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MULTI ATTRIBUTE USER PROFILE INFERENCE MODEL FOR IMPROVED CUSTOMER RELATION MANAGEMENT

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ABSTRACT

The market analysis has become more important where the organizations has the responsibility to maintain the relation with their customers. The marketing organizations have different customers from various part of the country. The customers has different type of interest and to maintain the bond with them, the organizations must find statistical solutions. There are number of approaches available for the detection of user interest but suffers to achieve the performance. To overcome the problem, a multi attribute user profile inference model has been proposed. The method identifies the user set who has purchased in earlier times and identifies the related items purchased by others. For each user from the user group, the method identifies their profile like finance, education, frequency of product purchase, and job profile. Using all these information the method identifies a subset of users to produce recommendations. Finally the method identifies the list of similar interested user groups and propagate the recommendations. The method improves the performance of customer relation management and improves the market growth.

Keywords:- Market Analysis, Customer Relation Management, User Profile Inference Model

I.   INTRODUCTION

The market analysis is the process of analyzing the market trace to find out some valuable information to be used to perform some developing activity. In general the customer of the organization would purchase different products. The purchase habit varies between different users according to many factors. By reading the market trace the market analysis can be performed. For example, whenever a product manufacturer plans to market the product, they want to identify the list of people or the region where it can be marketed. In general, a product manufacturer cannot recommend the new product information to all customers blindly. It would increase the marketing cost and the customer would not be interest in purchasing the product. So identifying the exact user who is more interested is essential.

On the other side, the customer organizations has the responsibility that maintaining the secrecy of the customer. They don't want their information to be published to the external world. So the customer information should be maintained in secret manner. Also the customer always want the notification about the product information in which they are interested. In order to keep the customer in their hand the organization must produce effective and related notifications to the customers. Also the organization must keep track of user interest and monitor how the user interest is changing. Also the manufacturer must monitor the customer requirements and identify what kind of products the user is interested on.

Using the market trace, the product manufacture could identify the type of product in which the user is interested on. For example, at each time window the product interest would change for the users like cosmetics and fabrics. Sometimes the customer would like to wear cool cloths but vary according to the time. So the product manufacturer would identify the interest change and can identify the product of interest to perform manufacturing.

The user profile inference model is one which uses the user profile details like location, job, financial status and so on. Using these information, the model could identify the type of product the user is purchasing and the status of the product they purchase. This helps the range of products the user is interest and the ability of the user in spending the product. The same product can be manufactured in different price and by using the u ser profile the list of users who can purchase the product can be identified.

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II.   RELATED WORKS

There are number of methods discussed earlier for the development of customer relation management and this section discuss about some of the methods.

Exploring the Relationship between Mode of Operation and Performance of Support Teams in Telecommunication Companies [1], addressed the performance of virtual teams carrying complex technical support tasks in telecommunication companies. The primary proposition of the study that there is a relationship between team performance (comprised of three factors, namely, goals achievement, customer satisfaction, and team health) and the mode of operation was tested. A secondary proposition that team size has a significant effect on the relationship between the mode of operation and support team performance was tested also. One hundred twenty support professionals working for telecommunication companies based in California's Silicon Valley completed web-based surveys, which offered data on support operations in virtual and face-to-face settings and assessment of teams' performance in each setting. Whereas the findings indicated correlations between the mode of operation and the three factors of support team, further analysis indicated weak linear relationships among the variables. In addition, data analysis failed to support a significant effect of team size on the relationships between mode of operation and the three measures of support team performance.

Exploring the Three- Path Mediation Model: A Study of Customer Perceived Value [2], investigates the direct and indirect relationship between service quality and behavioral intention and probes into the mediating role of customers' perceived value and customers' satisfaction in the indirect relationship between service quality and behavioral intention. The findings suggest that service quality and behavioral intention relationship is mediated at multiple levels as their relationship passes through the junctions of customer perceived value and customer satisfaction.

A review of customer relationship management: successes, advances, pitfalls and future [3], provide academics and practitioners working with customer relationship management (CRM) with a review of key topics, such as advances in CRM, the shifting role of consumers, issues with conceptualization and consumer exploitation. The authors further integrate concepts of fairness, trust and paradoxes of one-to-one marketing, which are little researched within customer management. As a result, the authors suggest eight propositions for improving the CRM scheme.

Customer Relationship Management (CRM) Processes from Theory to Practice: The Pre-implementation Plan of CRM System [4], provides an extensive review of the literature regarding the CRM processes. This review aims to increase the understanding of the different perspectives and the various types and levels of CRM processes. This paper reveals that there are four major perspectives of CRM processes which are customer facing level processes, customer oriented processes, cross functional CRM processes, and CRM macro-level processes. This paper recommends that for ensuring the successful adoption and implementation of any CRM initiative, organization should understand the different levels of CRM process and the integrated activities among the CRM processes at each level. In addition, for organizations to be successful adopters and implementers of CRM programs/systems, they should understand the need for business process reengineering and effective anticipation and management of the change that may accompany any CRM initiative. This paper suggests a pre-implementation plan for CRM programs/systems. Such a plan aims to initiate and communicate a customer-oriented culture within the organization. This step emphasizes on increasing the understanding of CRM concept and communicating and spreading the knowledge of the promising benefits of CRM programs/systems to all parties in the organization. All that will contribute in increasing the success rate of CRM programs/systems implementation.

Semantic Representation and Computation of Cloud-Based Customer Relationship Management Solutions [7], introduces a RDF vocabulary to semantically represent and compute quantitative indexes with the aim of providing a context-aware system to manage Customer Relationship Management (CRM) quality indicators. This tool is based on CRM Index, tailor made index based on Service Measurement Index to measure cloud CRM solutions. Apart

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from the tool itself, in the paper the authors introduce categories and attributes defined for the CRM world along with specific metrics.

How to Improve Customer Relationship Management in Air Transportation Using Case-Based reasoning [12], describes research that aims to provide a new strategy for Customer Relationship Management for Air Transportation. It presents our proposed approach based on Knowledge Management processes, Enterprise Risk Management and Case-Based Reasoning. It aims to mitigate risks facing in air transportation process. The principle of this method consists in treating a new risk by counting on previous former experiments (case of reference). This type of reasoning rests on the following hypothesis: if a past risk and the new one are sufficiently similar, then all that can be explained or applied to the past risks or experiments (case bases) remains valid if one applies it to the new risk or for new situation which represents the new risk or problem to be solved. The idea of this approach consists on predicting adapted solution basing on the existing risks in the case base having the same contexts.

Performance Measurement for Customer Relationship Management (CRM) [13], reviews and critiques CRM performance measurement tools found in the literature and reports results from a survey establishing current CRM performance measures adopted by a sample of companies.

All the above discussed methods considered only few factors and does not consider about the interest changes and produces less accuracy in customer relation management..

III. MULTI ATTRIBUTE USER INFERENCE MODEL

The multi attribute user inference model reads the market trace and splits the user trace. For each user the method identifies the list of products purchased and for each product the method compute the frequency of purchase. Then the method computes the User purchase weight for each product and the method collects the list of users who has the same interest. Based on identified users the method generates the recommendations to the users.
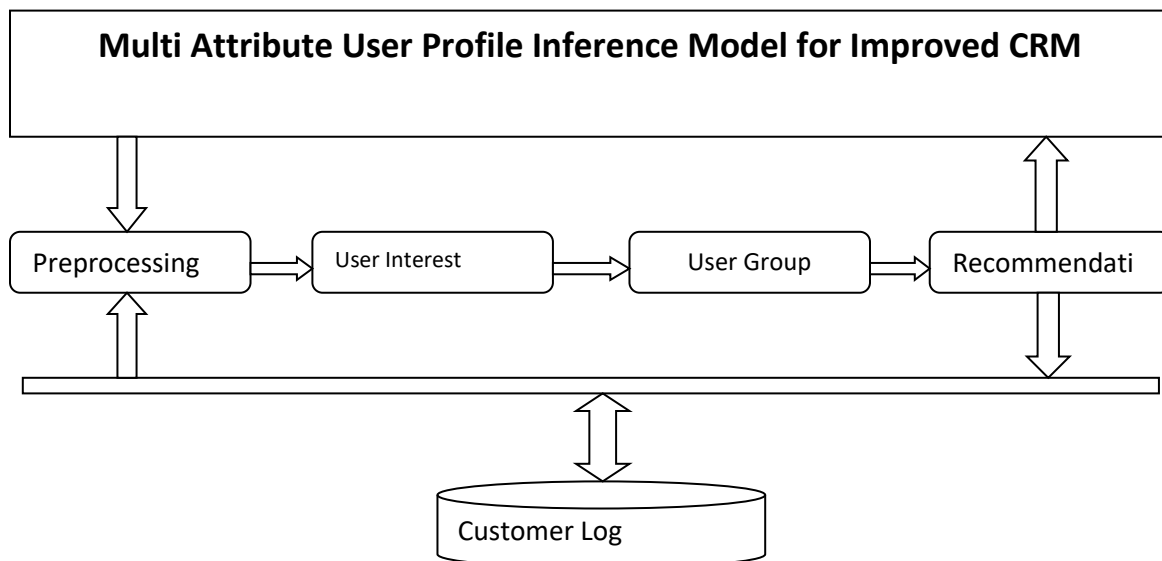
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3.1 Preprocessing:

The algorithm works towards any particular product and initially the method reads the market trace. Then first it identifies the list of unique customers and reads the logs belongs to them. For each distinct user log, the method identifies the list of distinct product purchased. Identified logs are grouped and will be used in the next to stage to perform interest detection.

Algorithm:

Input: Market Trace Mt.

Output: Consumer Log set Cls.

start

Read market trace Mt.

Identify distinct users Us.

$$Us = \sum_{i=1}^{size(Mt)} \sum Distinct(User) \nexists Us$$

Identify distinct products Dp.

$$Dp = \sum_{i=1}^{size(Mt)} \sum Distinct(Product) \nexists Dp$$

For each user Ui from Us

Split traces belongs to the user Ui.

$$CLS(i) = \int_{i=1}^{size(Mt)} \sum Mt(i).User == Ui$$

End

Stop.

The preprocessing algorithm split the entire market trace into number of small sets according to the number of users. Each user log is split into separate group which will be used to perform interest detection.

3.2 User Interest Detection:

The user may have different interest in purchasing the products. In this scheme, the method reads the user traces and for each product the method computes the product frequency. Using the product frequency the method computes the interest weight for each product. Finally the method selects a small set of products or interest as the user interest. Identified user interest will be used to identify the list of user groups.

Algorithm:

Input: Preprocessed Log Pl, User set Us, Product set Ps

Output: User Interest set Uis.

Start

For each user Ui from User set

For each product Pi from product set Ps

Compute purchase frequency Pf.

$$Pf = \int_{i=1}^{size(Uis)} \int_{j=1}^{size(Ps)} \frac{\sum Pl(i).Product==Ps(j)}{size(Pl(ui))}$$

Compute Product interest weight Piw.

$$PIW = pf \times \frac{\sum Pf(UIS)}{Pf}$$

End

Choose interest with higher weight,

$$Uis(i) = \int_{i=1}^{size(Uis)} \sum Uis(i).PIW > ITh$$

End

Stop.

The above discussed algorithm computes the product purchase frequency and interest weight for all the product. Finally the method selects a small set of interests based on the threshold.

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3.3 User Group Identification:

The users with similar interest have to be identified in order to produce recommendations. In this method, the purchase weight for each product is computed. Based on purchase weight computed, the method selects top products for each user.   Using the interest of users, the method selects the user groups who has similar interested users.

Algorithm:

Input: User Interest Set UIS, User Profile UP.

Output: User Group Ug.

Start

> Read User Profile Up.
> For each user Ui from Uis
> > For each interest I
> > > Compute purchase weight pw.
> > > $$Pw = \frac{I.Cost}{UP(Ui).Salary} \times Ui.Interestweight$$
> > End
> > Choose the interest with higher purchase weight .
> > Interest set Is $= \int \sum \text{Interest} \in \max(pw)$
> End
> Identify common interest between users Cm.
> For each user Ui
> > If UIS(Ui)€(1/3)(Cm)
> > > Add user to the group Ug.
> > End
> End

Stop.

The above discussed algorithm computes the purchase weight for the different interest or product of the user. If the purchase weight is higher than the threshold then the interest is added to the list. Based on the interest identified, the method identifies the common interest between different users. Using the common interest the method identifies the user groups.

3.4 Recommendation Generation:

In this stage, the method use the user groups and common interest as the input. Using these information the method generates recommendation for different users. Generated recommendation has been posted to the users. The user will be notified for the recommendations

IV. RESULTS & DISCUSSION

The proposed multi attribute user profile inference model for customer relationship management has been implemented and tested for its efficiency. The method has been implemented in advance java programming language with large set of data set which contains enough transaction information. The method has produced efficient results in identifying the group user interest as well as interest transition.

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*Table 1: Details of evaluation parameters*

Parameter	Value
Platform of implementation	Advanced Java
Size of log being used	5 million records
Number of attributes or items	200
Number of decision factors	Income, Education, Purchase Frequency

The Table 1, shows the details of evaluation parameters and it shows the details of value being used to evaluate the performance of the proposed approach.
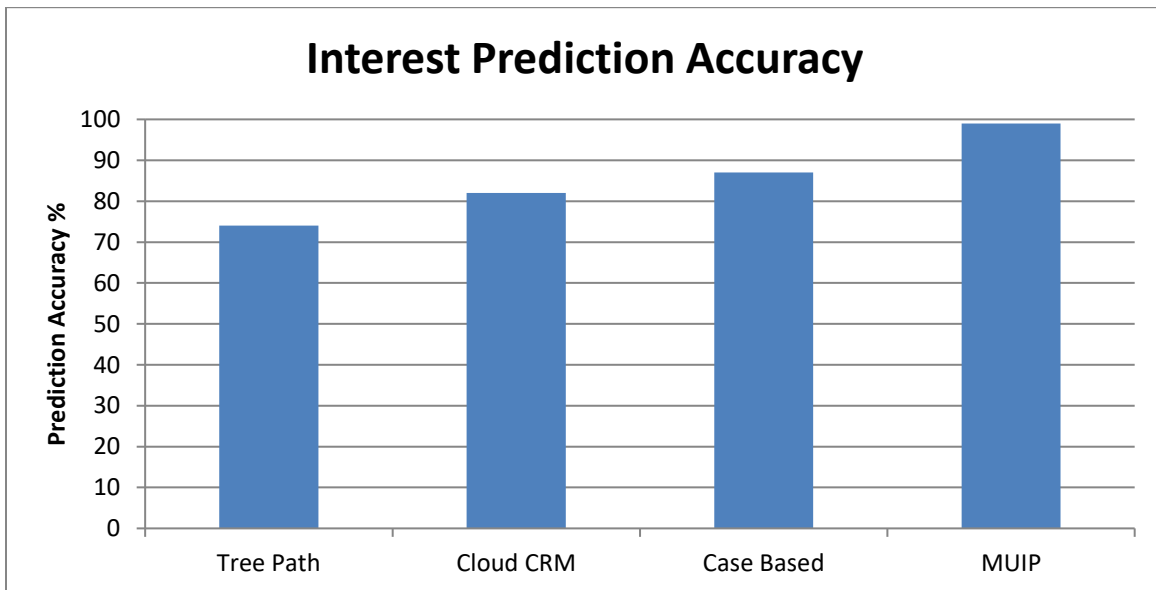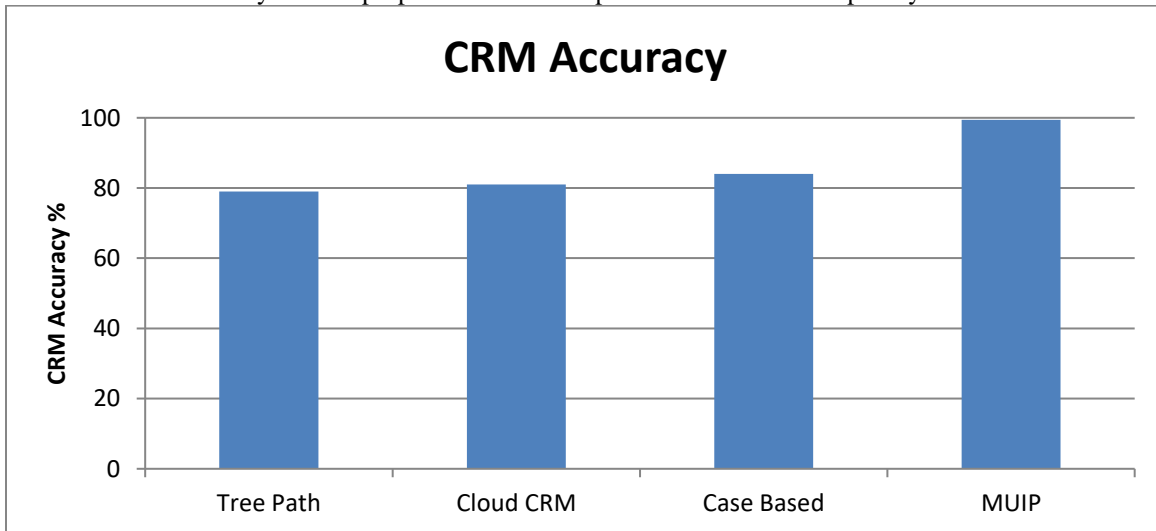

Graph 1: Comparison of interest prediction accuracy

The Graph 1, shows the comparison of interest prediction accuracy produced by different methods and it shows clearly that the proposed method has produced more accuracy in interest prediction which helps to maintain the customer relationship in more efficient manner.

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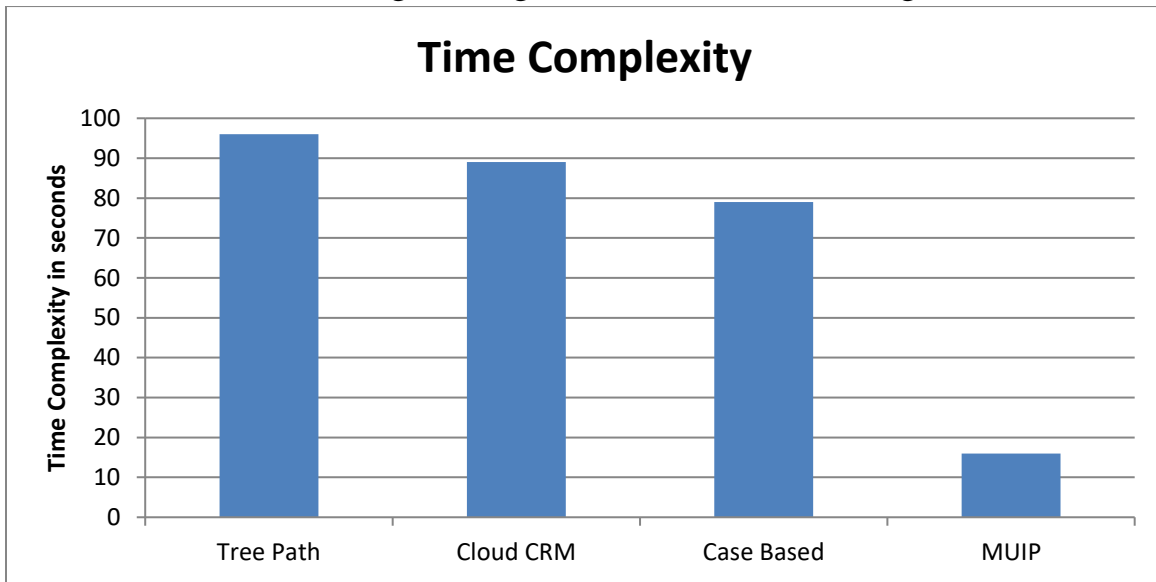
Graph 2: Comparison of time complexity in interest prediction

The Graph2, shows the comparative result on interest prediction time complexity produced by different methods and it shows clearly that the proposed method has produced less time complexity than other methods.

Graph 3: Comparison of CRM accuracy of different methods.

The graph 3, shows the comparative analysis on customer relationship management accuracy produced by different methods and it shows clearly that the proposed method has produced more accuracy than other methods.

V. CONCLUSION

In this paper, an efficient multi attribute user inference model has been proposed for the improvement of customer relation management. The method computes the user interest weight for different products and for each user a subset of interest is identified. Based on the interest weight the method identifies the user groups. Using the

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interest identified the method computes the purchase weight for different products. Based on the purchase threshold the method selects a small set of products for each user. Using the common interest identified the method generates recommendations for the customers. The method produces higher efficiency in maintaining customer relationship and reduces the time complexity as well.

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