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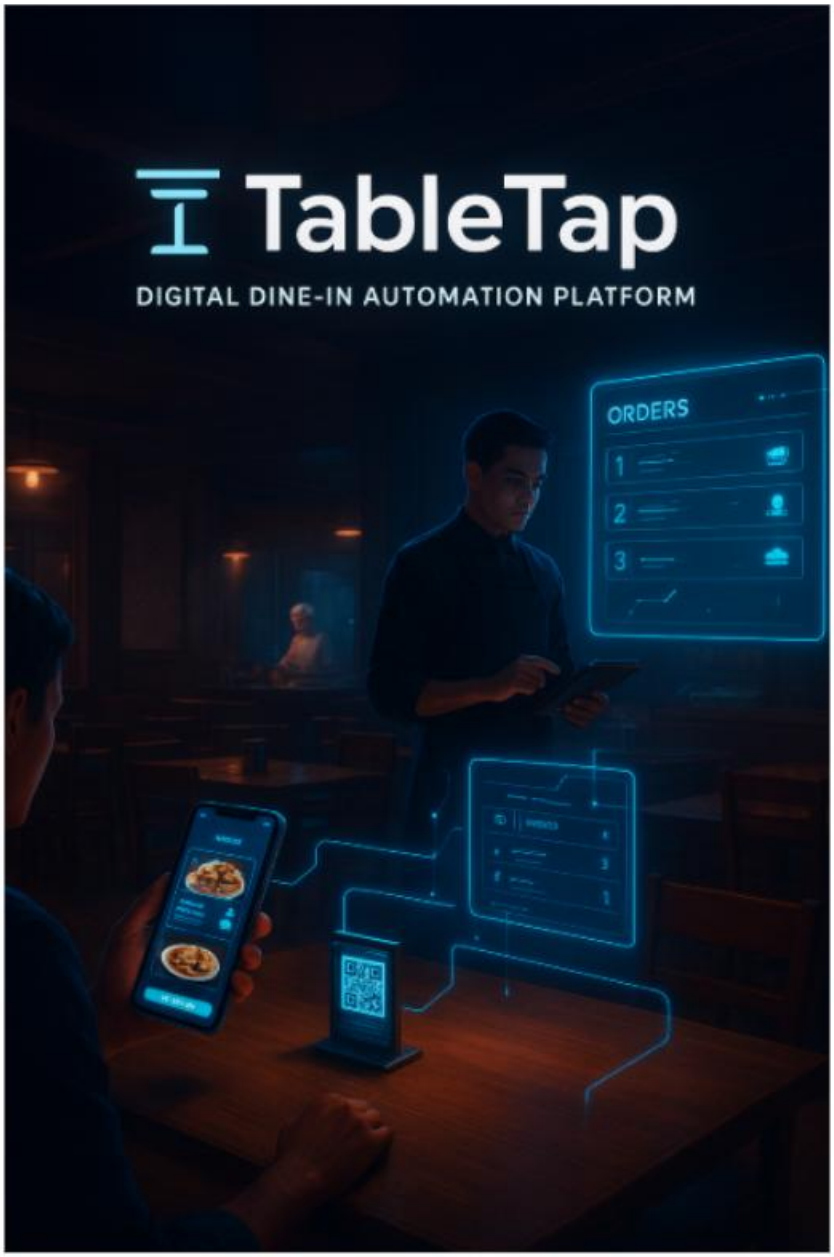

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Introduction

In Nepal's growing hospitality industry, many dine-in restaurants continue to depend on manual ordering, billing, and communication processes. These outdated systems lead to delays, inefficiencies, and inconsistent customer experiences. As the world moves toward digital transformation, the demand for contactless, efficient, and user-friendly dining systems is increasing.

TableTap addresses this need by offering a fully web-based platform that digitizes the dine-in experience. Customers can simply scan a QR code placed on their table to access the restaurant's digital menu, place orders, and make payments directly from their smartphones. The system is built to enhance service speed, reduce staff workload, and improve accuracy while maintaining security through unique phone-based session locks. With features such as real-time order updates, secure payments, and analytics dashboards, TableTap aims to modernize restaurant operations in Nepal.

Problem Statement

Despite technological advancements, many restaurants still face critical inefficiencies in dine-in service. Common issues include:

1. **Slow Manual Ordering:** Wait staff must take orders individually, creating bottlenecks during busy hours.
2. **Order Errors:** Manual communication often leads to incorrect or incomplete orders.
3. **Security Risks:** Public QR codes can be duplicated or misused, allowing unauthorized access.
4. **Billing Delays:** Manual payment processing prolongs table turnover, reducing efficiency.
5. **Lack of Insights:** Managers rarely have real-time data about orders, popular dishes, or performance trends.

   Hence, there is a strong need for a secure, automated dine-in platform that eliminates these challenges and enhances both user and staff experience.

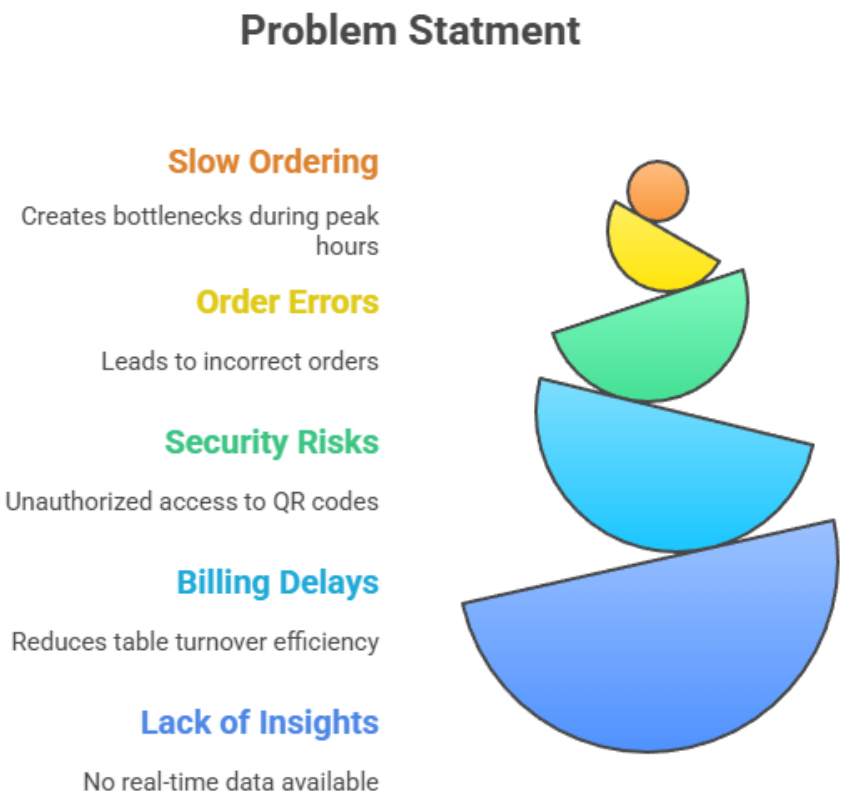

Figure 1: Problem Statement

Aim

The aim of TabelTap is to develop a secure, efficient, and intelligent dine-in automation platform that enables customers to browse, order, and pay digitally while providing restaurant management with analytics and streamlined operations.

Objectives

1. To create a web-based dine-in platform accessible through QR code scanning.
2. To enable secure session verification using phone-based authentication.
3. To automate order placement, tracking, and payment processing.
4. To develop role-based dashboards for diners, waiters, kitchen staff, and managers.

5. To integrate real-time communication between frontend and kitchen systems.
6. To provide analytics for performance monitoring and sales insights.
7. To ensure data protection through encryption, JWT authentication, and Argon2 password hashing.
8. To support multilingual interfaces (initially English and Nepali).

Scope

TabelTap encompasses core functionalities for all user roles within a restaurant environment.

For Diners:

- Scan a QR code to access the digital menu.
- Filter and select items based on category or preference.
- Place orders and make secure digital payments.
- Track order progress in real time and view past orders.

For Restaurant Staff:

- Instantly receive and manage digital orders from diners.
- Update order statuses (received, preparing, ready).
- Communicate efficiently with kitchen and cashier teams.
- Access real-time reports and order histories.

For Admins / Managers:

- Manage menus, item pricing, and table assignments.
- Monitor daily operations through an analytics dashboard.
- Oversee staff performance, orders, and payments.
- Generate reports on popular items, peak hours, and revenue trends.

Out of Scope (for Initial Version)

- Integration with third-party POS or delivery systems.
- AI-driven recommendation engine or chatbot ordering.
- Loyalty programs, discount coupons, or external consultancy modules. These features may be introduced in later phases once the base dine-in automation system is stable.

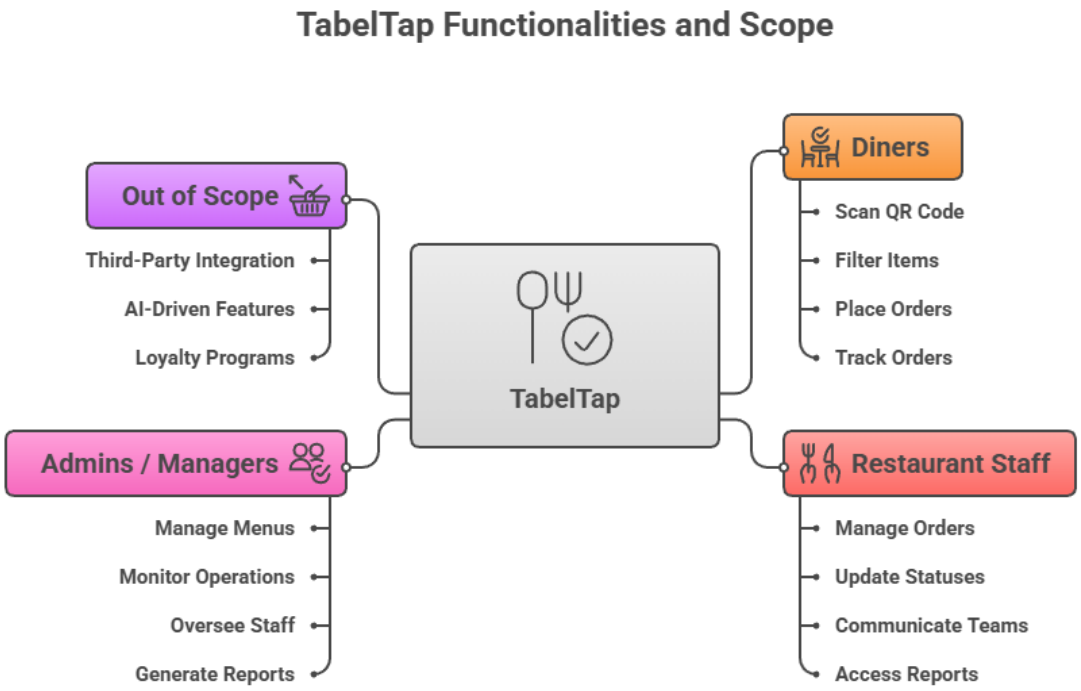

Figure 2: Scope

Literature Review

The global restaurant industry is rapidly evolving through digital transformation, with automation and contactless technologies reshaping customer experiences. Platforms such as ToastTab, Square for Restaurants, and Lightspeed have successfully digitalized dine-in operations in developed markets. They provide features such as cloud-based POS systems, digital menus, automated billing, and data analytics. These systems improve service speed and accuracy while optimizing staff efficiency. However, their limitations include high setup costs, dependency on advanced infrastructure, and limited localization for developing regions like Nepal. Subscription-based

pricing models and reliance on strong internet connectivity make these platforms inaccessible to smaller restaurants operating with tighter margins.

In Asian markets, affordable solutions such as eMenu and QR Order have emerged, focusing on simplicity and low-cost adoption. They enable diners to scan a QR code to view digital menus, place orders, and make payments. While these solutions improve convenience, they often lack data security measures, device-based verification, and advanced analytics. For example, generic QR-based systems can be misused if codes are duplicated or shared publicly, leading to unauthorized access. Additionally, such tools frequently operate in isolation without deep integration into backend management systems or reporting tools.

Closer to Nepal, Restorma represents one of the few systems that attempt to bridge dine-in digitalization with restaurant management. It offers QR-based menu access and order placement integrated with POS and property management systems (PMS). However, Restorma's primary focus lies in POS integration and hospitality administration, rather than enhancing the in-table customer experience. It provides limited security features for preventing fake scans, lacks real-time analytics for table efficiency, and offers minimal personalization or suggestive selling mechanisms. Consequently, while Restorma has laid groundwork for digital dining solutions in Nepal, it still reflects the broader industry trend of prioritizing backend management over customer-centric automation.

Within Nepal's ecosystem, platforms such as Foodmandu, Bhojdeals, and Foodmario have successfully digitalized food delivery services but remain limited to off-premise operations. No existing local system effectively addresses dine-in automation, secure QR verification, or role-based workflow integration between kitchen, waiter, cashier, and manager roles.

Some critics argue that excessive automation could depersonalize hospitality, diminishing the warmth that defines in-person dining. However, modern studies and market trends show that automation, when implemented thoughtfully, enhances service quality by allowing staff to focus on high-value, human-centered interactions rather than repetitive tasks like order-taking or billing.

Hence, a significant gap persists between global innovations and localized adoption. Current systems either emphasize back-office management (like Restorma) or online delivery (like Foodmandu) but fail to combine security, automation, and analytics for dine-in services. TabelTap

addresses this gap through a secure, phone-verified QR system, real-time order tracking, and analytics dashboards, creating a balanced ecosystem that improves operational efficiency while maintaining a personalized dining experience.

Synthesis of Gaps

From both international and local reviews, the following key gaps are identified:

- Absence of dine-in automation platforms in Nepal.
- No system offering secure QR session locks to prevent fake scans.
- Lack of real-time analytics and integrated communication tools for restaurant staff.
- Existing systems are either delivery-focused or lack personalization for in-house dining. TableTap bridges these gaps by integrating automation, analytics, and security into one cohesive platform tailored to local business needs.

Tools and Technologies

TabelTap is built with modern, scalable technologies designed for performance, security, and usability.

Frontend:

Developed using React and Vite for fast rendering, with Mantine UI, RSuite, and Zustand for component design and state management. React Query and Axios handle API communication, while React Router provides smooth navigation.

Backend:

Powered by NestJS, a robust Node.js framework, integrated with PostgreSQL and TypeORM for efficient data management. Redis and BullMQ manage queues and caching for performance optimization. Socket.io enables real-time order updates between users and staff. AWS S3 and Cloudinary are used for file and image storage. Security is ensured using JWT authentication, Argon2 password hashing, and dotenv for environment configuration.

Conclusion

TableTap represents a transformative leap in how dine-in restaurants operate. By combining QR-based automation, secure session management, and real-time analytics, it streamlines the entire dining workflow. Diners gain speed, accuracy, and convenience, while restaurant owners benefit from reduced manual work, improved insights, and higher efficiency.

Unlike existing local or global systems, TableTap focuses on the in-restaurant experience, not just digital delivery or POS management. Its secure design, scalable architecture, and localized approach make it an ideal solution for Nepal's evolving hospitality sector.

In the long term, as additional features like AI-driven recommendations and mobile app integration are introduced, TableTap could grow into a trusted brand that reshapes digital dining in Nepal and beyond.

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