

FlowLink: Multi-Sector Order Management and Supply Chain Platform

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ABSTRACT

Digital platforms have revolutionized business order management and customer interaction. Yet, many small and medium vendors across various sectors still struggle with fragmented or manual systems. To address this, this paper introduces FlowLink, a role-based, multi-sector order management platform designed to serve customers, retailers, and wholesalers. Users register by selecting their operational role, which tailors their workflow and access permissions. FlowLink focuses on managing the entire order lifecycle rather than inventory, making it suitable for vendors in diverse fields like grocery, medicine, hardware, and general supplies to process transactions efficiently. The platform's goal is to enhance order coordination, increase transparency among stakeholders, and establish a scalable foundation for cross-sector digital commerce.

Index Terms - Order management, multi-vendor platform, role-based access, digital commerce, supply coordination.

INTRODUCTION

Order management is an important aspect in supply chain coordination, particularly in scenarios where there is an interplay between multiple stakeholders, including customers, retailers, and wholesalers. This interplay happens on a regular basis. In small and medium-scale businesses, communication between buyers and sellers is still manual, involving communication through phone calls, messages, and messaging applications. This has led to issues like delays, mistakes, and communication problems, ultimately affecting the efficiency of these businesses. Small-scale businesses in different domains face similar problems, even though they operate in different domains. For example, there is no transparency in communication between buyers and sellers. Many existing digital platforms are either domain-specific or too complex and resource-intensive, making it difficult and impractical for small-scale businesses.

To overcome these problems, FlowLink is proposed as a scalable, sector-agnostic, role-based order management platform suitable for diverse vendor categories such as grocery, pharmaceutical, hardware, and other retail domains. By emphasizing structured workflows, role-specific functionalities, and centralized data handling, the system aims to enhance coordination, reduce operational overhead, and improve overall supply chain efficiency across multiple business sectors.

LITERATURE REVIEW

E-Commerce Multi-Vendor Application(IJSREM,2023)

This study led to the successful development of a centralized platform serving a wide variety of vendors. This comprehensive platform handles all necessary processes through a web portal[1]. A major advantage of centralization lies in the increased accuracy of tracking orders and improving operational efficiencies through digitalization. However, it only caters to normal e-commerce business processes and cannot handle multiple roles in a hierarchical manner, as in the case of wholesalers followed by retailers. Also, the restricted interactions between vendors and customers hinder scalability in the workflow and precise market segmentation.

FlowLink overcomes these problems through the implementation of a multi-role model in which wholesalers and retailers are incorporated with unique roles assigned to each. This improves the overall process of communicating orders across the entire chain. Additionally, FlowLink ensures complete transparency of all transitions in the entire order cycle, which is a major advancement over the previous single-role model.

1. Mobile Application Ordering System for Food and Beverage Industry(ICSGRC,2023)

The paper presents a mobile application related to food and beverage (F&B) ordering systems. It enabled customers to order food through mobile devices and receive automated confirmations with real-time status updates[2]. Analysis of the application showed a higher level of satisfaction compared to the traditional way of ordering. However, the application was limited in scope because it only applied to the food and beverage industry.

The FlowLink application overcomes these disadvantages since it does not restrict itself to a particular domain. It provides a domain-agnostic application with a role-driven workflow. It can be used in various business domains, including grocery stores, pharmacy stores, and hardware stores. It provides a generalized application related to ordering systems. It provides modular API support for adapting itself to various vendor domains.

Android-based Mobile Application Development to Connect Local Vendors with Customers (IJERT,2023)

The paper proposes the concept of DigitalVikreta, an Android-based mobile application that aims to bridge the gap between the local vendor and the customer. The proposed system includes the basic features of vendor registration, vendor discovery based on geo-location, ordering, and tracking[3]. The proposed architecture is based on the client-server model and ensures proper role definition between the vendor and the customer. The proposed architecture was tested and found to be effective in enhancing the efficiency of orders and vendor accessibility. The proposed architecture was also found to be limited to the client-server architecture and was not able to support the role chain between the vendor and the customer.

To overcome the drawback of the proposed architecture, FlowLink was proposed as an extension of the DigitalVikreta architecture. FlowLink proposes an architecture that provides the advantages of scalability and the ability to support the role chain between the vendor and the customer.

Web based Supply Chain Management System: Empowering Enterprises with Real-time Data and Performance Dashboards(*Journal of Electrical Systems*,2025)

The importance of the central dashboard for order tracking is highlighted in this research, which is useful for the decision-making process with the power of visualizations of orders and stocks. However, it is worth noting that the implementation of such systems is beyond the scope of small retail businesses.

The mentioned shortcomings of the system are improved by the FlowLink system through the implementation of the concept of dashboard-driven analytics with the power of mobile-first architecture. Thus, the traceability and visualization of the system are made possible for small-scale retail businesses and customers with the power of dashboards.

COMPARATIVE ANALYSIS

Feature	Previous Papers			
	E-Commerce Multi-Vendor Application	Mobile Application Ordering System for Food and Beverage Industry	Android Based Mobile Application Development to Connect Local Vendors with Customers	Web-Based Supply Chain Management System: Empowering Enterprises with Real-Time Data and Performance Dashboards
Platform	Web based Application	Android Application	Android Application	Web Based System
Target Users	Vendors and Customers	Customers and Restaurant Staff	Local Vendors and Customers	Customers and Administrators
Key finding	Multi-vendor platform to increase vendor reach and customer convenience	Demonstrates how mobile ordering improves user experience, reduces waiting time and enhances customer satisfaction.	Proposes an Android app DigitalVikreta that connects local vendors with customer	Web-based SCM system with real-time inventory tracking, dashboards and role-based access
Limitations	Does not focus on small/local retailers specifically, limited emphasis on real-time order tracking	Restricted to single business domain (Food and Beverage Industry)	Lacks advanced admin dashboards,role-based access control and web-based support for broader adoption.	Lacks accessibility for small-scale businesses
Communication	Limited notifications	Email notifications	In-app updates and email notifications	Status alerts and dashboards

PROPOSED SYSTEM

Problem Statement

Small and medium-scale enterprises (SMEs) are very important to the community, especially in the retail and distribution industries. However, most of these enterprises are still using unstructured processes in managing orders and inventory. For instance, communication between customers, retailers, and distributors is done through such platforms as phone calls, physical messages, and general messaging applications. These platforms are not organized and do not provide data centralization, traceability, and real-time synchronization.

The unorganized processes employed by the retailers and distributors may cause issues like missing orders, late confirmations, and unorganized communication. Moreover, the lack of an organized digital platform for communication generally obstructs the development of operations and the clarity of the entire supply chain. Although various digital platforms are available for handling supply chain operations in e-commerce, most of them are either vendor-specific or concentrate on a specific domain. Hence, there is a requirement for a more flexible digital platform that can efficiently handle communication and order processing for the entire supply chain.

Proposed Solution

The present study introduces FlowLink, a role-based, mobile-first order management platform designed to improve communication between wholesalers, retailers, and customers. As part of the FlowLink system, a digital

ecosystem will allow for the registration of multiple roles and access control. This setup enables all parties to communicate and carry out their tasks using system features that fit their roles and responsibilities.

The mobile app of the proposed system is built with the Flutter framework. This enables deployment on both Android and iOS devices using a single codebase. Node.js has been selected for the development of the server-side of the system. Node.js supports event-driven and non-blocking I/O operations. MongoDB is the chosen database management system that supports flexible and hierarchical data structures. JSON Web Tokens (JWT) will be used to ensure security.

System Architecture:

FlowLink adopts a scalable three-tier client-server architecture designed for high availability, role-based access, and seamless order management. Key components include:

- **Presentation Layer:** Cross-platform Flutter mobile app built with Dart, featuring role-specific UIs (Admin Dashboard, Customer Portal).
- **Application Layer:** Node.js/Express.js RESTful API orchestrated as modular microservices for loose coupling and independent scaling:
 - a. **Authentication Service:** JWT-based auth with OAuth 2.0 (Google, Phone OTP), role-based access control
 - b. **Order Management Service:** Handles CRUD for orders, integrates geolocation (Google Maps API) for delivery routing.
- **Data Layer:** MongoDB NoSQL database (sharded for scalability) with structured collections

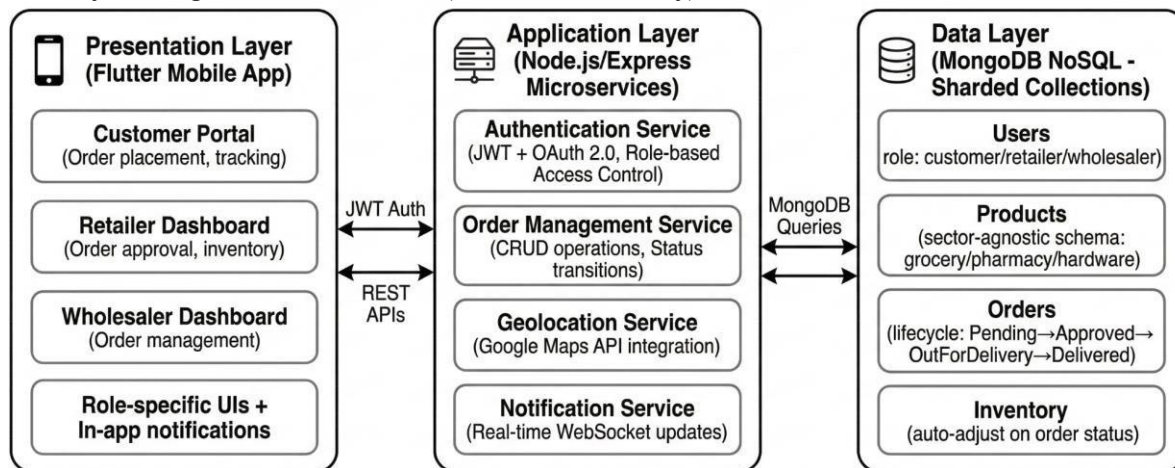


Figure 1: System Architecture Diagram

Novel Contributions

Multi-Role Hierarchical Workflow: It provides a structured wholesaler, retailer → customer order flow with approval chains and real-time visibility, which cannot be achieved with peer-to-peer structures, e.g., typical marketplaces.

Domain Agnostic Architecture: Single codebase using the flexibility of MongoDB and modular UI components of Flutter can serve multiple domains such as grocery, pharmacy, hardware stores, which cannot be achieved with typical domain-specific applications.

CHALLENGES

Limited Sector Adaptability

Though digital order management systems have improved significantly over time, some drawbacks are still affecting their efficiency in different business domains. One major problem that has been identified in existing literature is that it is not adaptable to different business domains. Most digital order management systems are developed for a particular domain, like food ordering or traditional e-commerce sites, making it hard to apply it to other domains [1], [2], [11].

Lack of well-structured role-based workflow management

Another limitation of the existing systems is the lack of a well-structured role-based workflow management. Some of the systems may support multiple user interactions within the system. However, the interactions between customers, retailers, and wholesalers may not be well-structured. Hence, the pattern of communication may remain fragmented[3],[12]. Such a limitation may restrict the potential of these systems in supporting multiple hierarchical roles in supply chains.

Scalability

Scalability is another issue that is still present in many systems. Although systems such as mobile-based systems and web-based systems are known to work well under certain conditions, system performance may be poor if the number of users, vendors, and transactions increases greatly [4], [12]. This is another problem that shows how important scalable systems are in supply chain management.

FUTURE DIRECTION

Integration of Artificial Intelligence

For future research and development, attention can be given to how the intelligence and flexibility of the system can be further elevated through the integration of Artificial Intelligence (AI) and analytics. AI-based algorithms can be used to facilitate demand forecasting, automated order recommendations, and intelligent decision-making. Such features can be useful to vendors to help them accurately forecast product demands and avoid stock shortages or delays in order fulfillment [8], [10]. AI integration into the system can help improve its efficiency and facilitate data-driven supply chain management.

Integration with Blockchain and IOT

Future developments could also consider incorporating Blockchain technology and Internet of Things (IoT) technology to further enhance the system's transparency. Blockchain technology can be utilized to record transactions securely and immutably. This will allow for a more transparent order history and supply chain activities. IoT technology can also be utilized to monitor inventory levels, storage conditions, and product movement within the supply chain [13]. The integration of Blockchain technology and IoT technology could result in a more reliable and intelligent digital ecosystem for order management and supply chain activities.

CONCLUSION

The comparative study of the existing order management systems revealed that the existing systems are designed to manage specific features such as mobile-based ordering systems, enterprise-level coordination systems, and order tracking systems. However, the existing systems are not able to provide a comprehensive solution to the diverse business environments. The key issues that were identified with the existing systems are the lack of sector flexibility, the lack of role-based workflow structuring, and the lack of data management for small and medium-scale enterprises. The findings of the study revealed the need for a generalized system that can efficiently manage the order management process and facilitate the communication and coordination of multiple stakeholders. To overcome the limitations of the existing systems, the proposed FlowLink system provides a role-based system that facilitates the coordination of multiple stakeholders such as wholesalers, retailers, and customers. The proposed system provides an efficient platform for the order management process.

REFERENCES

- [1] Shinde, A. Mundra, A. Shaikh, V. Sonavane, and K. Shirsat, "E-Commerce Multi-Vendor Application," *International Journal of Scientific Research in Engineering and Management (IJSREM)*, vol. 7, no. 5, pp. 1–7, May 2023, doi: 10.55041/IJSREM20423.
- [2] Y. H. Sam, P. H. Leong, and C. F. Ku, "The Implementation of Mobile Application Ordering System to Optimize the User Experience of Food and Beverage Industry," in *Proc. 2023 IEEE 14th Control and System Graduate Research Colloquium (ICSGRC)*, Shah Alam, Malaysia, Aug. 2023, pp. 22–26, doi: 10.1109/ICSGRC57744.2023.10215430.
- [3] G. Bhatia, H. Patil, P. Solanke, V. Joshi, P. Ubarhande, and H. Loya, "Android-based Mobile Application Development to Connect Local Vendors with Customers," *International Journal of Engineering Research & Technology (IJERT)*, vol. 12, no. 4, pp. 375–380, Apr. 2023.
- [4] O. A. Nasr, G. A. Alsarhani, A. Khalifah, and M. M. Alfafi, "Web-Based Supply Chain Management System: Empowering Enterprises with Real-Time Data and Performance Dashboards," *Journal of Electrical Systems*, vol. 21, no. 1, pp. 299–307, 2025.
- [5] M. Kumar and P. Kumar, "Design and Implementation of Web-Based Order Management System for Small and Medium Enterprises," *International Journal of Advanced Computer Science and Applications (IJACSA)*, vol. 10, no. 6, pp. 412–418, 2019.
- [6] S. A. Patil, R. R. Deshmukh, and P. S. Kulkarni, "Design and Development of Mobile-Based Order Management System for Retail Applications," *International Journal of Engineering and Advanced Technology (IJEAT)*, vol. 11, no. 4, pp. 58–63, Apr. 2022.
- [7] S. Kim, H. Park, and J. Lee, "LEAST: The Smart Grocery App," *International Journal of Computer Applications*, vol. 183, no. 19, pp. 25–31, 2021.
- [8] Y. Zhang, X. Liu, and M. Chen, "AI-Driven Smart Grocery Ordering System," *IEEE Transactions on Industrial Informatics*, vol. 19, no. 6, pp. 4321–4332, 2023.
- [9] M. Deshpande and S. Kulkarni, "Mobile-Based Retail Order Management Applications," *International*

Journal of Engineering Research and Technology (IJERT), vol. 11, no. 6, pp. 45–50, 2022.

- [10] A. Jahin, M. Rahman, and S. Haque, "AI-Driven Smart Grocery Ordering System," *IEEE Transactions on Industrial Informatics*, vol. 19, no. 6, pp. 4321–4332, 2025.
- [11] A. Kumar and S. Patel, "E-Commerce Using Flutter and Node," *International Journal of Scientific Development and Research (IJS DR)*, vol. 6, no. 4, 2021.
- [12] Kanishka Deo ,Kunal Kumar Shaw ,Rupesh Yadav, "Optimizing Supply Chain Management in Multivendor E-Commerce Platforms," *Journal of Emerging Technologies and Innovative Research*, 2024.
- [13] M. R. Mohan, K. Srivastava, and P. Mehta, "Supply chain resilience: A critical review of risk mitigation, robust optimisation, and technological solutions and future research directions," *Global Journal of Flexible Systems Management*, 2025.
- [14] K.Kalaiarasi, "Optimization of a multiple-vendor single-buyer integrated inventory model with a variable number of vendors," *Cauvery College for Women Research Proceedings*, 2020.