a percentage of the universe.

IV.CONCLUSION

Customer relationship management is a technology that manages the relationship with customer in order to improve the performance of business. In CRM, the customer identification is the important phase because it involves segmenting customers and analyzing their behavior for further customer attraction , retention and development. In this clustering technique data mining has used for customer segmentation and rule induction is used for describing customer behavior in each segment.Business people employ different benefits schemas for customer in different clusters and segments. So classifying a customer to the cluster plays an important role in CRM . For a good rule induction algorithm, the customers behavior in each cluster should be correctly characterized so that the new customer are predicted to the appropriate cluster.

REFERENCES

[1]   Pieter Adriaans,Dolf Zantinge,(2011),Data Mining,Pearson Education Ltd,Sixth Impression,2011.
[2]   Migueis,V.l.Camanho,A.S.Joao Falcao e Cunha (2012),Customer Data Mining for LifeStyle   Segmentation,Expert Systems eith applications,Vol.39.3959-9366.
[3]   Knowledge Management In CRM using Data Mining Tchniques,Sunil yadav,Aaditya Desai,Vandana Yadav,International Journal Of Scientific & Engineering Research, Volume 4,Issue &, July-2013.
[4]   The Effect Of Clustering in Apriori Data Mining Algorithm : A Case Study, Nergis Yilmaz and Gulfem Isiklar Alptekin, Proceedings of the World Congress on Engineering 2013 Vol III,WCE 2013,July 3-5,2013,London,U.K.
[5]   Data Mining: An Overview from a Database Perspective Ming-Syan Chen,Senior Member,IEEE,Jiawei Han,Senior Member,IEEE,andPhilip S. Yu,Fellow,IEEE, IEEE transaction On Knowledge And Data Engineering,Vol.8,No.8,No. 6,December 1996 .
[6]   Mining Changes in customer behaviour in retail marketing,Mu-Chen Chen,Ai-Lun Chiu,Hsu-Hwa Chang,Expert System with Applications 28,(2005), 773-781.
[7]   Data Mining By Heidi Kuzma And Sheila Vaidya.
[8]   Margaret H. Dunham, "Data Mining Techniques And Algorithms,", Aug.23,2000.
[9]   "Business Intelligence at Data Mining Techniques,"
[10] Richard Barker, "Managing Data Warehouse", Oct.2003.
[11] Berson, A., S. Smith, K. Thearling, "Building Data Mining Applications for CRM," McGraw- Hill, New York, 2000.
[12] Han, J. and M. Kamber, "Data Mining: Concepts and Techniques," Morgan Kaufmann, San Francisco, 2000.
[13] M. S. Chen, J. Han, and P. S. Yu. "Data mining: An overview from a database Perspective," IEEE Trans. Knowledge and Data Engineering, 8:866-883, 1996.
[14] U. M. Fayyad, G. Piatetsky-Shapiro, P. Smyth, and R. Uthurusamy, "Advances in Knowledge Discovery and Data Mining," AAAI/MIT Press, 1996.
[15] Two Crows Corporation, "Introduction to Data Mining and Knowledge Discovery," Third Edition (Potomac, MD: Two Crows Corporation, 1999), p. 4.
[16] George Cahlink, "Data Mining Taps the Trends," Government Executive Magazine, October 1, 2000, http://www.govexec.com/tech/articles/1000managetech.htm.