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by Alexander Setiawan

Group Buying Application Mobile Based with Naïve Bayes Methods

Alexander Setiawan[1], Anita Nathania[2], Andreas Gilbert Halim[3]

Informatics Department, Faculty of Industrial Technology Petra Christian University Surabaya

Email : alexander@petra.ac.id[1], anitanathania@gmail.com[2], m26415087@john.petra.ac.id[3]

Abstract— Shopping is an activity that must be done by everyone, starting from shopping for primary, secondary, and tertiary needs. In shopping, it is better to get the cheapest price if possible. Sometimes this can be happened by buying in a large quantity, and then the price will be count as wholesale price. With the development of technology nowadays, shopping can be done online, no need to come to the store. However, by buying things online it is hard to find seller that gives wholesale price.

Because of that, an application for helping user to find wholesale price is needed then, a Mobile-based Group Buying application was designed with Naïve Bayes Methods. This application has features such as notifications, reviews and discussions, wish list, search, and join group buying to get wholesale prices for the user. The result of this application indicated that 82,5% of users considered that the application has a complete feature, 89,8% of users considered that the application has a very good design, and users considered that the application very easy to use.

Keywords—Group Buying; Wholesale; Naïve Bayes Methods; Mobile Application.

I. INTRODUCTION

Shopping is an activity that is definitely carried out by everyone, starting from shopping for primary, secondary and tertiary needs. In shopping, it is certainly better if you can get the cheapest price possible. Sometimes this can be achieved by making large purchases, so you get a discount. With the development of technology today, shopping can be done online so there is no need to come to the store or to the place to sell it. Online shopping is a common thing in Indonesia and every year people who shop online are always increasing. Based on data from We Are Social, in 2017 the percentage of Indonesians who buy goods online reached 41% and from year to year it always increased by 15%, and based on data from ShopBack involving 1000 respondents, 70.2% of people claimed to shop more often online rather than coming to the store directly [7]. Of course, this is not a small amount. Although, making online purchases the habit of searching for the cheapest price might still be there. However, finding a seller who gives wholesale prices at online stores is a difficult thing. This is probably because goods sold have a high enough price, so it is not possible to make large purchases. Or if, in buying a lot of goods to get a wholesale price, the process of shipping goods will be difficult because they have to send goods together in large quantities.

The solution to this problem is to use the application of Mobile-based Group Buying. This is because the use of smartphones at this time has mushroomed everywhere. In addition, smartphone use is also used by all ages. This application will help users who have difficulty getting wholesale prices when shopping. The mobile application can help customer to got email confirmation step by step on their order [5].

II. LITERATURE REVIEW

A. *Group Buying*

Group buying can be defined as shopping activities in a group to get cheaper goods prices. Group buying sites work with sellers by agreeing to give discounts on products with the condition that the number of buyers is reached according to the predetermined requirements. In general, sellers provide discounts of 50% to 90%. This offer has a duration of 1 day to 1 week before the offer is closed. Buyers who have made a purchase will get an e-mail containing a discount coupon. The buyer only needs to print the coupon and show the seller when making a purchase [8].

Buyers who want to join group buying must have an account first. This account aims to access identity and track buyer activity, which makes buyers have easy access to give opinions about transactions that have been done, print coupons. Buyers who have made transactions cannot cancel their transactions. Group buying sites do not attract fees from sellers to display their products. The site gets compensation when the seller's specified number of buyers has been reached [9].

The phenomenon of group buying, started by the United States website named groupon.com in 2008. However, the concept of group buying can be found first in eastern collectivist culture [2]. Price and frugality are traditional values that are valued by collectivist culture [1].

Buyers from China are the first buyers who organize to spend with large groups to achieve lower prices from sellers. This experiment, known as tuangou, was heavily discussed on internet forums where buyers gathered according to their needs and planned collective purchases of furniture, food, and cars [2].

After forming a large group it will be agreed to meet the seller and request a discount. In a short time, the concept of group buying gained many fans from all over the world. Year after year, this concept also spread to Europe, South America, Africa and Australia and has returned to China and several Asian countries in a modified and simplified form. DailyDealGame stated that at the end of May 2012 there were 1,845 group-buying sites worldwide. The results offered by the combination of regular evidence-based sales transactions that are running. With the known linkage of purchase by the customer, the company has a marketing strategy, that strategy is the product placement in the company [10].

B. Naïve Bayes Methods

Naive Bayes is a simple probabilistic classification that calculates a set of probabilities by summing frequencies and combinations of values from a given dataset [6]. The algorithm uses the Bayes theorem and assumes all independent or non-interdependent attributes given by values on class variables [7]. Another definition says Bayes is a classification with probabilistic methods and statistics that predict future opportunities based on previous experience [3]

Naive Bayes is based on the simplifying assumption that attribute values are conditionally independent when given an output value. In other words, given an output value, the probability of observing together is a product of individual probabilities [8]. The equation of the Bayes theorem is [3] :

$$P(H|X)=(P(H).P(H))/(P(X)) \tag{1}$$

Where:

X	: Data with unknown classes
H	: The data hypothesis is a specific class
P(H|X)	: The probability of hypothesis H is based on condition X
P(H)	: Probability of hypothesis H
P(X|H)	: The probability of X is based on the conditions in the hypothesis H
P(X)	: Probability of X

To explain the Naive Bayes method, please note that the classification process requires a number of clues to determine what class is suitable for the sample being analyzed. Therefore, the Naive Bayes method above is adjusted as follows:

$$P (C | F1 ... Fn) = (P (C) P (F1 ... Fn | C)) / (P (F1 ... Fn)) \tag{2}$$

Where variable C represents the class, while variable F1 ... Fn represents the characteristics of the instructions needed to carry out the classification. Naïve Bayes is used to recommend products to users in the group buying application that will be created.

C. JQuery

JQuery is a framework built on JavaScript, not a language itself. jQuery is a complex library that was first launched in 2006, even though the original idea appeared earlier. jQuery makes JavaScript more accessible to lay developers because it has an easier syntax. With easier words so that ordinary readers can also understand, it can be said that jQuery is an open JavaScript library that has the main purpose to facilitate interaction between HTML documents, documents object model and JavaScript [4].

III. ANALYSIS AND DESIGN SYSTEM

A. Flowchart Design

Flowchart Design describes the processing data system serves to document the system used now and planning the design of the new system. The following flowchart application design can be seen in Fig. 1.

B. Activity Diagram

The user will press the join button on the selected product. Then the system will check whether the user request is join or cancel. If you join, eating the system will check the date of group buying for the product or not. If not, the system will add user data to members who participate in the group buying. When it's over, the system will notify that the group buying the product is over. If the cancel request, the system will expose the user from the member who joined the group buying. In Fig. 2 you can see the debt activity diagram display.
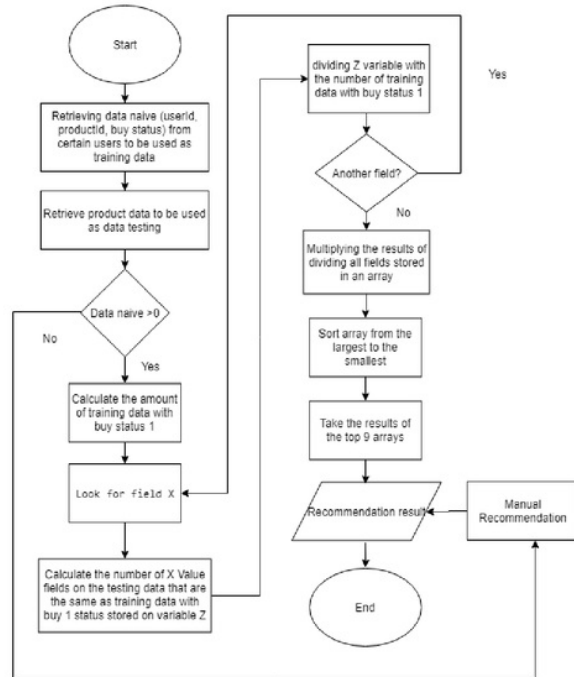

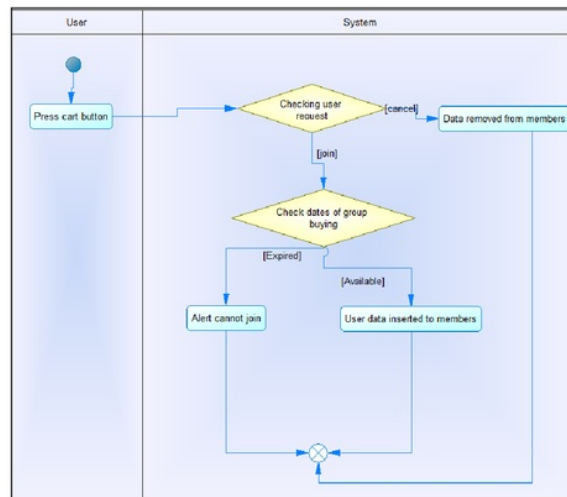Fig. 1. Flowchart Application

Fig. 2. Group Buying Activity Diagram

Product added features are features where users input new product data. Users will be asked to provide product data. The data is in the form of group buying dates, categories, prices, and product descriptions. Next, the system will check whether

all the required fields have been filled or not. If it is correct, the user will be entered into the database. In Fig. 3 you can see the display of activity diagrams plus the product.
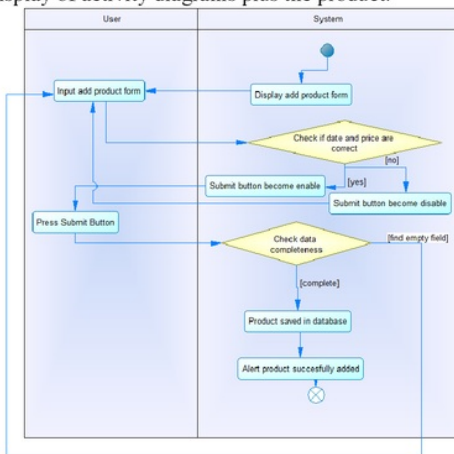

Fig. 3. Add Product Activity Diagram

IV. RESULT AND DISCUSSION

Naive Bayes testing is done on users with ID 8. In Table I you can see examples of products that have been seen by the user 8. Buy status is whether the product is in demand by the user or not. 2 products that will be selected for recommendation can be seen in Table II.

TABLE I.   TRANSACTION TABLE EXAMPLE USER ID 8

Product Id	Category	Price	Location	Buy
23	Fashion	100.000	Jawa Timur	0
30	Fashion	650.000	Jawa Timur	0
47	Toys	479.826	Jawa Timur	0
49	Toys	75.000	Jawa Timur	0
48	Toys	175.000	Jawa Timur	0
45	Food & Drink	65.000	Jawa Timur	0

TABLE II.   PRODUCT TABLE AND CATEGORY

Product Id	Category	Price	Location
23	Fashion	100.000	Jawa Timur
30	Fashion	650.000	Jawa Timur
35	Electronic	180.000	Jawa Timur
38	Electronic	258.000	Jawa Timur

After that, the calculation will be done manually with the formula P (X | Ci) * P (Ci) where X is the variable category, price, and location, while Ci is the buy status. The results of calculations can be seen in Table III.

TABLE III.   THE MANUAL CALCULATION AND RESULT TABLE

Product Id	Category	Price	Location	Result
23	Fashion	100.000	Jawa Timur	0.061
30	Fashion	650.000	Jawa Timur	0.061
35	Electronic	180.000	Jawa Timur	0.183
38	Electronic	258.000	Jawa Timur	0.183

From the results of manual calculations, 9 data with the highest values were taken to be used as recommendation

items. Comparison of program and manual calculations can be seen in Fig. 4. When compared from the results of manual calculations and program calculation results, the recommended product is the same product.

Fig. 4. The Result by Computer Calculation

The user has entered the mobile application will show the recommended product to the user. On the left side there is a side-bar to display products with various criteria. Display main menu application can be seen Fig. 5.
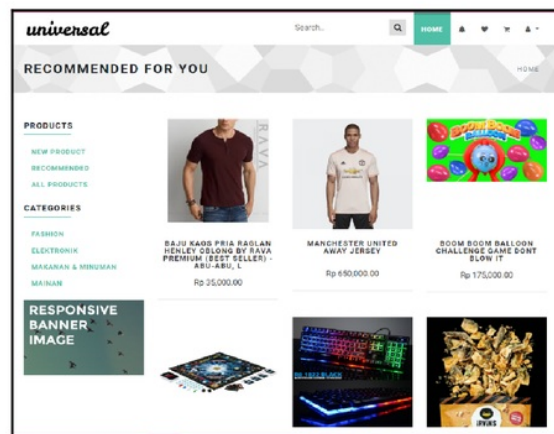

Fig. 5. Display Main Menu Mobile Application

In Fig. 6 you can see the shopping cart view of the application when the user presses the icon cart on the navigation bar. The application will display the product that has been followed by the user and the price description of the product. Users can also delete products from existing carts.
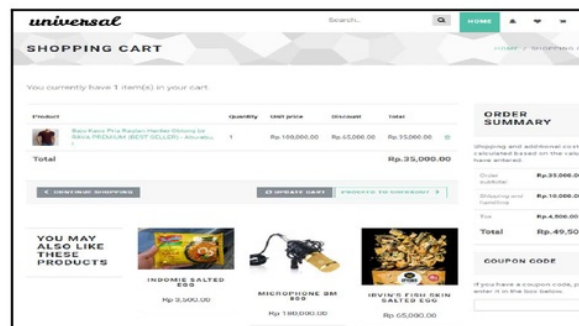

Fig. 6. Display Shopping Cart Based Recommended Users

At the end of the sales period, the manager can also see all the items sold in this mobile application. In this stock report, the manager can see the product name, product weight, product unit price, and the remaining stock held. On the initial page of the stock report display 10 items with the initial letter sorting. Stock reports can be seen in Fig. 7.

Fig. 7. Report on the remaining period of sale

V. CONCLUSIONS

Based on the results of the test, we can conclude the following:

1. Naïve Bayes Method can provide fairly accurate recommendations, if the value of the explanatory variable is quite specific and global.

2. The application has several features that other similar applications, such as prices that can be in various value.

3. This mobile application can provide confirmation in the form of e-mail on every status change made by admin and users.

4. Based on the results of the questionnaire given to students as participants of the event, 82.5% of users considered that the front page had a complete feature, 89.8% of users considered that the front page had a pretty very good design.

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