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Infant Immunization and Maternal Care System

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ABSTRACT: This paper presents the Infant Immunization and Maternal Care System, a web-based system designed to modernize the monitoring and management of maternal healthcare services and infant immunization records at the Rural Health Unit (RHU) of Cantilan, Surigao del Sur. The system addresses challenges associated with manual record-keeping, missed immunization schedules, delayed maternal visits, and inefficient data management. It integrates digital patient and infant records, vaccination and maternal visit scheduling, automated SMS notifications, user role management, and report generation to improve accuracy, efficiency, and reliability of healthcare operations. Evaluation based on software quality standards revealed high ratings in functional suitability, usability, and performance efficiency, demonstrating that the system is a secure and user-friendly platform for effective maternal and child healthcare monitoring.

KEYWORDS: Infant Immunization, Maternal Care, Web-Based System, SMS Notification, Healthcare Information System

I. INTRODUCTION

Maternal and child healthcare services play a critical role in reducing preventable diseases and improving public health outcomes. Timely infant immunization and consistent maternal care are essential components of primary healthcare systems, particularly in rural and geographically isolated areas. At the Rural Health Unit (RHU) of Cantilan, Surigao del Sur, healthcare providers continue to rely on manual and paper-based methods for managing immunization records and maternal health services.

These traditional practices often result in incomplete records, delayed updates, missed immunization schedules, and difficulty in tracking maternal visits. Paper-based logs are prone to loss, damage, and human error, while the absence of automated reminders limits the effectiveness of healthcare service delivery. As a result, healthcare workers face challenges in ensuring timely immunization and consistent maternal care.

To address these issues, this study developed the Infant Immunization and Maternal Care System, a web-based healthcare monitoring platform designed to digitalize record management, automate scheduling, and deliver timely SMS notifications. By integrating modern web technologies, the system enhances monitoring accuracy, improves accountability, and reduces administrative workload. This study aims to demonstrate that digital transformation through the proposed system can significantly improve maternal and child healthcare services at the community level.

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II. REVIEW OF LITERATURE

Routine immunization remains a critical public health strategy for reducing child morbidity and mortality, yet several challenges continue to affect its effective implementation, particularly in developing countries such as the Philippines. Cordero (2024) examined the status of routine childhood immunization in the Philippines and identified persistent challenges, including vaccine hesitancy, logistical barriers, and weak monitoring systems. The study emphasized the need for strengthened health information systems and digital interventions to ensure timely vaccination and improved immunization coverage. These findings support the development of a centralized digital platform for monitoring infant immunization schedules.

Similarly, Corpuz (2024) analyzed the timeliness and coverage of childhood vaccinations in the Philippines and found significant delays and disparities in immunization uptake across regions. The study highlighted that missed or delayed vaccinations are often linked to inadequate tracking mechanisms and limited follow-up systems. This reinforces the necessity of implementing an automated immunization tracking and reminder system, such as the Infant Immunization and Maternal Care System, to address delays and improve vaccination compliance.

The use of digital communication technologies has also been shown to improve immunization outcomes. Currie et al. (2024) conducted a systematic review on SMS-based interventions for improving vaccine coverage and timeliness among children and adolescents. The results demonstrated that SMS reminders significantly increased vaccination adherence and reduced missed appointments. This finding directly supports the inclusion of SMS notification features in the proposed system to remind caregivers of scheduled immunizations and maternal health visits.

In the local context, Del Rosario (2024) explored the role of digital platforms in sustaining healthcare messaging and immunization efforts during the COVID-19 pandemic in the Philippines. The study revealed that digital health platforms enhanced information dissemination, maintained public engagement, and supported continuity of immunization services despite mobility restrictions. These results validate the use of web-based systems to support maternal and child healthcare programs, particularly in rural and resource-limited settings.

Parental attitudes and decision-making also play a crucial role in immunization uptake. Dempsey et al. (2020) investigated the effect of an online values-based intervention on parental attitudes toward MMR vaccination. Their findings indicated that digital educational interventions positively influenced vaccine acceptance and informed decision-making. This underscores the importance of incorporating accessible and informative digital systems to support healthcare communication and caregiver awareness.

Table 1. Summary of Relevant Literatures

No.	Paper Title	Author Name	Key Points	Remarks
1	Routine Immunization for Children in the Philippines: Challenges and Interventions	Cordero (2024)	Identified gaps in routine immunization, including monitoring issues and missed schedules	Supports need for a centralized immunization monitoring system
2	Timeliness and Coverage of Childhood Vaccination in the Philippines	Corpuz (2024)	Reported delays and disparities in vaccination uptake across regions	Justifies automated scheduling and tracking features
3	SMS-Based Interventions for Improving Vaccine Coverage and Timeliness	Currie et al. (2024)	Demonstrated effectiveness of SMS reminders in improving vaccination compliance	Supports SMS notification feature
4	Role of Digital Platforms in Sustaining	Del Rosario (2024)	Showed digital platforms improved	Showed digital platforms improved

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	Immunization Programs		healthcare messaging and continuity of immunization services	healthcare messaging and continuity of immunization services
5	Digital and Online Interventions Influencing Vaccine Acceptance	Dempsey et al. (2020)	Found that digital interventions positively affect parental attitudes toward vaccination	Supports system use for caregiver engagement and awareness

In conclusion, the reviewed literature demonstrates that digital healthcare systems play a significant role in improving immunization coverage, maternal care monitoring, and healthcare service efficiency. Studies emphasize the importance of automated tracking, SMS-based reminders, and web-based platforms in addressing delays, missed vaccinations, and communication gaps. Furthermore, the integration of digital tools enhances data accuracy, caregiver engagement, and system reliability. These studies provide a strong foundation for the development of the Infant Immunization and Maternal Care System, which integrates automation, accessibility, and digital communication to support effective maternal and child healthcare monitoring.

III. METHODOLOGY

A. Research Design

The study employed a descriptive-developmental research design to develop and evaluate a web-based healthcare information system. The descriptive component focused on system evaluation, while the developmental component involved system design, implementation, and testing.

B. System Development

The system was developed using the Agile Software Development Life Cycle (SDLC). Requirements were gathered through interviews and consultations with healthcare workers. System modules were developed using web technologies and tested through iterative Agile cycles, including unit testing, integration testing, and user acceptance testing.

C. Participants and Locale

The study was conducted at RHU Cantilan, Surigao del Sur. Participants included nurses, midwives, Barangay Health Workers (BHWs), IT practitioners, and selected patients directly involved in maternal and child healthcare services.

D. Data Gathering and Evaluation Tools

Data were collected using a structured questionnaire based on software quality standards, evaluating functional suitability, usability, and performance efficiency. Responses were measured using a five-point Likert scale and analyzed using weighted mean.

E. Data Analysis Procedure

Weighted mean values were computed for each criterion under the ISO/IEC 25010 software quality model to determine the level of system acceptability. The computed means were interpreted using the following scale: 4.21–5.00 (Very Highly Acceptable), 3.41–4.20 (Highly Acceptable), 2.61–3.40 (Moderately Acceptable), 1.81–2.60 (Slightly Acceptable), and 1.00–1.80 (Not Acceptable). The overall weighted mean was used to determine the general acceptability of the system. In addition, qualitative feedback gathered from experts and users was analyzed thematically to supplement the quantitative findings. This combined analytical approach ensured a comprehensive evaluation of the system's usability, reliability, and performance efficiency, while system enhancements were guided by empirical data and the iterative Agile development process.

IV. RESULTS AND DISCUSSION

The developed of Infant immunization and maternal care system in a functional and user-friendly platform for managing maternal and infant healthcare records. Key features included patient and infant record management, immunization scheduling, maternal visit monitoring, automated SMS notifications, and report generation.

Evaluation results showed high acceptability across all criteria. Functional suitability ratings indicated that the system effectively supports healthcare operations. Usability results confirmed ease of navigation and efficiency for healthcare

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staff. Performance efficiency ratings demonstrated reliable system performance, including effective SMS notification delivery.

A. System Overview

The Infant Immunization and Maternal Care System was developed to replace traditional manual healthcare record-keeping and monitoring procedures with a centralized digital platform. The system features a web-based application designed for healthcare workers, including nurses, midwives, and Barangay Health Workers, enabling efficient management of maternal and infant records. The platform allows healthcare providers to record immunization data, monitor maternal visits, and manage patient information in real time, while automated SMS notifications remind caregivers of scheduled immunizations and prenatal or postnatal checkups.

B. Evaluation Results

To assess the effectiveness of the system, a total of 30 respondents composed of IT experts, healthcare workers, and system users assessed the system's performance. The evaluation results were analyzed using the weighted mean method and interpreted based on a five-point descriptive scale. Findings revealed that the Infant Immunization and Maternal Care System attained an overall mean rating of 4.83, corresponding to **"**Very Highly Acceptable" under e ISO/IEC 25010 standards

Table 2. Software Quality Evaluation of the Infant Immunization and Maternal Care System

Table	Quality **Characteristics**	Mean	Verbal Interpretation
1	Functional Suitability	4.83	Very Highly Acceptable (VHA)
2	Performance Efficiency	4.67	Very Highly Acceptable (VHA)
3	Compatibility	4.73	Very Highly Acceptable (VHA)
4	Usability	4.75	Very Highly Acceptable (VHA)
5	Reliability	4.85	Very Highly Acceptable (VHA)
6	Security	4.77	Very Highly Acceptable (VHA)
7	Maintainability	4.79	Very Highly Acceptable (VHA)
8	Portability	4.80	Very Highly Acceptable (VHA)
	Over-All mean	**4.83**	**Very Highly Acceptable (VHA)**

V. CONCLUSION

The study developed and evaluated the Infant Immunization and Maternal Care System, a web-based healthcare monitoring platform designed to improve the management of maternal healthcare services and infant immunization records. The system features centralized digital record management, automated scheduling, SMS notification reminders, and report generation, which collectively enhance efficiency, accuracy, and transparency in healthcare service delivery. Developed using the Agile Software Development Life Cycle (SDLC), the system effectively adapted to user feedback and evolving requirements.

Evaluation results indicated that the system was rated "Very Highly Acceptable" with an overall mean score of 4.83 based on the ISO/IEC 25010 software quality model, confirming its functionality, usability, performance efficiency, reliability, and security. Healthcare workers, IT experts, and system users affirmed the system's ease of use and effectiveness in supporting timely immunization and consistent maternal care monitoring. The findings highlight the system's potential as a scalable digital solution for rural health units and community healthcare settings.

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