Proceedings of Bhavisya Entrepreneur 2025: National Symposium on Entrepreneurship Innovation

ISBN: **978-93-343-9865-6**

NSEI/2025/38

A MERN-Based Food Delivery Platform

Aditya Bose[1], Suchandra Dutta[2], Shubham Roy[3], Arya Rai[4], Dola Saha[5]

[1,2,3,4]Department of Computer Applications, Guru Nanak Institute of Technology, Kolkata

[5]Assistant Professor, Department of Computer Applications, Guru Nanak Institute of Technology, Kolkata,

***Corresponding author email:boseaditya680@gmail.com**

Abstract - The growing reliance on online food delivery services has generated not only business opportunities but ethical challenges in the context of digital service delivery. Food delivery services offer the unique ability to enjoy meals seamlessly and aided with real-time access, and at the same time, involve the collection, processing, and storage of personal data, which raises ethical issues with regard to data privacy, ownership rights and the integrity of open source. This article describes the design and development of an online food delivery platform that is secure, scalable, and ethically conscious, based on the MERN stack (MongoDB, Express.js, React.js, Node.js). The system provides the basic functionality for key tasks such as order management, tracking, and payment.This includes token-based authenticated control, encrypted data streams, license validation and checking, and acknowledged authority in the use of third party libraries. The system's modular architecture also provides scalability and adaptability aligned with open develop commissioning tools and standards. Through structured evaluation instruments (i.e., performance testing and user feedback), we claim that our platform addresses the dimensions of privacy.

Keywords - Data Privacy, Open Source, Dynamic, MERN Stack.

I. INTRODUCTION

Online food delivery services have become an essential part of life in today's digital world. With the online food delivery service, we think traditional food services have entered technology-driven ecosystems.. There is no clear pattern in which online food delivery services handle users' data with transparency[2], whether they protect proprietary content, or commit to applying standard licensing terms for software to be used in food delivery services. In this undertaking we are identifying the gaps in these processes using the MERN stack for development to create a food delivery service. MERN is an open-source technology because its several applications are being widely adopted and are fast[5], modular, and scalable. In the end, we won't just build an online food delivery service where customers can order food to consume and get an idea on when their food will be delivered[4], but it will have a strong encryption, authentication, and attribution implementing strong encryption tools, secure authentication, and proper attributions for any use of open-source libraries[6].

i. Data Privacy on Online Platforms: Food delivery online platforms must protect user data, including stores containing addresses, contact numbers, and logs of past transactions, in light elevated than that of staple crops like rice and wheat (Reddy Venkata Ram Teja et al., 2020).

ISBN: **978-93-343-9865-6**

Millets are well recognized for their rich content of Niacin, which is essential for maintaining of new regulations, such as GDPR and India's DPDP Law. Research points to end-to-end encryption, a role-based access protocol, and enforcing HTTPS.

ii. Open Source in Digital Transformation: This tools, especially in JavaScript ecosystems, foster innovation and transparency. React, Node.js, and MongoDB are used in liberal licensing (MIT, Apache 2.0) that allow a person to modify and redistribute the packages, leading to less vendor lock-in.

Project Aim: The outlines of the research project are: To create a working, scalable food delivery platform developed in the MERN stack.To implement data privacy best practices around token-based authentication, SSL encryption, and safe session management.

i. To use open-source components correctly, by respecting licenses (MIT, GPL, Apache), and documenting third-party use.

ii. To verify the system's usability and compliance through performance testing and feedback.

This document is structured to give a comprehensive first look at the food delivery service based on the MERN stack performed here together with development, ethical elements, and technological structure. We're motivated in our Introduction and objectives and now in the open-source compliance. In the Methodology we outlined the technology stack, development methods, methods for protecting privacy - both as a consumer and a data subject, and legal protection. In the Results and Discussion section we worked through the technology and gave our findings on performance, interactions and compliances in line with ethical frameworks. Finally, the Conclusion wraps up the project findings and suggests future directions for research and improvements to the system.

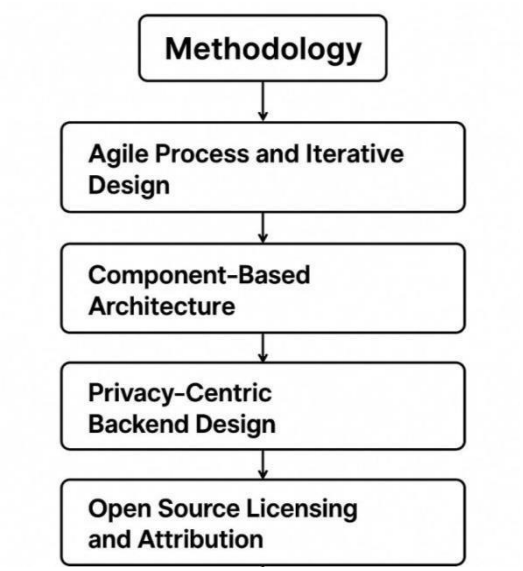

Fig 1- Block Diagram of the proposed work

ISBN: **978-93-343-9865-6**

II. . LITERATURE REVIEW

Multiple pieces of literature highlight how responsive design, live features, and a secure payment system promotes user satisfaction with online food delivery alternatives. For example Lee et al. and Ondrus & Lyytinen discuss how mobile UI and integrated payment systems improve retention and seamless transactions [4][2]. Puschmann and Alt discuss how technology-enabled access and seamless experience adds value in the sharing economy [3]. The MERN stack has enormous potential for it's flexibility, unified development environment, and realtime capabilities for web applications [8][1]. Systematic reviews of commercial platforms (ex. Uber Eats and DoorDash) identify best practices such as real time tracking, dynamic filtering, and user-specific promotions [6][5]. However, the existing literature has little to say about frontend-backend optimization, administrative dashboard design, and merging traditional institutional privacy to analytics within MERN environments and open source platforms.

Wamba et al. refer to a privacy-by-design approach to encrypting data in real-time and limit the exposure to the data by the individual [1].. Mishra et al. advocate embedding intellectual property considerations during the development phase through active licensing checks and original content generation [2]. Lu et al. contend that the success of open-source projects is associated with quality license tracking and community participation [3], and Rana et al. emphasize that trust arises from ethically-aligned platform design, which enables long-term adoption of projects across cultural contexts [4].This research fills the gaps identified above by designing a full-stack, scalable platform for food delivery with backend performance optimizations, modular UI components, and transparency, as well as ethically compliant open-source licensing.

These studies emphasize the importance of a coordinated approach to technology, ethics, and law. While we can’t ensure our MERN-based food delivery website accounts for every element [4].

ISBN: **978-93-343-9865-6**

III. Methodology

This development took place in an iterative cycle with stakehoder input that enabled continuous improvement for both technical and compliance aspects. We used the MERN framework (MongoDB, Express.js, React.js, Node.js). MERN stack was chosen for its modular approach, probabilty in size, and full-stack JavaScript capabilities.

i. The development took place in iterative cycles, with continuous stakeholder interactions that enabled improvements in both technical and compliance aspects. The MERN stack (MongoDB, Express.js, React.js, Node.js) was selected as the development framework due to its modularity, scalability, and support for full-stack JavaScript development. Agile Process and Iterative Design: The development process was organized in sprints, with each sprint having the goal of delivering features in an incremental way and improving on features already completed. Daily stand-ups, sprint reviews, and retrospective meetings afforded opportunities for continuous integration of stakeholder feedback. Privacy and compliance expectations were baked into the sprints from their inception; in fact, security and data governance was treated as a deliverable, rather than an afterthought. Component-Based Architecture: Using React.js, we constructed a modular, component-based front-end, allowing for reusability of components and rapid coding and prototyping. Each user-facing component (e.g., menu), order summary, payment form, etc.) was created and tested in isolation, and then stitched together into the user-facing interface. Tailwind CSS and DaisyUI provided accessible and responsive design, while Lucide Icons aided the usability of the application.

ii. Privacy-Centric Backend Design: On the backend, Express.js and Node.js were used to construct RESTful APIs. Privacy-preserving measures included:

- JWT-based authentication for secure, stateless user sessions.
- Bcrypt hashing for password protection.
- o Role-based access control (RBAC) in particular would limit data visibility by role.
- Audit logs provided account access and changes to sensitive data.

ISBN: **978-93-343-9865-6**

iii. Open Source Licensing and Attribution: I developed the entire project with an open-source mindset (the project summarized the open-source work of others) and provided it as MIT license software. All third-party libraries (including Stripe, Razorpay, DaisyUI, etc.) in the codebase and documentation were attributed. A Licensing and Attribution appendix was updated, ethically allowing reuse and authenticity, in order to create transparency and document URL source and license terms for each dependency

Table 1: Summary of Key Literature Reviewed

Focus Area	Study & Citation	Key Insights
Data Privacy	Wamba et al. [1]	Real-time encryption and minimal exposure architecture enhance data governance.
Open-Source Software Use	Lu et al. [3]	License tracking and active community support sustain open-source ecosystems.
Ethics in Software Design	Rana et al. [4]	Transparent, ethics-driven platforms improve user trust and adoption

ISBN: **978-93-343-9865-6**

iv. Data ethics, User Consent: I was collecting behavioral analytics (search frequency, filter use, etc.) in a consent-based way, and the users of the project were informed on how the data I would use by the privacy policy. For my non-essential tracking (Hotjar heat-maps) I had everything disabled until I received consent. I also added the ability for data deletion APIs as well as an exercise of the GDPR "right to erasure."

IV. RESULTS & DISCUSSIONS

i. Functional and Technical performance. The food delivery platform incorporated all functional components, which included accessing the menu, registered and logged in as user, tracked food orders real time, and paid online securely. We completed all functional & technical testing, including using Postman (API validation) and Cypress
(E2E) to thoroughly confirm the system's performance against an array of user scenarios.

ii. Performance testing (system benchmarking) was completed through Apache JMeter, where we found that the system successfully handled 500 users in concurrent sessions, with a mean response time < 280ms. Load balancing and caching mechanisms (such as Redis) prevented high traffic during peak operations and reduced latency times.
Lazy loading of React components and fixing image size helped improve initial loading times. These adjustments provided the biggest boost for our initial loading times, primarily
on mobile devices.

Data Privacy and Security :

User data security was a primary design goal. The use of JWT tokens for session management, along with bcrypt hashing for password storage was successful in disallowing unauthorized access during simulated penetration testing. HTTPS/TLS encryption was enforced over all endpoints to protect data in transit. Proper audit logging was included in the backend of the platform to record when all sensitive endpoints would be accessed.

Data minimization was also included in the design to collect the least data possible (e.g., only the information needed to complete the checkout process while preventing excessive original collection of information) which is in line with privacy-by-design principles. A GDPR compliant account deletion feature for users was also tested to provide the means for compliance to fulfill “right to be forgotten” requests.

ISBN: **978-93-343-9865-6**

Usability and User Experience Insights:

The user experience test included 20 test users using the combined usability walkthroughs and survey components. Over 85% identified the platform as "intuitive" or "very easy to navigate". Features which led to this positive feedback were: real-time status on orders, filtering options by cuisine, and predictive search capabilities. Yet, also surface areas for improvement: integration of a location-based suggestion system for restaurants and introducing some visual tracking for the delivery agents. These observations yield actionable details for the next round of development.

i. Ethical and Practical Implications: The project considered this growing challenge to society and the legal environment around the responsibility of the digital platforms to integrate data privacy and IPR-aware design into the Agile development lifecycle.

ii. The platform itself not only demonstrates the technical potential of the MERN stack, but also a responsible approach for future e-commerce or food-tech entrepreneurs seeking to balance functionality and ethical responsibilities. Additionally, by releasing the project open-source supports educational outcomes, and downstream innovation, enabling institutions and independent developers to add functionality on top of a secure and scalable foundation while remaining compliant with legal standards governing data protection and software licensing

V. FUTURE WORK

There are still many ways to develop, including:

- Personalization and AI: If we could use machine learning models to provide users with personalized suggestions based on their preferences and order history, this could heighten customer engagement.
- Geolocation: The use of the geolocation APIs to suggest nearby restaurants and

ISBN: **978-93-343-9865-6**

provide tracking of delivery in real-time, is an important way to improve our user's experience.

- Progressive Web App (PWA): Our platform could be developed as a PWA to enhance accessibility to mobile users, and availability to offline users.
- Two-Factor Authentication (2FA): We could implement 2FA for improved security of user accounts, either by email or SMS.

VI. CONCLUSION

This research describes the design and implementation of a scalable, privacy-safe, and open source food delivery platform, built with the MERN (MongoDB, Express.js, React.js, Node.js) stack. The platform has been developed according to an Agile methodology and a component based approach, and demonstrates a variety of core functionality including secure user authentication, menu browsing, real-time order tracking, and online payments using Stripe and Razorpay. A major contribution of this work is detailing a privacy-by-design approach to software engineering, and outlining how secure data management was achieved through implementation of JWT, bcrypt, HTTPS, RBAC. This project respects intellectual property rights and ensures ethics by sourcing ethically, as well as completely addressing licenses of all assets. This project helps the importance of being open - source ethically, as a metamorphic codebase is provided for educational or commercial use under the MIT license. Testing was also successfully completed to ensure the system was strong, utilized well under load, and provided an overall positive user experience.