

International Journal of Research Publication and Reviews

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

Design and Implementation of a Cloud-Integrated Restaurant Point of Sale (POS) System

Ms. Pallavi Marulkar¹, Ms. Vaishnavi Tandel², Ms. Malvika Thakur³, Mr. Gaurav Thakur⁴

¹Assistant Professor Department of Computer Engineering, PHCET, Rasayani

² Student Department of Computer Engineering, PHCET, Rasayani

Email: vaishnavit22hcompe@student.mes.ac.in

³ Student Department of Computer Engineering, PHCET, Rasayani

Email: malvikamt22hcompe@student.mes.ac.in

⁴Student Department of Computer Engineering, PHCET, Rasayani

Email: gauravpt22hcompe@student.mes.ac.in

ABSTRACT-

In the modern digital age, where speed and convenience are paramount, traditional manual methods of managing restaurant operations have become increasingly inefficient. This paper presents the design and development of a Restaurant Point of Sale (POS) System that streamlines order management, billing, and real-time transaction tracking. The system leverages PHP for backend processing and MySQL for structured data storage. By integrating features such as dynamic billing, digital receipts, and user role authentication, the proposed system enhances both customer experience and administrative control. Furthermore, the POS system reduces operational errors and improves data visibility, making it a viable solution for both small and large-scale food businesses.

Keywords: Restaurant POS, Order Management, Digital Billing, SQL Database, Real-Time Processing

INTRODUCTION

The food service industry is evolving rapidly in response to rising customer expectations, technological advancements, and competitive pressure. Efficiency, precision, and speed have become critical parameters that define success in restaurant operations. Manual processes, including handwritten orders and cash register-based transactions, often result in delays, miscommunication, and revenue loss.

To address these issues, Point of Sale (POS) systems have become integral to restaurant operations. A modern POS system not only handles billing but also manages orders, monitors inventory, and provides insights into customer behavior and sales performance. With features such as cloud integration and wireless access, these systems bring flexibility and convenience to both customers and restaurant staff.

This paper proposes a POS system designed with an intuitive interface, backend automation, and real-time analytics. The system supports multiple roles—admin and customer—with distinct privileges, ensuring operational security and seamless functionality. This will help a lot in the inventory management for various restaurants.

PRIOR STUDIES

Over the years, research and development in POS systems have significantly evolved. Early systems were hardware-centric, primarily focused on cash handling and transaction logging. As digital infrastructure grew, POS systems transitioned into software-based platforms offering cloud storage, mobile payment integration, and analytics.

Modern studies emphasize the incorporation of artificial intelligence for personalized menu recommendations, stock forecasting, and real-time feedback collection. Additionally, recent advancements highlight the necessity for secure digital payment gateways due to rising threats related to data privacy and transaction fraud.

The growing adoption of mobile and web-based ordering interfaces has also enhanced customer engagement while reducing operational delays. Studies agree that efficient POS systems contribute significantly to a restaurant's ability to scale, adapt, and meet dynamic customer expectations.

RELATED WORK

Several academic studies and industrial analyses have focused on the continuous transformation of Point of Sale (POS) systems within the restaurant sector, particularly in terms of automation, efficiency, security, and customer engagement.

Earlier implementations of POS systems were largely mechanical or electrical, functioning as advanced cash registers. These systems were limited to basic sales logging and receipt generation. With the evolution of computing, contemporary POS systems have transitioned into comprehensive software platforms that leverage cloud computing, artificial intelligence (AI), and mobile technologies to streamline restaurant operations.

Cloud-based POS platforms have gained significant attention for enabling remote data access, enhanced data security, and seamless system synchronization across multiple terminals. According to research, these systems improve operational control for restaurant owners, providing tools to manage inventory, monitor live orders, and analyze customer preferences from any location.

Studies also highlight the integration of mobile and web ordering systems as an impactful innovation in restaurant service. These platforms reduce wait times, minimize human error, and enhance customer convenience by enabling remote ordering and contactless transactions. Tablets and handheld devices used by staff facilitate real-time order processing and improve communication between the kitchen and front-end service staff.

Artificial Intelligence has been explored in POS systems for enhancing the decision-making process. AI-driven recommendation engines can suggest menu items based on customer purchase history and seasonal trends. Machine learning algorithms also support inventory forecasting and dynamic pricing, contributing to more efficient stock management and revenue optimization.

Another critical area of research is the security of electronic payment systems within POS frameworks. With the surge in digital transactions, secure payment gateways, encryption protocols, and fraud detection mechanisms have become integral features. Touchless payment technologies, including NFC and biometric authentication, are being adopted to ensure secure and user-friendly experiences.

In summary, related work indicates a growing emphasis on data-driven, intelligent, and secure POS ecosystems that align with the evolving demands of the restaurant industry. These innovations collectively support higher operational efficiency, better customer service, and improved profitability.

METHODOLOGY

The development of the Restaurant Point of Sale (POS) system follows a structured methodology that emphasizes user roles, real-time transaction management, and automated billing processes. The application is designed using PHP for backend scripting and MySQL for data management, ensuring seamless interaction between the system components and database.

1. Roll-Based Access and Authentication

The system incorporates two primary user roles: Administrator and Customer. Secure login functionality is enforced to differentiate between user privileges. Admin users can manage menu items, oversee customer transactions, and monitor historical data. Customers, upon authentication, are granted access to the menu interface for placing orders. Encrypted credentials stored in the MySQL database are validated via PHP functions to preserve data integrity and restrict unauthorized access.

2. Order Placement and Data Handling

Customers interact with a responsive menu interface that displays real-time item availability and pricing. Upon order submission, PHP scripts process the request by verifying item quantities and calculating subtotals. Validated orders are assigned unique transaction IDs and stored in the MySQL database. This structure enables easy retrieval and tracking of order records by administrators.

3. Dynamic Bill Computation

The system automates billing by calculating total amounts based on selected items and respective quantities. Subtotals are derived by multiplying item prices with quantities, followed by the addition of taxes and service charges if applicable. PHP handles these operations dynamically, ensuring accurate computations before proceeding to the final billing stage.

4. Receipt generation and printing

Upon order confirmation and bill finalization, the system generates a structured receipt containing order details, transaction ID, timestamps, and pricing breakdowns. PHP-based formatting scripts produce printer-friendly receipts that can be outputted through a connected thermal printer. These receipts serve as transaction proof and support order dispute resolution.

RESULTS

The developed Restaurant Point of Sale (POS) system was subjected to rigorous testing across various operational scenarios to ensure it met the functional expectations and usability standards outlined in the methodology. The evaluation primarily focused on assessing the system's performance from both the administrator's and the customer's perspectives, highlighting its ability to manage data, automate billing, and generate structured outputs.

E	RESTAURANT POS SVSTEM	SYSTEM ADMIN D	ASHBOARD						System Adm
1	Dashboard	<u> </u>							
	HRM	CUSTOMERS 2	e	PRODUCTS 26		3		\$1	65 (5)
3	Customers	112				N. Barris	actu y		
	Products								
	Orders	Recent Orde							(const)
	Payments	Recent Orde	15						See on
	Receipts	CODE	CUSTOMER	PRODUCT	UNIT PRICE	QTY	TOTAL	STATUS	DATE
		MCYE-3519	messi	Chicken Nugget	\$5	2	\$10	PAD	30/Mar/2025 4:16
			mosti	Frappuccino	\$3	2	\$6	NOTIMA	30/Mar/2025 4:06
POI	TING	YX2H-9751	111100						
EPOI	Orders	¥X2H-9751	(and the						

Fig:1(Admin Dashboard)

The administrator module of the application was observed to function as the central command panel, allowing users with administrative privileges to access and manipulate core features such as menu item management, order monitoring, and sales tracking. Upon login, administrators were directed to a dynamic dashboard interface that displayed real-time metrics including total orders, sales figures, and recently processed transactions. This functionality significantly reduces the overhead involved in manual data logging and reporting. The screenshot in Figure 1 illustrates the administrator dashboard with visible control elements for updating menu items, checking customer orders, and managing system logs.

From the customer's standpoint, the interface delivered a seamless and interactive experience. Once authenticated, customers could view the digital menu, select food items, adjust quantities, and proceed to place orders. The menu interface dynamically updated the subtotal as items were added or removed, thereby enhancing transparency and aiding decision-making. The system ensured that all order details were correctly logged into the database with corresponding transaction identifiers. Figure 2 shows the customer interface displaying item selections, real-time price updates, and checkout options.

> C 🔘 localhost/					🛊 🗖 🖸 🗐 🕸
🔠 🕴 🖬 M Inixox (7) - premova	t 🌀 Gmeil 🚺 YouTube	Maps 🌀 Courses 🛓 Down	loads 🛛 🙆 Lost and Found Info		🗅 Alf Bookmark
RESTAURANT POS SYSTEM	1 Add Ne	ew Product			
	IMAGX	PRODUCT CODE	NAME	FRICE	Actions
Dashboard	ALCONO D				
L HRM	93	FCWU-5762	Philly Cheesesteak	57	Delete I Update
Customers.					
E Products		JRZN-9518	Spaghetti Bolognese	\$15	Delete
Orders					
Payments		QZHM-0391	Reuben Sandwich	5 B	Delete
Receipts					
REPORTING		ICFU-1406	Submarine Sandwich	5.8	Delete
Orders.	1000				
Payments		CEWV-0438	Cheeseburger	\$ 3	Beleve d'Updace Go to Settings to activate Windows
	- PROBANC				

Fig:2(Customer view of menu interface)

Upon order confirmation, the billing component automatically computed the total payable amount by aggregating item prices, multiplying by quantities, and adding applicable taxes or service fees. The computation was executed in real-time through backend PHP scripts, ensuring immediate feedback to the customer and minimizing the risk of manual error. The detailed billing breakdown presented on the confirmation screen, as shown in Figure 3, allowed users to review their order before proceeding with the transaction.

	C O localhost/Next	🖈 🗖 🖸 I 🚳 E					
88	M M Inbox (7) - premnat	G Gmail 🤫 YouTube 🔉	Maps 🕝 Courses	🐮 Downloads 💿 Lo	st and Found Info		🗅 All Bookmarks
	RESTAURANT POS SVSTEM	MESSI DASHBOAJ	D				essi 🔍
	Dashboard	- <u>- 1</u>	0% I.				
-	My Profile	+ 11 Mak	e A New Order				
×	Make Order	0005	CUSTOMER	PRODUCT	TOTAL PRICE	DATE	ACTION
-	Payments	YX214-9751	messi	Frappuccino	5.6	30/Mar/2025 4:06	🛤 Pay Order
RE	ORTING						
台	My Orders						
16	My Payments						
6	Log Out						
							Activate Windows Go to Settings to activate Windows.

Fig:3(Billing module showing calculated taxes)

Subsequent to payment confirmation, the system generated a digital receipt formatted for print compatibility. This receipt was designed not only for immediate visual clarity but also to conform to the standard layout required by thermal receipt printers commonly used in restaurants. The format included essential details such as the list of items ordered, corresponding individual prices, quantity, total cost, transaction identification number, and the exact timestamp of the transaction. Furthermore, the receipt was structured in a minimalist yet readable design, ensuring all critical information was visible at a glance. The automatic generation of such receipts allowed for consistent documentation across all transactions, significantly reducing errors associated with handwritten bills. This digital record also facilitated easy verification and improved service quality by enabling quick reference in case of customer inquiries or refund processing. Figure 4 provides a visual representation of the printed receipt, emphasizing its clarity and the structured layout that enhances accountability in customer transactions.

127-0-0-1 4151 Willow Caks Lane, Sugartown (+000) 337-337-3069	ane, Sugartown Receipt #: MC 19			
Rece	eipt			
Item	Quantity	Unit Price	Tota	
Chicken Nugget	2	Unit Price S5 Subtotal: Tax: Total:	\$10	
		Subtotal: Tax:	\$10 14%	
		Total:	\$10	
Prin				

Fig:4(Receipt ready to print)

VI. CONCLUSION

The implemented Restaurant Point of Sale (POS) System improves both order management and billing functionality through its convenient system architecture. The PHP and SQL implementation provides safe database operations and live order monitoring which enables users to choose their selections and managers to track active orders effectively. The system achieves automation of restaurant operations by focusing its fundamental features on order processing while also adding bill generation and receipt printing capabilities.

The addition of an ordering interface benefits customers by decreasing mistakes and providing them more convenient service. The administrator dashboard presents restaurant personnel with an organized display of active orders alongside already completed ones in order to maintain smooth order processing. The system generates and prints receipts to provide documented records for both restaurant management and their customers during purchasing activities.

The system fulfills its primary targets through its lightweight structure which specifically meets requirements of restaurant settings. Additional improvements aimed at restaurant operations will include inventory tracking and data analysis capabilities as well as features for electronic payment processing but the current system primarily handles essential functions. The project proves that implementing this simple but potent POS system enables restaurants to enhance efficiency and accuracy while providing better management service quality in their operations.

REFERENCES

- 1. K. Li, Y. Chen, J. Liu, L. Zhang, and X. Mu, "Online Food Delivery Platforms and Restaurants' Interactions in the Context of the Ban on Using Single-Use Plastics," *IEEE Access*, vol. 9, pp. 96210–96220, Jul. 2021, doi: 10.1109/ACCESS.2021.3095296.
- H. Dev and H. Hamooni, "Profiling US Restaurants from Billions of Payment Card Transactions," in *Proc. 2020 IEEE 7th Int. Conf. Data Sci. Adv. Analytics (DSAA)*, Sydney, NSW, Australia, Oct. 2020, pp. 1–10, doi: 10.1109/DSAA49011.2020.00059.
- M. H. Manzoor and O. Hasan, "A Comparative Study on the Characteristics of Mobile Applications for the Restaurant Industry," in *Proc. 2021 Int. Conf. Comput. Sci. Eng. (IC2SE)*, Padang, Indonesia, Nov. 2021, pp. 1–6, doi: 10.1109/IC2SE52832.2021.9791944.
- 4. E. Elverda, T. A. Nahdah, and S. Hamali, "Consumer Decision-Making Criteria for Online Food Delivery Platforms: A Case Study in Jabodetabek Indonesia," in *Proc. 2023 Int. Conf. Inf. Manag. Technol. (ICIMTech)*, Malang, Indonesia, Aug. 2023, pp. 1–6, doi:

10.1109/ICIMTech59029.2023.10277741.

- R. Sonwane, A. Deshmukh, and S. Choudhary, "Designing Web Application of Online Food Ordering for Restaurant Chain using Web Technologies," in *Proc. 2023 3rd Int. Conf. Pervasive Comput. Social Netw. (ICPCSN)*, Salem, India, Jun. 2023, pp. 1–6, doi: 10.1109/ICPCSN58827.2023.00179.
- H. Khlefat, H. Attar, and A. Qusef, "E-Food: Success Factors for Establishing Online Food Retailing: A Case Study from Jordan," in *Proc. 2022 Int. Conf. Emerging Trends Comput. Eng. Appl. (ETCEA)*, Karak, Jordan, Nov. 2022, pp. 1–6, doi: 10.1109/ETCEA57049.2022.10009882.
- Y. Zheng and X. Meng, "An Inventory Management Model in Mobile Commerce," in *Proc. 2010 Int. Conf. Inf. Sci. Manag. Eng. (ISME)*, Shaanxi, China, Aug. 2010, pp. 1–4, doi: 10.1109/ISME.2010.35.
- L. T. Yong, C. Y. Qi, C. S. Yee, A. Johnson, and N. K. Hoong, "Designing and Developing a PDA Food Ordering System Using Interaction Design Approach: A Case Study," in *Proc. 2009 Int. Conf. Comput. Technol. Dev. (ICCTD)*, Kota Kinabalu, Malaysia, Nov. 2009, pp. 1– 5, doi: 10.1109/ICCTD.2009.18.
- 9. W. Zhang, "Research on e-commerce mode of food enterprises," in *Proc. 2010 Int. Conf. Networking Digit. Soc. (ICNDS)*, Wenzhou, China, May 2010, pp. 1–4, doi: 10.1109/ICNDS.2010.5479468.
- 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. 1–6, doi: 10.1109/ICSGRC57744.2023.10215430.