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WEB-BASED MATERNITY RECORD SYSTEM WITH APPOINTMENT AND BILLING FOR A LYING IN CLINIC IN LAGUNA

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ABSTRACT

In response to challenges faced by the lying - in clinic in employing manual practices for clinic operations, particularly in record management, appointment scheduling, and bill generation, researchers conducted a study using a descriptive-quantitative research design. To understand these challenges comprehensively, both midwives/healthcare providers and affected patients participated. Focusing on the paper-based processes, the researchers identified barriers in the lying-in clinic's operations and how manual practices impacted patient satisfaction in maternal care. Findings revealed most midwives/healthcare providers were cynical about the effectiveness of manual practices, suggesting the paper-based system needed enhancements. Another finding showed patients receiving maternal care were generally dissatisfied with the clinic's paper-based processes, indicating that integrating the developed system could elevate patient satisfaction. Overall, the study suggested an information system integration could enhance the lying-in clinic's efficiency and raise the standard of patient care. These conclusions aligned with the primary objective of the researchers – developing the record system with appointment and billing for the lying-in clinic in Santa Rosa, Laguna with a consistent and organized approach to managing patient records, appointment schedules, and bill generation.

Keywords: *Maternity record system, record management, appointment scheduling, bill generation, midwives, lying-in clinic, ISO Software Characteristics*

INTRODUCTION

Nature and Scope of the Problem Investigated

Humans have always had an ardent desire to make things better. Throughout history, individuals engaged in crafting tools and methods to simplify daily tasks. This drive for improvement was not just a journey of progress; it was an emotional experience. Motivated by real benefits, individuals found joy and meaning in contributing to a better world. Each new solution was not just a step forward; it was a reminder of the human spirit's ability to innovate. According to an article published by The Nation in 2018, “As more existing technologies are stacked onto each other and developed into something greater, consumers and businesses alike could expect to see more opportunity with future technology.” A foundation and blueprint emerged through the integration of these stacked existing technologies, laying the groundwork for the creation of information management systems in the healthcare industry.

In response to the existing process challenges faced by the lying-in clinic, the study aimed to improve the quality of healthcare services provided to the patients of the lying-in clinic. It sought to restructure the management of maternity records by using technological advancements tailored to the client’s needs, reduce dependence on paper-based records, ensure better data quality, enable easier and more accessible information searches, and prevent the risk of losing crucial health information. Ultimately, these efforts aimed to uphold the standard of care and support extended to patients, particularly mothers.

Research Questions

The primary objective of the study was to develop a Record System with appointment and billing functionalities. In addressing the existing challenges encountered by the lyingin clinic, the study evaluated the effectiveness of developing a system for both patients and healthcare providers of the lying-in clinic. In detail, this study answered the following research questions:

1. What systems were currently in use by the healthcare providers at the lying-in clinic with regards to:
    - Record Management System ○ Appointment
    - Billing

2. How did the healthcare providers at the lying-in clinic generate accurate and timely reports?
3. How did the currently in-use system by the healthcare providers impact the level of satisfaction among patients receiving maternity care?
4. How was the current system measured relating to the following ISO software characteristics:
    - Reliability ○ Functionality ○ Maintainability
    - Security

Research Framework

The Input-Process-Output framework served as a conceptual paradigm that described the workflow and activities of researchers for developing the system. This framework indicated the input, process, and output.

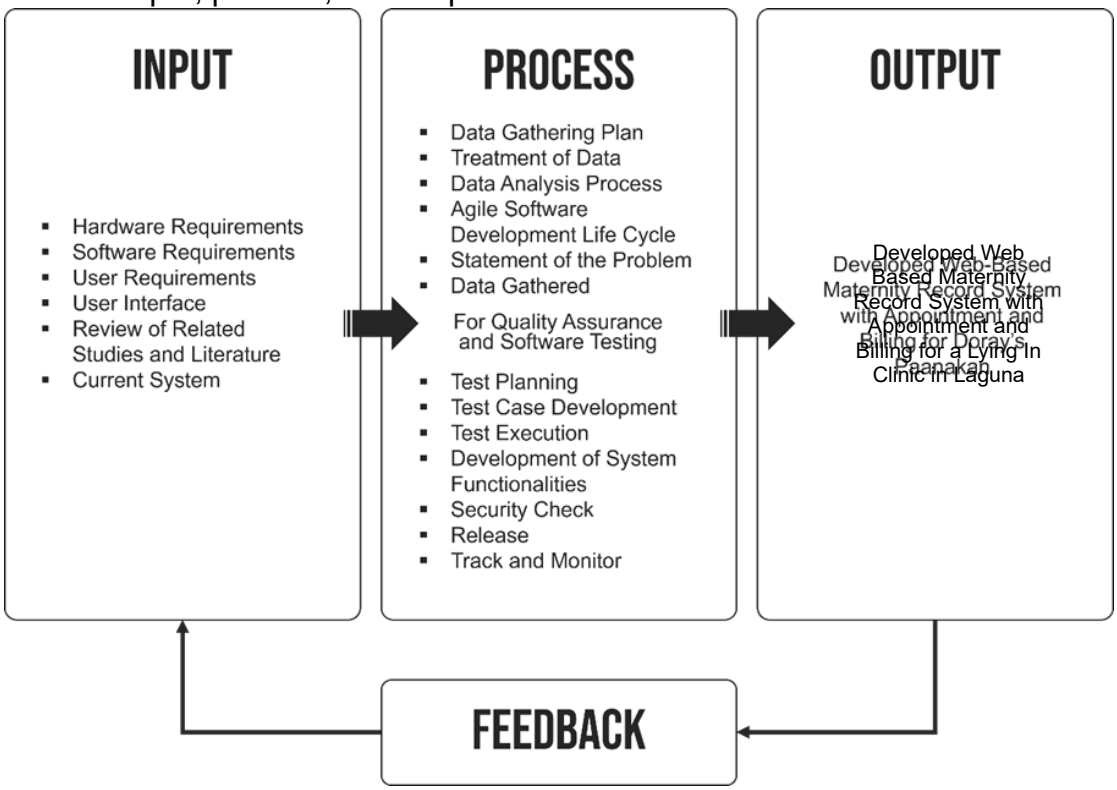

Figure 1: Conceptual Framework

Research Significance

To improve the existing operational process at the lying-in clinic, researchers developed a Web-Based Maternity Record System featuring Appointment and Billing functionalities. The rationale behind this proposal was to address challenges faced by both patients and healthcare providers in the clinic's daily operations. These challenges encompassed issues such as constraints in maternity record storage space, record-keeping errors, difficulties in accessing specific health information, and the risk of losing crucial health

data, all of which impacted the provision of healthcare services. Moreover, the researchers outlined the significance of the study, emphasizing its potential contributions not only to the client but also to the broader field of study.

Scope and Limitation

The aim of the study was to determine and create a Web-Based Maternity Record System focused on enhancing operational competencies and optimizing patient services in three key areas: (1) Record Management System, (2) Appointment, and (3) Billing. It was emphasized that the billing area exclusively pertained to the generation of invoices and did not encompass any functionalities related to payment options or transactions. The phone numbers provided were utilized strictly for record-keeping purposes and not for notification purposes. The research was conducted at a lying-in clinic in the City of Santa Rosa, Laguna. The study participants involved healthcare providers and patients, particularly mothers of the lying-in clinic.

Review of Pertinent Literatures

Healthcare organizations historically required the active engagement of diverse stakeholders, including medical professionals and health administrators, to interact with Health Information Systems (HIS). The pivotal role of these systems in the healthcare industry lay in their ability to diminish operational expenses, guarantee the precision of administrative data, and facilitate overall management processes.

A Health Information System (HIS) was essentially a system designed to handle healthcare data. It encompassed the entire process, from collecting and storing a patient's electronic medical record (EMR) to managing and transmitting it. In addition to this, HIS also contributed to supporting policy development. All these coordinated efforts aimed to enhance outcomes and create a mutually beneficial situation for both patients and healthcare professionals (Sharma, 2023). To enhance comprehension without unnecessary redundancy, a clear definition of the Health Information System was provided. This definition served as a valuable resource for researchers and readers, facilitating a deeper understanding of information systems within the healthcare context.

Reliable and high-quality HIS, such as Electronic Health Records (EHRs) and Electronic Medical Records (EMRs), enhanced the efficiency of healthcare institutions by recording medical data like prescriptions and diagnostic information using the innovative system rendered from modern technology. Furthermore, HIS also contributed to enhancing patient care (Sinhasane, 2022). Within the healthcare sector, explaining Information Systems became a guiding tool for researchers, directing them towards potential research directions.

In 2022, an article by Bell was featured in The Scott-Clark Medical, offering a comprehensive analysis of Information Systems in healthcare facilities. This analysis carried significant importance for researchers as it served as a guide for determining the most suitable type of Health Information System (HIS) to address specific client needs.

Whether the requirement was for Electronic Medical Records (EMR) and Electronic Health Records (EHR), Practice Management Software, Patient Portals, Remote Patient Monitoring (RPM), Master Patient Index (MPI), Clinical Decision Support (CDS), or Laboratory Information System (LIS), this review aided researchers in comprehending the various options available for fulfilling the requirements. The choice of HIS could influence how medical practitioners, administrative staff, and patients interacted with healthcare data and technology.

METHODOLOGY

Research Design

This study implemented a descriptive research design, which involved systematically observing, documenting, and analyzing phenomena to provide a detailed account or description of the subject under investigation. The descriptive research design is a research paradigm that focuses on investigating and mapping challenges or processes. The primary goal of this research design was to shed light on the characteristics of a particular subject or phenomenon, without manipulating variables or imposing external influences. Descriptive research design aimed to provide a detailed and accurate description of the subject under study, capturing its various aspects. Through systematic analysis of collected data, descriptive research design sought to identify patterns within the observed features. While primarily focused on description, it also provided insights into the characteristics of the subject, laying the groundwork for future descriptive research. Moreover, it aimed to establish clear parameters, defining the scope and key elements of the phenomenon being investigated. Descriptive research enhanced understanding and communication by using methods like charts and graphs to visually illustrate findings, offering a detailed description of the studied phenomenon.

Research Locale

The research was carried out at a certain lying-in clinic, established in Barangay Ibaba, City of Santa Rosa, Laguna. The lying-in clinic was selected for several reasons: it required enhancements in its record- keeping practices, it was easily accessible, willing to engage in the research, and it served as a representative example of lying-in clinics. The insights gained from this study could potentially benefit similar healthcare facilities. Data was collected through survey questionnaires at a convenient time for the participants.

Population and Sampling Design

This study's population consisted of healthcare providers, specifically the midwives responsible for managing the record system at the lying-in clinic, as well as their patients receiving maternal care at this privately owned establishment. The midwives were chosen through a total enumeration process, while the selection of patients was based on half of the clinic's weekly patient volume. This population was chosen with the aim of enhancing the current record management system and improving the quality of healthcare services delivered to the lying-in clinic's patients. The researchers were confident in using this

sampling method, considering it helped them understand and describe both groups involved in the study. This approach ensured a comprehensive analysis of interactions, highlighting how the clinic's paper-based record management systems and other practices impacted the overall healthcare experience of their patients.

Research Instrument

Developing research instruments involved careful consideration of various factors. In pursuit of gathering meaningful data for the study, the researchers chose to employ survey questionnaires for both midwives and patients, serving as the respondents of the study. This strategic decision was aimed at ensuring the efficacy and relevance of the data collection process.

Data Gathering Procedure

The initial phase in the data gathering process involved the researchers preparing by outlining objectives and securing necessary permissions and ethical approvals. This was formalized through a letter addressed to the client. Subsequently, the researchers set up data collection tools, such as questionnaires, designed to the research goals. These instruments underwent testing with small sample groups to detect and resolve any issues in the questions or methodology.

When gathering data from the sample using these instruments, the researchers informed the study respondents about the questionnaire's purpose and how to answer it. Post data collection, the researchers organized the gathered information by categorizing responses for analysis. Utilizing statistical methods for analysis facilitated the drawing of meaningful conclusions, paving the way for the development of an enhanced system.

RESULTS AND DISCUSSION

Objective 1. Identification of challenges encountered by the Lying In Clinic. In pursuing this objective, the researchers employed a questionnaire as a means of gathering data to identify issues faced by the lying-in clinic in Record Management System, Appointment scheduling, and Billing processes. Seven (7) midwives/healthcare providers from the lying-in clinic participated by responding to the provided questionnaire. The statistical analysis method utilized by the researchers was frequency distribution presented through graphical charts. This approach facilitated an interpretation of the data, allowing the researchers to understand the distribution of responses across different measurement scales provided by the midwives/healthcare providers, thus enabling the formulation of a meaningful interpretation. One of the result highlights is the userfriendliness assessment of the current record management system. Results are shown in Figure No. 2.

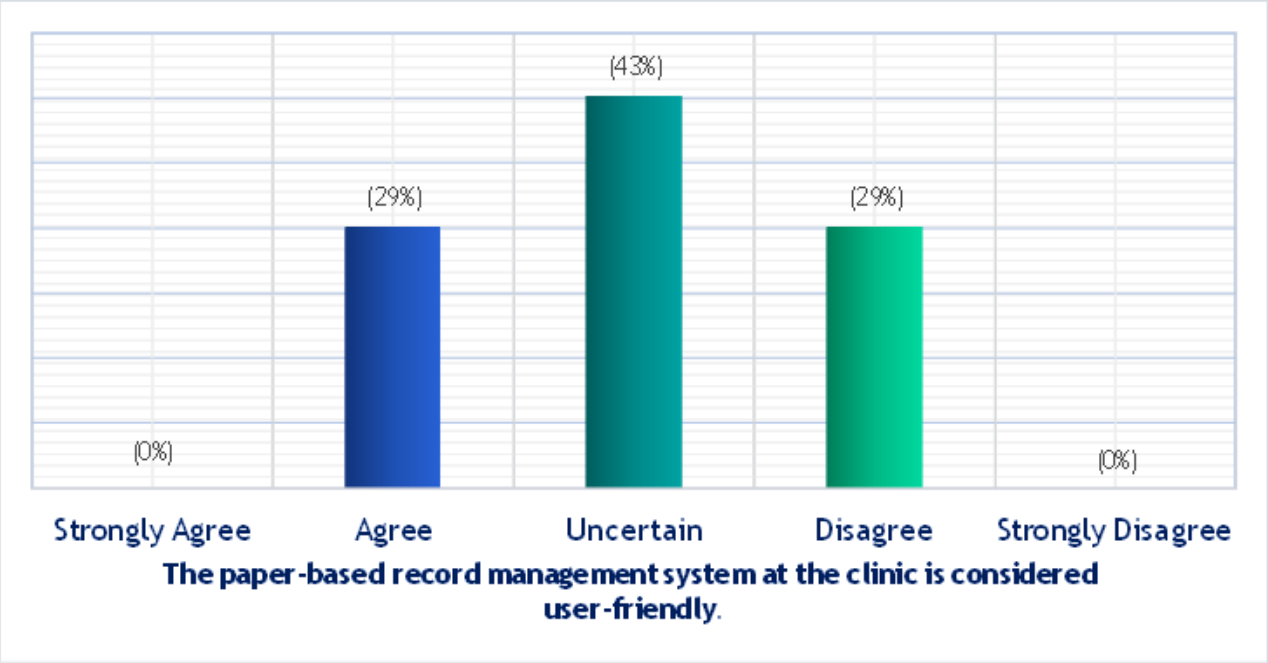

Figure 2: User-Friendliness Assessment of the Current Record Management System

In assessing the user-friendliness of the lying-in clinic's current record management system, 43% or 3 out of 7 respondents were uncertain about this statement, revealing a lack of a clear outlook among the respondents. Furthermore, 29% agreed, and another 29% disagreed, while there were 0% responses in strongly agree and strongly disagree options regarding the behavior of the current system in being userfriendly. These results denote that the midwives/healthcare providers in the lying-in clinic were uncertain about whether the current record management system they were using in their daily operations was considered user-friendly.

The uncertainty surrounding the user-friendliness of the clinic's current record management system merely indicated a lack of conviction and confidence among the midwives/healthcare providers. These findings aligned with the research conducted by Dissanayake et al. (2020), where they discovered that the introduction of a web-based system for Public Health Midwives in Sri Lanka brought forth numerous benefits, including the user-friendly design of a Health Record Management System. These results aimed to address the concerns of midwives/healthcare providers, as previous literature demonstrated that such systems facilitated ease of access and updating of maternity information, ultimately eliminating the need for manual.

Objective 2. Challenges in accurate and timely report generation at the lying – in clinic. To achieve this goal, the researchers employed a questionnaire to collect information and determine the challenges that the lying – in clinic had in producing precise and timely reports. Seven (7) midwives/healthcare providers from the lying-in clinic took part by answering the given questionnaire. The researchers used frequency distribution represented through graphical charts as their statistical analysis method. This method made it easier for the researchers to interpret the data, helping them comprehend how

the responses varied across the various measurement scales that the midwives and healthcare providers provided. This allowed them to formulate a meaningful interpretation. Figure 3 shows the result in one of the items provided to answer this objective.

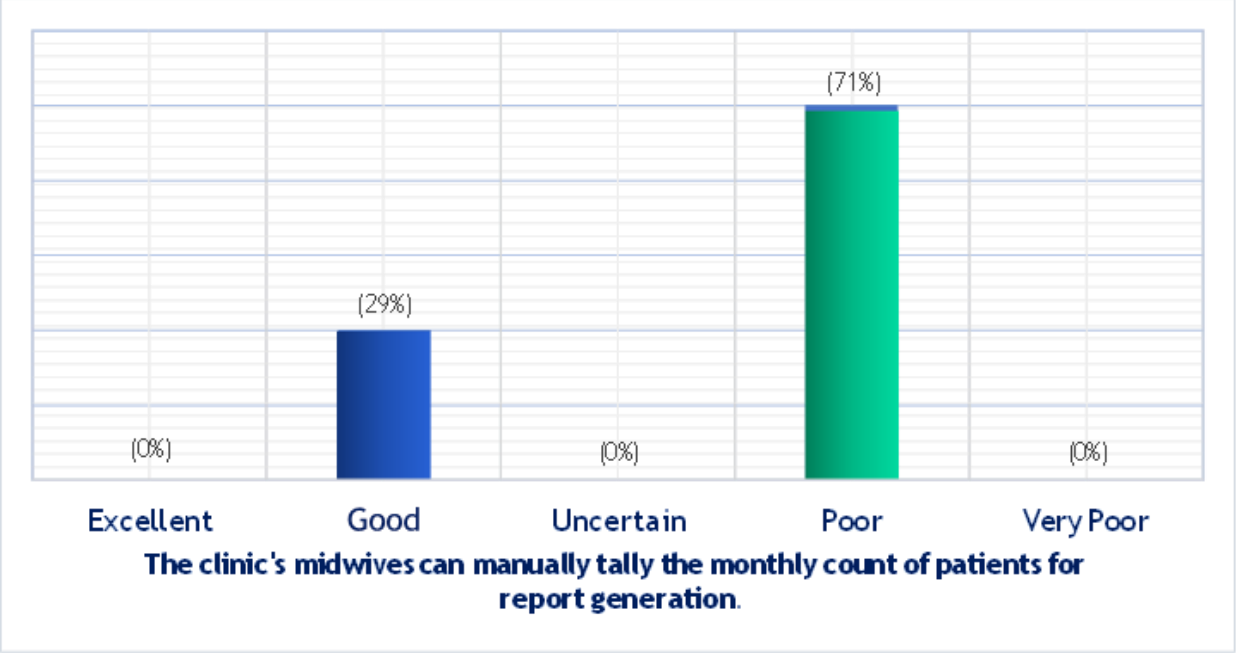

Figure 3. Manual Tallying of Monthly Patient Count by Clinic Midwives

About 71% of the midwives/healthcare providers marked this statement as poor on the given Likert scale. 29% said that manual counting of monthly patients is just good, while there is 0% in the excellent, uncertain, and very poor options. These findings resulted in an analysis that most of the clinic staff counting the monthly patients in the lying-in clinic is not promising, given that they are counting these numbers manually.

Given the midwives/healthcare providers dissatisfaction with their current patient counting method for reporting, the study of Salon (2022), underlined the significance of introducing Electronic Medical Records (EMRs) in maternity clinics. The author stressed that EMRs provided a crucial advantage in efficiently storing data for generating reports, thereby enhancing operational efficiency. Considering this, the implementation of EMRs was envisioned to bring about positive changes in the monthly patient counting process, with the system's advanced features ensuring accurate tallies not only for mothers but also for infants, contributing to a more comprehensive and effective healthcare management system.

Objective 3. Impact of the clinic's healthcare system on patient satisfaction in maternity care. In pursuance of this objective, the researchers employed a questionnaire as a means of gathering data to measure the Reliability, Functionality, Maintainability, and Security characteristics of the current system used by the clinic. Thirteen (13) patients from the lying-in clinic participated by responding to the provided questionnaire. The statistical analysis method utilized by the researchers was frequency distribution presented through graphical charts. This approach facilitated an interpretation of the data, allowing the researchers to understand the distribution of responses across different

measurement scales provided by the midwives/healthcare providers, thus enabling the formulation of a meaningful interpretation. See figure 4 for one of the results of the indicator stated in the data gathering tool.

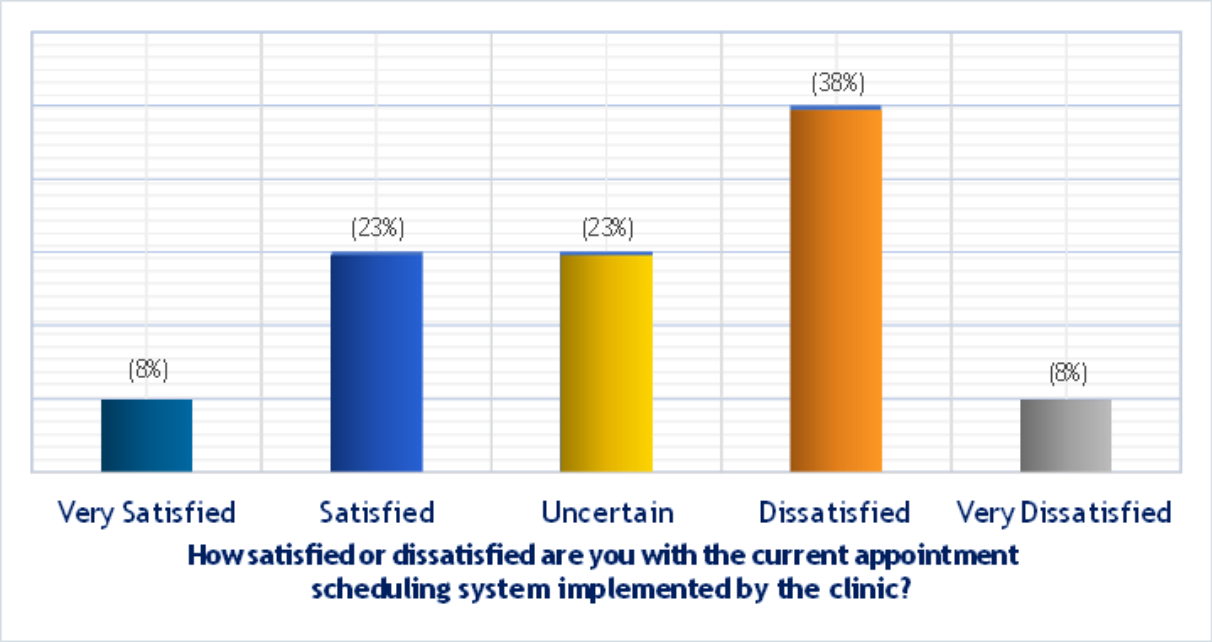

Figure 4. Evaluation of Satisfaction with the Current Appointment Scheduling System

A percentage of 38% of the respondents were dissatisfied with this question, suggesting that the clinic's current appointment scheduling system failed to satisfy the patients with its performance in terms of scheduling. Conversely, 23% of the respondents were satisfied with this question, and another 23% were uncertain. Moreover, 8% of respondents were very satisfied with this question, and another 8% were very dissatisfied. This insinuated that, to meet the demands and improve the clinic's patient service satisfaction, the current system required further improvements.

The findings of the study aligned with the research conducted by Mahfouz et al. (2023), which centered on evaluating patient satisfaction with the implemented "Mawid" System in Primary Healthcare Centers (PHCCs) in the Jazan Region. The study reported an impressive satisfaction rate of 94.3% following the integration of the new appointment system. Their research aimed to address identified weaknesses in the existing system, primarily focusing on reducing patient waiting times and ensuring doctors were adequately prepared for their services. Motivated by the positive outcomes observed in the existing study, researchers were determined to further enhance clinical outcomes for the client. This determination arose from the dissatisfaction expressed by most surveyed patients regarding the current appointment system at the clinic. Building on the insights gained, the goal was to contribute to ongoing improvements in the appointment scheduling system and overall satisfaction.

Objective 4. Measuring the current system in relation to the ISO Software characteristics. In pursuance of this objective, the researchers employed a questionnaire as a means of gathering data to measure the Reliability, Functionality,

Maintainability, and Security characteristics of the current system used by the lying0-in clinic. Seven (7) midwives/healthcare providers from the lying-in clinic participated by responding to the provided questionnaire. The statistical analysis method utilized by the researchers was frequency distribution presented through graphical charts. This approach facilitated an interpretation of the data, allowing the researchers to understand the distribution of responses across different measurement scales provided by the midwives/healthcare providers, thus enabling the formulation of a meaningful interpretation. Table No. 1 shows the summary of the results.

Table 1: Summary of ISO Software Characteristics of the Current System

ISO Software Characteristic	Percentage				
	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
Reliability	3.2%	8.7%	17.1%	38.4%	32.6%
Functionality	12.9%	19.4%	18.2%	34.7%	14.8%
Security	18.3%	22.1%	27.4%	19.8%	12.4%
Maintainability	21.7%	23.9%	24.4%	14.2%	15.8%

The results above provided insights on how the researchers will develop the system.

Conclusions

Since the establishment of lying-in clinic it had only ever used paper-based record management, appointment scheduling, as well as billing generation in providing services to their patients. In today's modern era, the manual practices of the clinic faced a multitude of challenges as the emergence of modern technology navigated its way into the healthcare environment. With the rise of technology, its integration into healthcare settings ushered in a new era of data management and optimum processing.

Record management, appointment, and billing were the operations employed by the clinic within the manual practices. While the clinic's paper-based record system was functional for midwives/healthcare providers and provided satisfaction to some patients, it had ambiguities that impeded the midwives/healthcare providers from efficiently providing care, leading to patient dissatisfaction. The findings of the study revealed that most midwives/healthcare providers were cynical about the effectiveness of the manual practices utilized by the clinic, suggesting that the paper-based system required further enhancements and optimizations. It was emphasized in the study by Salon (2022) that the integration of Electronic Medical Records (EMRs) in the healthcare setting could significantly improve operational efficiency and elevate the quality of patient care. Drawing

on the evidence from Salon's study, it was evident that the development of the Maternity Record System could bring substantial improvement to the clinic's processes and operations, particularly in record management, appointment scheduling, and bill generation.

Subsequently, other findings of the study showed that the patients receiving care from clinic were generally dissatisfied with the clinic's paper-based processes. According to the study of Hadland et al. (2022), the women interviewed in their study viewed the use of digital technology in maternity care positively.

The researchers had developed the web based record system to offer the clinic a consistent and organized approach to managing patient records, appointment schedules, and bill generation. This integration not only aligned with the clinic's commitment to providing high- quality maternal healthcare but also ensured the clinic kept up with the ever-evolving healthcare landscape.

Recommendations

The following are recommended by the researchers based on the results of the study:

Training users in utilizing the developed system. To facilitate a smooth transition from manual procedures to the developed system, it will be necessary to conduct comprehensive training sessions for the midwives/healthcare providers, patients, and other potential users at the lying in clinic.

Integration of telehealth appointments. Incorporating a telehealth appointment feature into the developed system will be highly beneficial for future studies. This integration will provide a valuable solution for both midwives/healthcare providers and expecting mothers at the lying in clinic.

Digital payment options. Integrating digital payment options into the developed system will offer a convenient and secure way for patients to settle their bills efficiently. By incorporating various digital payment methods such as credit cards, mobile wallets, ewallets, or online bank transfers, the system will optimize the billing process, reducing the reliance on traditional paper-based payment methods.

Compliance with Ethical Standards

The researchers complied with the basic standards of research ethics and also followed the Data Privacy Act in the collection and process of data gathered.

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