

Web-based SMS Notification Appointment and Records Management System

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Effective records management plays a pivotal role in ensuring the smooth operation of health clinics, as it guarantees that patient files and administrative documents are systematically preserved and easily retrievable (Amin et al., 2020; Bali et al., 2011). Traditional manual record-keeping, which involves storing piles of paper in folders, cabinets, or boxes, often poses challenges such as misplacement, delayed retrieval, and susceptibility to physical damage. In contrast, a digital records management system streamlines these processes, offering quick and accurate access to specific information when needed (Vos et al., 2020; Julaihi et al., 2024; Putri and Yulianti, 2024). As Chopade and Pachghare (2021) explain, the core benefits of implementing such systems include the elimination of redundant data, faster and simpler retrieval, and enhanced security of sensitive information. These advantages are particularly critical for hospitals and clinics, where daily operations involve managing large volumes of confidential medical records. Without a proper digital system, retrieving files can be not only cumbersome but also time-consuming, potentially leading to service delays and inefficiencies.

Beyond records management, clinics also face the challenge of ensuring patients comply with scheduled appointments. An SMS notification appointment system emerges as an effective solution to this problem. In the fast-paced lifestyle of today, patients often forget medical appointments due to personal or professional commitments. Study revealed that approximately 30% of patients require reminders for follow-up visits, and as many as 70% end up missing their schedules altogether (Alkomos et al., 2020). This high no-show rate can disrupt clinic operations, reduce service efficiency, and even result in financial losses. Research highlights that SMS messages have a 98% open rate (Sumrak et al., 2025), making them a reliable communication channel. By integrating SMS notifications, clinics can significantly reduce missed appointments, improve patient turnout, enhance continuity of care, and ultimately optimize their operational workflow.

Javaid et al. (2024) further underscore how the integration of computer-based management systems has revolutionized organizational practices across various industries, including healthcare. Both small-scale and large-scale clinics now rely on electronic systems to automate data processing, from storing patients' case histories to monitoring their treatment progress. Such advancements not only minimize the risk of human error but also enhance decision-making, resource allocation, and patient satisfaction. Modern information systems, therefore, serve as valuable tools that support both administrators and patients in achieving more organized and reliable healthcare management.

For clinic administrators, digital systems streamline appointment scheduling, patient registration, and record monitoring, thereby reducing clerical workload and increasing efficiency. For patients, the SMS notification system provides timely and convenient reminders, often sent at

least one day before their scheduled check-up or consultation. This proactive approach encourages patient compliance with treatment schedules, reduces instances of missed visits, and strengthens the overall provider-patient relationship.

The main objective of this study is to minimize the clinic's dependence on paperwork by introducing a comprehensive solution: the web-based SMS notification appointment and records management system. The system is designed not only to save time spent on manual data recording but also to evaluate and enhance the overall efficiency and effectiveness of healthcare service delivery. By integrating records management with automated appointment reminders, the system seeks to foster a more reliable, patient-centered, and technologically advanced approach to clinic management.

Theoretical Framework

The Importance of Maternal Record Management

Maternal records play a critical role in ensuring the health and safety of expecting mothers, particularly first-time mothers, as they provide a comprehensive and organized account of prenatal care (Joseph et al., 2022). These records allow healthcare providers to track and monitor potential risks or complications during pregnancy, enabling timely interventions that can significantly improve maternal and fetal outcomes. Traditionally, maternal records have been maintained on paper and stored in physical cabinets or filing systems. While paper-based records may allow straightforward retrieval in some cases, they are prone to human error, such as inaccurate data entry, misplaced files, or duplication of information. Such inefficiencies can delay the provision of care and complicate patient

management, potentially affecting pregnancy outcomes.

In the Philippines, the healthcare system has largely relied on manual record-keeping, especially in hospitals and clinics (De Mesa et al., 2024; Elepaño et al., 2025). However, challenges associated with paper records, such as limited storage capacity, difficulty in updating information, and risk of data loss, underscore the need for more efficient solutions. Implementing a digital record management system offers a practical alternative, providing accurate, organized, and secure storage for patient information while enabling quick retrieval of critical data when needed. Electronic record systems not only reduce administrative workload but also ensure that maternal information is consistently reliable, supporting better clinical decision-making and improving overall maternal healthcare management.

Integration of Electronic Records with SMS Notification Systems

Electronic record management systems become even more effective when paired with patient communication tools, such as SMS notification systems (Quinn et al., 2019). These systems serve as reminders for patients regarding their scheduled appointments, helping reduce late arrivals and missed visits, which are common in traditional healthcare delivery models. Timely notifications enhance patient adherence, encourage engagement, and improve punctuality, ultimately leading to a more streamlined and efficient healthcare service.

Research has consistently demonstrated that electronic record systems are more accurate and reliable than manual systems. The 2015 Maternity Care Patients Study found that authorized healthcare personnel could retrieve specific patient information quickly and efficiently, which is vital for monitoring pregnancy progress and responding to potential

complications. When combined with SMS reminders, these systems ensure that patients are consistently reminded of upcoming check-ups, fostering compliance with prenatal care schedules. This integration contributes to improved maternal health outcomes by minimizing missed appointments, reducing administrative errors, and supporting continuity of care.

System Usability and Operational Efficiency

Beyond accuracy and patient communication, the usability of digital systems is a key factor in their effectiveness. A system that is intuitive, user-friendly, and easy to navigate can significantly reduce training time for clinic staff, allowing them to focus more on patient care rather than administrative tasks. Operational efficiency is enhanced when users can quickly perform tasks such as updating patient records, generating reports, and tracking appointments.

The developed system demonstrates that ease of use directly impacts adoption and satisfaction. Even staff members who were initially unfamiliar with digital tools were able to operate the system with minimal guidance. This efficiency reduces workflow bottlenecks, minimizes errors, and ensures that patient care processes are streamlined. Consequently, usability not only benefits staff productivity but also indirectly improves patient experience by ensuring timely service delivery and accurate record-keeping. The system thus represents a practical solution that enhances both operational efficiency and user satisfaction in maternity care settings.

Research Framework

Data

This phase presents the evaluation of data collected from

respondents of the web-based SMS notification appointment and records management system. The data provides insights into system effectiveness, usability, and user satisfaction.

This study involved 50 participants who completed the survey. The total number of respondents was determined using Slovin's formula, and a random sampling method was applied to distribute the questionnaires, ensuring a representative sample of the population.

Data for this project were collected using questionnaires. A questionnaire is a set of carefully standardized questions designed for selected respondents to answer, allowing the systematic collection of relevant information. The survey instrument was designed to gather factual information from respondents and was classified according to ISO 25010 into four categories: performance efficiency, maintainability, suitability, and usability. A Four-Point Likert Scale was employed to capture participants' responses, with categories of Strongly Agree, Agree, Disagree, and Strongly Disagree. Each scale was assigned a corresponding mean range to facilitate the interpretation of evaluation results for each survey item.

The study employed the weighted mean to evaluate the overall responses, providing a quantitative assessment of how well the developed system maintains its performance, reliability, suitability, and usability. The objectives of the study, along with the outcomes of validation and testing, were reported and analyzed to measure the effectiveness of the developed system.

Experimental Design

In the design phase, the proponents developed a system to transition manual patient records into an electronic maternity management system.

Once the system design and features were finalized, programmers began the actual creation and integration of the system.

Figure 1 illustrates the experimental design of the study. The process begins with the admin, who manages the system, logging in using a verified username and password. Upon successful authentication, the admin gains access to the admin dashboard, which provides an overview of the maternity clinic's services, billing statements, and inventory management system.

Figure 1

Experimental design of the study



Figure 2

Design of patient interaction

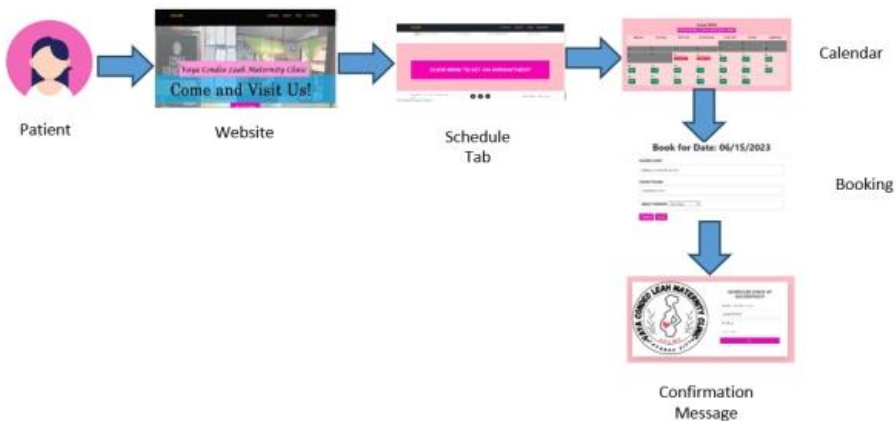


Figure 2 illustrates the experimental design for patient interactions with the system. The process begins with the patient accessing the website and navigating to the schedule tab. Using the calendar, the patient selects a

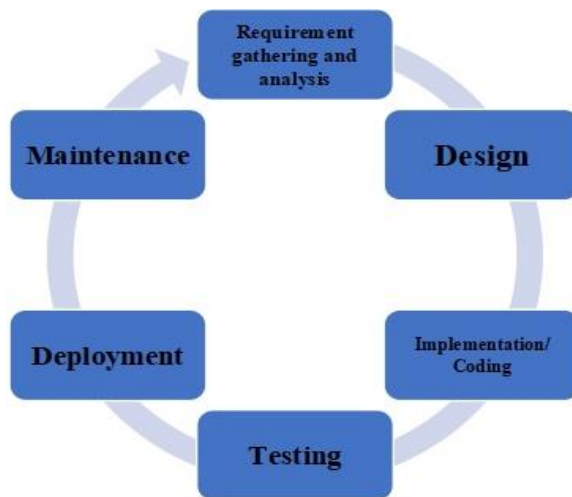
preferred date based on their availability. Next, the patient proceeds to the booking form, where they enter their name, contact information, and select a preferred midwife as their attending caregiver. Finally, a confirmation message is displayed, indicating that the appointment has been successfully booked.

Procedures of the Different Phases

Before beginning system development, it is essential for developers to understand the operations and requirements of the maternity clinic. Familiarity with the institution allows developers to identify the needs of stakeholders, outline system requirements, and plan the development sprints effectively.

Understanding the business requirements prior to development is crucial; however, the adaptability of the Agile methodology allows for adjustments as new insights or changes arise. This ensures that the software solution is both effective and aligned with the clinic’s needs. Thorough project planning before development not only prepares the team for upcoming sprints but also increases the likelihood of project success.

Figure 3
Agile model



System users. Patients have access to the website to book appointments, while administrators can access the full system, including patient profiles, medical histories, doctor prescriptions, schedules or appointments, staff information, and reports.

Implementation/Coding. During the implementation phase, programmers use various languages such as PHP and JavaScript. They also utilize technologies and tools including Visual Studio Code, HTML, the CodeIgniter framework, Bootstrap, CSS, XAMPP, and MySQL to build a robust and effective system tailored to the client's needs.

Testing. At this stage, the system becomes available to users, and the development team conducts comprehensive testing to ensure full functionality. Any bugs or issues identified are promptly addressed. User feedback is also gathered to guide refinements and improvements.

Deployment. Once successfully installed, clients can access the software. The development team provides ongoing support to ensure smooth system operation and to address any irregularities. Further iterations may be implemented to enhance the system or add new features.

Maintenance. During the maintenance phase, programmers continue to update and improve the system. A well-designed system should be accessible, reliable, and easy to maintain. Maintenance ensures that the clinical management system continues to process data effectively and meets the operational needs of the maternity clinic.

Before diving into the progression of system development, it is important for developers to thoroughly understand the institution where the project will be implemented. In this case, researchers and developers alike need to familiarize themselves with the specific context, operations, and needs of the maternity clinic. This foundational knowledge allows developers to make informed decisions, identify challenges, and propose

solutions that genuinely address the clinic's requirements. By engaging with stakeholders early on, developers can outline clear project requirements and prepare well-structured development sprints.

Understanding the business demands before initiating development is a critical step that ensures alignment between the clinic's needs and the system's capabilities. At the same time, the use of Agile methodology provides the flexibility to adapt to changes that may arise during the process. Agile allows teams to refine features, address unforeseen issues, and continuously improve the system throughout its development cycle. This adaptability is essential in healthcare environments, where patient needs, administrative practices, or technological requirements may evolve.

Careful project planning prior to actual development increases the likelihood of project success. It equips the development team with a roadmap to follow, establishes clear goals, and ensures that resources are efficiently allocated. Moreover, it fosters preparedness for the upcoming sprints, enabling the team to work systematically while maintaining the capacity to adjust as necessary. Ultimately, combining thorough institutional understanding with Agile's flexibility ensures that the software solution is not only well-designed but also effective in supporting the maternity clinic's operations.

Technical Framework

This section presents the materials used in developing the system. In addition, it presents the overview and evaluation of the system.

Materials

Software

Visual Studio Code was used as the primary text editor for coding

the web-based SMS notification appointment and records management system. The system was developed using JavaScript, PHP, MySQLi, the CodeIgniter framework, Bootstrap, and CSS. Visual Studio Code provides a streamlined environment for debugging, task execution, and version control, offering developers the essential tools for a rapid code-build-debug cycle. More complex workflows can be handled by full-featured IDEs, such as Visual Studio IDE, if needed.

Table 1

Software specifications and software platform

System Type	x64-based PC
Operating System	Windows 10 Pro
System Model	2OAU030JP
Language	Php, JavaScript
System Directory	Xampp localhost, MySql
Text Editor	Visual Studio
Designing	HTML, CSS, JavaScript

Hardware

The successful implementation of the proposed system requires specific hardware components that will support its development and operation. These hardware requirements are essential to ensure that the system functions efficiently, processes data effectively, and delivers reliable performance for both administrators and patients. The details of the necessary hardware specifications are presented in Table 2, which outlines the minimum and recommended requirements needed for the development and deployment of the system. By meeting these requirements, the clinic can guarantee smooth execution of tasks such as records management,

appointment scheduling, and SMS notifications, while also ensuring system scalability and long-term usability.

Table 2

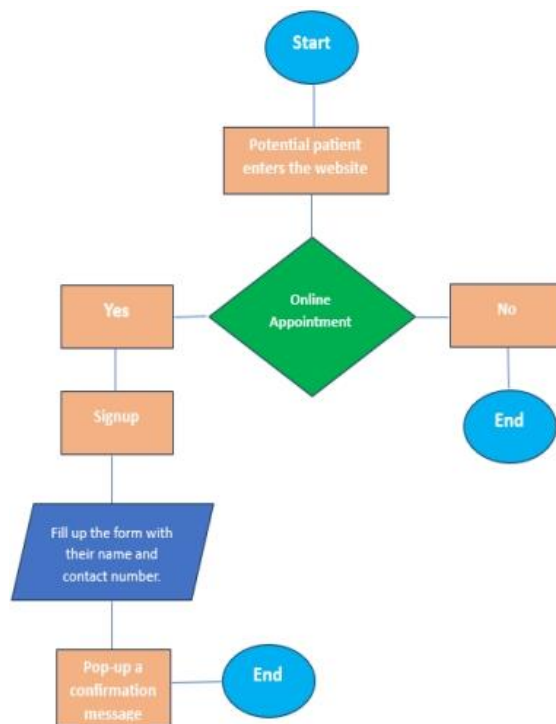
Hardware specifications

Laptop	Hp, ASUS, Dell, MacBook, or any kind of laptop
Mouse	Wireless or wired type
External Keyboard	Wireless or cable
WIFI	Pocket Wifi, piso wifi, mobile hotspot
Processor	Intel ® Core™ i5-4200M CPU @ 2.50GHz, 2494 Mhz
RAM	4.00 GB
Hard Disk Space	20 GB (x6 Bit)

Flowchart Diagram

Figure 4

Process of online appointment through website



The flowchart in Figure 4 illustrates how patients interact with the clinic’s website and the appointment booking system. It visually represents the sequence of steps from accessing the website to successfully scheduling an appointment, helping to clarify the system’s workflow and user interactions.

ERD Case Diagram

Figure 5
ERD case diagram for admin

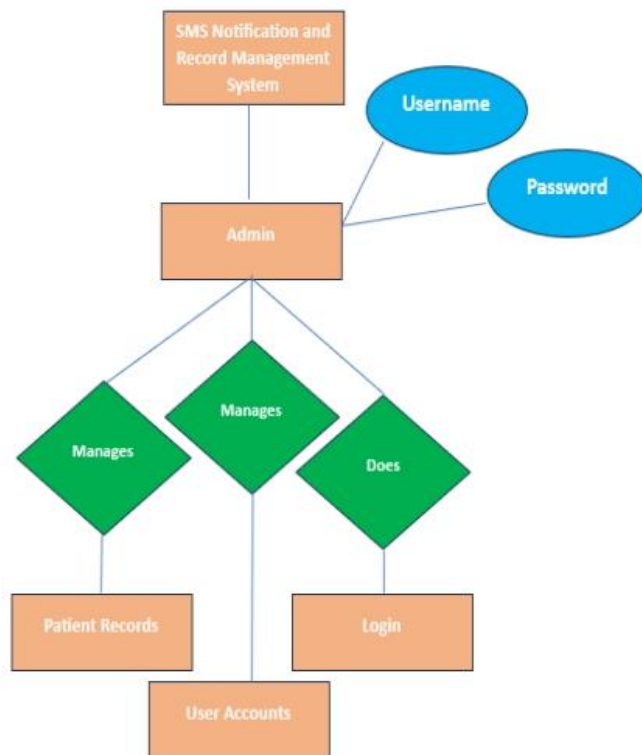


Figure 5 shows that the system is managed by the admin. First, the admin must enter a verified username and password to log in. Once authenticated, the admin can access and manage all data stored within the system.

Figure 6

Design of the developed system

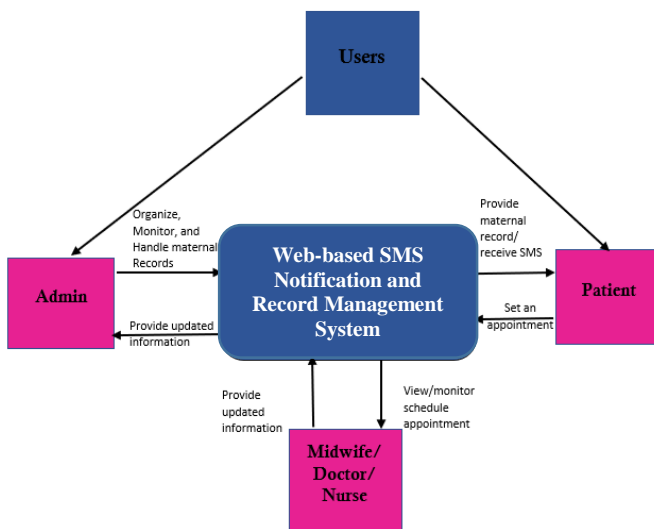


Modeling

System modeling is a technique used to organize and define the structure and flow of data within a system, as well as the logic, procedures, and rules implemented by system processes.

Figure 7

The context data flow diagram of the developed system

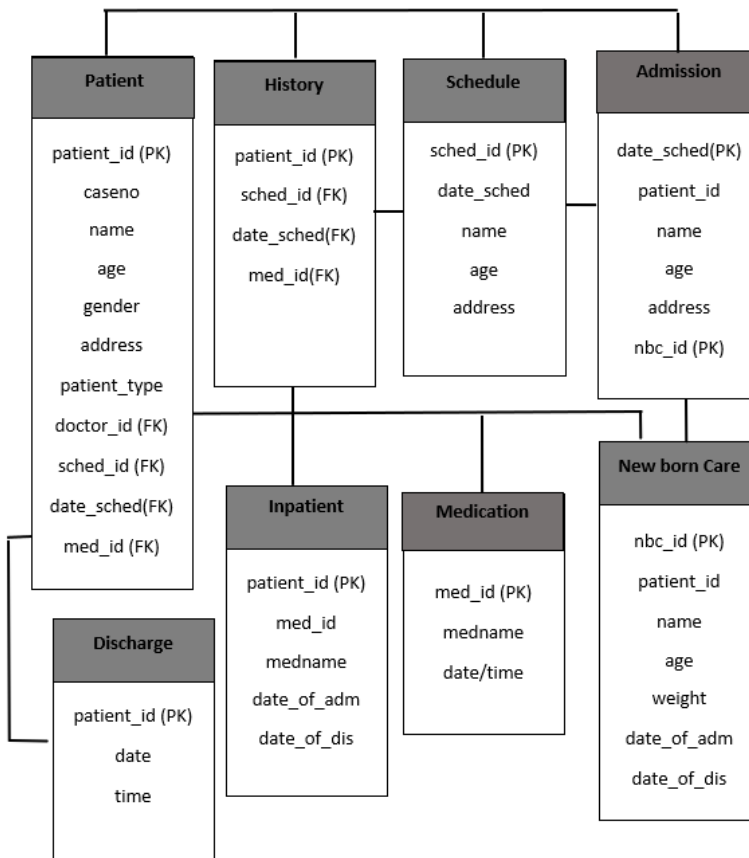


The study illustrates the system’s logical design using a context-level Data Flow Diagram (DFD). A context DFD provides a high-level view of the system, showing its boundaries and scope. The central element in the diagram is the web-based SMS notification and records management system. The system interacts with three external agents: administration, midwives and clinic personnel, and expectant women. Figure 8 presents the developed context DFD for the system.

Database Schema

Figure 8

Database schema of the system



Database Tables

The clinic management system comprises eight tables:

Patient table – Manages all patient records, including patient ID, name, age, address, patient type, doctor ID, and schedule ID.

History table – Contains patient history information, including patient ID, schedule ID, scheduled date, and medication ID.

Schedule table – Stores schedule records, including schedule ID, scheduled date, name, age, and address.

Admission table – Maintains patient admission records, including patient ID, scheduled date, name, age, address, and NBC ID.

Medication table – Contains records of medications assigned to patients.

Inpatient table – Manages patient ID, medication ID, medication name, date of admission, and date of discharge.

Newborn care table – Maintains records of newborns, including name, weight, date of admission, and date of discharge.

Discharge table – Stores patient ID, discharge date, and time information.

Figure 9

Website design



Figure 9 shows the design of the website while Figure 10 shows the

style of the calendar in booking a check-up date with the clinic.

Figure 10

Calendar



Figure 11 shows the fields in booking an appointment.

Figure 11

Booking appointment

Book for Date: 06/15/2023

MAIDEN NAME
REBULLO CRISTINE ESTILA

Contact Number
09173601515

SELECT MIDWIFE: Lilia Lwag

Submit BACK

Figure 12 shows the confirmation message indicating successful

booking.

Figure 12

Confirmation message

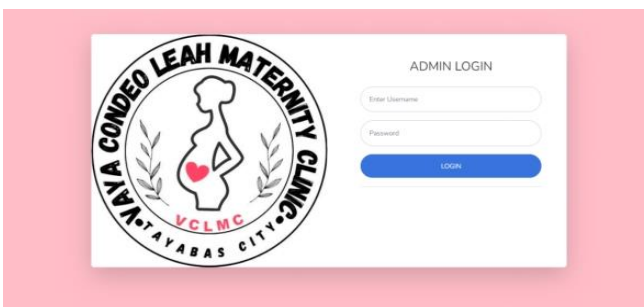


The following figures illustrate how the system operates. First, the patient visits the website. If they wish to schedule an online appointment, they can navigate to the Schedule tab and click the square button to begin the process. Next, they select their preferred date and sign up for an appointment. Finally, a confirmation message will appear, indicating that the appointment has been successfully booked.

The admin logs in by entering their username and password.

Figure 13

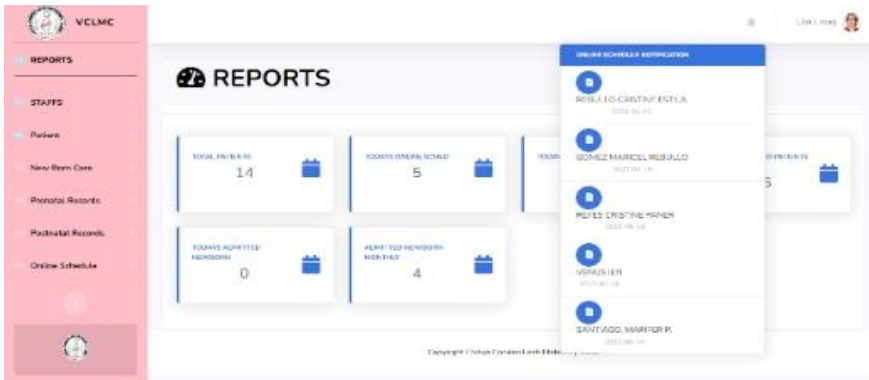
Admin's login



After logging in, the dashboard will appear, displaying reports and a summary of the system's information.

Figure 14

Dashboard / Reports



Under the Newborn Care section, the admin can view records.

Figure 15

View records



To retrieve patient information, the user must go to the search bar and type the name of the patient to be retrieved.

Figure 16

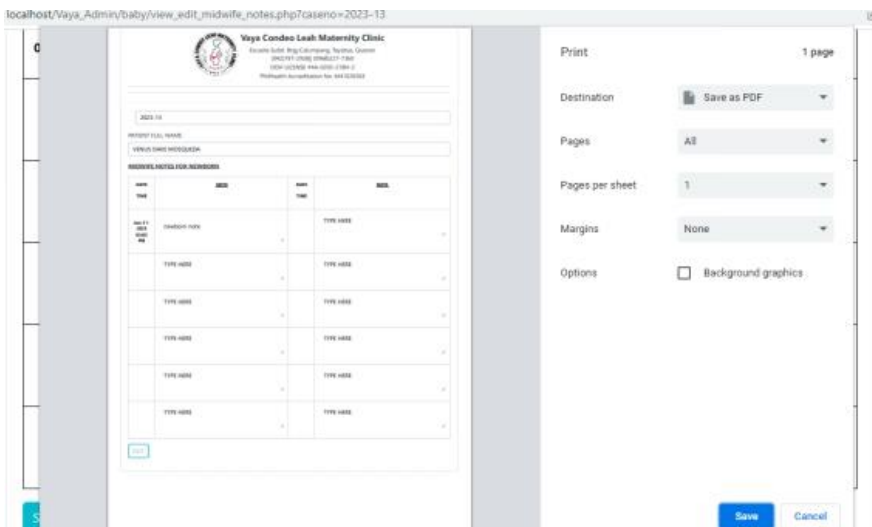
Search patient



The system also allows documents to be printed.

Figure 17

Printable documents



Cost Benefit Analysis

Operational cost-benefit analysis evaluates and quantifies the monetary value of the system's benefits and costs to determine whether the

investment is justified. The system’s operational costs are summarized, including details on duration, monthly expenses, and the total overall cost of using the system.

Table 3

Operational cost analysis

Operational Cost	Units	Months	Cost	Total
Electricity (Computer and Printer)	4	7	Php 450.00	Php 3,150.00
Internet Fee	4	7	Php 400.00	Php 11,200.00
Maintenance Fee	4	3	Php 500.00	Php 6,000.00
Subtotal				Php 20,350.00

Table 4

Developmental cost analysis

Development Cost	Units	Months	Cost	Total
Programmers	1	1	Php 17,578.00	Php 17,578.00
System Analyst	1	1	Php 30, 954.00	Php 30, 954.00
Internet Fee	1	12	Php 1,299.00	Php 15, 588.00
Researcher	2	12	Php 22, 992.00	Php 45,984.00
Subtotal				Php 110,104.00

Table 3 and Table 4 present the estimated cost-benefit analysis to determine whether the system provides a worthwhile investment.

System Evaluation/Testing

This section presents the survey results based on responses from 50 participants. The questionnaire was developed using the ISO 25010 standard, focusing on four key aspects of system quality: performance efficiency, maintainability, suitability, and usability.

Table 5*Weighted mean distribution of the criteria for the developed system*

Criteria	Weighted Mean	Remarks
Performance Efficiency	3.76	Strongly Agree
Maintainability	3.78	Strongly Agree
Suitability	3.64	Strongly Agree
Usability	3.76	Strongly Agree
Average	3.74	Strongly Agree

Table 5 shows that the overall system evaluation survey yielded an average weighted mean of 3.74, indicating that respondents rated the system as outstanding in terms of performance efficiency, maintainability, suitability, and usability. This demonstrates that the system effectively meets the specified requirements.

For Performance Efficiency, the system was found to be easy to understand, with an average weighted mean of 3.76 and a remark of Strongly Agree, reflecting respondents' satisfaction with the system's performance.

Regarding Maintainability, the system was perceived as easy to maintain and cost-effective, with an average weighted mean of 3.78 and a remark of Strongly Agree, indicating that respondents are satisfied with its maintainability.

In terms of Functional Suitability, respondents agreed that the system functions well and could serve as a valuable tool for their community. The average weighted mean for this attribute was 3.64, with a remark of Strongly Agree, confirming that the system meets its intended functional requirements.

For Usability, respondents who were initially unfamiliar with the

system indicated that they were able to quickly learn its controls within a few minutes. The average weighted mean for Usability was 3.76, with a remark of Strongly Agree, highlighting that the system is user-friendly and easy to operate.

Economic feasibility. Economic feasibility assesses whether the anticipated benefits of the system outweigh or justify its projected costs. A cost-benefit analysis was conducted to evaluate the application. By examining the system's advantages and potential drawbacks, feedback on the overall costs and benefits was obtained, providing an accurate comparison. The ISO 25010-based questionnaire survey also contributed to evaluating the economic feasibility, confirming that the system delivers value relative to its cost.

Technological feasibility. The technological feasibility of the system was confirmed through successful project completion and positive feedback from respondents. Many highlighted that the system is particularly useful for generating monthly reports and performing routine tasks efficiently.

Operational feasibility. The developed system is operationally feasible, as it is easy to manage and requires minimal training for users. Survey results indicate that clients were satisfied with the system's functionality and found it intuitive, requiring only a brief demonstration to understand its operations.

Conclusion

The developed system is a web-based application with features that facilitate patient appointment booking through the website. For

administrative users, the system allows accurate storage, updating, archiving, and retrieval of patient information. The system effectively addresses the challenges faced by some clinics in managing patient records. It also sends SMS notifications to patients, reminding them of their appointments, thereby reducing the likelihood of late arrivals or no-shows. Additionally, it supports the creation of electronic documentation for in-clinic stays.

Evaluation results indicate that the system is functional, reliable, and valuable. Respondents unanimously agreed that the system is user-friendly, enabling clients to perform tasks efficiently and accurately. The system successfully met ISO 25010 standards for performance efficiency, maintainability, functional suitability, and usability.

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