



## RESEARCH ARTICLE

## Revolutionizing Pharmaceutical Care: Toward a Unified Pharmacy Management System for Northern Iraq

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### ABSTRACT

This paper presents a novel project that aims to transform pharmacy operations by creating a unified advanced information system that is specifically customized to meet the demands of pharmacies in the northern region of Iraq. The suggested system offers a wide range of comprehensive features. Enabling smooth information exchange between various parts of the healthcare system is its main objective. We achieve this seamless exchange. The main aim of this paper is effectively integrated pharmaceutical management platform. The system is precisely engineered and consists of 28 classes, each carefully designed to meet particular operational needs, with intuitive relationships and clearly defined responsibilities distributed among them as illustrated in our comprehensive UML diagrams. By utilizing a SQL XAMPP database and the Java programming language, it combines a strong architecture with an easy-to-use interface that was developed through multiple rounds of user testing with actual pharmacists and staff members from various pharmacy settings across Northern Iraq. Its diverse range of functions includes but is not limited to, managing medicine sales, optimizing obtaining, monitoring expiration dates, managing personnel data, and supervising financial transactions. With built role-based access controls, and full compliance with relevant data protection regulations to safeguard sensitive patient and prescription information. To ensure the system truly meets the needs of pharmacy operations clearly defined success metrics that measure tangible improvements in efficiency, accuracy, and patient care.

**Keywords:** Information management system, healthcare integration, pharmacy management, decision making, and modular system, data security, user-centered design, system scalability

### INTRODUCTION

In today's globalized world, both public and private sectors prioritize globalization and innovation. Information systems (IS) are now vital tools, driving organizational and business workflow improvements across various sectors like higher education, healthcare, finance, manufacturing, and retail. These systems not only boost efficiency but also help managers across industries make more informed decisions by reducing uncertainty.<sup>[1-3]</sup>

Moreover, technological and scientific advancements have revolutionized traditional medicine, shifting towards digitization with biotechnology at its core. This has led to the emergence of smart healthcare, combining information technology with traditional medicine under biotechnology's guidance.

Healthcare practice relies heavily on evidence-based decisions and requires the use of quality healthcare data. Health management IS (HMIS) are among the core elements of health system building blocks. However, setting reveals a lack of adequate information regarding the quality of health information data.<sup>[4]</sup> One of the major technologies

that aid contemporary healthcare solutions is smart and connected wearables.<sup>[5]</sup> Smart healthcare heralds a multi-level transformation in the medical industry, encompassing shifts in the medical model from disease-centric to patient-centered care, the construction of informatization from clinical to regional medical sectors, and a paradigm shift in medical management from general to personalized approaches. The profound impact of information technologies since the mid-1990s extends beyond academia to shape global economic growth.

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**Received:** May 05, 2024

**Accepted:** August 29, 2024

**Published:** July 01, 2025

**DOI:** 10.24086/cuesj.v9n2y2025.pp7-17

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In various industries, including pharmacy, these technologies have been recognized as pivotal drivers of progress. The integration of technology and the Internet into pharmacy practice marks a significant milestone, with technology and automation playing instrumental roles in streamlining business processes.

Information technologies have permeated diverse aspects of pharmacy practice, from oncology to pharmacokinetics, facilitated by the widespread availability of the internet and the proliferation of healthcare-specific smartphone applications. This pervasive adoption of IT in pharmaceutical practices underscores its growing significance and relevance in optimizing pharmacy operations and enhancing patient care.

Improving the performance of inventory control systems of healthcare items minimizes inventory-related costs, potentially leading to a reduction in the cost of treatment and providing overall satisfaction to patients.<sup>[6]</sup>

The HMIS is made up of numerous subsystems, including the Pharmaceutical Management Information System, Laboratory Information System, and Nursing Information System. In IS, information is collected irregularly and randomly, and data is incomplete and improperly analysed. Therefore, there is a need for a comprehensive information system.<sup>[7]</sup>

Pharmacies, as integral components of the healthcare landscape, heavily rely on information technology to bolster productivity, streamline operations, and simplify day-to-day tasks. This study delves into the development of a sophisticated information system tailored for pharmacists, emphasizing its modular architecture and sophisticated capabilities.

Rooted in the concept of shared material among various healthcare facets, this system promises to revolutionize pharmacy management by providing a comprehensive suite of features designed to optimize operational efficiency and promote seamless information sharing. Advances in information technology have made it easier to determine decision-making strategies outside of the traditional domains. One technique to apply inventory control to drugstore management is to create a database that allows for numerous demand-supply adjustments.

It also simplifies the many aspects of pharmacy management in general, particularly the requirement for demanding medications. Especially in terms of predicting the duration of a drug's use based on the pharmacy environment.<sup>[8]</sup>

In contrast to traditional paper-based systems, a conventional pharmacy typically relies on manual methods for inventory management, supplier coordination, and sales tracking, supplemented by a basic point-of-sale system for customer transactions. However, these conventional point-of-sale methods often only provide limited functionality for tracking sales and generating invoices.

A more efficient and effective approach to maximizing profitability involves transitioning from manual processes to automated systems. Computerized pharmacy management systems (PMS) offer a myriad of benefits, significantly enhancing efficiency and effectiveness in management tasks. These systems streamline routine activities, improving accuracy,

reducing errors, and providing valuable insights for informed decision-making.<sup>[9]</sup> In addition to the numerous advantages of computerized PMS, there is a compelling case for the adoption of a unified system across all pharmacies in the North of Iraq. Moving towards a unified system would facilitate seamless integration and information sharing among pharmacies, ultimately enhancing the overall efficiency and effectiveness of pharmacy operations in the region. By standardizing processes and data management practices, a unified system would not only optimize workflow but also improve patient care and safety through enhanced coordination and communication among healthcare providers. Furthermore, a unified system would enable centralized monitoring and analysis of pharmacy data, allowing for better resource allocation, inventory management, and strategic decision-making at both the local and regional levels.

This centralized approach would also facilitate compliance with regulatory requirements and quality standards, ensuring consistency and accountability across all pharmacies. Overall, the implementation of a unified PMS in the North of Iraq holds the potential to revolutionize pharmacy practice, improve healthcare outcomes, and contribute to the advancement of the healthcare system in the region.

The “digital revolution,” or the move from analog to digital technology, has changed our lives and opened up new opportunities in a variety of societal activities.<sup>[10]</sup> The pharmaceutical business in Northern Iraq confronts issues due to fragmented management systems, which impede efficient coordination and jeopardize patient care. To remedy this, a unified PMS is proposed, which uses modern IS technology to streamline operations and improve patient care.

This system integrates a variety of capabilities, including inventory and prescription management, and provides real-time data to help user make informed decisions. The implementation of this system intends to transform pharmaceutical care delivery by promoting collaboration and improving patient outcomes.

## BACKGROUND

Information and communication technology plays a pivotal role as an indispensable component of modern life. It has significantly elevated and fortified various aspects of human existence, encompassing advancements in healthcare, and educational methodologies, as well as ensuring safety and security measures.<sup>[11]</sup>

The literature review offers a comprehensive exploration of the development and impact of PMS and IS in healthcare contexts, Health IS offer many potential benefits for healthcare, including financial benefits and for improving the quality of patient care.<sup>[12]</sup> Delve into the challenges and strategies associated with implementing PMS in resource-limited settings, illuminating effective system deployment techniques. In the context of increasing deployments of unified PMS and the merging of hospitals into single health systems, pharmacy informatics (PI) teams face growing opportunities and challenges. Pharmacy leaders must carefully consider the impact of technology utilization within multihospital health systems, taking into account organizational structures and their

effects on technology implementations and dedicated support teams. Common challenges in implementing electronic medical records and other technologies in multihospital systems include harmonizing practices, addressing platform compatibility, and ensuring interoperability. Collaboration between IT and information technology teams is crucial to develop practical strategies for implementing pharmacy automation and software, thereby facilitating safe and effective patient care. Key areas of focus include organizational structures impacting informatics teams, pharmacy integration and standardization, formulary management, data analytics, and clinical decision support systems. Addressing these challenges is essential for ensuring the successful implementation and utilization of PMS in the evolving healthcare landscape.<sup>[13]</sup>

### Current Landscape of PMS

In recent years, the global healthcare landscape has witnessed significant advancements in PMS, aimed at optimizing pharmacy operations and enhancing patient care. The revolution in the digital economy is forcing the retail pharmacy industry to develop new business models to achieve operational excellence.<sup>[14]</sup>

Highlight the prevalence and diversity of PMS solutions across different regions of the world, showcasing a wide range of functionalities tailored to meet the unique needs of pharmacies in various settings. These systems encompass features such as inventory management, prescription processing, patient records management, and billing functionalities, providing comprehensive support for pharmacy workflow automation, every pharmacy strives to reach out to its most valued clients; therefore, this industry uses new technologies in this respect to match the correct sales method and improve consumer satisfaction.<sup>[15]</sup>

However, despite the widespread availability of PMS globally, access to advanced solutions remains limited in certain regions, particularly in resource-constrained settings such as the North of Iraq. Several challenges faced in implementing of PMS in developing countries, citing issues related to infrastructure, funding constraints, and workforce capacity as significant barriers to adoption. Emphasize the need for tailored solutions that address the specific needs and challenges faced by pharmacies in regions with limited resources.<sup>[16-18]</sup>

In the North of Iraq specifically, the availability and adoption of PMS vary depending on factors such as geographical location, healthcare infrastructure, and economic conditions, providing insights into the current landscape of PMS in the region, highlighting both the progress made and the remaining challenges. While some pharmacies in urban centers may have access to advanced PMS solutions, pharmacies in rural areas often rely on manual processes or basic software applications due to limited resources and infrastructure. The impact of system factors such as compatibility, complexity, security, and privacy on Pharmacists' confirmation and behavioral control in utilizing IS within healthcare services in Iraq. The studies found that factors like system compatibility, complexity, secure medical information sharing, and information privacy positively influence Pharmacists' confirmation and behavior in using health IS.<sup>[19]</sup>

The literature highlights the critical need to address the unique challenges and requirements faced by PMS, particularly in regions like the North of Iraq. With ongoing advancements in technology, it becomes increasingly vital to enhance access to and usability of PMS solutions, especially in resource-constrained settings. By improving the availability and usability of PMS solutions, pharmacy operations can be optimized, ultimately leading to better patient care outcomes. In the context of this research, drug information resources play a crucial role in medication discovery, utilization, and management. However, there is a lack of comprehensive information about the types of resources utilized by Iraqi community pharmacists.<sup>[20]</sup> Therefore, this research objectives include identifying the types of drug information resources used by pharmacists and understanding the common drug information questions they encounter in their work within community pharmacies. Addressing these objectives will provide valuable insights into improving drug information access and utilization within Iraqi community pharmacy settings, thereby enhancing overall pharmacy operations and patient care outcomes.

### Proposed Innovations in PMS

In recent years, the global healthcare landscape has seen remarkable advancements in PMS, aimed at optimizing pharmacy operations and improving patient care. These systems offer a wide array of functionalities tailored to meet the unique needs of pharmacies worldwide, including inventory management, prescription processing, patient records management, and billing functionalities. The implementation of a unified and efficient PMS across all pharmacies in the North of Iraq would revolutionize healthcare delivery and patient outcomes in the region. By standardizing IS, pharmacies would experience streamlined operations and workflows, minimizing errors and ensuring consistent quality of care.

Enhanced communication and collaboration among healthcare providers would facilitate seamless continuity of care and improve patient safety. The system's robust data analysis capabilities would support evidence-based decision-making, proactive medication management, and targeted interventions to enhance patient health outcomes. In addition, centralized monitoring and auditing would ensure regulatory compliance and accountability in pharmacy operations. Overall, this standardized approach to pharmacy management would optimize resource utilization, reduce costs, and ultimately improve the quality and accessibility of pharmaceutical care in the North of Iraq.

### PROPOSED SYSTEM AND METHODOLOGY

The methodology of this research centers on the development of a comprehensive PMS, focusing on essential functionalities such as sales, purchases, drug introduction, and accounting calculations for discounts, staff management, and profit tracking.

The system is designed to streamline operations and minimize the need for additional staff, with a single user managing all aspects of the system. Developed using Java programming language and XAMPP SQL database, the system

integrates these languages to create an efficient pharmacy application. Java Eclipse was utilized for program creation, while PHPADMIN XAMPP application server was employed for database development.

The system comprises 28 classes, each dedicated to specific tasks. For instance, the “Introduce drug” class facilitates drug introduction to establish company presence and reputation among pharmacists, while the “Buying drug” and “Selling drug” classes enable barcode scanning for quick data retrieval and insertion into the database.

The system ensures accurate differentiation between buying and selling drugs by utilizing distinct barcode identifiers. Overall, the methodology outlines the technical aspects and functionalities of the proposed PMS, highlighting its efficacy in optimizing pharmacy operations and facilitating efficient drug management processes.

### Collecting System Requirements

To ensure the proposed PMS is well-designed and aligned with project goals, a thoughtful and thorough approach was taken to gather system requirements. This included reviewing relevant research and expert materials, closely examining the existing system’s structure and performance, and analyzing how data flows in and out of the current setup. These steps helped uncover key insights, identify gaps, and clearly define what the new system needs – paving the way for a more efficient and effective solution.

### System Design Strategies

The proposed system offers robust security, including strong password protection and secure messaging. It accommodates multiple user roles – managers, administrators, and regular users – each with tailored access and permissions. This includes detailed records such as drug name, type, barcode, dosage, cost and selling prices, manufacturing and expiry dates, source, import quantities, and current stock. In addition, the system tracks sales and purchases comprehensively, capturing prices, quantities, dates, and vendor details to support efficient monitoring and decision-making, as illustrated in Figure 1.

### System Architecture and Design

Our proposed Unified PMS follows a thoughtfully designed modular architecture that prioritizes flexibility, maintainability, and scalability to meet the diverse needs of pharmacies across Northern Iraq. Figure 2 presents a comprehensive system architecture diagram illustrating how the various components interact across multiple layers, from the user interface through to external system integrations.

The system consists of 28 interconnected classes organized into logical modules, each responsible for specific functionality within the pharmacy management ecosystem. These classes work together seamlessly while maintaining a clear separation of concerns. Key classes include.

- User management: Handles user authentication, authorization, and profile management with granular

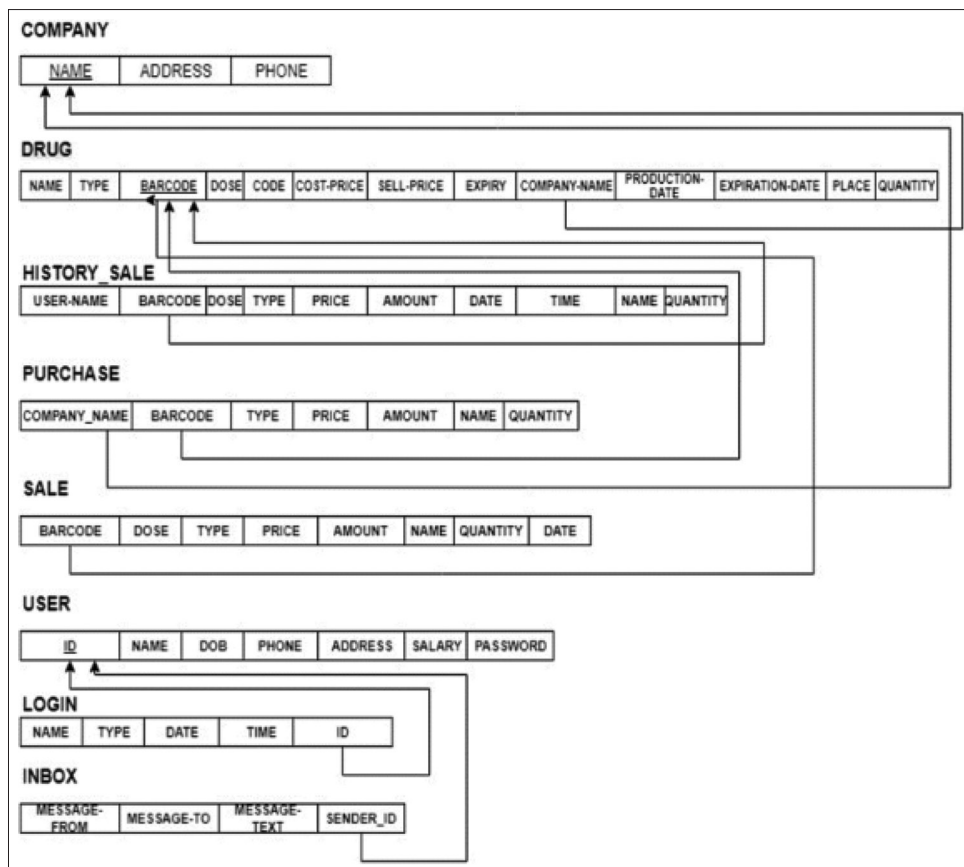
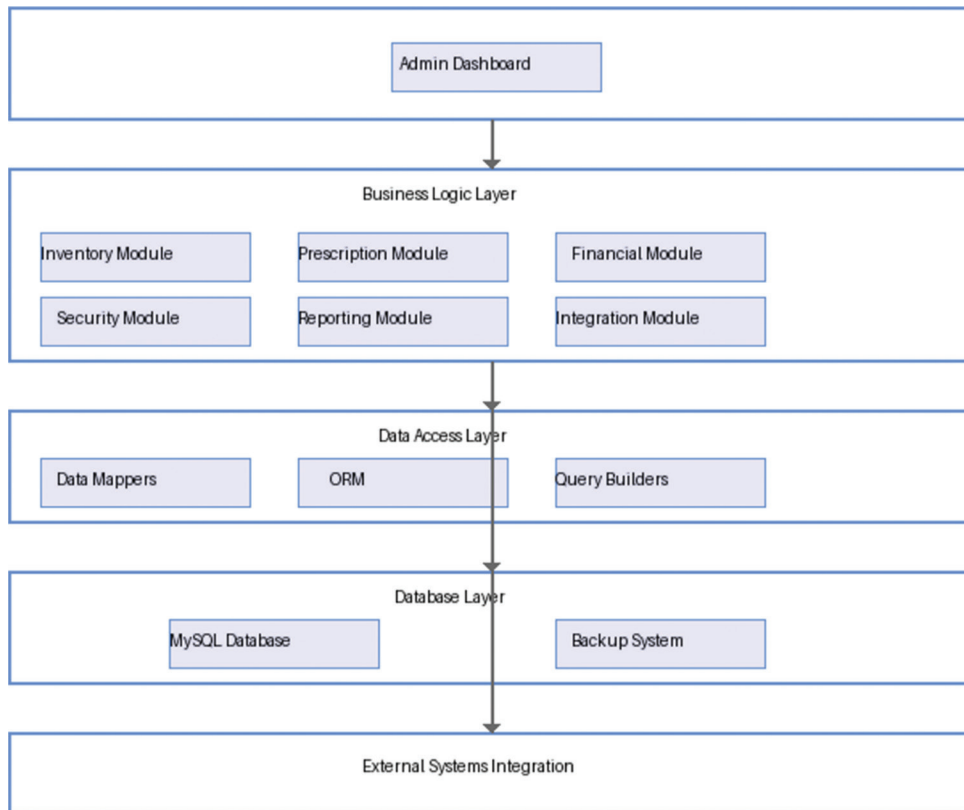


Figure 1: The relationships between the classes of the proposed system



**Figure 2:** Architecture diagram of the unified pharmacy management system

role-based access control (RBAC) that ensures staff members can only access information relevant to their specific job functions.

- Inventory controller: Manages medication stock levels with intelligent reordering suggestions, tracks warehouse operations, and provides real-time visibility into inventory status across multiple locations.
- Prescription processor: Processes and validates prescriptions, performs automatic checks for drug interactions and contraindications, and maintains comprehensive prescription histories.
- Patient records: Securely maintains comprehensive patient information and medication history while ensuring privacy compliance and providing quick access to critical health information.
- Financial transactions: Manages all aspects of billing, payments, and insurance claims processing and generates detailed financial reports for business analysis.
- Report generator: Creates customizable reports for inventory, sales, and business analytics with flexible filtering options and visual data representations.
- Integration manager: Facilitates seamless data exchange with external healthcare systems through standardized APIs, ensuring consistent and reliable information flow.

## SYSTEM IMPLEMENTATION AND RESULTS

### System Deployment and Integration

The proposed PMS provides flexible deployment options, functioning as a standalone solution for individual pharmacies

and a fully integrated component within hospital management systems providing the popularity of pharmacies in hospital settings. Integration with existing hospital management systems can improve operational efficiency and collaboration, as shown in the Figure 3.

### User Authentication and Access Control

The login page acts as the entrance to the proposed system's secure login feature, which provides distinct user roles and functionalities. Managers have the authority to establish admin accounts, and admins can in turn create user accounts. This page allows users to register for new accounts or log in if they already have an account, as shown in Figure 4.

The proposed system offers a user-friendly interface for creating new accounts, capturing all essential user details with clarity and ease. To enhance user convenience and security, it also includes features for password recovery and reset. These functionalities are illustrated in Figure 5 demonstrating the system's focus on providing a smooth and supportive user experience.

The "Change Password" feature updates user passwords and allows the generation of new passwords. This feature improves security by allowing users to periodically reset their passwords, lowering the danger of illegal access and protecting data. Furthermore, the option to change passwords allows users to keep control over their account security, resulting in a safer and more secure user experience within the system, as shown in the Figure 6.



Figure 3: Integration of proposed system within hospital management systems



Figure 4: Proposed system login functionality

### Dashboard and Core Functionalities

After a successful login, users are directed to the Dashboard – the main hub of the system – featuring 28 essential components. This central page is tailored to each user’s role, whether administrator or manager, delivering relevant tools and information accordingly.

The system streamlines user and medication tracking, including automatic barcode generation for each medicine. It also ensures accurate financial recordkeeping, managing payments received, pending payments, and outstanding balances.

A key feature is its reliable expiration tracking for medications, helping prevent stock issues. Additionally, users can generate Excel reports at any time, empowering

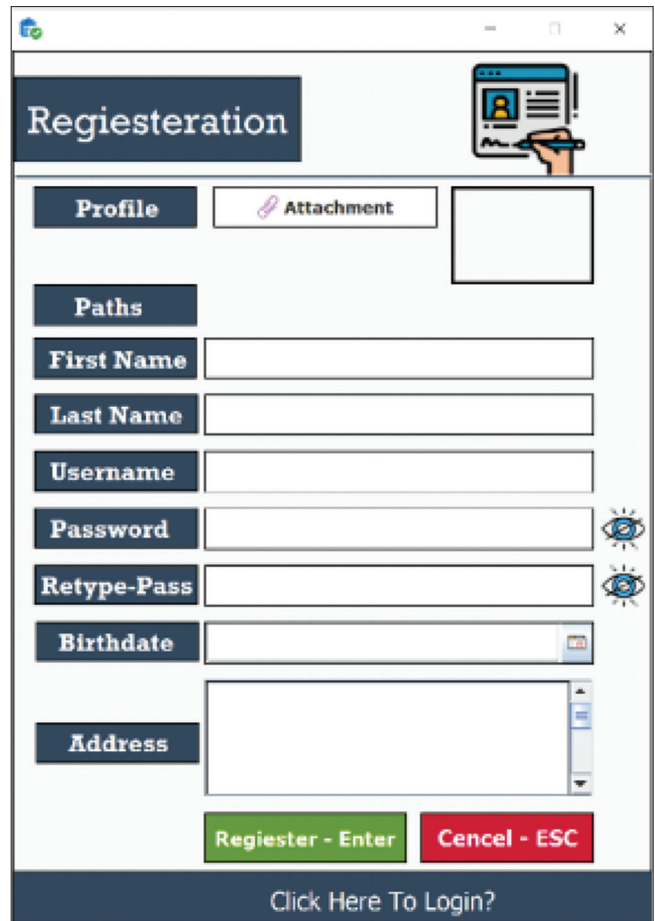


Figure 5: Proposed system registration process

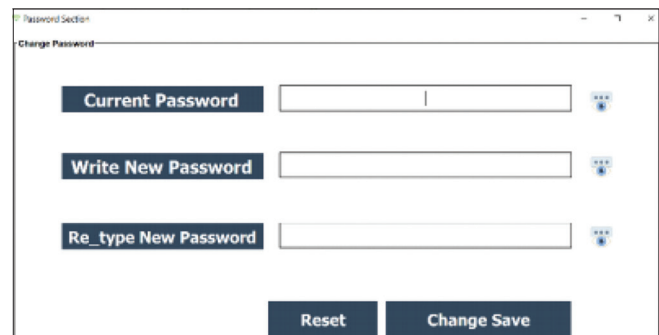


Figure 6: Proposed system change password page

administrators and managers to make informed decisions through timely, data-driven insights, as illustrated in Figure 7.

The dashboard of the proposed system supports three languages—English, Arabic, and Kurdish—making it accessible and user-friendly for a diverse audience. This multilingual functionality ensures users can comfortably navigate and interact with the system in their preferred language, enhancing usability and satisfaction. This feature is particularly valuable in linguistically diverse regions like Northern Iraq, where it fosters smooth communication and engagement among users from various cultural backgrounds. By accommodating different language preferences, the system

promotes wider adoption and long-term success, as illustrated in Figure 8.

The proposed system also includes a human resource management embedded system, which is critical for smoothly managing employees or users within the system. This feature gives full information about employees, including their job titles, contact information, and salary, streamlining HR processes and improving workforce management efficiency, as shown in the Figure 9.

### Medication Management Features

The proposed system includes Automated Barcode Generation for each medication, which simplifies the process of organize

medications at the pharmacy and tracking them within the system. This function not only increases speed and efficiency, but it also ensures accuracy, allowing for exact tracking and control of medication inventories. Furthermore, the use of barcodes results in cost savings by optimizing inventory management operations and minimizing the possibility of errors, as shown in the Figure 10.

The proposed system will provide a catalog for medication details obtained from multiple sources, as shown in the Figure 11. This feature allows the users to import information such as the medication’s name, type, barcode, production, and expiry dates, as well as a graphic picture of the medication. Furthermore, the system collects data about the manufacturing company and defines buying and selling

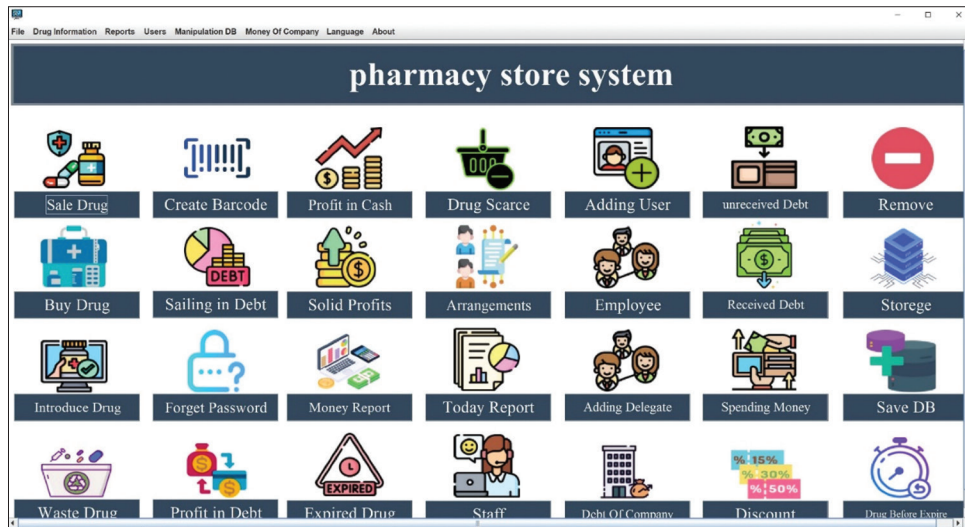


Figure 7: Proposed system dashboard page

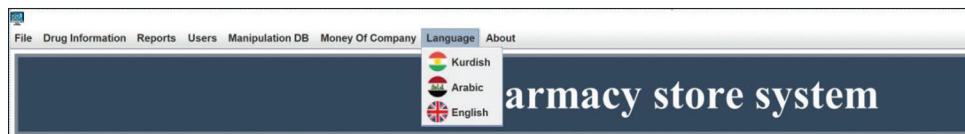


Figure 8: Proposed system multilingual feature

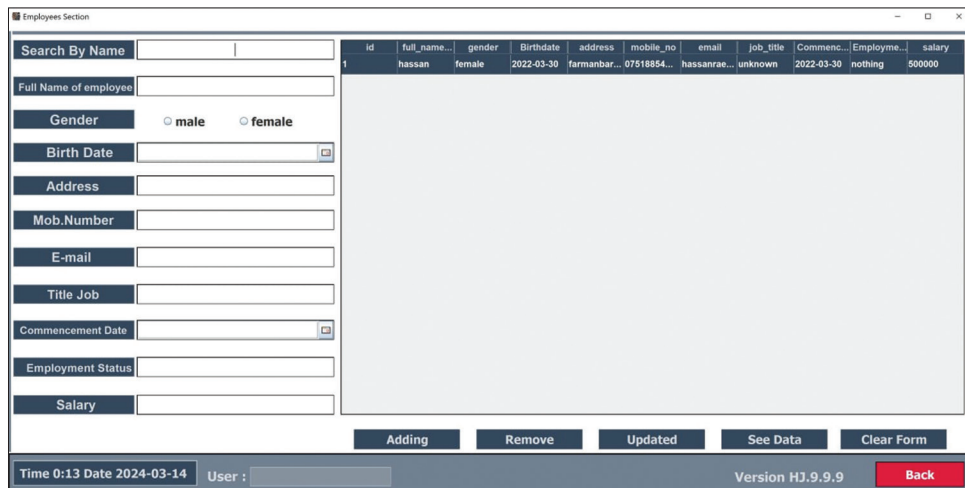


Figure 9: HR embedded system

prices, resulting in a comprehensive catalog of medication-related information.

Furthermore, the system includes a tool that allows the user to add picture of the medicine information table. This feature allows users to contribute visual representations of medications with their corresponding details, improving the system’s usability and efficiency. Pharmacists and administrators can identify pharmaceuticals more quickly and accurately by putting medication photos into the database. This visual aid not only improves the user experience, but it also adds to better medication safety and patient outcomes, as shown in the Figure 11.

The proposed system calculates profits such as medicine types, purchasing data, and selling pricing depending on predetermined amounts for a certain medication. The system provides management with an efficient and effective tool for assessing the profit of each medicine in the pharmacy. This aids in the decision-making processes, allowing management to strategize effectively and optimize inventory management procedures, as shown in the Figure 12.

The proposed system has an efficient expiration tracking system for medications, which visually distinguishes expired, near-expiry (within 10 days), and non-expired medications through color-coding – red, yellow, and green, respectively. This in-built color scheme enhances visibility and facilitates

quick identification of medications nearing expiration, thereby minimizing losses due to expired medications, as shown in the Figure 13.

The proposed system is designed with reliability in mind, offering robust data backup and restore capabilities that enhance overall security. These features ensure that critical pharmacy data remains protected and recoverable in case of system failures or data loss.

By safeguarding the integrity of essential information, the system minimizes operational disruptions and supports smooth, uninterrupted management processes. This level of dependability not only boosts user confidence but also contributes to more efficient and streamlined pharmacy operations, as illustrated in Figure 14.

### System Reliability and Data Safety

#### User-centered design and usability

The Unified PMS was built and designed focusing on the real needs of pharmacy professionals. Instead of simply introducing new technology, we collaborated closely with the people who would actually use the system. Through interviews and observations with 25 pharmacists and 15 technicians in pharmacies across Northern Iraq, we gained a deep understanding of their daily routines and challenges. Their feedback directly shaped the system’s features and interface for instance, after many users highlighted the difficulty of managing partially filled prescriptions, we created a dedicated tracking feature to address that need.

#### Scalability and performance considerations

The system has been designed with scalability in mind, ensuring it can meet the needs of pharmacies of various sizes today while allowing for future growth. In the future, mobile app and web app versions of the system are under construction and will be added to enhance accessibility and usability. These apps will allow users to access the system from anywhere at any time, further increasing the flexibility of the system and

Figure 10: Barcode generation

Figure 11: Importing the medication details to system

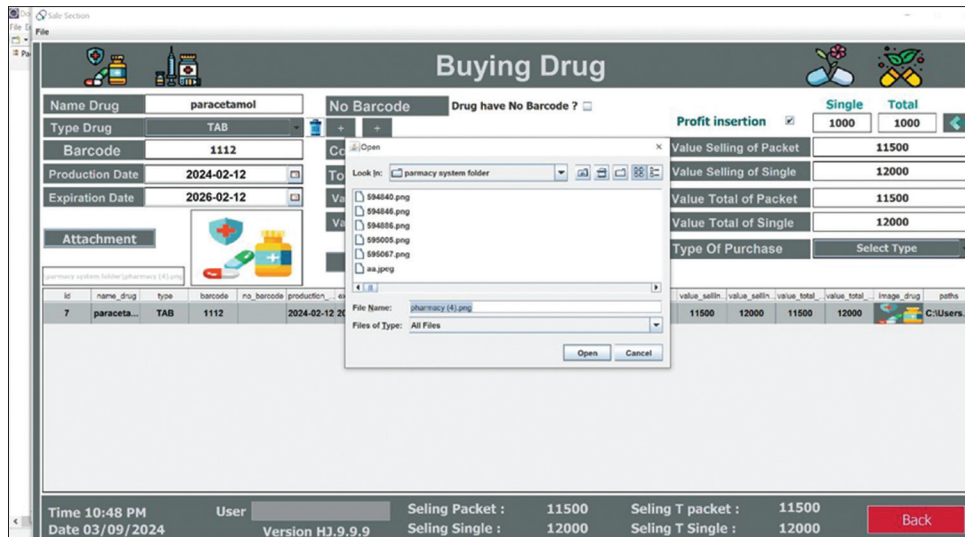


Figure 12: Importing the medication pictures feature

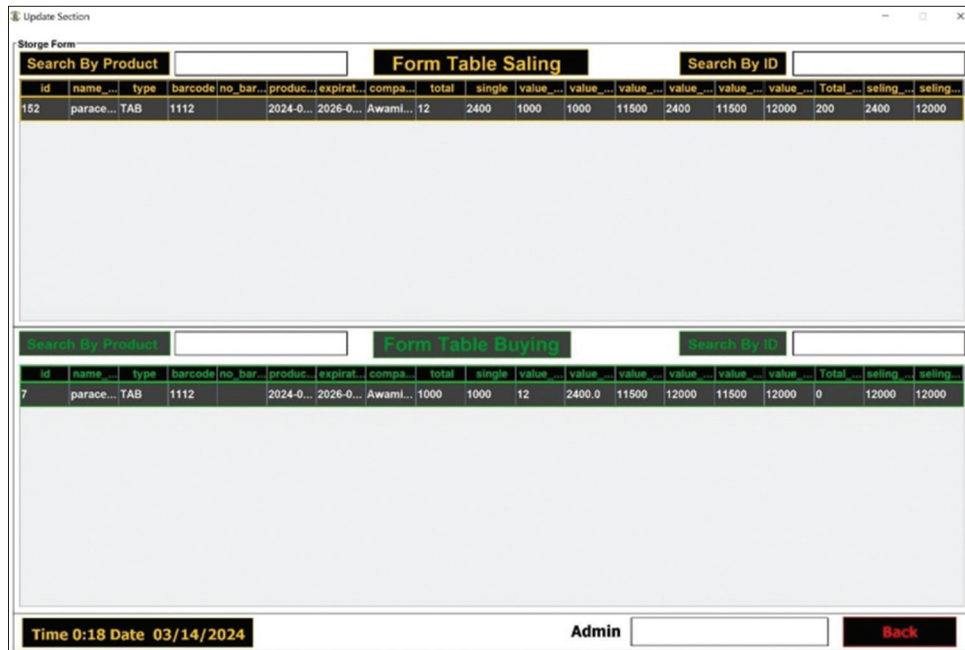


Figure 13: Expire feature

supporting continuous service improvement. The system’s architecture is designed to scale seamlessly as pharmacy operations grow or as additional locations are added to a network. This flexible approach ensures that pharmacies only pay for the resources they need while maintaining consistent performance regardless of size or growth stage.

*Security and data privacy*

The Unified PMS handles highly sensitive personal data, including patient medical histories, prescriptions, and financial details. To ensure this information is protected, we’ve implemented several security and privacy measures:

- RBAC: Access to data is restricted based on user roles, ensuring individuals only see what they need for their job.

- Multi-factor authentication: Administrative access requires both a password and an additional verification method, like a one-time password (TOTP).
- Audit logging: All activities in the system are logged with details such as user, timestamp, and actions, providing a traceable record for security and accountability.

*Database optimization and management*

The database forms the foundation of our Unified PMS, storing everything from inventory records to patient information. We’ve carefully optimized its design for performance, data integrity, and long-term maintainability:

- Database design: Our system utilizes a relational MySQL database with the following optimizations:

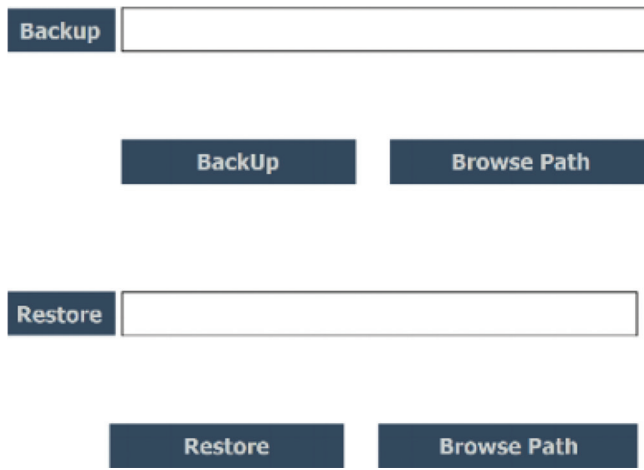


Figure 14: Backup feature

Well-defined relationships with referential integrity constraints enforced at the database level to prevent orphaned records and maintain data consistency

Planned indexing strategy based on actual query patterns identified during performance testing, ensuring fast data retrieval without excessive storage overhead

Table partitioning for large datasets (particularly transaction history and audit logs) to improve query performance and simplify maintenance operations like backups and archiving

- Backup and recovery: We've implemented a comprehensive data protection strategy to prevent information loss:

Automated incremental backups are performed hourly with minimal performance impact, capturing only changes since the previous backup to reduce storage requirements and processing time

Complete database backups conducted daily during configured off-peak hours when system usage is typically lowest.

### EVALUATION AND VALIDATION

To ensure the unified PMS delivers meaningful improvements to pharmacy operations and patient care, we've developed a comprehensive evaluation framework that measures real-world impact rather than just technical specifications:

Pilot Implementation: We've designed a phased rollout approach to validate the system in authentic pharmacy environments:

- Phase 1: Initial deployment in 3 carefully selected urban pharmacies with varying sizes and customer volumes to test core functionality in controlled environments with good technical infrastructure
- Phase 2: Expansion to 5 additional pharmacies including rural locations with more challenging infrastructure conditions to validate system performance in diverse settings
- Phase 3: Implementation in 2 hospital pharmacies to thoroughly test integration capabilities with hospital systems and validate specialized workflows unique to institutional settings

Each implementation phase includes a structured 3-month evaluation period with systematic data collection through system logs, staff interviews, and patient feedback to provide a comprehensive view of system performance

We've established multiple feedback channels for pharmacists, technicians, and administrators to report issues, suggest improvements, and share success stories throughout the pilot process

Success Metrics: We've defined specific, measurable key performance indicators to objectively evaluate the system's impact across multiple dimensions:

Category	Metric	Target improvement
Operational efficiency	Average time to process prescriptions	40% reduction
Operational efficiency	Staff time spent on inventory management tasks	50% reduction
Operational efficiency	Time required to generate management reports	75% reduction
Financial performance	Inventory carrying costs	25% reduction
Financial performance	Average revenue per transaction	10% increase
Financial performance	Losses from expired medications	80% reduction
User experience	System usability score from staff surveys	Score above 80/100
User experience	Training time for new staff members	30% reduction
Patient care	Prescription error rate	90% reduction
Patient care	Average patient wait time	35% reduction

### FINDING DISCUSSION

The findings of this study highlight the crucial need of reinventing pharmaceutical treatment in Northern Iraq by implementing a Unified PMS. Significant benefits can be obtained for managers, users, and patients by utilizing an updated and professional management system designed to meet the demands of modern medicine marketing. This system should focus on improving management processes to make error detection and prevention easier, as well as fulfilling with the current marketing expectations to streamline operations.

Furthermore, the system should prioritize effective decision-making capabilities to improve pharmacy performance and patients' satisfaction, resulting in increasing the sales income, and decreasing marketing costs.

Furthermore, by maximizing the utility of computers and systems in supplying, managing, and utilizing information effectively, the Unified PMS enables administrative levels within businesses to make informed decisions, overcoming the constraints of manual systems. Overall, the implementation of such a system has the potential to significantly improve pharmaceutical care in Northern Iraq, ultimately improving service quality and patient outcomes.

## CONCLUSION AND FUTURE WORKS

In conclusion, this research emphasizes the importance of creating a modernized management system adapted to the region's pharmaceutical demands. The proposed Unified PMS promises major benefits to managers, users, and patients, with a focus on improved management procedures, efficient decision-making skills, and increased customer satisfaction.

The system has many features such as: Easy to use since it has a visual interface that make human interaction flexible, easy to update by adding or deleting information, and generating different reports such as profit and debt.

The future work will focus on developing a mobile application to supplement the system, allowing for easy access and management anytime and anywhere. This application will have in-built dashboards with numbers displaying visual indicators such as the quantity of drugs sold and available, providing real-time information for informed decision-making. By incorporating mobile technology into the system, stakeholders should expect increased accessibility and efficiency in pharmaceutical management, hence improving the quality of pharmaceutical treatment in Northern Iraq.

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