An innovative approach of online recommendation mechanism for achieving SELLER'S and BUYER'S reciprocity

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Abstract— The purpose of this paper is to present a novel e-commerce model which is aimed at enhancing shopping experience for both the buyers and the sellers by overcoming the limitations of the existing models. This will be accomplished by incorporating the traditional features of brick and mortar market place such as price negotiations, incentives, discounts and supplementary product recommendations. The distinguishing factor of this model is that, its stated features will be made available while maintaining privacy control for its users. The model will utilize collaborative filtering and users' behavioral analysis.

Index Terms—smart-shopping, retailer profit, user behavior, mobile-application, e-commerce, recommendation, personalize, customer satisfaction, privacy.

1. INTRODUCTION

Evolution of shopping with the installment of e-commerce during the last decade, has opened the gates to new research areas like customer satisfaction, customer loyalty and retaining a customer. Business-to-consumer(B2C) E-commerce has become a necessity, which has caused a shift of brick and mortar retailer to Business-to-business(B2B) model, creating an area for a third-party i.e. e-commerce websites [1]. Retailers need techniques to accommodate smart consumers, by fulfilling their socio-economic needs.

As more and more traffic is being generated towards e-commerce solutions, need to parameterize the techniques required to enhance profit margin, has been increasing. Market orientation is mainly governed by the customer needs, therefore contemporary e-commerce solutions involve consumers in product development, distribution and production planning [2]. Several studies have been conclusively established that consumer does not buy product just because of the features, but because of its needs. Considering consumer and consumer's needs the pivot point, this paper focuses on the consumer-technology relationship, with the objective of analyzing consumer needs.

In today's fast and everchanging world the concept of smart-shopping has become a challenge for retailers. Smart-shopping constitutes of three factors time, money and energy spent by the consumer [5]. Two factors of smart shopping i.e. time and energy have been catered by e-commerce solutions, yet the third factor i.e. monetary benefit often seem to remain unsolved, due to the absent feature negotiation. Price and recommendations are among the key factors which affects the buyers attitude for shopping [6]. In this paper, we are proposing a strategy of combining recommendations and discounts to incorporate, the absent negotiation feature, in contemporary e-commerce solutions. It can be an asset for customer's budget if they know where to look for the best deals and how to get discounts. In this proposed model monetary benefit has been considered a crucial factor, because financial incentives along with customer satisfaction, are found to attract other customers as well, hence increasing traffic [2].

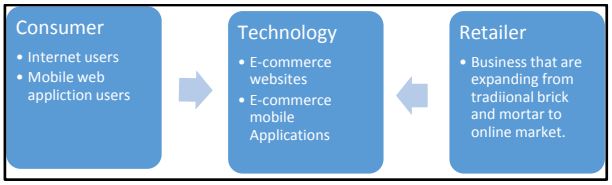

Figure 1 Contemporary e-commerce architecture

In this paper, we will describe a model based on the three actors depicted in Figure 1.0. First section of this paper defines information and processing involved at the consumer, retailer and technology respectively. In second section, we will illustrate a model, that will cover the parameters and techniques of all three actors. Third section represents a study conducted on two individual groups for the verification of the methodology. This model will be able to

- Explore the areas of hidden profit.
- Extract more profit for retailer.
- Enhance shopping experience for consumers.
- Incorporate personalize features while maintaining privacy of the consumer.
- Deal with new consumer and regular consumers accordingly, providing them each equal opportunity.

The objective of this paper is to describe a model to effectively increase profit margin of retailer by focusing on consumers interest.

2 Related Work

Among contemporary solutions is the ebay's best offer system. According to ebay's best offer system, user is provided with an option of Make an offer. This offer is not applied to all the items but some selected items. User can negotiate on price of the products (that have Make an offer option), with retailer. Retailer can accept offer, decline offer or make a counter offer. Retailer can have many offers for one product so user should make his best offer [7]. In the existing system, the information generated during, the course of each successful or unsuccessful transaction is shared with the retailers making the buyer's position susceptible and vulnerable in comparison with the retailers. In the proposed model, each transaction / negotiation will be one independent event happening in a secluded environment such that the information generated during the transaction is not shared with the other retailers in the market place.

Mona is a mobile application for personal shopping assistance, it fulfills the need of an in-store assistant. This artificial intelligence based application, searches the online stores (registered) and provides user with the best product listing. Product listing provided by the application is based on the user's choice of size, brand, color and price. This application uses collaborative filtering, content based filtering [8].

Negotiation factor can be incorporated in e-commerce by involving software agents. Utilization of software agents for negotiation can be categorized in three classes: (1) Human to human negotiation, (2) agent to agent and (3) human to agent. Extensive study has been conducted in [9], exploring the third category. In [9] the authors have divided their agent in four sub-categories, Competitive agents, Conceding Agents, Conceding-Competitive, and Competitive-Conceding. According to their study Conceding agent made the highest achievement, these agents offered the highest concession in the beginning. Current work of this paper falls in the first category (i.e. human to human negotiation), yet it utilizes features of, the highest achiever, Conceding agent.

3 Model

The detail of the information required from user and retailer is described below:

a) Information from User

- Consent
- Age

Application based on this model requires all the users to provide their information through Login form. Essential information required for the methodology to generate results are Age and Consent.

First, all the users are divided in two main categories, based on their Consent. Users are asked to provide their consent if they want to avail the Personalized feature or not. If user is complacent about Personalized feature, then result will be generated according to equation (3) (mentioned in section 3.1.2), otherwise Generalized feature will be assumed. Generalized feature is to cater those consumers who are reluctant in having their views and habits widely known, and avoid Personalized feature [3].

Generalized feature subdivides users in five distinct groups according to their age. Age groups classification recognized by this model are: 10-18,19-27,28-38,39-48 and 49-60.

Generalized feature will generate results according to (1) (mentioned in section 3.1.1).

b) INFORMATION FROM RETAILER

Retailer will be required to enter all the product information along with a fixed percent (%) of discount.

Potential for retailers to sell more relies mainly on, selecting right consumer and offering him the product according to his needs. As consumers do not buy products just because of their features but to fulfill their needs. Discount percentage mentioned by retailer will be offered to only selected users (selection process is based on (1) and (2) described in section 2.1.3).

3.1. ENGINE PROCESSING

Engine processing is divided in two categories:

- Generalized Feature
- Personalized Feature

Objective of this engine is to predict, products according to consumer's needs. Two distinct methodologies are implemented for each feature.

Collaborative filtering is used by most of the popular websites like amazon to recommend products. It uses information of user's interaction with any website to recommend products. The main challenges of this techniques are sparsity and scalability [4]. Methodology implemented in our model mitigate with these two challenges very effectively. All online recommenders work on large datasets, resulting in confusing user behavior analysis matrix (i.e. sparsity). To mitigate this situation our method first divides users in Age groups. This pre-processing of prediction consolidates results. Architecture depicted in the Figure 2.0 helps in controlling scalability issue. In this architecture, a webservice has been implemented with the objective of generating recommendation results. Results generation for Generalized feature is timed at every 6 hours. Results generated by an execution will be used for the next six hours. Results Generation for Personalized user experience is timed at every 24 hours. Results generated by an execution will be used for the next twenty-four hours.

3.1.1. METHODOLOGY FOR GENERALIZED FEATURE

Generalized feature utilizes age groups and generates a recommendation list. Interest percentage will be calculated for each product-category. For calculation of product-category interest percentage, (1) is used.

$$Product - category\ Interest_{\%age} = \frac{(\alpha_i)_j}{(\beta)_i} \times 100 \quad (1)$$

In.(1), i = 1-5 for five age groups, α = number of users, j=1-n for each product-category of product, and β= total number of users registered with application. Interest percentage of a product-category will be calculated for each age group (e.g. Interest percentage for accessories will be calculated for five age groups). Interest percentage for a product-category (e.g. j=1) is calculated by dividing all users of an age group (e.g. i=1) that have visited product-category j=1, to the total number of users of age group i=1.

After calculating interest percentage forall product-categories, four of the highest product-categories will be selected. From these product-categories two products (that have maximum number of visits) from each highest product-category is selected, according to (2).

$$Product_{selected} = \max(visits)_j \quad (2)$$

3.1.2. METHODOLOGY FOR PERSONALIZED FEATURE

If user selects Personalized feature, recommendation list will be generated according to the results of (3). Personalized feature will generate result, for each user distinctively. This feature generates results based on the twenty-four-hour activity of user.

$$Product - Category\ Interest_{\%age} = \left\{\frac{(\mu)_j}{\rho}\right\} \quad (3)$$

In (3), k=1-n, n is number of users utilizing personalized feature, j= 1-n, n is number of product category, (μ)j= number of visit of a user in category j, ϱ= total visit of user. For a user k=1 product-

category interest percentage, for each category i.e. 1-n, is calculated. Product-category percentage for personalized feature will be calculated by dividing, number of visits of a user (e.g. k=1) on a category (e.g. j=1), to total number of user's visit (i.e. user k=1). After selecting four of the highest product-category percentage, products will be selected according to (2).

3.2. ARCHITECTURE

The architecture of the mobile application, based on the model described above will be three tiers. Data layer is a Database management system, namely MySQL, Business layer is divided into two parts, one is our Web Services and second is Content Management system to manage the data, and lastly, Presentation layer is our Android based application.

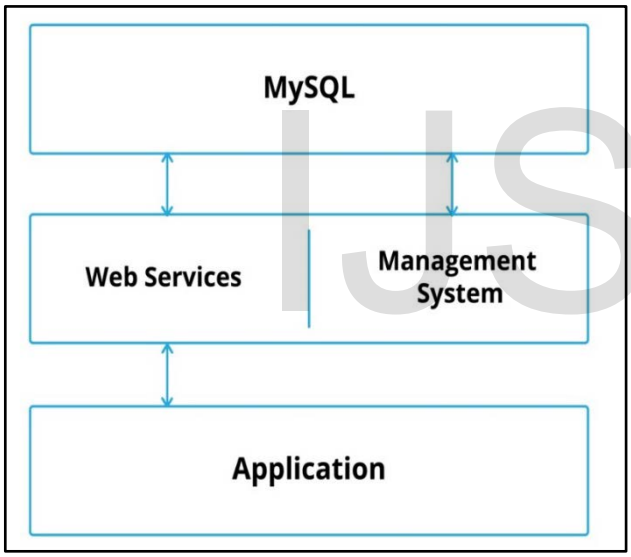

Figure 2 Applicatiion architecture

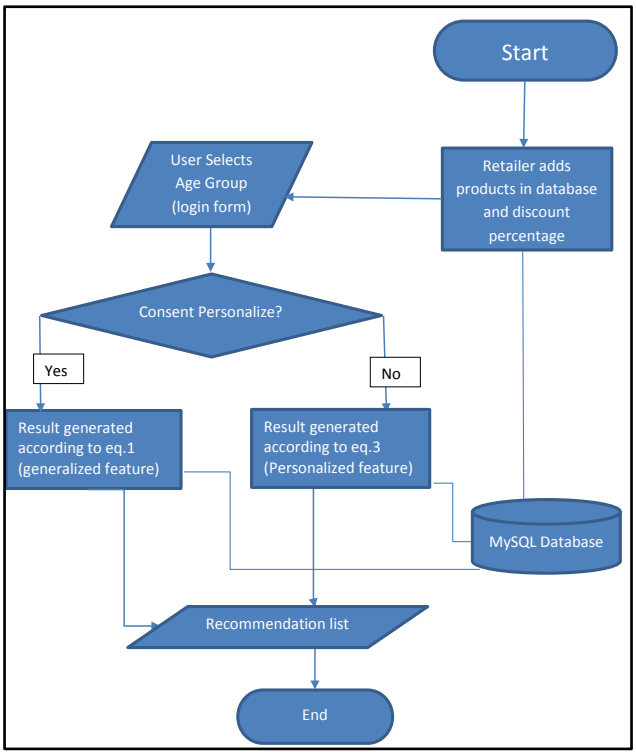

Figure 3 System Flow

4. FLOW CHART

5. RESULTS

For the verification of above mentioned model a survey was conducted. Data gathering was accomplished by the distribution of questionnaires manually and electronically. This study has been completed with one age group i.e. (19-27) as target, for data collection, analysis and verification.

Participants were divided in two groups G1 and G2. G1 has all female participants and G2 has all male participants. G1 is used for data collection and analysis. G2 is used for data verification. Figure 4.0 represents division of participant, according to their age, in group G1. Figure 5.0 represents the product-category interest percentage for age group 19-27. For the verification process, data gathered through G1 has been applied to group G2.

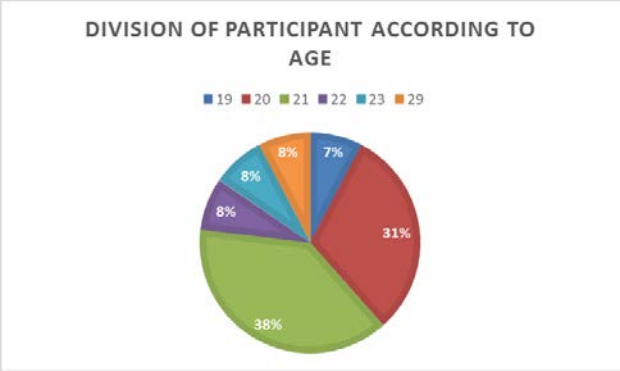

Figure 4 Partcipants of G1

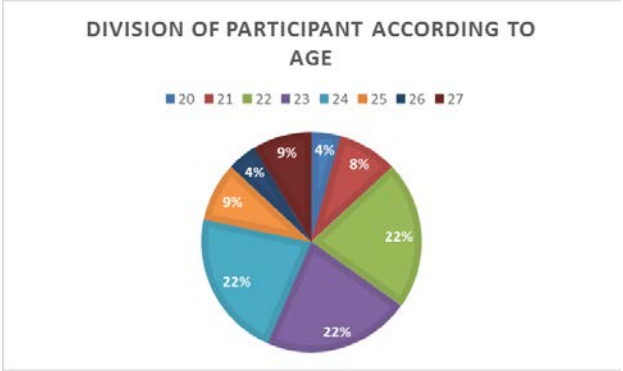

Figure 6 Participants of G2

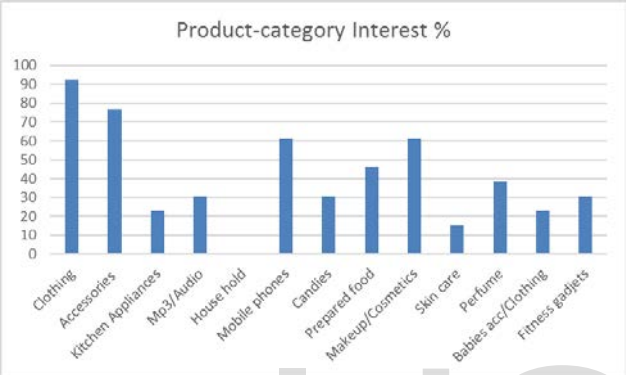

Figure 5 Product-category interest % for age group (19-27)

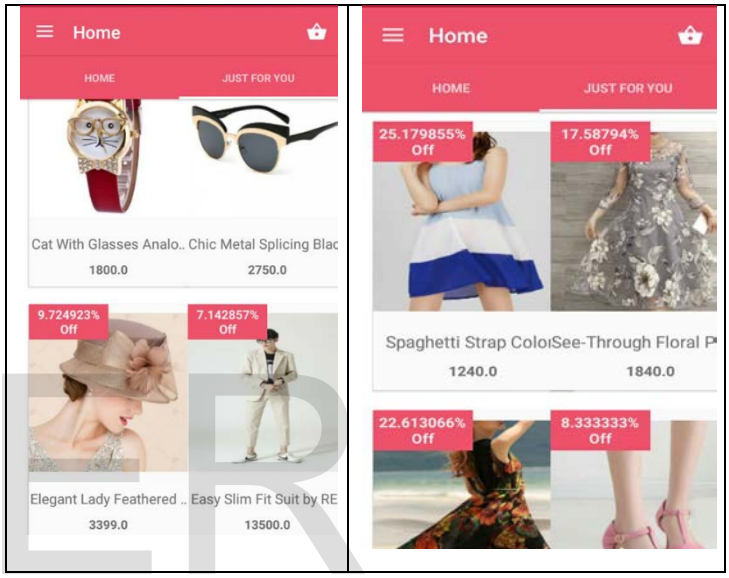

Figure 7 Application view of discount

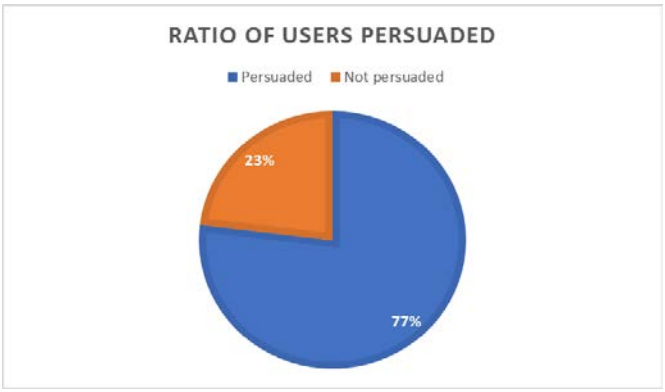

Figure 8 Result

According to the result depicted by Figure 5, Clothing, Accessories mobile phones and make-up/cosmetics are selected product categories. Products for recommendation list will be selected from these categories. Figure 6.0 represents division of participants according to their age in G2 group. G2 is used for verification of the data. Following discount offers, manifested through Figure 7.0, were presented to G2. G2 has only male participants. Figure 8.0 represents the result gathered from G2. Figure 9.0 represents percentage of participant that were persuaded by the discount offer through blue, i.e. 77%.To increase the accuracy of result, product description including pictures and prices used for application development, as depicted in Figure 7, were taken from [10],[11].

6. CONCLUSION

In this study, we have described a model, with the aim to enhance online shopping experience, in ways where brick and mortar experience exceeds online shopping experience. Model describe in this paper has been implemented by using android platform. Study involved two groups G1 and G2. Data has been collected through G1 to train our engine.

Results produced by the engine has been verified using G2. As depicted in Figure 8.0, 77% of our users were persuaded by the offer presented to them. This study has been based on merging two factors recommendation and generating discount offers, to enhance shopping experience. In future, researchers can formulate models to enhance manual support features and product texture substantiation, for online customers.

7. BIBLIOGRAPHY

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