

**MEDICAL BILLING SYSTEM USING PROCESS  
SCHEDULING**

**MINOR PROJECT REVIEW**

*By*

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*In partial fulfilment for the Course*

*Of*

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## ABSTRACT

The Bash script for "Sakib's Medicine Store" goes beyond standard functionality by dynamically updating the medicine list through file reading, ensuring adaptability to changes in inventory. Additionally, the implementation of process scheduling optimizes the bill printing procedure, preventing conflicts and enhancing the overall operational efficiency of the store. The script further incorporates error handling mechanisms, providing robustness in the face of unexpected situations during file processing or scheduling. With a commitment to user experience, the script maintains clarity in presenting options and processing orders while seamlessly managing background tasks. "Sakib's Medicine Store" script stands as a comprehensive and reliable tool, offering a sophisticated yet user-friendly solution for efficient medicine store operations.

Furthermore, the script implements a secure authentication mechanism, ensuring that only authorized personnel can access sensitive functionalities like inventory management and sales reporting. This additional layer of security fortifies the overall integrity of the system, instilling confidence in users regarding data confidentiality and protection.

In terms of scalability, the script accommodates the growth of the medicine store by efficiently managing a rapidly expanding inventory. The file reading mechanism dynamically adjusts to fluctuations in product availability, ensuring accurate and up-to-date information for both staff and customers.

Error handling is not just a feature but a cornerstone of the script's reliability. Robust error-checking mechanisms are embedded at critical points, gracefully handling unexpected scenarios, such as invalid inputs or file corruption. This proactive approach not only prevents potential disruptions but also streamlines troubleshooting, making the script resilient in real-world, dynamic environments.

Moreover, the script supports comprehensive reporting functionalities, providing detailed insights into sales trends, popular products, and overall business performance. The integration of graphical representations enhances data visualization, offering stakeholders a more intuitive understanding of the store's operations.

In essence, "Sakib's Medicine Store" script transcends conventional expectations by delivering a sophisticated, extensible, and secure solution. Its user-friendly design, coupled with advanced features, positions it as a robust tool for efficient medicine store management, adaptable to the evolving needs of the business.



# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 General**

Healthcare administration is a complex and vital aspect of delivering effective medical services. In the pursuit of optimizing the workflow in medical facilities, the development of a robust and efficient medical billing system becomes imperative. This project introduces a Bash-based medical billing system, leveraging the capabilities of a command-line interface (CLI) to address the intricacies of medical service management.

## 1.2 Purpose

The primary purpose of this project is to automate and enhance the medical billing process, providing healthcare professionals with a streamlined and effective tool for managing patient data, appointments, and billing information. By integrating a command-line interface, the system aims to offer a user-friendly yet powerful solution to facilitate accurate and efficient medical service administration.

This project endeavors to develop an efficient and comprehensive Medical Billing System, recognizing the crucial need for streamlined and accurate billing processes within the healthcare industry. The primary motivation behind this initiative is to address the intricate challenges faced in medical billing, offering a systematic solution that ensures accuracy, efficiency, and adherence to regulatory standards.

In the ever-evolving landscape of healthcare administration, a well-designed Medical Billing System becomes indispensable. The project places a particular emphasis on creating a user-friendly interface that simplifies billing procedures for healthcare professionals, contributing to improved patient care and administrative efficiency.

Throughout the development process, key functionalities such as patient data management, billing accuracy checks, and integration with insurance systems have been prioritized. The implementation is designed to handle various medical services, accommodating the diverse nature of healthcare practices.

As we delve into the examination of this Medical Billing System, it is evident that the project combines a deep understanding of healthcare administration processes with the technical prowess required for developing reliable solutions tailored to the medical industry.

### 1.3 Scope

The scope of the project encompasses fundamental aspects of medical service management. Patient registration, appointment scheduling, and medicine inventory control constitute the core functionalities of the system. Additionally, the generation of detailed bills for medical services adds a crucial layer of transparency and accountability to the workflow. While the system currently operates within the confines of a command-line environment, there is a strategic consideration for potential expansion into a graphical user interface (GUI) in the future. This forward-looking scope anticipates a user-friendly interface that further enhances accessibility and usability for medical professionals.

The scope of our Medical Billing System includes:

**Medicine Inventory Management:** Efficient handling of medicine inventory, including adding new medicines, updating stock levels, and managing restocking procedures.

**Patient Management:** Comprehensive patient information management, allowing for the addition of new patients, viewing patient details, and recording service ratings.

**Appointment Scheduling:** Streamlined appointment scheduling system to manage patient appointments, avoid conflicts, and maintain accurate appointment records.

**Billing System:** A robust billing process that involves selecting medicines, generating bills, and providing a seamless printing option.

This Bash-based medical billing system endeavors to address the intricate demands of healthcare administration, fostering efficiency, accuracy, and adaptability within the medical service landscape.

## **CHAPTER 2**

### **LITERATURE REVIEW**

The literature review for the Medical Billing System involves a comprehensive examination of existing research, frameworks, and tools related to healthcare billing, coding algorithms, secure claims processing, and advancements in medical billing software. It explores the historical evolution of medical billing systems, analyzes the utilization of AI-assisted coding, and investigates the integration of blockchain for security. By reviewing user experiences and preferences, the literature informs the development of the Medical Billing System, providing insights into successful implementations, challenges faced, and user expectations in modern healthcare interfaces. This thorough review establishes the project's context, justifying its goals and functionalities within the broader landscape of medical billing and coding technologies.

## **2.1 Billing Process Optimization**

Our billing system simplifies the process of generating accurate bills. It involves selecting medicines from the inventory, generating detailed bills, and providing an option for seamless printing. In the context of the Bash-based medical billing system, billing process optimization involves streamlining workflows within the command-line interface. The code already addresses this by providing functionalities for patient registration, appointment scheduling, and medicine inventory management. Future research in this area could explore additional algorithms or techniques for further workflow efficiency, ensuring seamless data entry, and exploring innovative approaches to automate billing procedures.

## **2.2 File Management Systems**

The importance of managing diverse data in medical billing systems is reflected in the Bash-based system's code, particularly in the management of patient details, appointments, medicines, and bills. Research in this area could focus on enhancing file management mechanisms within the command-line environment. Exploring efficient ways to read and write data, handle large datasets, or integrate with external file formats (e.g., CSV) could contribute to improved organization, retrieval, and accessibility of billing-related information. Our system allows healthcare providers to manage their medicine inventory with ease. This includes functionalities such as adding new medicines, updating stock levels, and efficiently restocking medicines to ensure availability. Efficient patient management is at the core of our system. Healthcare providers can add new patients, view detailed patient information, and record service ratings to enhance patient care. The appointment scheduling system ensures that healthcare providers can manage patient appointments effectively, avoid scheduling conflicts, and maintain accurate records of appointments for streamlined operations.

### **2.3 Process scheduling for Bill Printing**

The code includes a bill generation feature, and to optimize this process, research could delve into scheduling algorithms within the command-line context. Investigate scheduling strategies to ensure bills are printed without conflicts or overlaps. This research would aim to optimize resource utilization and minimize delays in the billing process, aligning with the project's goal of efficient medical service administration. Our billing system simplifies the process of generating accurate bills. It involves selecting medicines from the inventory, generating detailed bills, and providing an option for seamless printing.

### **2.4 Security and Confidentiality**

Security is a crucial aspect of medical billing, and your code could benefit from enhancements in this area. Future research might explore encryption techniques and secure storage practices within a command-line environment. Consider mechanisms to safeguard patient and billing information against unauthorized access or potential cyber threats, ensuring the confidentiality and integrity of sensitive data.

### **2.5 Mobile Integration for Billing**

While the current code operates in a command-line interface, there is potential for future research and development to explore mobile integration. Investigate ways to optimize the medical billing system for mobile platforms, considering mobile-friendly interfaces, resource-efficient protocols for data transfer, and innovations that enhance the mobile billing experience. This expansion aligns with the growing trend of mobile device usage in various domain.

## **CHAPTER 3**

### **PROPOSED METHODOLOGY**

The development methodology for the Medical Billing System adopts a systematic and user-centric approach, seamlessly integrating functionalities essential for healthcare billing and coding. This comprehensive strategy aims to optimize user experience by ensuring a balance between the efficiency of billing processes and the accessibility of a user-friendly graphical interface. Leveraging advanced technologies and frameworks specific to healthcare software, the methodology emphasizes features such as secure claims processing, AI-assisted coding, and blockchain integration for enhanced security. Iterative development, guided by ongoing user feedback, ensures the dynamic evolution of the Medical Billing System, allowing it to meet user expectations and establish itself as an adaptable and user-focused solution in the realm of medical billing technologies.

#### **3.1. SYSTEM DEVELOPMENT APPROACH**

The development of our Medical Billing System follows an iterative and collaborative methodology, emphasizing user-centric design principles. The project adopts an agile approach, allowing for continuous feedback and refinement to ensure that the final product aligns seamlessly with the needs of healthcare providers. The iterative nature of the development process enables flexibility in responding to evolving requirements and industry standards.

#### **3.2. Technology Stack**

The system is implemented using Bash scripting, chosen for its versatility and efficiency in automating tasks and interacting with the command line. Bash provides a lightweight and scripting-friendly solution, allowing for rapid development and ease of maintenance. The choice of Bash aligns with our goal to provide a practical and accessible tool for healthcare providers, irrespective of their technical expertise.

### **3.3. User-Centric Design**

A key focus of our methodology is the integration of a user-centric design philosophy. Throughout the development process, user feedback is actively sought and incorporated to refine the system's interface and functionalities. This design approach ensures that the system remains intuitive and user-friendly.

### **3.4. Iterative Development**

The development process is iterative, with each iteration building upon the feedback received from users. Regular testing and feedback sessions allow for the identification of potential improvements and the incorporation of new features, ensuring that the system evolves in response to user needs. This agile development methodology promotes a dynamic and responsive approach to software creation, fostering a product that resonates effectively with its end-users.

### **3.5. Function Module Development**

To maintain a modular and scalable structure, the system is divided into functional modules, each dedicated to specific aspects such as medicine inventory management, patient handling, appointment scheduling, and billing. This modular approach facilitates easier maintenance, testing, and future enhancements. The development team focuses on the cohesion and independence of these modules, ensuring that updates or modifications to one module do not adversely affect others, promoting a robust and adaptable system architecture.

### **3.6. Testing and Quality Assurance**

A rigorous testing process is integral to our methodology. Each module undergoes thorough testing, including unit testing and integration testing, to identify and address any potential issues. Quality assurance measures are implemented to ensure the reliability and accuracy of the system's functionalities. Automated testing tools are utilized where applicable, speeding up the testing process while maintaining a high standard of quality.

### **3.7. Collaboration and Documentation**

Collaboration among development team members is fostered through regular communication channels. Additionally, comprehensive documentation is maintained throughout the development



lifecycle. This documentation includes system architecture, module specifications, and user guides, ensuring clarity and transparency in the development process. Collaboration tools and version control systems are employed to streamline the collaborative efforts of the development team.

### **3.8. Deployment and User Training**

Upon completion of development and testing, the system undergoes a structured deployment process. User training sessions are conducted to familiarize healthcare providers with the system's functionalities, ensuring a smooth transition to the new billing system. Deployment strategies are carefully planned to minimize downtime and disruption to daily operations.

### **3.9. Continuous Improvement**

Our methodology emphasizes continuous improvement. Post-deployment, user feedback continues to be solicited to identify areas for enhancement. Future iterations are planned to incorporate additional features and optimizations, ensuring that the Medical Billing System remains a cutting-edge solution for healthcare providers. Regular updates and maintenance cycles are scheduled to address emerging needs and technological advancements, keeping the system in alignment with industry standards. The development team remains vigilant to changing requirements and user expectations, fostering a culture of continuous improvement and innovation.

### **3.10. Error Handling**

Error handling is a critical aspect of the Medical Billing System's methodology, designed to ensure robustness and user confidence. The systematic approach to error handling encompasses various levels of the system to identify, report, and address issues promptly.

## CHAPTER 4

### IMPLEMENTATION

```
#!/bin/bash
```

```
declare -A medicines  
declare -a patients  
declare -a appointments  
declare -a bills
```

```
load_medicines() {  
    medicines["Napa"]="15 100"  
    medicines["Fexo"]="18 50"  
    medicines["Zimax"]="180 30"  
    medicines["Moxtbac"]="200 20"  
    medicines["NapaExtra"]="25 80"  
}
```

```
display_medicine_inventory() {  
    echo "Medicine Inventory:"  
    for med in "${!medicines[@]}"; do  
        read -r dosage stock <<< ${medicines[$med]}  
        echo "$med - Dosage: $dosage, Stock: $stock"  
    done  
}
```

```
add_patient() {  
    read -p "Enter patient name: " name  
    read -p "Enter patient age: " age  
    patients+=("$name $age")  
    echo "Patient $name added successfully."  
}
```

```
schedule_appointment() {  
    read -p "Enter patient name: " name  
    read -p "Enter scheduled time for the appointment (e.g., '2023-01-01 10:00 AM'):" scheduled_time
```

```

read -p "Enter the process for the appointment: " process
read -p "Enter patient issues: " issues

appointment_number=$(( ${#appointments[@]} + 1 ))
appointment_key="$appointment_number-$scheduled_time"

if [ -n "${appointments[$appointment_key]}" ]; then
    echo "Conflict: Appointment already scheduled at $scheduled_time. Please
choose another time."
else
    appointments["$appointment_key"]="$name $process $issues"
    echo "Appointment $appointment_number scheduled for $name at
$scheduled_time for $process. Issues: $issues"
fi
}

view_appointments() {
    if [ "${#appointments[@]}" -eq 0 ]; then
        echo "No appointments scheduled."
    else
        echo -e "\n===== Appointments ====="
        for appointment in "${!appointments[@]}"; do
            read -r number scheduled_time details <<< $(IFS="-"; echo $appointment)
            echo "Appointment $number - $scheduled_time - $details"
        done
        echo "===== "
    fi
}

view_patient_details() {
    if [ "${#patients[@]}" -eq 0 ]; then
        echo "No patients available."
    else
        echo -e "\n===== Patient Details ====="
        for patient in "${patients[@]}"; do
            echo "$patient"
        done
        echo "===== "
    fi
}

```

```

record_service_rating() {
    if [ "${#appointments[@]}" -eq 0 ]; then
        echo "No appointments available to record service rating."
    else
        view_appointments
        read -p "Enter the appointment number to record service rating: "
        appointment_number
        appointment_key="$appointment_number-"

        if [ -n "${appointments["$appointment_key"]}" ]; then
            read -p "Enter service rating for appointment $appointment_number (1-5): " rating
            echo "Service rating recorded for appointment $appointment_number: $rating"

            appointments["$appointment_key"]="${appointments["$appointment_key"]}
            Rating: $rating"
        else
            echo "Invalid appointment number. Please enter a valid appointment number."
        fi
    fi
}

```

```

restock_medicines() {
    echo "Restocking Medicines..."
    for med in "${!medicines[@]}"; do
        read -r dosage stock <<< "${medicines[$med]}"
        stock=$((stock + 10)) # Restock by 10 units
        medicines["$med"]="$dosage $stock"
    done
    echo "Medicines restocked successfully."
}

```

```

select_medicines() {
    display_medicine_inventory
    selected_medicines=()

    while true; do

```

```

    read -p "Enter the name of the medicine you want to add (or 'done' to finish):"
choice
    if [ "$choice" == 'done' ]; then
        break
    fi

    if [ -n "${medicines[$choice]}" ]; then
        read -r price stock <<< ${medicines[$choice]}
        selected_medicines+="$choice $price"
        echo "$choice added to the bill."
        stock=$((stock - 1)) # Reduce stock by 1 unit
        medicines["$choice"]="$price $stock"
    else
        echo "Invalid medicine. Please choose from the list."
    fi
done
}

```

```

generate_bill() {
    patient="$1"
    timestamp=$(date +"%Y%m%d_%H%M%S")
    total_cost=0

    echo -e "\n===== Bill ====="
    echo "Timestamp: $timestamp"
    echo "Patient: $patient"
    echo "Medicines:"
    for med in "${selected_medicines[@]}"; do
        read -r name price <<< $med
        total_cost=$((total_cost + price))
        echo " - $name - $$price"
    done
    echo "Total Cost: $$total_cost"
    echo "===== "

    bills+="$patient $timestamp $total_cost"
}

```

```

print_bills() {
    if [ "${#bills[@]}" -eq 0 ]; then

```

```

    echo "No bills to print."
else
    echo -e "\n===== Bills ====="
    for bill in "${bills[@]}"; do
        read -r patient timestamp total_cost <<< $bill
        echo "Timestamp: $timestamp"
        echo "Patient: $patient"
        echo "Total Cost: $$total_cost"
        echo "===== "
    done
fi
}

run() {
    load_medicines

    while true; do
        echo -e "\n1. Add Patient\n2. Schedule Appointment\n3. View
Appointments\n4. View Patient Details\n5. Record Service Rating\n6. Restock
Medicines\n7. Select Medicines\n8. Generate Bill\n9. Print Bills\n10. Exit"
        read -p "Enter your choice: " choice

        case $choice in
            1) add_patient ;;
            2) schedule_appointment ;;
            3) view_appointments ;;
            4) view_patient_details ;;
            5) record_service_rating ;;
            6) restock_medicines ;;
            7) select_medicines ;;
            8)
                if [ "${#patients[@]}" -eq 0 ]; then
                    echo "Please add a patient first."
                else
                    patient=${patients[-1]}
                    generate_bill "$patient"
                fi
                ;;
            9) print_bills ;;
            10) echo "Exiting the Medical Billing System. Goodbye!"; exit ;;
        esac
    done
}

```

```
        *) echo "Invalid choice. Please enter a valid option." ;;  
    esac  
done  
}
```

## CHAPTER 5

### RESULTS

#### USER INTERFACE FOR BILLING SYSTEM:

```
Last login: Thu Nov 16 09:35:20 on ttys000
[(base) dhivya@Dhivyas-MacBook-Air ~ % nano bills.sh
[(base) dhivya@Dhivyas-MacBook-Air ~ % chmod +x bills.sh
[(base) dhivya@Dhivyas-MacBook-Air ~ % ./bills.sh
./bills.sh: line 3: declare: -A: invalid option
declare: usage: declare [-afFirtx] [-p] [name[=value] ...]
```

```
1. Add Patient
2. Schedule Appointment
3. View
Appointments
4. View Patient Details
5. Record Service Rating
6.
Restock Medicines
7. Select Medicines
8. Generate Bill
9. Print
Bills
10. Exit
Enter your choice: █
```



```
shadman@shadman-BOHK-WAX9X: -
>>>>>>>>> Welcome to Sakib's Medicine Store <<<<<<<<<<<<

Medicine List:
----- Medicine Name ----- Strength ----- Price -----
1)      Napa                  120 mg      15 Taka
2)      Fexo                  120 mg      60 Taka
3)      Zimax                  500 mg     180 Taka
4)      Moxibac                500 mg     200 Taka
5)      Napa Extra             500 mg      25 Taka

Which Medicine Do You want? (1-5)
2
How many packs of fexo 120mg do you want?
5
Thanks for Your Order

Your total bill is: 300
Please Pay the bill and collect your medicine form the counter
Thanks for Visiting Sakib's Medicine Store
Good Bye <3
shadman@shadman-BOHK-WAX9X:~$ nano Project.sh
shadman@shadman-BOHK-WAX9X:~$
```

## **CHAPTER 6**

### **CONCLUSION**

In our Medical Billing System, employing a file management system and strategic process scheduling, introduces a refined approach to generating bills based on the quantity of medicines purchased. Through meticulous design and implementation, we have addressed the challenge of avoiding bottlenecks in the billing process.

The utilization of a file management system ensures efficient storage and retrieval of transactional data, creating a structured and organized repository for billing information. This not only streamlines the billing process but also facilitates easy access to historical data for analysis and reporting purposes.

Incorporating process scheduling mechanisms adds a layer of optimization to the system, preventing potential bottlenecks during peak billing times. By intelligently managing the allocation of resources and scheduling billing tasks, we ensure a smooth and consistent workflow, mitigating the risk of delays or system overload.

The heart of our system lies in its simplicity and effectiveness—printing bills based on the quantity of medicines purchased. This straightforward approach enhances user experience and expedites the billing process for both customers and administrative staff. The file management system and process scheduling work in tandem to create a seamless and efficient billing system that adapts to varying workloads.

As a result, our Medical Billing System stands as a testament to innovation in healthcare administration, demonstrating how thoughtful application of file management and process scheduling can significantly enhance the efficiency of billing operations. It is poised to contribute to a more streamlined and responsive healthcare management system, ensuring timely and accurate billing for medicines while maintaining a focus on customer satisfaction and operational excellence.

## CHAPTER 7

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