Sales QR billing, analytics and prediction

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Abstract: The current billing system at customer location uses RFID tags on which the billing data is stored and scanned at the billing counter for final bill amount. This system is complicated to use and requires the workers to take special training in order to use it correctly. The data is overwritten every time the RFID cards are reused, thus there was no way for data storing and thus no analysis can be done for improvement of the sales. Moreover there is no system which records and keeps a track of available quantity of the product. The system that we are proposing is QR based billing System. In this system users will be given a QR token which they can use to load items on it. The data will be scanned from the item QR code and will be written in the user's QR token. This token will be scanned at the bill counter and bill will be generated which will contain all the information related to the purchase. This system is connected to a centralised database and the billing history is updated in real time. Thus we are able to do the analysis of the data and we can pull out the records of any day at any time for further prediction or profit maximization.

KEYWORDS: QR generation, invoice, data analytics, data mining.

I. INTRODUCTION

Billing system if implemented strategically and the data managed with equal dedication can be very helpful of market basket analysis, sales report generation, profit margin and growth visualization and predictions. Also utilizing different approach for Invoice generation can result in efficient usage of time with minimizing usage of paper. Especially, in times like today where even payment methods have reached our phone.

Data analysis is the process of analyzing raw data in order to discover useful. Analysis refers to breaking a whole into its separate components for individual examination. Data analysis is a process for obtaining raw data and converting it into information useful for decision-making by users. Data is collected and analyzed to answer questions, test hypotheses or disprove theories. Data analytics techniques can reveal information and metrics that would otherwise be lost in the mass of information. This information can then be used to optimize processes to increase the overall throughput of a business.

The system that is currently used at real time shop is RFID based billing system. The drawback is that every time the data on the RF cards is rewritten and it is not easy to use hence employees need to take special training in order to use the system. A Q.R based billing system would provide a sophisticated way of combining the information of sale and as well as customer which can be correlated in the database. This data can be then used to predict the future requirement of the products.

II. LITERATURE SURVEY

In the paper "Design and Implementation of Firewall Integrated Distributed Billing System" by Zhaolong and W. Ling, they have implemented a Firewall Integrated Billing System where the billing system is deployed on a specialized VLAN. This system has a Billing-Firewall gateway, which manages the requests and avoids bottleneck. Each gateway will manage separate billing entry. By applying such distributed pattern, the load is divided. This system increases throughput but has an adverse effect on the speed.

In the paper "Shopping cart with automatic billing system through RFID and ZigBee" by P. Chandrasekar and T. Sangeetha, they have made specialized carts which can scan items in them and sent to the main computer and the bill is computed dynamically. Since invoices are calculated dynamically, time of billing is saved. This is more evident in the case where a customer buys a lot of items. But a drawback is that not all items are scanned.

In the paper "Using data mining technique to improve billing system performance in semiconductor industry" by Y. Chen, Y. Chang, Y. Kan, R. S. Chen and S. F. Wu a very similar module to ours exist. They scan their historic data for future predictions. They have used decision tree algorithm for mining process. This implementation has decreased their billing time from 36 minutes to 2.7 minutes at a cost of 2% decrease only in the billing rate. They have used ETL tools for data collection and pre-processing and OLAP operations for visualization. They have successfully increased profits. But still, the correctness of predictions is completely depended on data.

In the paper "Method and System to process payment using url shortening / QR codes" by Douglas Schoenberg, Villanova, PA (US); Jon Biedermann, Doylestown, PA (US); Joshua Gardner, Hatboro, PA (US); Ronald D. Leatherman, Abington, PA (US), their approach is to use a QR code in particular that eliminates the need for a payer to type in a URL or shortened URL and speeds form access from mobile devices.

III. DISCUSSION

The above literature survey has given us an insight to design and implement our own system which has a lot of similar technologies like QR, Data Mining, Analysis and Warehousing. The design of our system can b represented as,

A. System Flow:-

First motto of our design is to reduce the usage of paper in invoice generation and QRs and make the implementation eco friendly. To make that possible, each customer is given a unique QR which makes him eligible for purchasing. All the items bought by the customer will be linked to that unique QR which when scanned at the billing section will present all the purchase data of that customer.
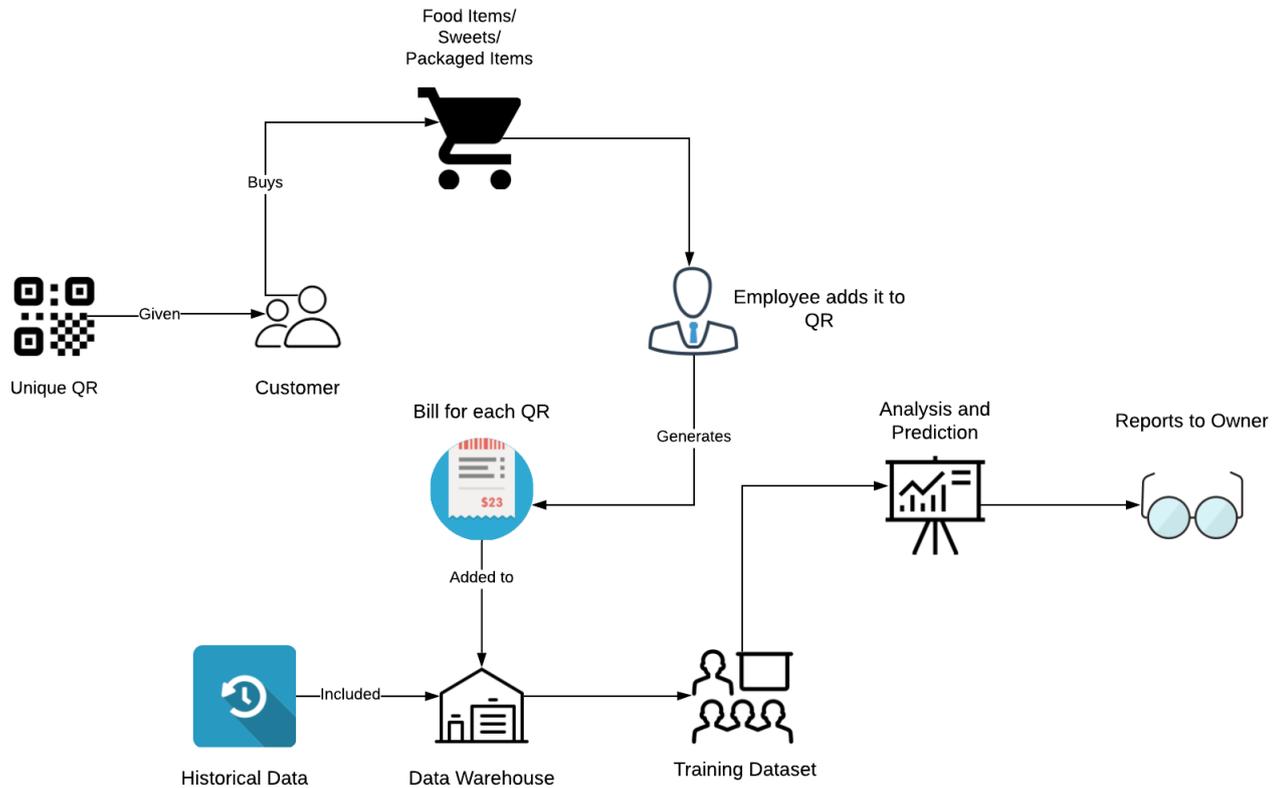
B. Dataset:-

As we are dealing with a huge data here, we must have a way to organize it in order to extract the best out of it. Since we are dealing with a large volume of historical data as well, we must have a structure that will not only help us to add more data in it, but also will be perfect for analysis and prediction. The following Entity-Relationship diagram is made to support this and give us a greater insight.
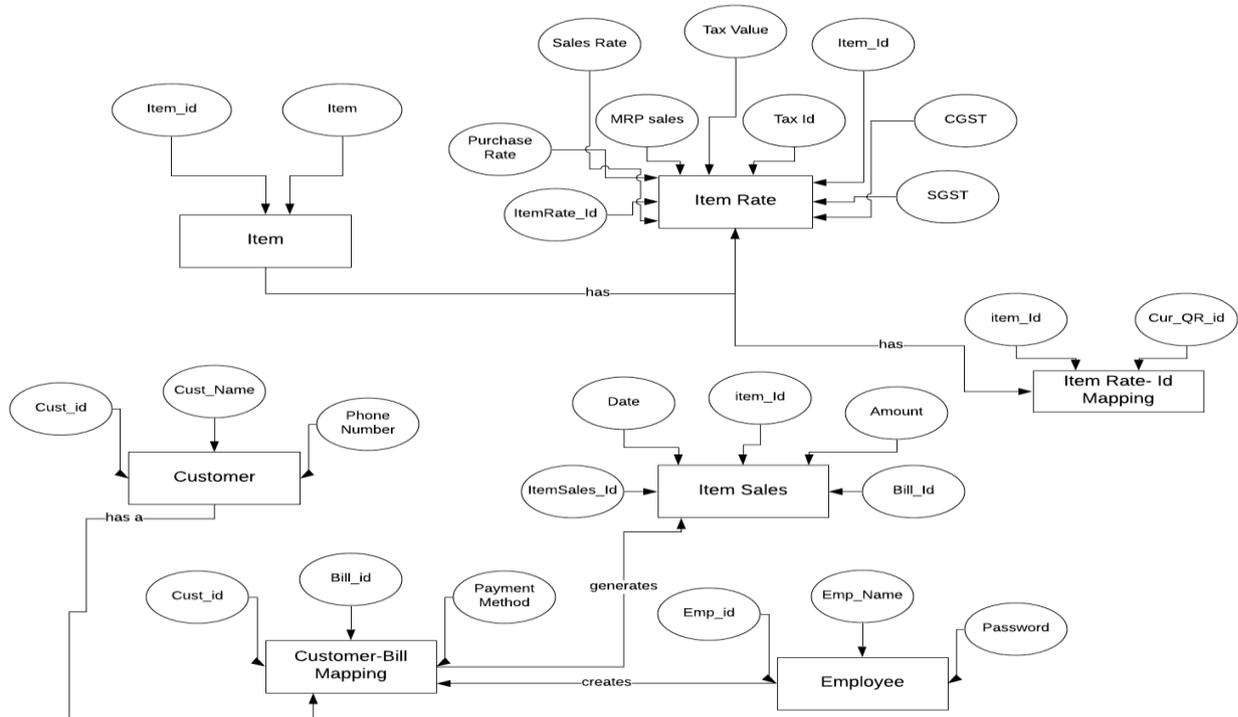
C. Use Case Diagram

We must understand what all users are going to be a part of the system, what are their roles and responsibilities and with what components are they going to interact. In what way their actions will affect the system. In order to understand that we must design a use case diagram that will involve all these actors in it.
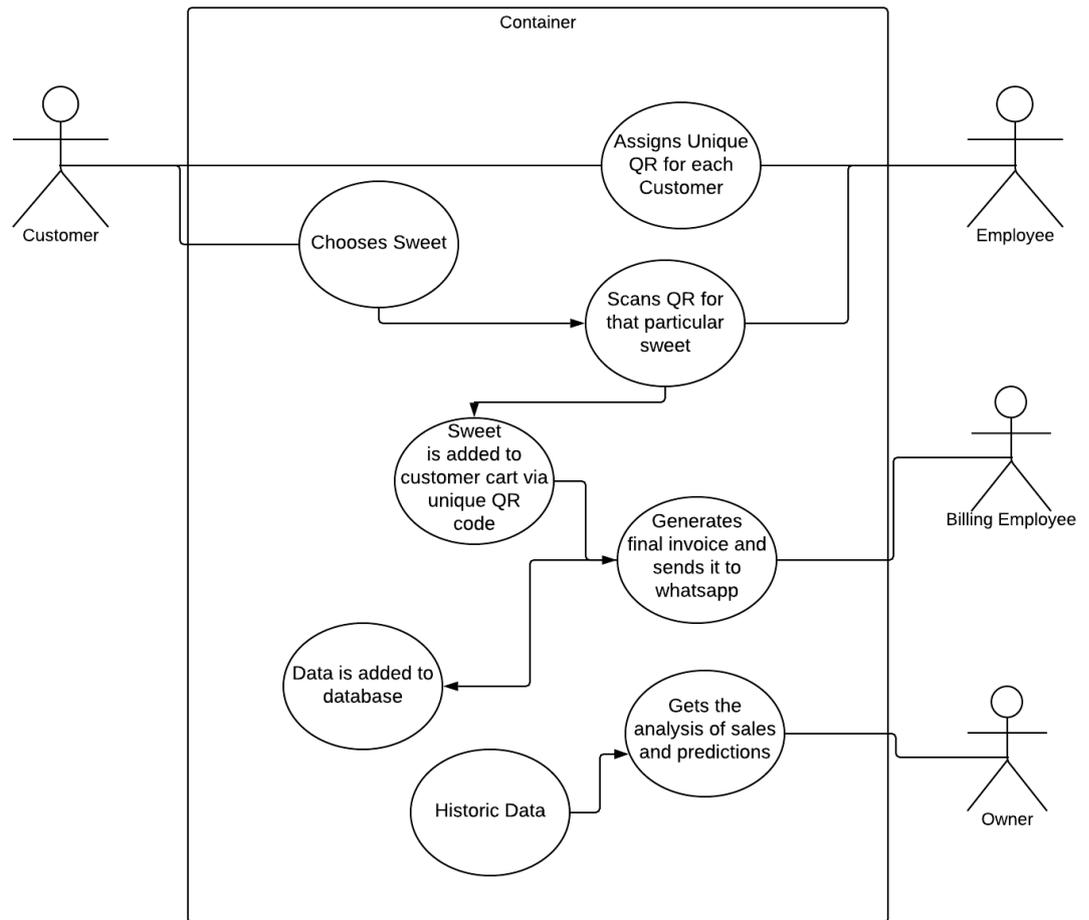
D. Activity Diagram

Along with these, we must understand the flow of the system for which we need an activity diagram. Similar to use case diagram, it will also focus on the users of these programs and the flow and control of program based on their actions and decisions.
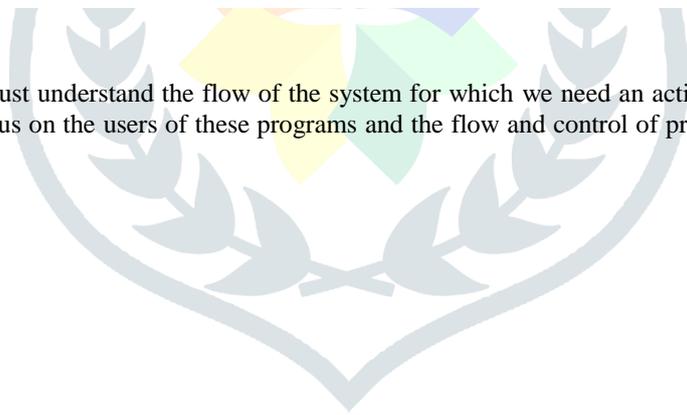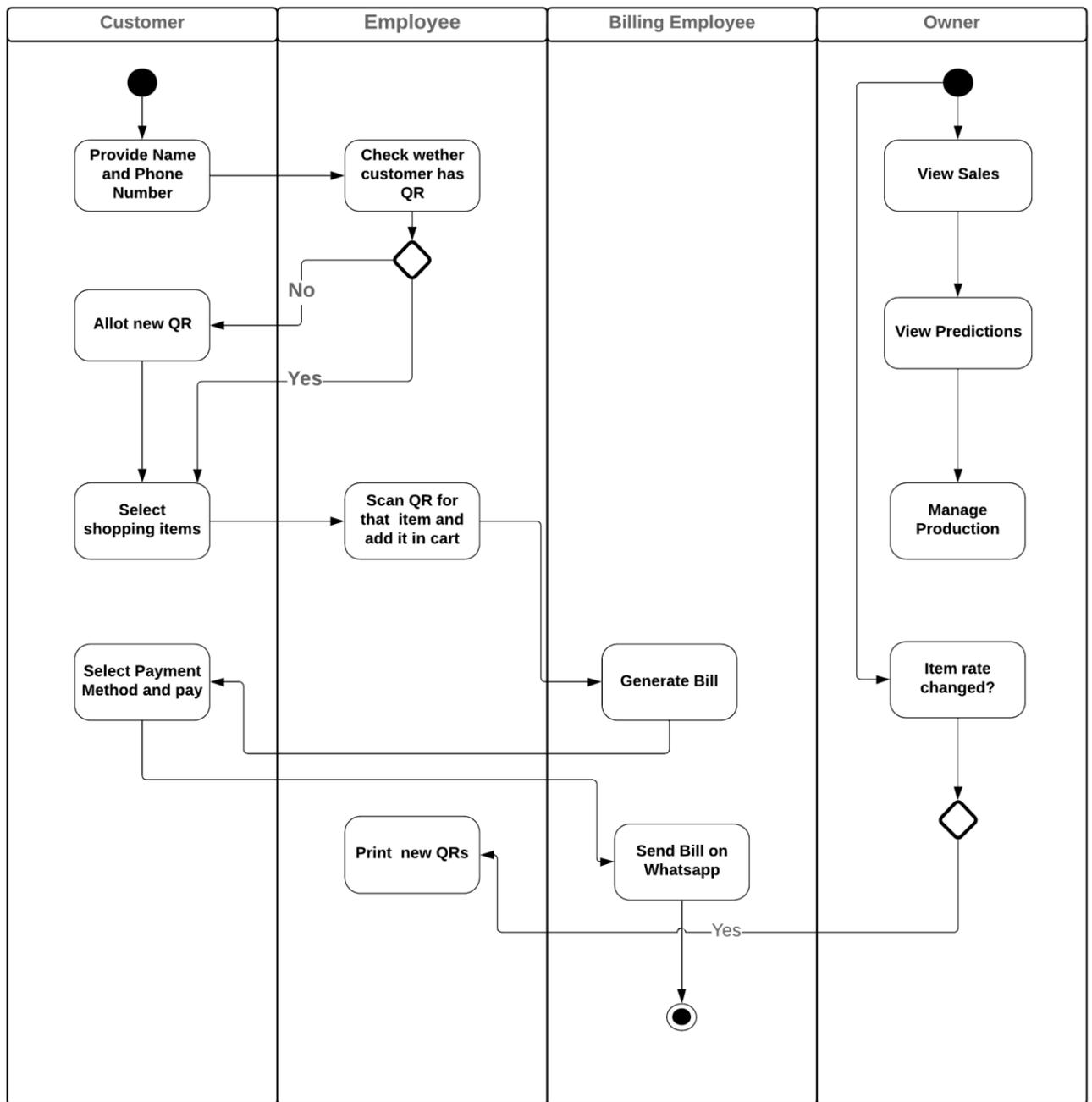
E. Class Diagram

After understanding the basic design of the system, in order to implement it we must decide what all classes are going to be a part of the system. Along with that, we must what each class will do and what variables will be a part of it.

Cart

+qr_Id: Varchar
-cust_Id: Integer
+cust_Name: Varchar
+cart_Number: Integer
+item_Qr: Varchar
+listOfItems: ArrayList<ItemList>
+cartPrice: Integer
+cartWeight: Integer
+itemName: Varchar
-item_Id: Integer

+ addItemInCart(item_Id):ItemList
- deleteItem(item_Id)
- clearItem()

Analysis

+start_Date: Integer
+end_Date: Integer

+getPrediction(start_date, end_date)
+getSales(start_date, end_date)

Login

+user_id : varchar
-password : varchar

- getUserInfo(user_id, password): Boolean
+ login(user_id)

Analysis

+qr_Id: Varchar
-cust_Name: Varchar
-cust_phone: Integer
+whatsapp_avail: Boolean

+send_Bill_Pdf(cust_phone): Boolean

Customer

+qr_Id: Varchar
- customer_Id: Integer
+customer_Name : Varchar
- customer_Phone: Integer

+ add_Customer()
- delete_Customer(cust_Id)
- update(cust_Id)

ItemList

- item_Id: Integer
+item_Price: Integer
+item_Name:Varchar

- add_New_Item()

Bill

+ bill_Id: Integer
+ bill_Item: ArrayList <ItemList>
+ bill_Amnt: Integer
+tax_Val: Integer
+ cust_Id: Integer
+ cust_Name: Varchar
+ cust_Phone: Integer
+ payment_Method: Varchar

+generate Bill()
-save_In_Database()

Based on the above design we have divided the system into 4 parts. These are,
- ❑ Generation of QR code
  - – *Customer*
  - – *items*
- ❑ WhatsApp API
  - – *Bill and Offer*
- ❑ Analysis
  - – *Customer(Loyal)*
  - – *Item Analysis(Festive Season)*
- ❑ Real Time Dataset
  - – *From Chitale(Client Franchises) Outlets*
  - – *Synthetic Dataset*

The generation of QR can be done by the python library called "pyqrcode". It can encode the data and save the QR code in a PNG format. This PNG image can be used to paste on the bill, give to the user for scanning later at billing center and also if deployed on a large scale, can be made into cards like a credit card which the customers can bring along after they some to purchasing.

The use of Whatsapp business API is imminent to send bills on the customer's whatsapp account instead of printing a bill which will save paper and make this project environment friendly.

The analysis part will contain,
- ❑ Classification
  - – *Customer classification (frequent and rare)*
  - – *Naïve Bayes Algorithm can be used.*
- ❑ Clustering
  - – *Maximum and minimum purchased items*
  - – *K Means Algorithm is used.*
- ❑ Association Rule Mining
  - – *For frequent item set.*
  - – *FP Growth can be used.*

- ❑ Generating Cubes based on: (Partial Materialization)
  - – *Daily Sales*
  - – *Monthly Sales*

- *Yearly Sales*
- *Item cubes*

Also, the prediction should not only be done on the basis of English calendar but also on Marathi calendar system, since the sales of the client that is "Chitale Bandhu" is very much depended on it.

IV. CONCLUSION

This is a centralized billing system where with QR codes scanning entire bill of a customer will be generated at billing center. A digital copy of bill will be sent to customer .The application also uses study of data warehousing to figure out loyal customers and supply them good offers via messaging. Along with this well study of frequent item sets using association rule mining and real-time online analysis of daily, monthly and yearly sales along with sales during festive seasons.

The future scope of this project can be declared as,

- To increase the throughput in case of large scale implementation.
- To extend the application to work on android devices to make the application more handy and easy to use for employees.

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