Case Study on an Android App for Inventory Management System with Sales Prediction for Local Shopkeepers in India

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Abstract—The retail sector has widely adapted different inventory management applications and some retail chains even employ prediction software to analyze future sales. However, a lot of day-to-day shopping in India happens through local shops. The owners of such mom-and-pop shops do not necessarily have the capital to invest in proprietary applications for setting up an inventory management system. Needless to say that same is the case for any sales prediction software. As a result, many of the shopkeepers end up hoarding a lot of irrelevant and non-profitable products that lead to financial losses. A very cost-effective and accessible solution for this problem is a mobile application that provides all the features of a point-of-sale system as well as gives future sales insights. It will enable shopkeepers to manage their current product purchases and invoicing. The predictive sales analysis will help them to modify their investments on products and supplies thereby ensuring maximum profits. If a shop houses relevant products that cater to customer needs, its customer reach will increase. The Economic Times published an article in the May of 2019, which stated that the number of smartphone users in India is expected to rise by 84% to 859 million by 2022 from 468 million in 2017. It is safe to assume that a large population of shop owners will have smartphones in the following years. Hence, equipping the local shopkeepers with a mobile application will prove instrumental since it will give them exposure to all the aforementioned benefits.

Keywords—sales; prediction; data mining; inventory; products; shopkeepers; profits; mobile application; data mining; android.

Abbreviations—PoS: Point-of-Sale, Mobile App: Mobile Application, OS: Operating System, GUI: Graphical User Interface, CPU: Central Processing Unit.

I. INTRODUCTION

Mobile phones have become a vital part of day-to-day life today. The e-commerce trend has taken businesses online and has proved to be beneficial for them. In a basic e-commerce system, the merchants put their products on display over the website and the customers searching for that product can place an order using the same website. Payment portals do the transactions, and then a delivery service delivers the products to the designated customer. E-commerce websites hold the potential to showcase a wide variety of products at once and therefore, are equally convenient to buyers and sellers. The sellers can generate a report of their sales or product demands either manually or through a data mining software. Even with so much backbone in the e-commerce industry, many shopkeepers in India have chosen to stay completely offline. This scenario raises the need to understand the reason for the same. A major contributing factor for local shopkeepers to not take their businesses online is the lack of monetary funds and resources. It may seem a personal drawback from afar but if we aim at achieving social development, this problem needs to be addressed, and a viable solution must be found. Accessing a point-of-sale system via their own mobile phones is definitely one of the most feasible solution to this problem. Android apps are free to download and can provide an equally good user interface like that of a computer-based inventory management system

A seller can manually list down all the products and investment and tally it with to total sales to produce a profit report but that is not to say tedious and monotonous. Through data mining techniques the same results can be achieved more quickly and one can even get a graphical representation for better understand makes the process more engaging. Traditionally to perform any product based analysis, different software is needed to be purchased. A mobile app with an amalgamation of both these trends will make the whole process more convenient. The Android app should comprise all of the following functionalities for catering to the need of the shopkeepers under consideration:

1. Add/ Update/ Delete Category of products.
2. Add/ Update/ Delete Products in every category.
3. Display the existing inventory list.
4. Barcode scanning for incoming products and invoices via a phone camera.
5. Sales report and predictions.

II. LITERATURE SURVEY

Literature[1], In this paper, the performance of a hosted website is predicted using data mining techniques. The website traffic and conversion rates are considered as the attributes for the data mining logic. Website traffic is the number of users who visit the website. Conversion rate is the percentage of a website's visitors out of the total visitors that have completed the desired goal for that online business. Data analysis can be used to design extraction models that define future data trends. The technique used in this paper for data mining and prediction reports is fuzzy logic. Fuzzy logic is used when the outcome is uncertain. In cases where it cannot be determined whether a condition is true or false, fuzzy logic is used as it provides flexibility in logical reasoning. This makes it efficient for predictive analysis in particular clusters.

In Literature[2], the author describes demographics as a statistical representation of the characteristics of a population. These are mostly the socio-economic features of an individual. The age, educational level, occupation, income, marital status, the average size of family, etc. are all considered as demographics. In terms of the website, these demographics are extracted from the visitors. In the data analysis process, these demographics are categorized into groups and mapped with their frequent activities on the website. The paper follows a technique where the demographic clusters are combined with corresponding transaction data clusters to generate input for the data prediction mode. The data mining task is done using the k-mean algorithm. K-means algorithm categories input item-set into "k" number of clusters based on their similarity. The similarities are calculated using the Euclidean distance method. It is an effective algorithm where large input item-set are available.

Literature[3], In this paper, profit for tour agency which predominantly focuses on air travel is predicted. Air travel has become a sort of trend in recent years. Therefore many travel agencies have focused their business activity on air travel to increase transactions and corporate profit. Online ticket sales are proportional to the profits earned for any agency. To analyze this, ticket fare is clustered into groups based on the price range for various different airlines. Historic data from airlines can be used to extract ticket fare and other profit affecting factors, for the trading model and linear regression is used to generate the results.

Literature[4], Here, the author describes that the system proposed in the paper is for online stationery. The system aims at improving the current functioning method of the same by adding association rules and then giving suggestions to the owner on what products should be included with the already existing ones. Association rules are used to suggest relevant and similar items to the shop owners by segregating items based on support and confidence. In the Apriori algorithm, the candidate item-set is generated from larger item-set from the previous pass. In every pass, the items which do not satisfy the support are discarded. In this way, the store can have a varied range of products that support customer demand as well as contribute to the profit of the store.

Literature[5], In this paper the author describe, The paper is for the prediction of the retail store sale. The system predicts variation in the sales of a retail store and test its usability. To achieve this temporal POS data from past three years was used from supermarkets. The predictive accuracy of the alteration in sales value varied between 75% to 86% according to the changes in the number of product attributes. They also crated a three different categories based on there daily data and by which they can predicted the sales of yesterday and put those products which are having more sales yesterday and they also make decision of the products which are having less sale by this model. They was using regression model here for prediction and deep learning model for prediction accuracy check.

III. PROPOSED SYSTEM

To make the android app most compatible the minimum SDK version should be defined as 15 and the target SDK version should be defined as 28. A crucial part of this mobile app is sales prediction and analysis. This can be achieved by employing data mining algorithms on the customer data collected as well as the temporal data fed in by the shopkeepers. The best-suited algorithm for the same is Regression Analysis.

Regression Analysis (Linear regression):

The regression analysis is done by equating two variables in linear manner. The two variables are termed as dependent and independent variable. The independent variable is the value in the existing data set. For a sales prediction model, the independent variable can be the value of investment. The dependent variable is the value to be predicted. The equation for linear regression is

$$Y = a + bX$$

where, Y is independent variable,
X is dependent variable
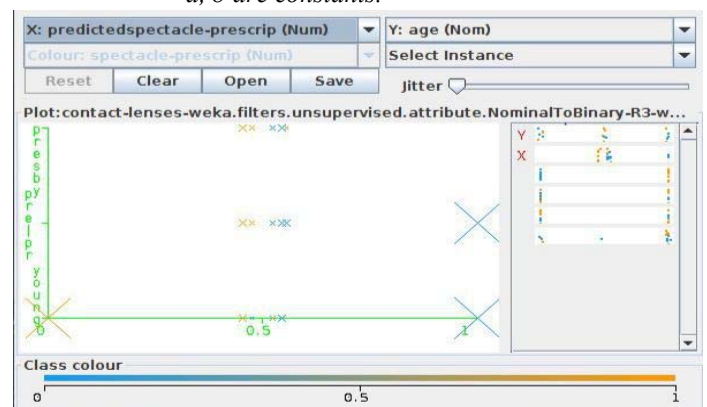a, b are constants.

Fig 3.1: Regression analysis on sample data set

The value for a and b is estimated from the t-statistic of the existing data set. For a sales forecasting model, Y can be the future sales and X can be the investment.

This mobile system is an upgrade on the traditional point-of-sale or inventory management systems which we see in big retail chains, medical stores or industrial warehouses. Traditionally, a lot of hardware equipment like monitor screens, CPUs, physical barcode scanners, POS machines, etc. These hardware needs are eliminated by using mobile phones as the screen and processing unit, integrating barcode scanning through a phone camera and accepting payments via net banking or a unified payment interface. This reduces the prerequisite investment costs. A general database of common categories can be connected to the app at the time of release. As a result, the labor of initial data entry on the shopkeeper's side will be significantly reduced. Since the mobile app already caters to adding and removing categories, the shop owners can modify this database as per their will and requirement. Third-party payment portals can be incorporated to make the process cash-less and reliable. A record of payments can also be analyzed to find out the purchasing trends and in-demand products. One of the future scopes of this app is that the processing can be taken over the cloud so that the app consumes less memory space but functions speedily and efficiently.

Following is a demonstration of how the user interfaces will appear:

Figure 3.3: GUI for viewing current Inventory List

Figure 3.2: GUI for generating customer invoice.

Figure 3.4: GUI for reading Sales Report

IV. CONCLUSION

AA good percentage of people in India have access to smartphones and that percentage will greatly increase in the coming 2-3 years. With such favorable circumstances, an Android app is ought to flourish and attract a wider customer base over a period of time. Thus it is advantageous to have a mobile application that not only assists with inventory and invoice operations but also helps with sales analysis. Since sellers are presented with performance reports and product analysis, they can make necessary changes in their policies or way of operation after thoroughly studying and understanding all the factors that impact their sales. Similarly, customers will avail of the experience of accessing the right products at the right time and will stay informed about new products simultaneously. With time, as more and more data is fed into the database the accuracy of the data mining model will improve and regression analysis will be presented with over a 96% accuracy. From the perspective of profits for the app vendor company, they can present in-app purchases to the shopkeepers like unlimited sales report storage, e-mail sharing of invoices with customers, etc. Therefore the app will not only assist in bringing about social empowerment and development but will also present profitable business opportunities to app development companies.

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