WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Starbucks Chain Opening Management System

Dr. Manju Arora [a], Harsh [b]

[a] *Department of Information Technology Jagan Institute of Management Studies, Sector-5, Rohini, New Delhi 110085 , India*
[b] *Department of Information Technology Jagannath University Bahadurgarh, Haryana, India*

A B S T R A C T

This study offers a way to simplify the process of selecting and allocating new store locations. The proposed system integrates machine learning to check the suitability of locations based on geographical, competitor presence, and socio-economic factors and incorporates a real-time auction system to assign store opportunities to vendors. The system supports store allocation through bidding. The backend is divided into three main modules/components. The first is location suitability, and the second is auction: Firebase is used to implement the real-time auction system, and RESTful APIs are developed using Node.js and tested with Postman to ensure secure and efficient performance.

Keywords: Store Expansion, Machine Learning, PCA, K-Means Clustering, Vendor Bidding, Auction System, Firebase, Location Suitability, Retail, Analytics, Real-Time Notification, Admin Dashboard.

Introduction

The Starbucks Chain Opening Management System represents an approach to enhancing the decision-making process for new store locations.

Finding the most suitable spot for a new store is a difficult process including several factors and difficulties. Among these are demographic trends and competition analysis metrics. By leveraging Machine Learning, System aims to address these complexities through predictive analytics that can streamline decision-making processes to find location suitability.

Another aspect of the Starbucks Chain Opening Management System is its auction-based allocation system. Through this concept, Starbucks creates a competitive marketplace that not only benefits the company but also its vendors. Allows for the strategic selection of store sites based on real-time data.

There are some cases where manual assignment of store locations may be preferable. Various strategic business needs may necessitate a more hands-on approach, especially in unique geographical or cultural contexts.

Objectives

- Predict locations for new Starbucks stores using machine learning.
- Implement a real-time auction system to allocate store location to vendors.
- Admin can manually assign store locations to vendor.
- Ensure the system is scalable, secure, and performs efficiently.

Literature Work

Starbucks' international growth has been the focus of many case studies or strategic evaluations. According to The Strategic Institute [1], Starbucks' international success is rooted in its ability to combine global brand consistency with local adaptability, highlighting the importance of planned store and marketplace entry tactics. While effective, traditional shop growth strategies frequently rely on financial predictions, competitor mapping, and demographic surveys – all of which are slower and less objective than current machine learning algorithms.

Accredian's analysis [2], emphasizes how Starbucks used localization and customer behavior data to dominate new markets. However, these techniques still rely on manual judgment and are prone to bias or delayed responsiveness to market dynamics.

Several research papers on store expansion suggest the use of clustering algorithms like K-means and PCA for dimensionality reduction [3]. This supports the design of machine learning model, which uses PCA, and Random Forest to predict the suitability of store locations based on economic data.

Moreover, current business models are missing an automated vendor allocation system. As suggested by many smart retail architectural models, our system incorporates market-driven fairness and automation achieved using Firebase-based real-time auctioning [4]. When strategic overrides are required, our method not only simplifies the vendor selection process but also permits administrative control.

Proposed Methodology

A proposed approach finds the suitable location for expansion, and then the suitable location will be stored, and the admin will either push it into auction or assign it manually to the verified vendors.

Location Suitability

The system makes use of K-means for clustering and the PCA algorithm for dimensionality reduction. The model assigns a label (0, 1 and 2) to each location.

0 – location is not suitable

1 – location is moderately suitable

2 – location is highly suitable

Classification Report:

Label	Precision	Recall	F1-Score
0	0.98	0.96	0.97
1	0.97	0.98	0.98
2	0.98	0.98	0.98

Fig. 1 - Classification Report.

The Classification Report (as shown in Fig. 1) includes:

- Precision - How many predicted suitable locations were actually suitable.
- Recall - How many actual suitable locations were correctly identified?
- F1-score - A balance between precision and recall.

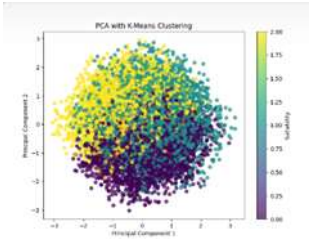

Fig. 2 – Plot of PCA components.

1.1. Auction Based Vendor Assignment

Once a location has been checked for suitability, and it is stored in the DB if the location is suitable. This module introduces a transparent process, ensuring that the most committed vendor gets the right to open a store in that location.

Auction Based Vendor Assignment

- Vendor registration: The vendor registers on the platform and submits documents for verification.
- Admin approval: The admin verifies the documents manually and either approves or rejects the request.
- Push location to auction: Once ML marks a location suitable, it will be pushed to auction with minimum bid amount.
- Bidding phase: The vendor can participate in the upcoming auction and put in a bid on available locations.
- Real-time update: Using Firebase listeners, all vendors get live updates whenever a new bid is placed within some time window defined by the admin.
- Winning logic: Once the timer ends, the highest bidder is automatically recorded, and a payment link is opened for that vendor.
- Notification: Notify vendors about new auctions and auction wins via emails.

Manual Store Assignment

The strategic decision to manually assign store locations, despite the prevalence of data-driven methodologies, arises from various situational considerations and contexts specific to the retail environment. In instances where standard predictive analytics may not fully encapsulate the nuanced variables affecting store success, particularly within culturally or geographically unique contexts, a manual approach can offer tailored insights. These specific scenarios often include the introduction of stores into emerging markets, locations with unique cultural dynamics, or areas where local consumer behavior significantly diverges from trends.

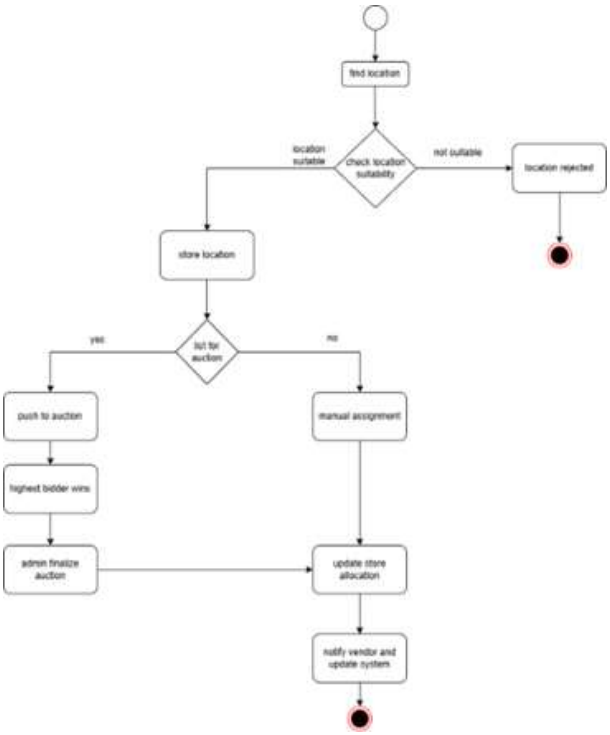

Fig. 3 – Workflow.

Results

The results obtained from implementing the Starbucks Chain Opening Management System verifies the suitability of the location using machine learning.

Machine learning module

- The model based on k-means, PCA and random forest, showed a prediction accuracy of 90%.
- The Classification report (Fig. 1) shows high precision and recall, demonstrating the model's effectiveness in identifying suitable locations.
- Average prediction time: < 2 seconds

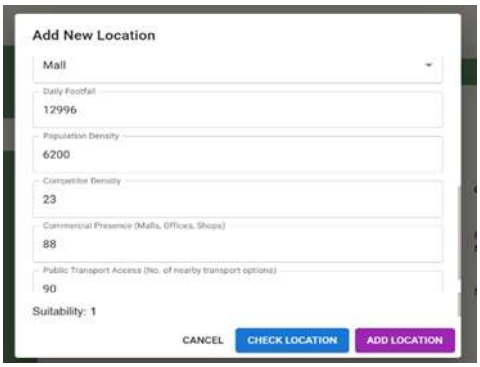

Fig. 4 - Checking location suitability.

Auction module performance

- Real-time bidding using Firebase ensured < 0.7 second delay across vendor devices.

- Vendors received real-time updates via email.
- Auction history was logged and stored in Firebase.

Fig. 5 - Bidding Platform.

Manual Assignment Module

The admin dashboard allows for instant assignment of stores.

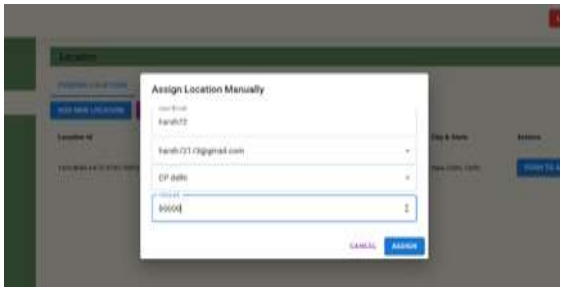

Fig. 6 - Manual assignment.

Future Implications

- Mobile application support: Develop a mobile app for vendors to manage payment, auctions, and payments.
- Real-time socio-economic data monitoring: Enhance the model to adapt to the fluctuation of commercial presence, footfall, and other economic factors.
- Blockchain smart contracts: Use smart contracts to secure the transactions like payment and bidding.

Conclusion

The system provides a robust, scalable framework for optimizing store expansion. By integrating machine learning predictions with real-time vendor engagement via auction and admin flexibility via manual assignment, it ensures high transparency, faster decision-making, and better alignment with business goals. The use of PCA and Random Forest algorithms allows the model to reduce the high-dimensional data into meaningful, decision-oriented insights. With an accuracy of 90%, the ML module effectively predicts suitable locations, categorizing them into suitability levels. The system's modular architecture allows for easy future upgrades, making it a viable long-term tool for Starbucks strategic expansion.

References

1. The Strategy Institute. "Starbucks International Strategy: A Case Study for Global Success." https://thestrategyinstitute.org/insights/starbucks-international-strategy- a-case-study-for-global-success
2. Accredian Blog. "How Starbucks Conquered the World Through Expansion, Localization and Brand-Building Success." https://blog.accredian.com/how-starbucksconquered-the-world-through-expansion-localization-and-brand-building-success/
3. Han, J., Kamber, M., & Pei, J. (2011). Data Mining: Concepts and Techniques.
4. McKinsey & Company. "Smart Retail Technologies and Global Trends." (2020)