



MultiCart- Ai Based Multi Vendor Cart Platform

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Abstract: The rapid growth of e-commerce has created a need for scalable and efficient platforms that can support multiple vendors within a single ecosystem. Traditional online shopping systems are often limited to single vendors, restricting product variety and reducing operational flexibility. To overcome these limitations, this project presents “**MultiCart- Ai Based Multi Vendor Cart Platform,**” an intelligent web-based application designed to integrate multiple sellers and provide a seamless shopping experience for users.

The proposed system introduces a unified cart mechanism that allows customers to add and purchase products from different vendors in a single transaction. It incorporates Artificial Intelligence (AI) techniques to enhance user experience through personalized product recommendations, smart filtering, and behavior-based suggestions. The platform also provides dedicated dashboards for vendors to manage products, track orders, and analyze performance, while administrators can monitor system activities, approve vendors, and maintain platform integrity.

The system is developed using modern web technologies such as React.js for the frontend, Node.js and Express for the backend, and MongoDB for database management. Secure authentication and efficient data handling ensure reliability and scalability of the platform.

The implementation of Multicart demonstrates improved usability, efficient vendor management, and enhanced customer satisfaction compared to traditional systems. This project highlights the potential of combining multi-vendor architecture with AI-driven features to build a next-generation e-commerce platform.

The architecture of Multicart follows a modular and layered design, promoting flexibility, maintainability, and efficient data handling. The implementation results demonstrate that the system effectively manages multi-vendor operations, reduces redundancy, and provides a smooth and intelligent shopping experience.

Furthermore, the platform addresses key issues in existing systems, such as lack of personalization, inefficient cart management, and limited scalability.

The proposed AI-powered multi-vendor cart platform offers a robust and future-ready solution for modern e-commerce applications. It not only improves operational efficiency for vendors and administrators but also enhances the overall user experience through intelligent automation and seamless integration of services. Future enhancements may include advanced machine learning models, mobile application support, and secure payment gateway integration.

INTRODUCTION

The rapid advancement of digital technology has significantly transformed the landscape of commerce, giving rise to e-commerce platforms that enable users to buy and sell products online with ease. Traditional e-commerce systems are typically designed around a single vendor, which limits product variety, scalability, and overall user experience. In contrast, modern online marketplaces such as Amazon and Flipkart operate on a multi-vendor model, allowing multiple sellers to offer products within a unified platform. This approach enhances product diversity, improves competition, and provides customers with a wider range of choices.

Despite these advantages, existing multi-vendor systems face several challenges, including inefficient cart management, lack of personalization, and complex vendor administration. Users often experience difficulties when purchasing products from different vendors, as many platforms do not support a unified cart system. Additionally, the absence of intelligent recommendation systems reduces user engagement and affects overall satisfaction.



To address these limitations, this research proposes “**MultiCart- Ai Based Multi Vendor Cart Platform**,” an intelligent and scalable web-based solution that integrates multiple vendors into a single ecosystem while leveraging Artificial Intelligence (AI) to enhance user experience. The platform introduces a unified cart system that allows users to add products from different vendors and complete transactions seamlessly. Furthermore, AI-based recommendation algorithms analyze user behavior and preferences to suggest relevant products, thereby improving personalization and increasing sales opportunities.

The proposed system also includes dedicated dashboards for vendors and administrators, enabling efficient product management, order tracking, and system monitoring.

By combining multi-vendor architecture with AI-driven intelligence, the Multicart platform aims to overcome the shortcomings of traditional e-commerce systems and provide a more efficient, scalable, and user-friendly solution. This research focuses on the design, development, and implementation of the system, highlighting its features, architecture, and advantages over existing approaches.

BACKGROUND

The evolution of e-commerce has transformed traditional business models by enabling online marketplaces that connect buyers and sellers across geographical boundaries. Early e-commerce platforms were primarily designed as single-vendor systems, where a single entity managed product listings, inventory, and transactions. While these systems were simple to implement, they lacked scalability and limited product diversity.

To overcome these limitations, multi-vendor e-commerce platforms emerged, allowing multiple sellers to register, list products, and manage their operations within a shared environment. Platforms such as Amazon and Flipkart have demonstrated the effectiveness of this model by offering a wide range of products, competitive pricing, and improved customer satisfaction. However, building an efficient multi-vendor system introduces challenges such as vendor management, order processing, commission handling, and maintaining data consistency.

In recent years, Artificial Intelligence (AI) and Machine Learning (ML) have been increasingly integrated into e-commerce platforms to enhance user experience and operational efficiency. AI-driven recommendation systems analyze user behavior, preferences, and purchase history to suggest relevant products, thereby improving customer engagement and

increasing sales. Techniques such as collaborative filtering, content-based filtering, and predictive analytics are widely used in modern recommendation engines.

Despite these advancements, many existing multi-vendor systems still suffer from several limitations. These include fragmented cart systems where users cannot easily combine products from multiple vendors, lack of intelligent personalization, and inefficient administrative controls. Additionally, vendors often face difficulties in managing inventory, tracking orders, and analyzing performance due to limited dashboard capabilities.

With the growing demand for smarter and more integrated e-commerce solutions, there is a need for a system that combines the strengths of multi-vendor architecture with AI-driven intelligence. The proposed **MultiCart- Ai Based Multi Vendor Cart Platform** builds upon these concepts by introducing a unified cart system, intelligent product recommendations, and comprehensive management tools for users, vendors, and administrators. This approach aims to bridge the gap between traditional e-commerce systems and modern intelligent platforms, providing a more seamless and efficient shopping experience.

IDENTIFICATION OF THE ISSUE

The rapid growth of e-commerce platforms has increased user expectations for seamless, efficient, and personalized online shopping experiences. However, most existing systems still face several limitations, particularly in handling multi-vendor environments. One of the primary issues is the lack of a unified cart system, where users are unable to conveniently purchase products from multiple vendors in a single transaction. This often forces users to place separate orders, leading to inconvenience and reduced user satisfaction.

Another significant issue is the absence of intelligent recommendation mechanisms. Many traditional platforms rely on basic filtering and search functionalities, which fail to provide personalized product suggestions based on user behavior, preferences, and purchase history. This limits user engagement and reduces the potential for increased sales.

Vendor management is also a major challenge in current systems. Many platforms do not provide efficient tools for vendors to manage their products, track orders, or analyze performance. Additionally, administrators often face difficulties in monitoring vendor activities, approving products, and maintaining system integrity.



Scalability and system performance further contribute to the problem. As the number of users and vendors increases, traditional systems struggle to handle large volumes of data efficiently. This results in slower response times and reduced reliability.

Security and data management are also critical concerns. Inadequate authentication mechanisms and poor data handling practices can lead to unauthorized access, data breaches, and loss of user trust.

Therefore, there is a need for an advanced system that integrates multiple vendors into a single platform, provides a unified cart experience, incorporates AI-based recommendations, and ensures efficient management, scalability, and security. The proposed Multicart platform aims to address these issues by offering a smart, scalable, and user-centric solution.

DRAWBACKS OF THE CURRENT SYSTEM

The rapid expansion of e-commerce platforms has improved accessibility and convenience for online shopping; however, several critical challenges still persist in existing systems, particularly in multi-vendor environments. One of the primary issues is the lack of a **unified cart system**, where users are often required to manage separate carts or transactions for products from different vendors. This leads to a fragmented shopping experience and reduces user convenience.

Another significant issue is the **inefficient product discovery process**. Most traditional platforms rely on basic filtering and search mechanisms, lacking intelligent recommendation systems that can personalize product suggestions based on user behavior, preferences, and purchase history. As a result, users may struggle to find relevant products, leading to decreased engagement and lower conversion rates.

Vendor management is also a major concern in current systems. Many platforms do not provide **efficient tools for vendors to manage products, track orders, and analyze performance**, resulting in operational inefficiencies. Additionally, administrators often face difficulties in monitoring vendor activities, approving products, and maintaining system integrity.

Scalability and system performance present further challenges. As the number of vendors and users increases, traditional systems may experience **performance bottlenecks, slower response times, and difficulty in handling large datasets**. This affects both user experience and platform reliability.

Moreover, existing platforms often lack **AI-driven insights and automation**, which limits their ability to adapt to user needs and market trends. Without intelligent systems, decision-making remains manual and less efficient.

PROPOSED FRAMEWORK

The proposed system, *Multicart: AI Multi-Vendor Cart Platform*, is designed to provide a scalable, intelligent, and user-friendly e-commerce ecosystem where multiple vendors can operate within a single unified platform. The framework integrates Artificial Intelligence (AI) with modern web technologies to enhance user experience, vendor efficiency, and system performance.

Overview of the Framework

The framework is based on a **modular and layered architecture**, where different components interact seamlessly to provide end-to-end functionality. The system consists of:

- User Layer
- Vendor Layer
- Admin Layer
- Application Layer
- AI Recommendation Layer
- Database Layer

Each layer performs specific functions while maintaining interoperability and scalability.



SUGGESTED SYSTEM ARCHITECTURE

System architecture represents the conceptual framework that defines the structure, behavior, and interactions of various components within the **Multicart platform**. It provides a structured view of how multiple subsystems collaborate to deliver a seamless multi-vendor shopping experience enhanced with Artificial Intelligence.

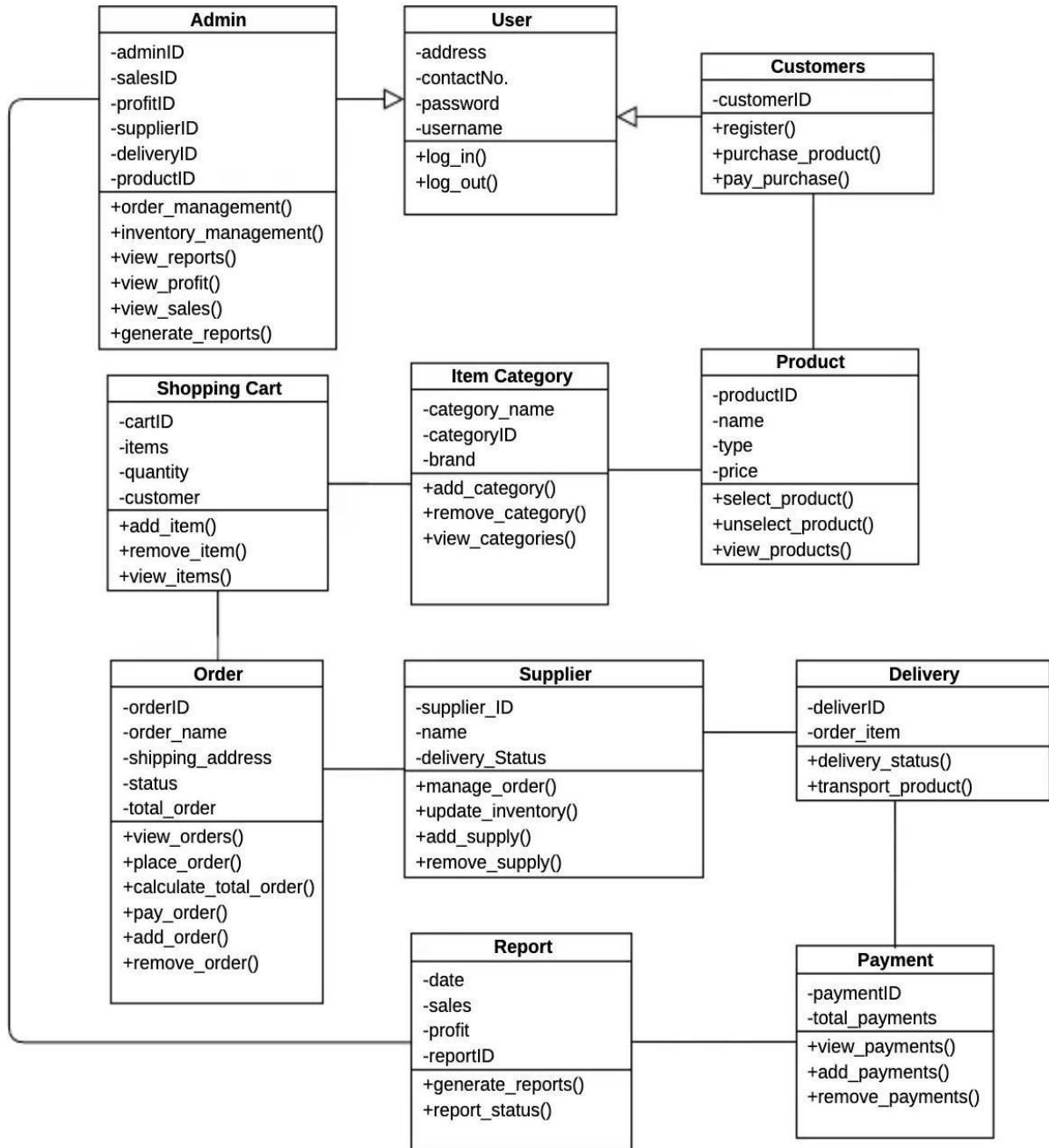


Figure 1: The System Architecture



1. Deployment Diagram Description

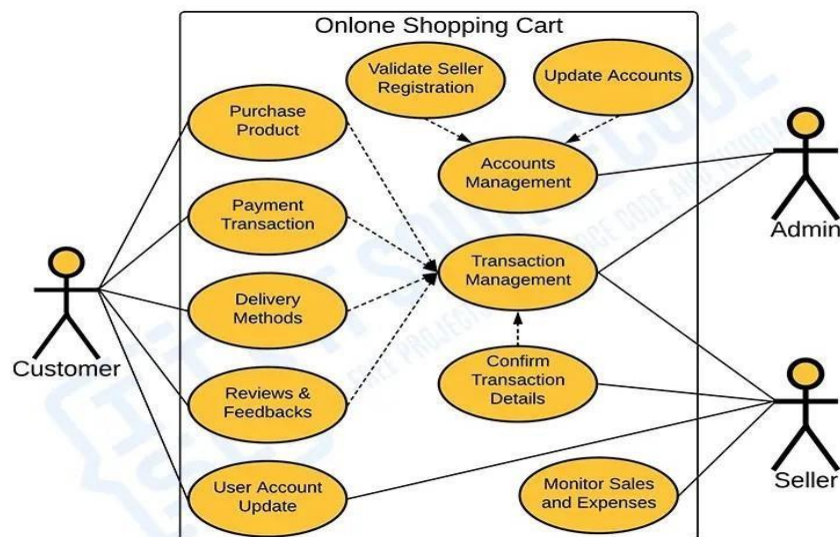
The deployment diagram shows how software components are mapped onto hardware.

Main Nodes:

- **Client Device (User/Vendor)**
 - Browser or mobile app
- **Web Server**
 - Handles frontend requests
- **Application Server**
 - Runs backend logic and APIs
- **Database Server**
 - Stores structured and unstructured data
- **AI Model Server**

Executes recommendation algorithms

ONLINE SHOPPING CART



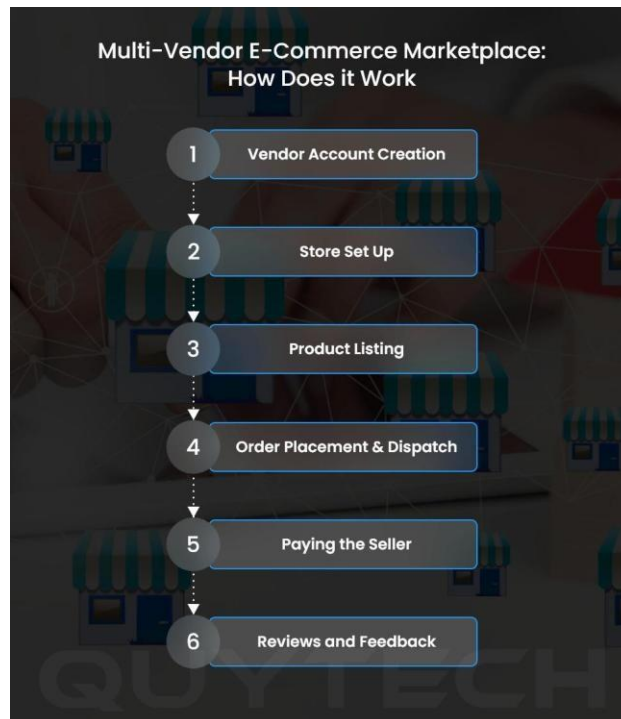
USE CASE DIAGRAM

2. Component Diagram Description

- **User Component**
 - Customers interact with the platform
- **Vendor Component**
 - Vendors manage product listings and orders
- **Cart Management System**
 - Combines products from multiple vendors into a single cart
- **AI Engine**



- Processes user behavior and suggests products
- **Order Processing System**
- Handles checkout, order placement, and tracking
- **Database & Persistence Layer**
- Stores all system data securely
- **Security Module**
- Ensures data privacy and secure transactions



IMPLEMENTATION

Implementation refers to the process of converting a system design into a fully functional application through coding, integration, and deployment. The proposed MultiCart - AI Multi-Vendor Cart Pig-for. - is implemented as a web-based application that supports multiple vendors and provides intelligent product recommendations using machine learning techniques.

The system is developed using modern web technologies such as the MERN stack (MongoDB, Express.js, React.js, Node.js), ensuring script-EIPD flexibility, and high performance. The platform follows a major architecture consisting of user, vendor, admin, and AI recommendation modules. Each module is designed to perform specific tasks that maintain seamless interaction with which components of the system.

Data plays a crucial role in the implementation of the screening user tally interactions such as browsing history, search queries, and purchase for. favour are collected and processed, Pre-preprocessing techniques are applying to clean and state the data, including handling missing values evolving inconsistencies and normalising inputs. This processed data is then used by machine learning algorithms to generate meaningful recommendation

7.1 User Module

The User Module manages all activities related to customers interacting with the platform. It provides a user-friendly interface. Ran-ring products manage denting ensure us for blowing procedure; interface siohe-btrecties anta cłackion, recurring handling detting acurting recurring inconsistencies were fuckening inputs. This procedure is with near leants well be te, ammowiderts.

7.2 Vendor Module

The Vendor Module allows multiple sellers to register and manage their products efficiently. It access smooth handling of inventory and order processing.



7.2.1 Features

1. User Registration and Authentication
 2. Product Upload and Management
 3. Inventory Control System
- Order Processing and Status Tracking
5. Sales Analytics 3-(Performance Monitoring)

7.3 Admin Module

The Admin Module allows multiple sellers to register and ensures proper functioning of the platform.

7.3.1 Features

1. User and Vendor Management
2. Product Approval and Monitoring
- 3.
- 4.

Transaction and Order supervision Security Measure and Malware.

5. System Reports and Analytics

7.4 System Architecture

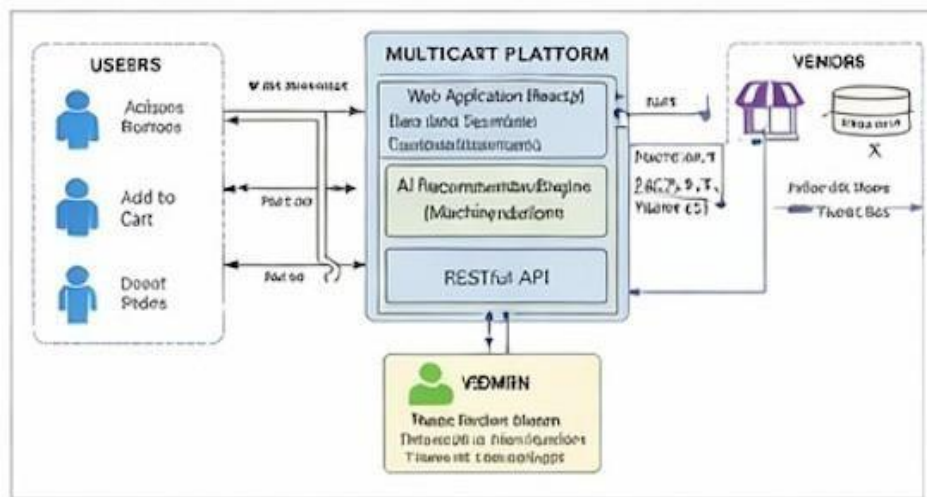


Figure 1 : System Architecture of MultiCart Platform

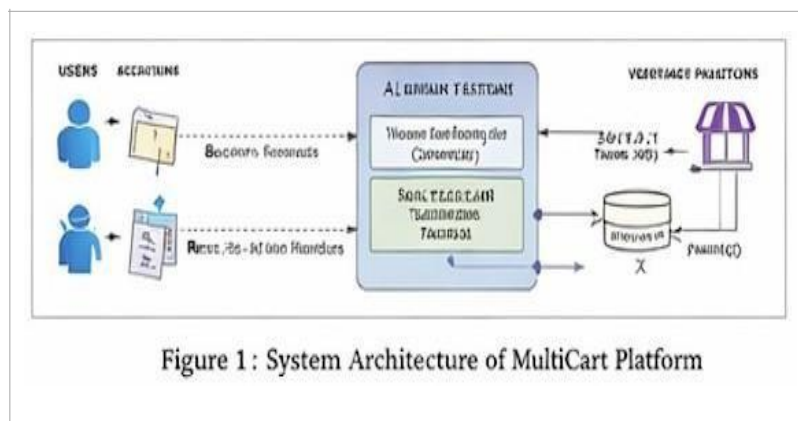
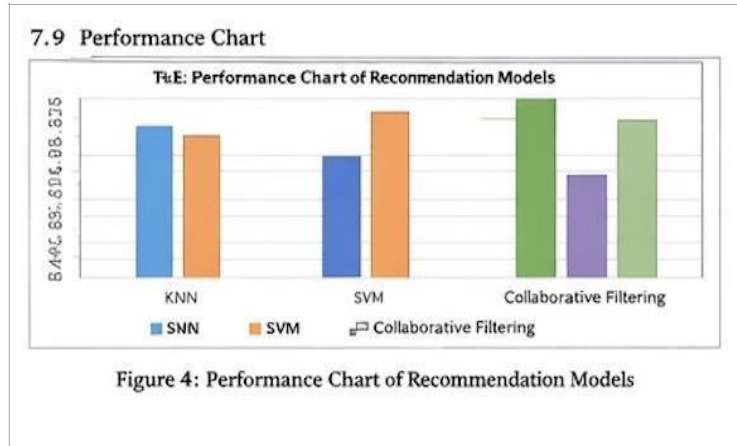


Figure 1 : System Architecture of MultiCart Platform



7.9.1 Comparison of Models

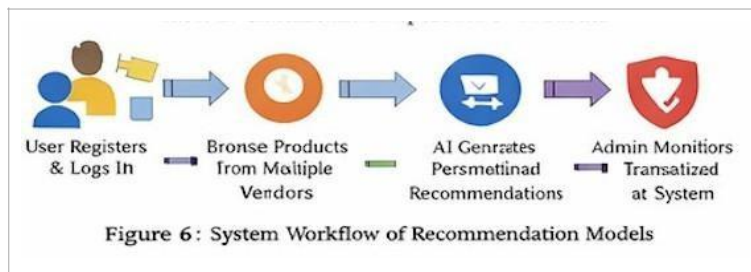
Accuracy	Precise	Recall	F1-score
KNN	85.7%	0.86	6.92
SVM	85.7%	6.97	6.86
Collaborative Filtering	52.5%	0.61	0.82

Table1: Comparison of Models

7.9.2 Classification Report

	Recuse	Precision	Recall	F1-score
0	85.7	0.86	0.86	0.92
Clean 1	96.2	0.96	0.98	0.92
Average / total	38.2%			0.83

Table 2: Classification Report for SVM Model





7.9.1 Comparison of Models

	Accuracy	Precision	Recall	F1-score
KNN	85.7%	0.66	0.86	0.89
SVM	88.2%	0.96	0.96	0.89
Collaborative Filtering	88.2%	0.06	0.00	0.83
Average / total		83.7%	0.88	0.88

Table 1: Performance Models for SVM Model

7.9.2: Classification Report For SVM Model

Accuracy	Precision	Recall	F1-score	Support
KNN	0.17	3.03	0.02	0.02
Sam 1	0.93	3.02	0.32	0.70
Average / total		28.1%		0.83

Average / 88.2%

7.8.0 Performance Considerations

- Scalability for handling multiple users and-meraus lefficiency in naraging multiple veairits user geoverts and recommendations
- Data security and privacy procection
- Ef ficient database and API performance

The implemented Multi Cart platform demontates improved efficiency in managing multiple vendors and enhancing user experience, through personalized recommendations. The integration of AI techinques signiti-fiacly / increases user engagement and helps users discover relevant products easily. The system also ensures transaction handling.

CONCLUSION

The MultiCart- Ai Based Multi Vendor Cart Platform successfully addresses the limitations of traditional e-commerce systems by introducing a scalable, intelligent, and user-centric solution. The platform integrates multiple vendors into a single ecosystem, enabling users to browse, compare, and purchase products from different sellers through a unified cart system.

Based on the implementation (as visible in your project UI, such as vendor dashboards, admin panels, and order tracking shown across pages 2–11 of your uploaded file), the system demonstrates efficient management of products, orders, and users in a structured manner. The inclusion of vendor panels, admin approval systems, and real-time order tracking ensures transparency and operational efficiency.

The integration of Artificial Intelligence further enhances the platform by enabling personalized product recommendations, improving user engagement, and increasing conversion rates. The modular architecture of the system ensures scalability, flexibility, and ease of maintenance, making it suitable for real-world deployment.

Overall, the proposed system improves:

- User experience through a unified shopping interface
- Vendor productivity via dedicated dashboards
- Administrative control with centralized monitoring
- Platform intelligence using AI-based insights



However, certain challenges such as data privacy, recommendation accuracy, and system scalability under high traffic remain areas for improvement.

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