



Algorithm for Cloud Based Integration of CRM, BPM & DM for SME's

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Abstract—The enterprises have developed automated systems to optimize the Software Development Life Cycle (SDLC) and hence it makes software development fast. The Sales-force CRM is one of the big proprietary vendors which provide CRM software. Sugar-CRM provides open-source CRM software. It has integrated with Process-maker -BPM to make its process automated. Data Mining tools have integrated with CRM systems to find and extract hidden customer information from large databases of CRM. CRM has deployed on Cloud, which reduces CapEx (capital expenditure), provides on-demand services that are always on, anywhere, anytime, anyplace on any device and IT-Technology independent as well. The purpose of this paper is to developed an algorithm for the application “CBCBD” (Cloud Based Integration of CRM systems with BPM and DM techniques for SMEs), that provides a centralized place to SMEs and users from where they can select CRM, BPM or integrated CRM-BPM-DM systems in a cloud.

Keywords— Customer Relationship Management(CRM), Business Process Management(BPM), Data Mining Technique(DM), Cloud Computing, Small & Medium Enterprises(SME)

I. INTRODUCTION

Cloud computing is a computing that provides virtualization, scalable, elastic IT-related capabilities, distributed computing, networking, software, shared resources and knowledge etc., as a pay-per-use basis to external customers by the use of internet. Cloud computing includes fault tolerance, high scalability, availability, flexibility, improved the creation and delivery of IT solutions, [20] also reduced overhead for users.[1] **CRM** could be a system that manages all of a company's relationships and interactions with its customers, and provides it one read of the consumer across the organization. This centralized and integrated arrangement reduces prices, efforts, and frustrations related to the repetitive handling of information from totally different systems. It additionally [19] will increase revenues through higher sales and promoting performances. **BPM** could be a disciplined approach to spot, design, execute, document, monitor, and live each machine-controlled and non-automated business processes to realize consistent, targeted operational results that align resources to associate degree organization's strategic goals [21]. **DM** software is one amongst variety of analytical tools for analyzing knowledge. It permits users to research knowledge from many alternative dimensions or angles, reason it, and summarize the relationships known.

On integrating the CRM systems with Data mining tools and BPM system, developers can extract the valuable customers and make its process automated respectively. CRM has deployed on cloud, so that each user can access at any time from any place. In this research paper an algorithm for the application “CBCBD” (Cloud Based Integration of CRM systems with BPM and DM techniques for SMEs) is presented, that provides a centralized place to SMEs and users from where they can select CRM, BPM or integrated CRM-BPM-DM systems in a cloud [1].

II. LITERATURE SURVEY

The need for the development of application “CBCBD” (Cloud Based Integration of CRM systems with BPM and DM

Technique for SMEs) has been suggested by the literature.[18]

In 2010 the authors Armbrust et al. establish the data-centre code and hardware to decision a Cloud. The personal Cloud refers to internal datacenters of a business or alternative organization not created out there to the final public. Cloud Computing is that the add of SaaS and Utility Computing, however it doesn't embrace personal Clouds. The authors similarly perceive cloud computing as a collective term, covering the pre-existent computing ideas like SaaS and utility computing.[10] Prantosh kumar proposed in 2012 in research that the cloud computing has prospects, challenges and opportunities with special relation to its rising want within the tutorial and dealing space of knowledge Science. Dimitrios Lekkas et.al. published in 2010 that the recent emergence of cloud computing has drastically altered everyone's perception of infrastructure architectures, code delivery and development models[17]

Anca Apostu et.al established in 2012 that Cloud computing represents an enormous amendment within the manner computing is completed in companies. Hasan Darvish et.al proposed in 2012 that within the last decade, the ever increasing pressure of competition featured by businesses has diode to the event of CRM. They proposed that CRM implementation has three strategic, three structure and two cultural problems.[3]

Chin Shan proposed in a research “Customer Relationship Management Associated Firm Performance: An Empirical Study of Freight Forwarder Services” in 2012 that CRM used for trial and examined its impacts on firm performance within the context of freight forwarder services.[5],[13] Evert F. Duipmans et.al established a research paper “Towards a BPM Cloud design with knowledge and Activity Distribution”. He has given the analysis work on distribution [16] resolution during which a business process is separated into individual business processes to be dead within the cloud and on-premise.[6] Hubert Baumeister proposed in research “Customer Relationship Management for SME’s” the advantages of CRM for SME’s and their special needs to CRM software and limitations for SME during the implementation.[7]

Sunil Yadav, Aaditya Desai, Vandana Yadav proposed in 2013 within the research “Knowledge Management in CRM mistreatment data mining Technique” that in today’s competitive business world client may be a important quality to an enterprise and DM helps in extracting valuable customers[1],[12].

Kam Tin Seong, Aditya Hridaya Misra projected in 2013 in research “Be client Wise or Otherwise: Combining data processing and interactive visual analytics to research massive [15] and sophisticated customer resource management (CRM) information” that the analysis of client data of a supplying company is very important to improve sales and profits[2].

P. Sravanthi and M. Madhavi projected in 2012 that nowadays, client orientation has been one amongst the foremost issues of economic firms.[4]

III. PROBLEM STATEMENT

This research approaches some problems that exist now-a-days in the integration of cloud based applications. There is no any procedure and algorithm is defined for the Cloud based integration of CRM systems with Data-Mining technique and BPM for SMEs.

IV. PROPOSED ALGORITHM

The application “CBCBD” is developed which provides cloud based integration of CRM systems with Apriori algorithm and BPM systems for small and medium enterprises and users. This application provides process flow management, extract information of hidden valuable customers and enable each user to use this application from everywhere and anytime.

A. Flowcharts of all Modules in CBCBD application

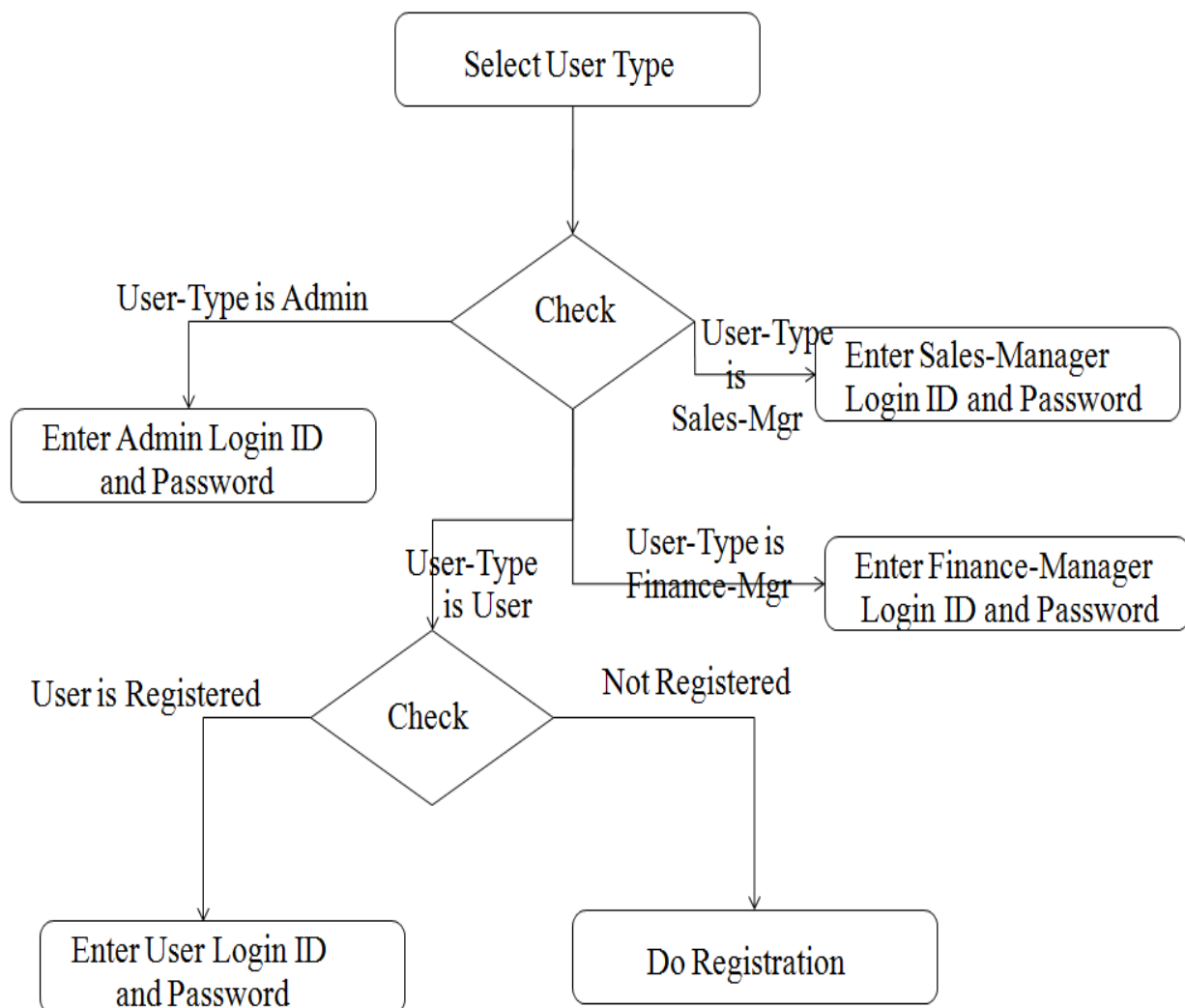


Fig. 1 Flowchart of Login Module

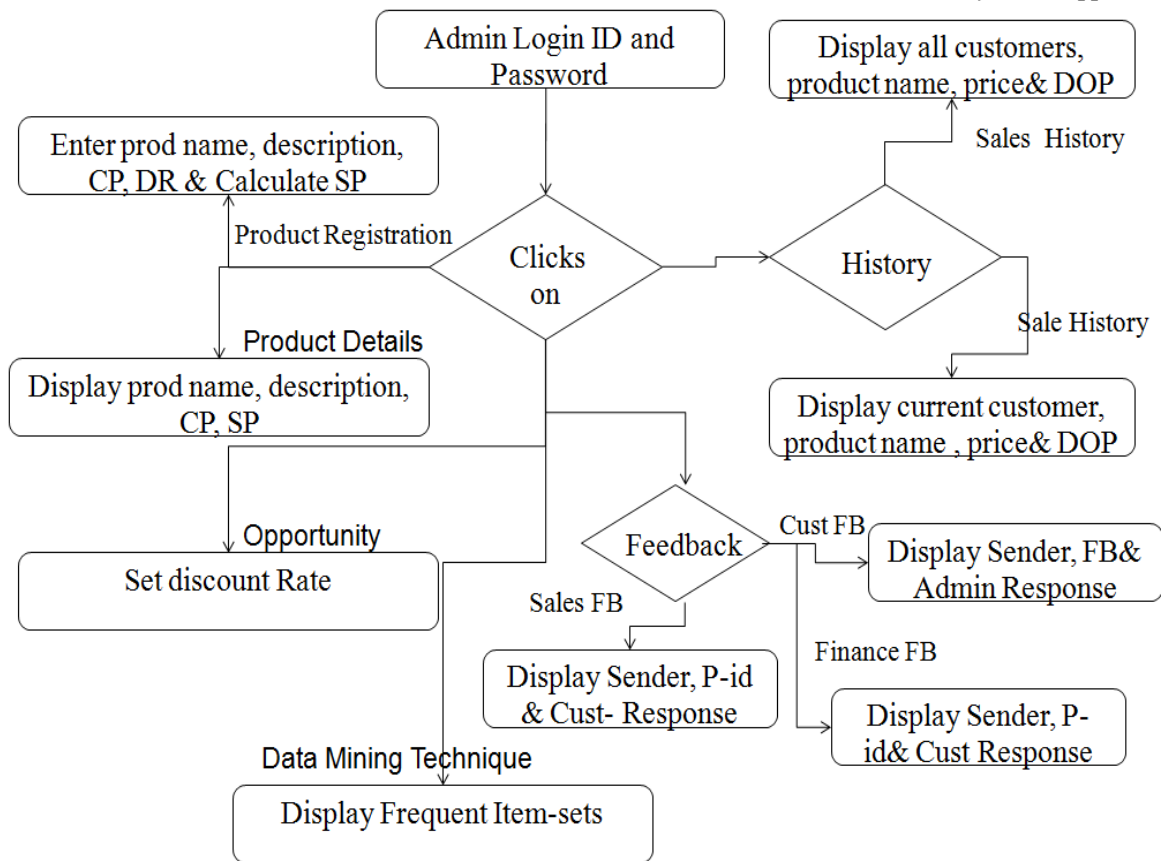


Fig. 2 Flowchart of Admin Rights in CRM Module

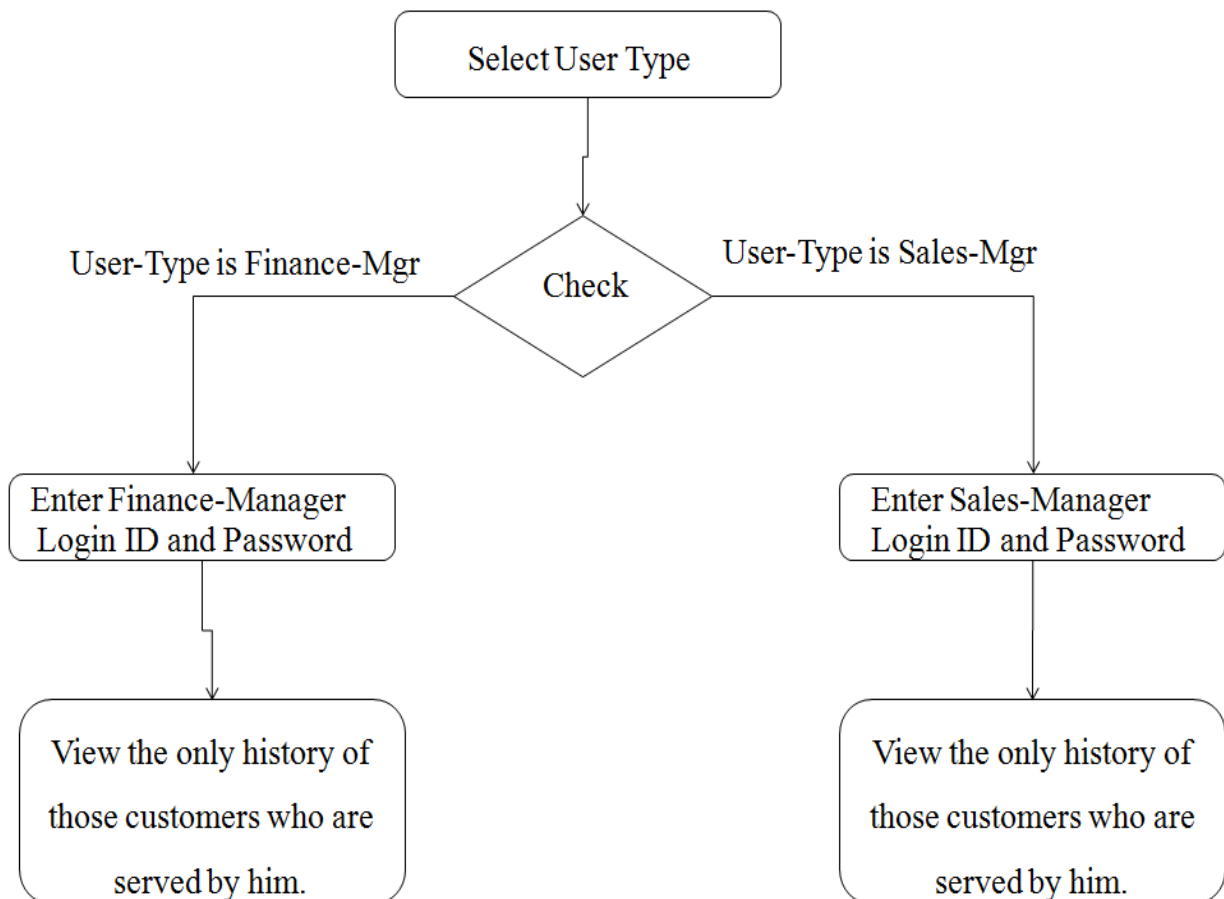


Fig. 3 Flowchart of Finance & Sales MGR Rights in CRM Module

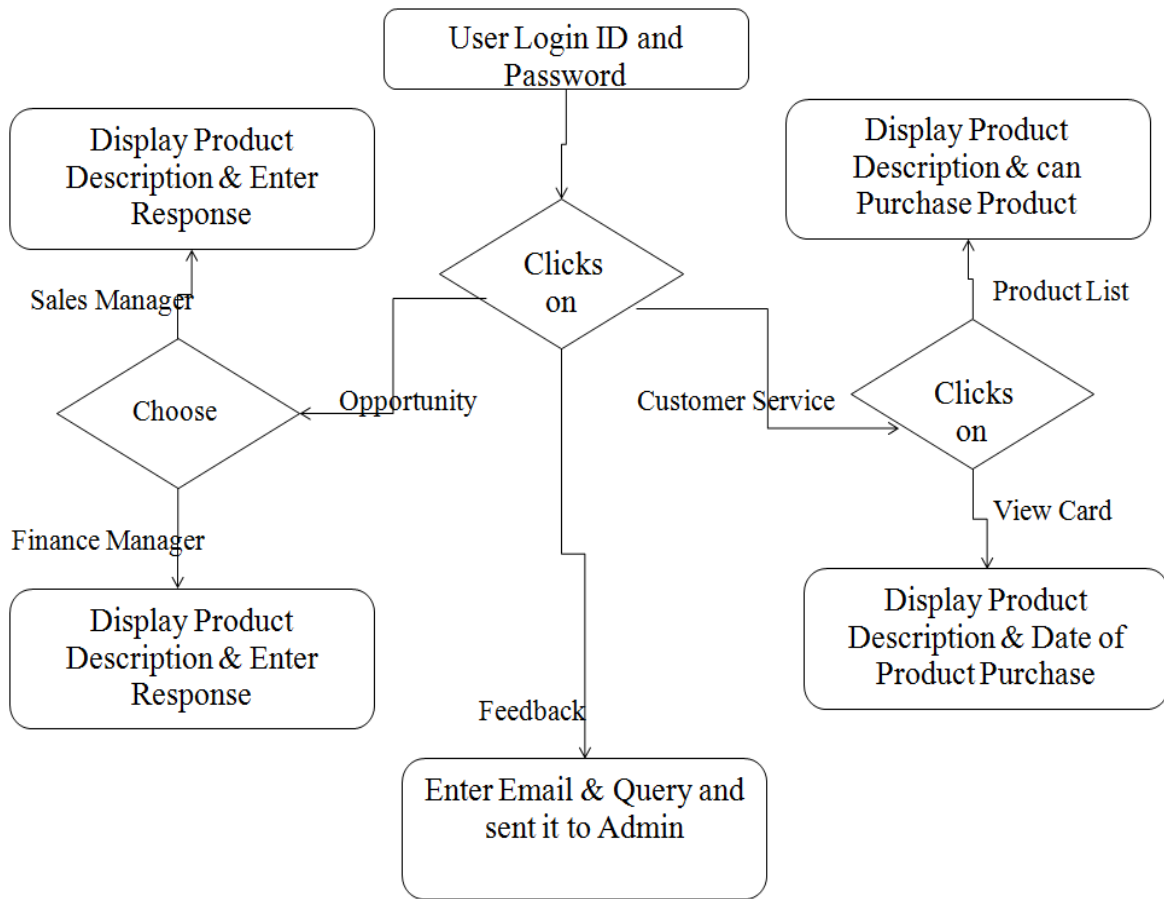


Fig. 4 Flowchart of User in CRM Module

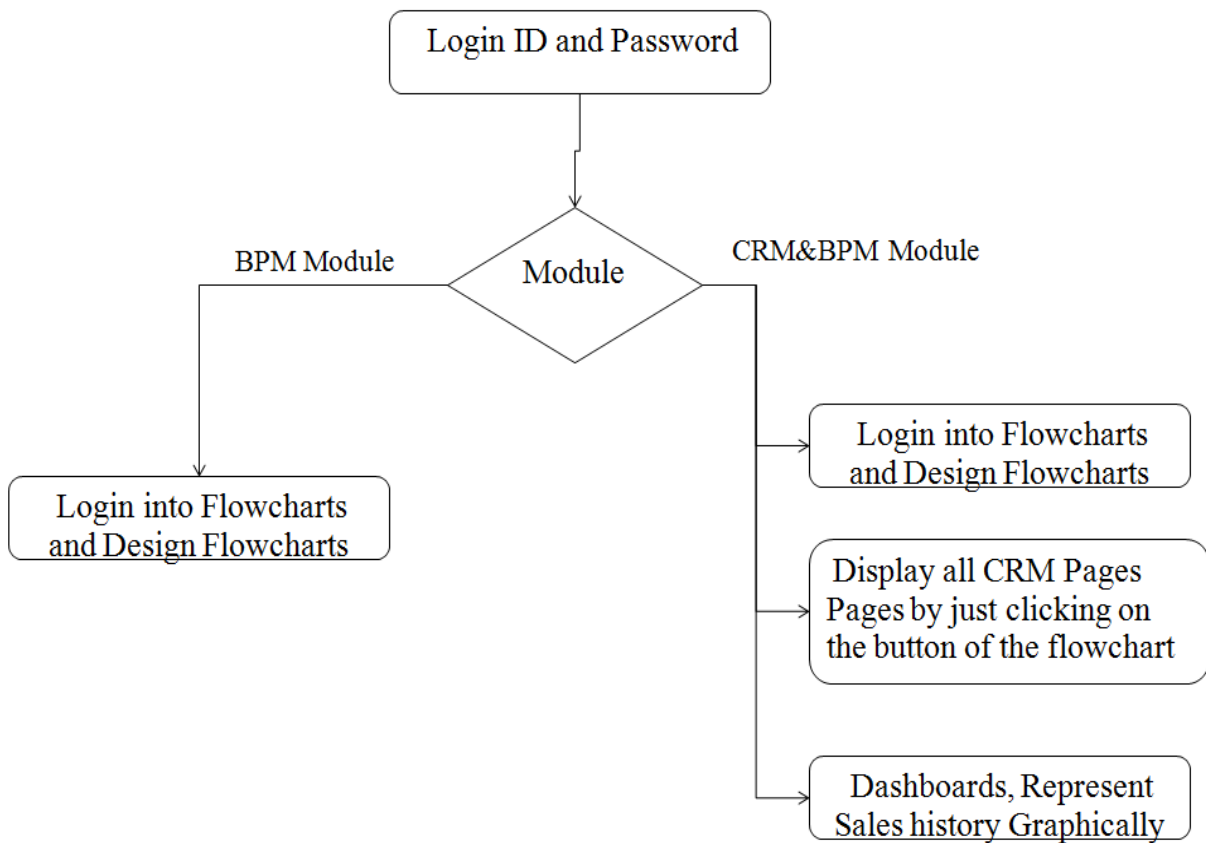


Fig. 5 Flowchart of BPM and CRM-BPM Module

B. Algorithm for CBCBD Application

1. Login Module

Step 1. If user-type = "Admin"
Then enter Login ID and Password

Step 2. If user-type = "Sales Manager"
Then enter Login ID and Password

Step 3. If user-type = "Finance Manager"
Then enter Login ID and Password

Step 4. If user-type = "User"
Then
If user is registered
Then enter Login ID and Password
Else do registration
Enter name, email, password, address and phone
Then after successful registration enter Login ID and Password

2. CRM Module

Step 1. If user-type = "Admin"

Step 2. For Product Registration
Enter "product name and description" and it should be contains only alphabetic characters (a to z and A to Z)
Enter "cost-price and discount rate"
If cost-price and discount rate is not null
Then
Calculate sales-price = (cost-price - (cost-price * discount rate)) /100

Step 3. For Product Details
// This will show a list of all available products with their prices
Print S.no., Name of Product, Description, cost price and sales price

Step 4. Sales History
// For Current History
Print name of current customer, product name , price and date of purchase
// For all sold product History
Print name of all customers, product name, price and date of purchase

Step 5. Feedback
// Customer Feedback
Print sender name, feedback and response from ADMIN
// Sales Feedback
Print sender name, product id and customer response
// Financial Feedback
Print sender name, product id and customer response

Step 6. Opportunity
// Provides set the discount rate
If action = edit
Then
Go to "Product Registration"

Step 7. Apriori Algorithm
 C_k : Candidate item set of size k
 L_k : frequent item set of size k
 $L_1 = \{\text{frequent items}\};$
For (k = 1; $L_k \neq \text{NULL}$; k++) do begin
 C_{k+1} = candidates generated from L_k ;
for each transaction t in database do
Increment the count of all candidates in C_{k+1}
that are contained in t
 L_{k+1} = candidates in C_{k+1} with min-support
End
Return $\bigcup_K L_k$;
End

1: self-joining L_{k-1}
Insert into C_k
Select p.item₁, p.item₂, ..., p.item_{k-1}, q.item_{k-1}
from L_{k-1} p, L_{k-1} q
Where p.item₁=q.item₁, ..., P.Item_{k-2}=q.Item_{k-2},
P.Item_{k-1} < q.Item_{k-1}

2: pruning

For all item sets c in C_k do
 For all $(k-1)$ -subsets s of c do
 If $(s$ is not in $L_{k-1})$ then delete c from C_k
 Step 8: if user-type = "Sales Manager"
 Then sales manager can view the only history of those customers who are served by him.
 Step 9: if user-type = "Finance Manager"
 Then finance manager can view the only history of those customers who are served by him.
 Step 10: if user-type = "user"
 Step 11: For Opportunity
 If the user selects sales manager
 Then
 Print s.no, product name, price, discount and discount price
 Enter response
 If the user selects Finance manager
 Then
 Print s.no, product name, price, discount and discount price
 Enter response

Step 12: For Service
 Step 12 (a) if user selects "product list"
 Then
 Print product name, description, cost price and sales price
 If user wants to purchase the product
 Then
 Click on add to list
 Step 12 (b) if user selects "View Card"
 Then
 Print s.no, product name, description, cost price, sales price and date of purchase
 Step 13: For Feedback
 If user wants to give feedback
 Then
 Enter email and query
 And send it to admin.

3. BPM Module

Step 1: For Flowchart
 If any user wants to design flowchart
 Then
 Login into flowchart and design flowcharts

4. CRM+BPM Module

Step 1: For Flowchart
 Login in to chat
 If login done successfully
 Then
 Show all the CRM Pages by just clicking on the button of the flowchart in BPM
 Step 2 : For Dashboard
 The dashboard will show the sales history graphically.

V. RESULTS

The application "CBCBD" provides its sales history on dashboard and has improved efficiency, performance, productivity, customer retention, customer satisfaction rate and profit of SMEs.

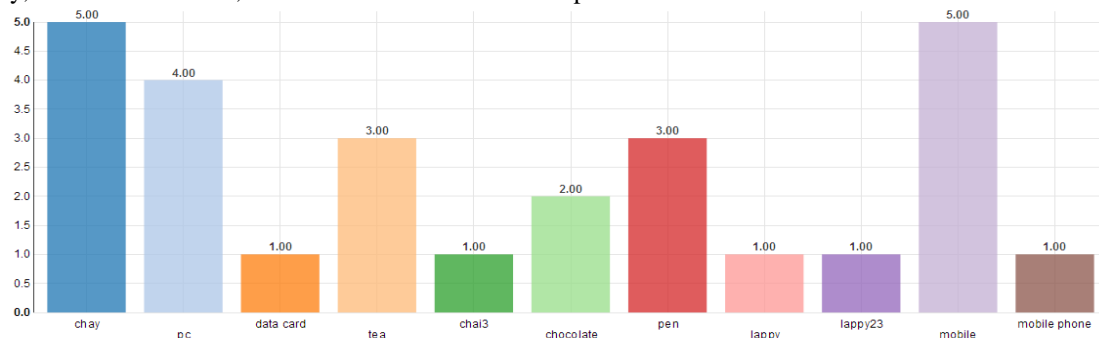


Fig. 6 Dashboard of Application

VI. CONCLUSION & FUTURE WORK

The objective of this research was to develop an application that can provide SMEs and users, a centralized place from where they can select CRM, BPM or CRM-BPM-DM on Cloud. During the research study, there was an effort to fulfil above objective by developing “Cloud Based Integration of CRM systems with BPM and DM techniques for SMEs”.

Integration of CRM systems with Apriori Algorithm and BPM Systems has increased the sale of products which give higher benefit to SMEs and users. This integrated application has thus resulted into improved efficiency, performance, productivity, customer retention, customer satisfaction rate and profit of SMEs.

Some of the limitations are also required to be resolved in the future. This proposed system “cloud based integration of CRM system with BPM and DM Technique” can be applied for fuzzy logic and neural networks. Customizations can be applied at BPM&CRM level. BPM has many features like Rules Engine, Knowledge Management, Collaborative Tools, Document Management, so all these features can be used in the CRM systems at the time of BPM integration. To make communication easier with another system, the web-service can be designed for “CBCBD”. Today as market demand of mobile applications are increasing, so to run an application in mobile environment or on mobile devices, development of new features is required.

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