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Design and Implementation of an Automated Customer Relationship Management System

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Abstract – **This paper proposes an automated customer relationship management system (CRM) to help maintain a good relation with customers. CRM can help any organization to survive and grow in a competitive market. It helps to know and treat each customer uniquely and effectively, resulting in a long-term fruitful relation with customer. This requires knowing the preferences of the individual customer. Making a successful CRM is very challenging as information about customer's preferences and behavior often difficult to obtain. In this paper we implemented a CRM system that can automatically communicate with present and future customers based on the information it has in its database. Making a database with the latest information about customer's trends and choice is crucial. This includes collecting data from various sources and then analyzing the data. Using modern computing techniques like data mining and web analytics, customer's likes, preferences, behavior can be discovered. This information can be used to effectively communicate with the customers and it can help management decision making. The methodology was implemented in this CRM system and found that it was very helpful in maintaining a good customer relation.**

Keywords – **Customer interaction, Customer Relationship Management, Data mining, Web analytics, Management decision making**

I. INTRODUCTION

Customer Relationship Management (CRM) [1] is a strategy for managing a company's relationships and interactions with its customers and potential customers. It helps to improve profitability. By CRM, we mean E-Customer Relationship Management (eCRM) that is based on Internet and software technologies. CRM enables a company to focus on its organization's relationships with individual people – whether those are customers, service users, colleagues or suppliers. Some of the biggest gains in productivity can come from moving beyond CRM as a sales and marketing tool and embedding it in one's business, from HR to customer services and supply chain management. This system can be used by an organization for several benefits, for instance:

- To build up a good relationship by communicate with customers
- To find a centralized e-mailing system to the customer
- To inform business offerings, new or discounted product to customers
- To categorize customers according to their product interaction
- For marketing automation
- To notify a customer of product shipment status
- To facilitate location base service
- To know region base product popularity
- To help predict about for specific product in a specific zone

Many researchers and engineers are working with CRM. As a result such systems are gaining popularity day by day. But after investigating the systems currently available for CRM, we found that most of them are using old technology that is why those are not adaptable in current development trends like:

- Fast data manipulations
- CRUD system without webpage
- Mail template system
- Fast application loading
- Application security
- Enjoyable UX
- Information retrieval from Web
- Data mining

We have tried to overcome these limitations and develop a modern and effective CRM system with best User interactivity.

Several scholars has published research findings about successful CRM. It was found that if CRM only focuses on technology solution, then it will not be very effective. Also if CRM is designed in such a way that it only works with sales and marketing department, and it follows one-one correspondence scheme [2] then it will also fail to maximize the customer satisfaction. In this respect authors in [3] proposed a CRM that is focuses on people, process and technology, to maximize the effective interaction with customers. Such CRM should bind together R&D, marketing, finance, sales, service,

operations, HR, Information technology and Internet services. Bhardwaj and Prakash [4] published a research paper that demonstrated the importance of eCRM with the help of a qualitative study. They showed that the effective use of eCRM can dramatically improve the quality of business and increase profit. A re

Figure 1: Entity Relationship Diagram for CRM

by Schmidt et al [5] showed that the impact of a public cloud CRM model that make use of cloud-computing service is very strong. They told that many countries are reluctant to cloud based CRM in spite of its benefits. The authors discussed the core influencing factors of cloud CRM and their finding can be used to make a secure and efficient CRM. Our proposed system can be very well integrated with a cloud based server. Furthermore, authors in [6] described a social CRM keeping customer engagement in focus. They urged that earlier CRM did not take into account this important factor. Any company now can take the advantage of web 2.0 and data mining technology to mine social networks, blogs, wiki etc. in order to make sure customer engagement. That is why latest CRM software are incorporating social CRM features.

In this paper we proposed a CRM that incorporates the features describe by the above mentioned research papers. The methodology section describes the procedures we followed in building the proposed CRM. The result section describes the software we implemented for this CRM.

II. METHODOLOGY

Our CRM software is web based. The reason for choosing web based design is portability. We can access the CRM anywhere and anytime on any device. To build the desired CRM, we had the following requirements:

- Hardware requirements
- Software requirements

Hardware requirements:

- Server System
- Internet Connection

Software requirements:

- Operating System: Windows 7/8, Linux Mint
- Web browser: Mozilla Firefox/Google Chrome/Internet Explorer

We used the following programming technologies to build make it robust and user friendly:

JAVA: JAVA is an object oriented high level programming language. We used java in server side for the purpose of implementing information retrieval and knowledge discovery algorithms. Our CRM make use of data mining and web analytics for discovering information about customer, this is called data mining.

PHP: PHP is a widely-used scripting language initially designed for Web programming.
We used PHP for backend programming and accessing database.
MySQL: Web application heavily uses the functioning between a user and services provided by the server, which contains a database as its backend. As our CRM demands lots of data to store in database, we chose most reliable database technology MySQL. MySQL also ensures the security we need in our application & most importantly faster access of data.

CSS: CSS stands for Cascading Style Sheets. Styles define how to display HTML elements. As our CRM will be web based, using CSS we can make great user experience.

JavaScript: JavaScript is the programming language of the Web. It is easy, powerful and object oriented. So it can be used to build complex and sophisticated systems like CRM.

jQuery: jQuery is a quick, tiny as well as feature-rich JavaScript library. We used it alongside traditional JavaScript for ease of maintenance of our CRM project.

Entity-Relationship Diagram (ERD):
ERD is a pictorial representation of entities and their relationships to each other in regard to the organization of data within databases or information systems [7].

The basic elements involved in an ERD are defined as follows:

Attributes: they are classes of values that represent atomic properties of either entities or relationships. Figure 1 shows ERD for our CRM.

Dataflow Diagram:
A data flow diagram is a graphical representation of the flow of data through an information system, modelling its process aspects [8]. Our CRM uses several user information that flows from one module to another according to classification rules.

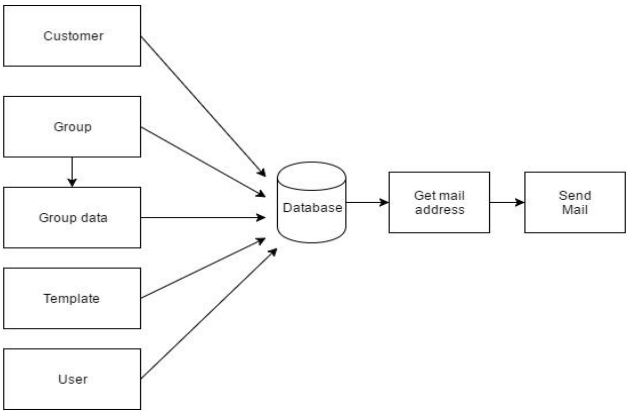


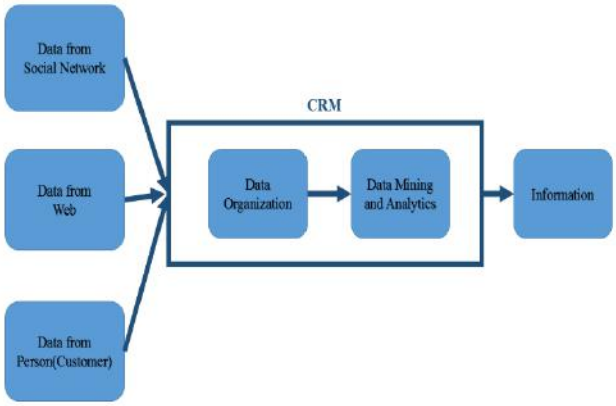
Figure 2: Dataflow diagram of CRM

Figure 2 shows the dataflow diagram of our CRM.

Trivial information, like birthday, anniversary etc. can be used as a scope to wish a customer on these special days. This will increase make the customer feel valued. But to know what customer like or hates, what is his preferred trend etc. we need sophisticated techniques. That's why we need data mining and other computing techniques.

Data Mining and Web Analytics:
The proposed CRM will try to find information about a customer form web. For instance, customer's Facebook and Tweeter profile may be investigated to find his preferences and taste. To achieve this we need some special techniques, such as data mining and web analytics. Data mining [9] is a popular technique that helps to discover patterns from a large set of data. With the help of data mining we shall be able to know our customer better. Customer's interest, likes, dislikes, preferences, trends, sentiment etc. can be known and predicted using data mining. Web mining is also a data mining. It tries to find new information from the web resources. For example, customer's digital fingerprints on the internet(WWW) can be collected and analyzed to find information about the customer. The CRM can make use of web analytics [10]. It is the measurement, collection, analysis and reporting of web data for purposes of understanding and optimizing web usage. It can be used as a tool for business and

Entities: they are real-world objects with common properties.
A relationship: it is an association among several entities.



market research, and to assess and improve the effectiveness of a website. So, the website related to our customer can be the

Figure 3: CRM uses data from multiple sources

subject of web analytics, so that we can find useful information about our customer.
Figure 3 shows the block diagram of the CRM that makes use of data mining and web analytics to discover customer's preferences and opinion.

Various data mining methods are available in the field of computer science. For example, feature extraction, market basket analysis, cluster detection, genetic algorithms, link analysis, decision trees, neural nets and memory-based reasoning are very popular and effective. Here we choose feature extraction technique using term frequency-inverse document frequency [11] to determine sentiment of customer's social media posts. Google analytics [12] is used for web analytics to discover user behavior in various websites. Lastly, Apriori algorithm [13] is implemented for customer analysis.

Using all the information collected from customer and generated by processing data, we can communicate with our customer in a more fruitful way. We can offer the customer according to his taste and preference. This information will also help management decision making. Customer satisfaction will be understood more precisely. This will pave the way for sustaining in the competitive market.

We tried to implement these features in our CRM. The resulting software is described in the result section. The software can categorize the customers according to some predefined criteria. Then, according the information that we have at hand, form web and from personal field study, the software will give us suggestion. This includes communicating with the customer and suggesting customer's positive or negative feedback regarding our products.

III. RESULTS

The application software was built using various programming language. It is a web based software with server that does all the real time analysis.

Figure 4: Dashboard of CRM application software

In the following description, the application software is pictorially demonstrated.

Firstly the application has an attractive interface. The first page has sign up and sigh in options. In this place admin must have to login with email and password to manage the entire system. After login admin can see this dashboard interface where he/she can get the statistics of entire system like percentage of customer in individual groups, total groups, customers, today birthday of customer etc. which is shown in figure 4.

New customer data save through a form as shown in figure 5. In this form admin will enter the customer information and save it to system.

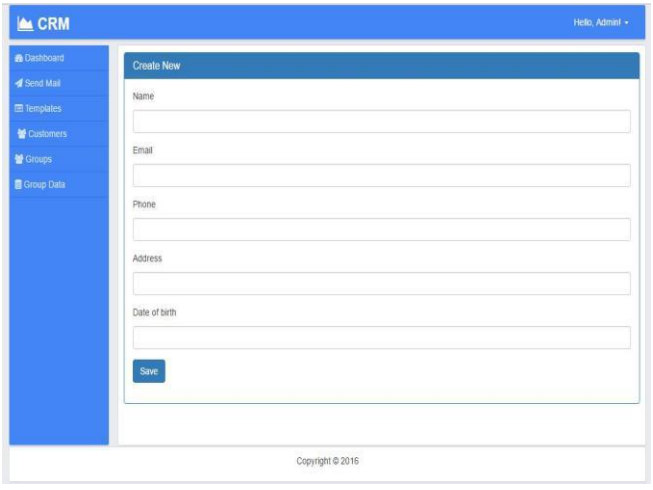


Figure 5: New customer data entry

The page shown in figure 6, shows to admin the total number of customer paging with 10 customers per page. The data will show up in descending order. Each record can be edit or delete by clicking the record action buttons.

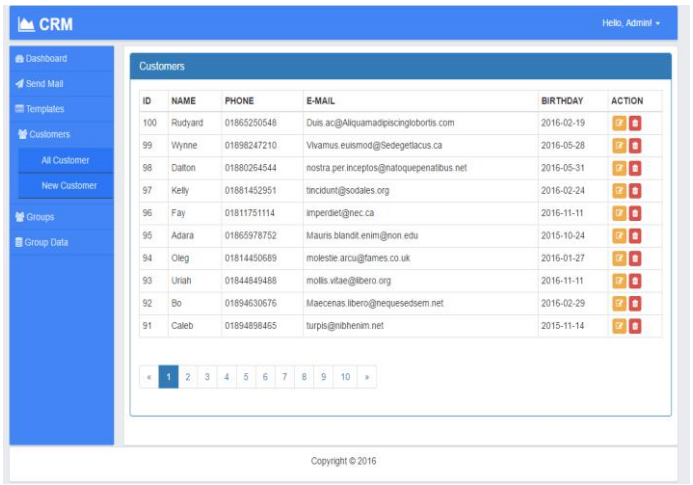


Figure 6: All customers' description shown

Admin can add, edit or delete group name in single page without any page refresh. Admin can assign, update or remove a customer in a group. A customer can be added in different group but not allowed in a single group twice. This is shown in figure 7.

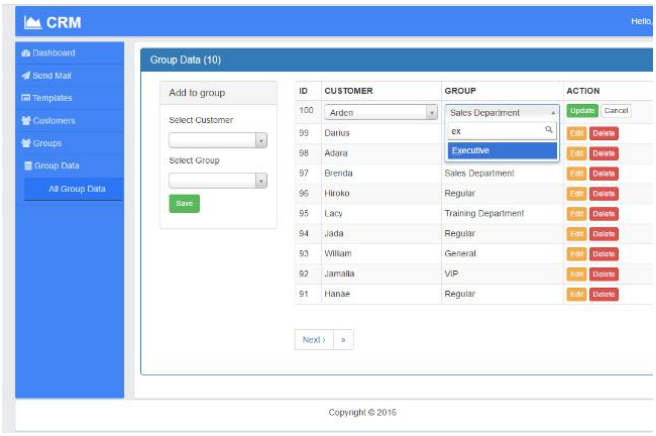


Figure 7: Group data create, delete, update, and delete options

The admin can save the mail template for sending to customer regular or future, as shown in figure 7. One can save the mail template for sending to customer. Figure 8 shows a snapshot of email sending. The admin can also send a mail to a group using group email sending system, it will send a mail to all customers who are added in selected group, as shown in figure 9.

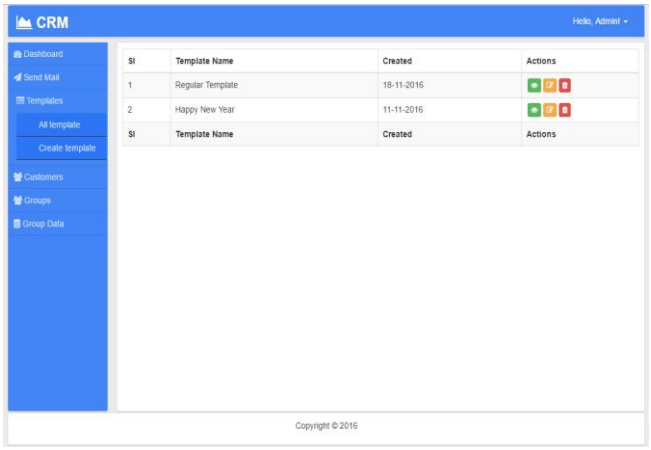


Figure 7: Email template system

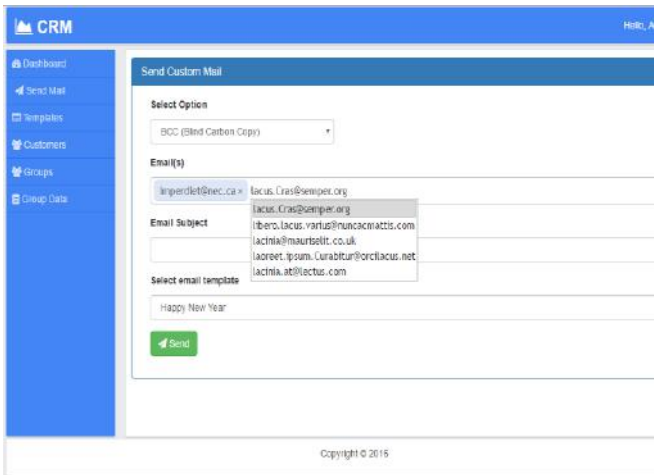


Figure 8. Single/Multiple mail sending system

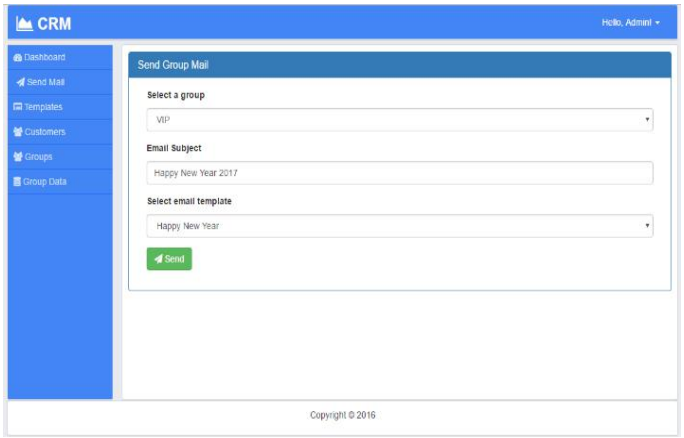


Figure 9. Group email sending system

IV. FUTURE PLAN AND CONCLUSION

This CRM software has some limitations. In future we will try to overcome those limitations. For example, information retrieval and data mining feature will be made accurate and efficient so that those features can help us to find useful information about market and customer. Besides, sentiment analysis technique can be extended to include more data from social media, web and local information to discover customer satisfaction regarding our products. Also to know the emerging trends in the customer preferences, more efficient data mining algorithm can be used. Moreover, communication with the customer can be made more interactive so that the customer does not feel irritated. This may be achieved by combining online and offline communication by understanding customer's need and preferences.

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