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RESEARCH ARTICLE

Automated Beer Parlour Billing System using VB.NET and MS Access Database

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Abstract

The growing need for precision and efficiency in hospitality management has driven small and medium-sized businesses to adopt digital billing solutions. This study presents the design and implementation of an *Automated Beer Parlour Billing System* developed using Visual Basic .NET and Microsoft Access. The system replaces error-prone manual billing methods by integrating automated billing, inventory control, and sales tracking into a unified desktop platform. Development followed a structured methodology encompassing requirement analysis, modular programming, and systematic testing to ensure functional accuracy and security. The system architecture employs a two-tier client–server model, featuring a presentation layer for user interaction and a data access layer for database operations, enabling consistent real-time data flow. Key modules—Login, Product Management, Point of Sale (POS), Receipt Generation, Sales Reporting, and User Management—collectively enhance operational speed, billing accuracy, and accountability. Implementation results show that automation significantly improved transaction efficiency, reduced human error, and strengthened inventory management. The interface design promotes usability, requiring minimal technical expertise while supporting role-based access and encrypted authentication. Evaluation confirmed compatibility across multiple Windows environments and reliable performance even on low-specification systems. Discussion highlights that the system's modular structure not only simplifies maintenance but also aligns with modern design principles for small-scale business software. Although limited by its desktop architecture and database scalability, the system offers a robust foundation for future web or cloud migration. Overall, the project demonstrates that cost-effective technologies like VB.NET and Microsoft Access can deliver practical, scalable automation for small businesses—enhancing accuracy, transparency, and decision-making in hospitality operations.

Keywords
Automated Billing; Hospitality Management; Visual Basic .NET; Point Of Sale System; Small Business Automation.

1 | INTRODUCTION

The increasing demand for accuracy and efficiency in hospitality operations has prompted the development of automated billing systems tailored to small and medium-sized enterprises. The *Automated Beer Parlour Billing System*, developed using Visual Basic .NET and Microsoft Access, is designed to replace error-prone manual billing methods commonly found in bars and beer parlours. Manual processes often result in miscalculations, stock discrepancies, and service delays that hinder operational reliability and profit management. By integrating database-driven automation, this system aims to improve billing precision, accelerate transaction speed, and facilitate effective inventory monitoring. The approach aligns with technological frameworks described in *Microsoft Visual Basic .NET Documentation* and *Microsoft Access Database Engine Documentation*, both of which provide robust support for desktop-based data applications. According to *Retail Technology Review* (2020), well-structured point-of-sale systems not only improve transaction accuracy but also strengthen decision-making by generating reliable data on sales and customer activity. Studies such as those by Anusuya (2025) and Bhuravane *et al*. (2025) reinforce this argument by demonstrating how automated billing software can mitigate human error and streamline the recording of transactions in commercial settings. Anusuya's *BillSmart* model, which employs automation for grocery checkout processes, illustrates the operational benefits of integrating intelligent billing algorithms that ensure consistency in pricing and payment validation. Similarly, Bhuravane *et al*.'s work on the *Paavti Pustak* invoice system emphasizes the administrative value of digital invoicing in reducing manual workload and enhancing accountability across sales operations.

The hospitality sector's dependency on manual systems not only slows customer service but also complicates stock management and record-keeping. As highlighted by *Johnson and Smith* (2019), inefficient database design and lack of data integration hinder accurate business analytics, restricting managers from understanding sales dynamics and product performance. The *Automated Beer Parlour Billing System* addresses these shortcomings by employing a structured database model capable of storing and processing multiple sales transactions, tracking inventory levels, and enforcing user authentication to prevent unauthorized data manipulation. In alignment with *Smith* (2018), who stresses the importance of translating problem analysis into practical programming solutions, the use of VB.NET ensures flexibility in handling interface design, business logic, and secure data communication between modules. Furthermore, the system reflects the broader trend of small business automation noted by the *Business Technology Journal* (2021), which associates digital transformation with cost reduction, improved productivity, and more reliable data-driven management practices. Research by Kabra *et al*. (2023) and Korneev *et al*. (2014) further supports the relevance of automation across sectors, highlighting how system optimization and real-time data processing enhance operational decision-making and efficiency. In practical terms, the *Automated Beer Parlour Billing System* seeks to achieve accuracy in computation, consistency in reporting, and transparency in business records, forming a scalable foundation for small hospitality enterprises seeking to modernize their operations through affordable technological adoption.

2 | SYSTEM SPECIFICATIONS

The development of the *Automated Beer Parlour Billing System* employs Visual Basic .NET as its core programming language, executed within Microsoft Visual Studio 2012 or later versions as the integrated development environment (IDE). The system utilizes Microsoft Access (version 2003 or later) as the database management platform, supported by the Microsoft Access Database Engine 2010 for runtime functionality. Designed as a desktop-based application built on the .NET Framework, the software operates efficiently on Windows operating systems, ensuring accessibility for businesses with standard computing resources. To function optimally, the system requires a minimum Intel Pentium 4 processor or equivalent, 2GB of RAM (with 4GB recommended for enhanced responsiveness), 200MB of available storage, and a display resolution of at least 1024×768 pixels. Although optional, the integration of a receipt printer is encouraged to facilitate professional and efficient transaction documentation. The system maintains compatibility with Windows 7, 8, 10, and 11, provided that the necessary .NET libraries are installed and properly configured. From a structural perspective, the application adopts a two-tier client–server architecture. The presentation layer is responsible for managing user interactions, including input validation, graphical interface rendering, and the display of billing data and receipts. Meanwhile, the data access layer governs communication with the database, executing Create, Read, Update, and Delete (CRUD) operations, handling transaction processes, and maintaining data consistency across modules. This architectural choice offers practical advantages such as simplified deployment, direct database connectivity for rapid data retrieval, and reduced infrastructure complexity—attributes that make it particularly suitable for small and medium-sized hospitality enterprises. Furthermore, the design promotes ease of maintenance and troubleshooting, allowing administrators to manage system performance without specialized technical expertise.

The database structure, implemented in Microsoft Access, underpins all system functionalities through a well-defined schema designed to maintain data integrity and support reporting processes. Core tables include the Products table, which

stores details such as product ID, name, category, unit price, stock quantity, and description; the Sales table, which records transactional information including sale ID, timestamp, total amount, payment method, and the ID of the user responsible for the transaction; and the SaleItems table, which documents individual items sold by linking sale IDs to product IDs through foreign key relationships. Each record in this table contains item quantity, sale-time unit price, and subtotal values to ensure precise transaction tracking. Access control is handled through the Users table, which secures authentication and authorization by storing encrypted passwords, usernames, user roles (administrator or cashier), and account status indicators. The relationships among these tables—enforced through primary and foreign key constraints—preserve referential integrity and ensure accurate cross-referencing of data across modules. This relational structure not only supports reliable transaction processing but also enables the generation of detailed analytical reports for managerial review.

3 | SYSTEM FEATURES AND FUNCTIONALITIES

The Automated Beer Parlour Billing System integrates several functional modules that collectively ensure secure operations, accurate billing, efficient inventory management, and comprehensive reporting. Each feature has been designed to enhance workflow efficiency, protect data integrity, and simplify administrative control within small to medium-sized hospitality businesses. The system begins with a secure login and logout process that regulates user access and activity. Authentication requires valid credentials, which are verified against records stored in the *Users* database table. Passwords are encrypted to ensure security, and user sessions are established only after successful verification. Role-based access control distinguishes between administrators and cashiers—administrators have unrestricted privileges, while cashiers are confined to billing and product management functions. The logout procedure terminates active sessions, redirects users to the login interface, and logs all session activities for audit purposes. This structure reinforces accountability and prevents unauthorized system access or data tampering. The product management module serves as the foundation for inventory administration. Authorized personnel can register new products by specifying relevant attributes such as name, category, unit price, quantity, and description. Existing product details can be modified when prices or stock quantities change, while obsolete items can be archived to preserve transaction history and maintain data consistency. The module displays all product entries in an interactive, searchable table that includes identifiers, categories, current prices, stock availability, and operational status. This design ensures that product data remains accurate, enabling bar managers to monitor stock levels, adjust pricing strategies, and organize inventory efficiently. At the core of the system lies the Point of Sale (POS) module, which automates billing and transaction recording. The POS interface presents the entire product catalog, displaying current prices and stock quantities. Staff can easily select items, specify purchase quantities, and process transactions with real-time computation of subtotals and total amounts, including applicable taxes or discounts.

The interface allows adjustments—items can be added, removed, or modified before confirming a sale—while automatically validating stock availability to prevent overselling. Upon payment, the system updates the inventory database, logs the sale, and finalizes the transaction without manual calculation, ensuring operational speed and accuracy. Once a transaction is completed, the receipt generation module automatically produces a professional digital or printed receipt. Each receipt contains essential details such as the business name, contact information, transaction date and time, unique receipt number, itemized list of purchased products, subtotal, applicable taxes, total payment, payment method, and cashier identification. Receipts can be printed, displayed on-screen, or exported for electronic delivery. Beyond documenting transactions, this feature enhances customer confidence, supports after-sale inquiries, and strengthens the establishment's professional image. The sales reporting module provides management with detailed access to historical transaction data. Users can view sales summaries filtered by parameters such as date, cashier, or product. Each record includes a transaction ID, total amount, and cashier information, with the option to expand entries to review specific items sold. These reports facilitate performance evaluation, identification of high-demand products, and assessment of sales trends across daily, weekly, or monthly intervals. Additionally, sales data can be exported to external spreadsheet software for extended analysis or integrated into management reports for decision-making purposes. Finally, the user management module centralizes administrative control over staff accounts and permissions. Accessible only to system administrators, it supports the creation of user profiles with defined roles and encrypted credentials. Administrators can modify user details, reset passwords, change access levels, and activate or deactivate accounts as needed. The system maintains a complete user list that records each individual's role, status, and activity logs. This feature ensures accountability, supports workforce management, and maintains secure, role-specific access to system resources.

4 | RESULTS AND DISCUSSION

4.1 Results

4.1.1 Implementation

The implementation of the Automated Beer Parlour Billing System produced a fully functional desktop-based application capable of automating billing, sales recording, and inventory management in small and medium-sized hospitality businesses. Developed using Visual Basic .NET and Microsoft Access, the system was designed to enhance transaction speed, billing accuracy, and data management efficiency. The development process began with requirement analysis through direct consultation with bar owners and staff to understand their workflow challenges, such as manual billing errors, time delays, and poor data tracking. These findings informed the design of the system architecture, database schema, and user interface. The system design incorporated workflow diagrams, database normalization, and security protocols. Implementation followed a modular structure—each functional component was developed independently and later integrated into the final system. Testing stages, including functional, performance, and user acceptance testing, confirmed that all modules operated correctly and consistently under real-world conditions. The Login Module ensures data security through encrypted authentication and role-based access control, allowing only authorized personnel to perform specific operations. The Product Management Module enables adding, updating, or deleting product data while validating input accuracy to maintain consistency.

The POS/Billing Module acts as the system's core, automating total computation and updating inventory upon each sale. The Receipt Generation Module produces standardized receipts for customer transparency, and the Sales Tracking Module records transactions and generates reports for management use. The database implementation uses a normalized structure to prevent redundancy and maintain data integrity. The Products, Sales, SaleItems, and Users tables are interlinked via primary and foreign keys to ensure reliable relationships between data entities. Referential integrity constraints prevent orphan records and ensure accurate cascading updates. Queries were designed to handle frequent operations such as retrieving product lists, validating login credentials, and calculating total sales. Installation and setup were tested on Windows 7, 8, 10, and 11, confirming compatibility with various system environments. Minimum hardware requirements included an Intel Pentium 4 processor, 2GB RAM, and 200MB storage space. Even under limited configurations, the application performed efficiently, indicating its suitability for resource-constrained businesses.

4.1.2 System Design

Figures 1 through 5 illustrate the main user interfaces developed during the implementation process, representing the logical flow from product registration to sales reporting. Each interface was designed with usability, efficiency, and data consistency in mind, ensuring that all modules interact seamlessly through a shared database framework.

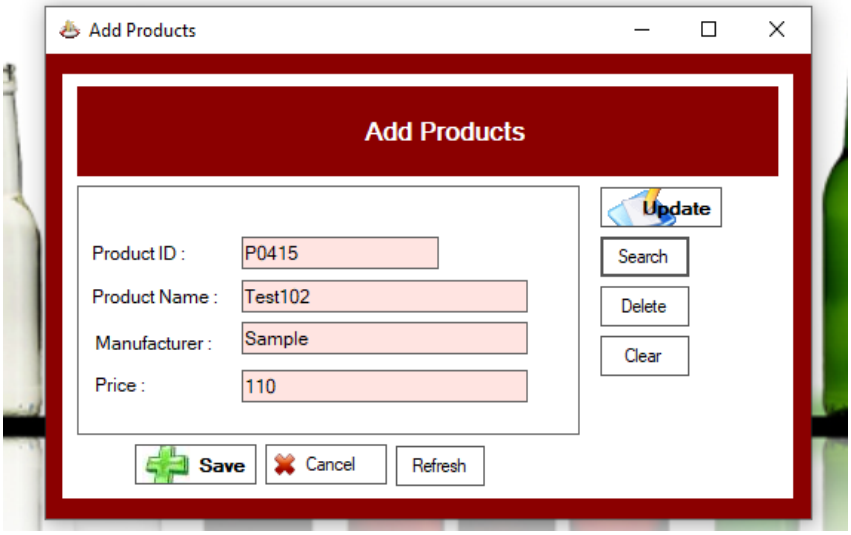


Figure 1. Product Form

Figure 1 shows the Product Form, which allows administrators to register, modify, or remove products within the system. The form includes input fields for product name, category, unit price, and quantity, all linked directly to the database. It also features validation mechanisms to ensure complete and accurate data entry before submission.

This interface facilitates structured inventory management by reducing manual input errors and maintaining accurate product records across the system.

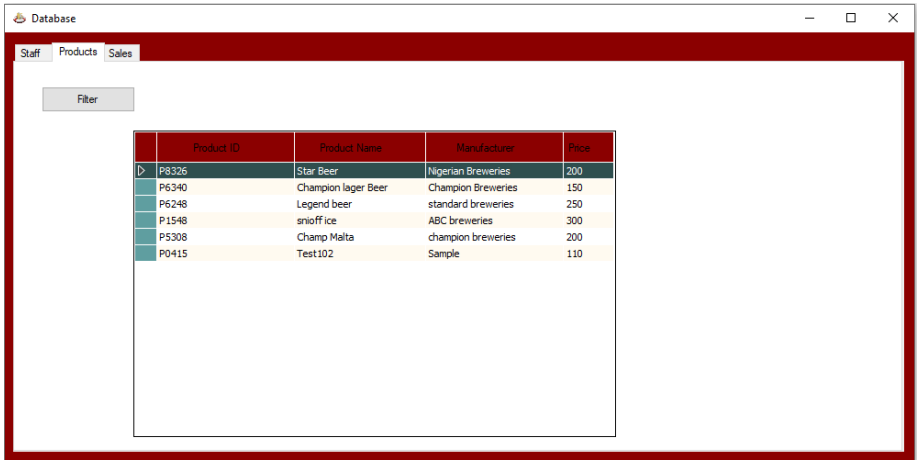


Figure 2. Product List Interface

Figure 2 illustrates the Product List Interface, which displays a searchable and sortable table of all available products. Users can organize products by name, price, or category, allowing managers to monitor stock availability, pricing consistency, and inventory turnover in real time. The dynamic search and filter functions enable quick access to data, while the interface's synchronization with the product database ensures that updates made in the Product Form are reflected immediately.

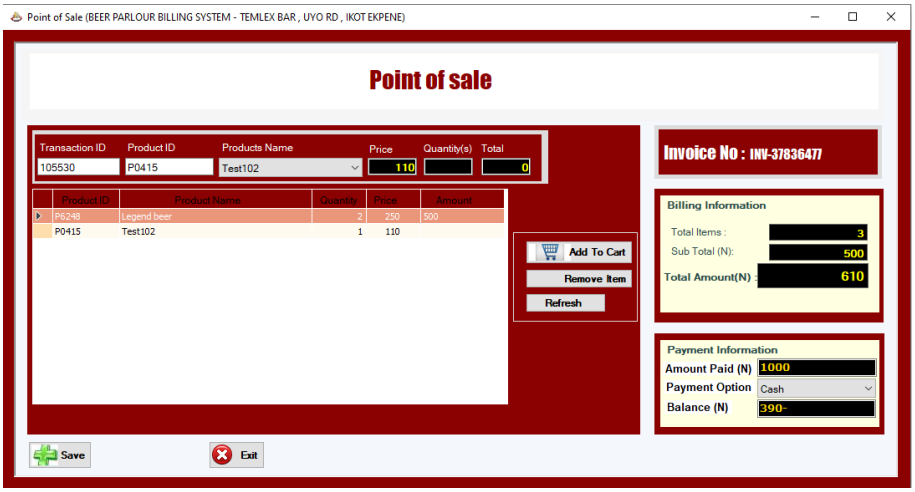


Figure 3. Billing Form POS Interface

Figure 3 presents the Billing or POS Interface, which represents the core of the system's functionality. Through this interface, cashiers can dynamically create customer bills by selecting products and entering quantities. The system automatically computes subtotals and totals, updates inventory in real time, and validates stock availability before processing transactions. This module reduces waiting time, eliminates calculation errors, and streamlines the payment process, ultimately improving service efficiency and customer experience.

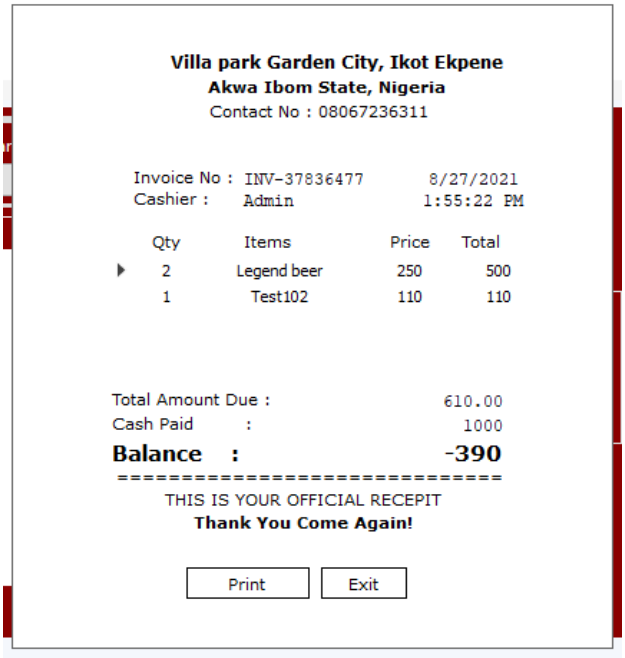
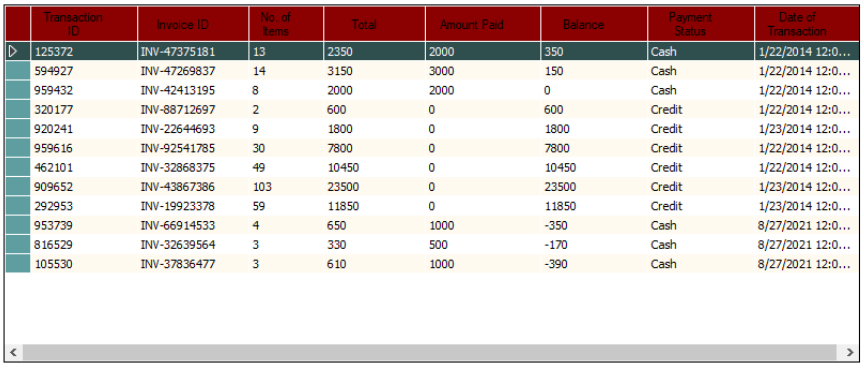


Figure 4. Receipt Layout

Figure 4 displays the Receipt Layout, automatically generated upon the successful completion of a transaction. The receipt includes the establishment's name, contact information, transaction ID, product details, total cost, and cashier identification. Receipts can be printed or exported digitally for storage or email delivery. This feature enhances operational professionalism by ensuring accurate, consistent documentation and providing customers with clear proof of purchase.



Transaction ID	Invoice ID	No. of Items	Total	Amount Paid	Balance	Payment Status	Date of Transaction
125372	INV-47375181	13	2350	2000	350	Cash	1/22/2014 12:0...
594927	INV-47269837	14	3150	3000	150	Cash	1/22/2014 12:0...
959432	INV-42413195	8	2000	2000	0	Cash	1/22/2014 12:0...
320177	INV-88712697	2	600	0	600	Credit	1/22/2014 12:0...
920241	INV-22644693	9	1800	0	1800	Credit	1/23/2014 12:0...
959616	INV-92541785	30	7800	0	7800	Credit	1/22/2014 12:0...
462101	INV-32868375	49	10450	0	10450	Credit	1/22/2014 12:0...
909652	INV-43867386	103	23500	0	23500	Credit	1/23/2014 12:0...
292953	INV-19923378	59	11850	0	11850	Credit	1/23/2014 12:0...
953739	INV-66914533	4	650	1000	-350	Cash	8/27/2021 12:0...
816529	INV-32639564	3	330	500	-170	Cash	8/27/2021 12:0...
105530	INV-37836477	3	610	1000	-390	Cash	8/27/2021 12:0...

Figure 5. Sales List Interface

Figure 5 depicts the Sales List Interface, which provides access to detailed transaction history and supports managerial decision-making. It includes search and filter options by date, cashier, or transaction amount, enabling efficient data retrieval. The interface also supports revenue and performance analysis, allowing business owners to view total daily, weekly, or monthly sales as well as best-selling products. These analytical features help identify sales trends, monitor staff performance, and support data-driven decisions.

Overall, the system's design demonstrates clear operational improvements and a strong focus on user experience. Billing accuracy increased significantly as automated computations eliminated manual calculation errors. Transaction processing time was reduced due to faster data retrieval and automatic receipt generation. Inventory management became more reliable through real-time updates that reflect stock changes immediately after each sale. Furthermore, record-keeping improved through centralized data storage and the ability to retrieve historical sales information efficiently.

4.2 Discussion

The results demonstrate that automation substantially enhances operational efficiency in small-scale hospitality businesses. The Automated Beer Parlour Billing System successfully integrates multiple business

functions—billing, inventory management, sales tracking, and data reporting—into a single platform that supports real-time processing and reliable data flow. The development approach, following a modular and layered architecture, ensured that each subsystem operated independently yet cohesively. This aligns with the architectural recommendations of Johnson and Smith (2019), who emphasize that small business applications benefit from direct database access and simplified client-server models to minimize latency and maintenance costs. Security testing confirmed the reliability of the system's authentication mechanisms. Encrypted password storage and role-based access ensure that sensitive operational data remain protected, a practice supported by Smith (2018) as a core principle of business application security. The implementation of activity logging and session management also ensures accountability, allowing administrators to monitor user actions and identify anomalies in system use. From a usability perspective, the graphical user interface was well received during user acceptance testing, particularly for its intuitive design and logical workflow. Bar staff reported a significant reduction in billing time and improved customer satisfaction—findings consistent with Anusuya (2025) and Bhuravane *et al*. (2025), who observed that automated POS systems reduce transaction errors and streamline customer interactions. The Sales Tracking Module, shown in *Figure 5*, demonstrated strong analytical potential. It allows managers to access performance metrics such as total revenue, sales frequency, and product popularity. This capability aligns with Kabra *et al*. (2023) and Korneev *et al*. (2014), who highlight the value of automation in enabling data-driven decision-making and performance optimization in small enterprises.

The system also provides measurable business benefits. Financially, automation reduces labor costs associated with manual record keeping, prevents revenue loss from calculation errors, and optimizes inventory levels through real-time tracking. Operationally, the system increases customer throughput and improves service quality during peak hours. In terms of business intelligence, it provides reliable analytics for decision-making, staff evaluation, and long-term planning. However, the system also presents certain limitations. Its current desktop-based structure restricts multi-user access and remote management, and Microsoft Access imposes performance constraints when handling large datasets or multiple concurrent users. The lack of web and mobile integration limits scalability and real-time connectivity across multiple outlets. To address these issues, future enhancements should focus on migrating to more robust relational database systems such as SQL Server or MySQL, integrating cloud-based data storage for centralized management, and expanding the system into a web or mobile platform to increase accessibility. Additional improvements could include real-time analytics dashboards, barcode scanning, supplier management, and integration with accounting software or customer loyalty systems. Overall, the implementation and evaluation of the Automated Beer Parlour Billing System confirm that low-cost, accessible technologies like VB.NET and Microsoft Access can deliver significant operational benefits for small and medium-sized businesses. The project demonstrates that automation not only increases accuracy and speed but also provides a framework for informed managerial decisions and sustainable business growth.

5 | CONCLUSIONS

The Automated Beer Parlour Billing System demonstrates an effective and economical approach to automating billing operations for small and medium-sized bars and beer parlours. Developed using Visual Basic .NET and Microsoft Access Database, the system successfully addresses the persistent issues associated with manual billing, including calculation errors, slow transaction speed, weak inventory oversight, and inadequate business reporting. The system's primary contribution lies in its integrated feature set encompassing product management, automated billing, receipt generation, sales tracking, and user management within a unified platform. Its intuitive interface design allows staff with minimal technical training to perform complex operational tasks efficiently. The use of accessible and low-cost technologies makes it suitable for small businesses with limited IT infrastructure, while its modular architecture ensures ease of maintenance and scalability. Implementation results indicate clear operational benefits. Billing accuracy was improved through automation, customer service speed increased due to real-time processing, and inventory control became more consistent through automated stock updates.

The inclusion of sales tracking and reporting tools enhanced business intelligence by providing managers with actionable data for informed decision-making. Collectively, these improvements led to higher operational efficiency, customer satisfaction, and profitability. While the system's desktop-based nature and reliance on Microsoft Access present limitations in scalability and remote accessibility, these trade-offs are acceptable for its intended scale of deployment. For businesses that later require more advanced features, the current system provides a solid foundation for migration to cloud-based or multi-user architectures without disrupting established workflows. From an educational and developmental perspective, this project serves as a valuable resource for VB.NET developers and IT students. It offers practical exposure to designing and implementing database-driven desktop applications, user authentication, transaction processing, and user interface design for business applications. Learners can modify and extend the system to deepen their understanding of software engineering

principles and adapt it to similar use cases in other sectors. Ultimately, the success of this system reaffirms the relevance of desktop-based applications in small-scale business environments where simplicity, reliability, and affordability are key priorities. As technology evolves, the foundational structure of this system can inform the development of future web or cloud-enabled solutions, bridging traditional desktop models with modern distributed architectures.

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