

Ob-Gyn Clinic Online Scheduling System

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ARTICLE INFO

Keywords: Clinic
Management System,
Developmental Research,
Ob-Gyn, Scheduling

Received : 05 February

Revised : 20 February

Accepted: 22 March

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Jacinto, Hilario, Olipas, Cunanan:

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ABSTRACT

This study aimed to design, develop, and assess an Ob-gyn Clinic Online Scheduling System using the stages of the software development life cycle. The respondents were IT experts and end-users who were purposively sampled from the Science City of Munoz, Nueva Ecija, Philippines. The system was evaluated using the International Organization for Standardization (ISO) 25010 software standards. The results indicated that the SDLC model was effective in designing and developing such a system. The IT experts and end-users assessed the technical features and quality of using the system and gave favorable and acceptable ratings. The developed system was intended to help hospitals in accommodating their outpatients, particularly pregnant women or people with uterus problems, by making it easier for them to schedule their available time, date, or days and reducing their time spent waiting for their turn. Based on the assessment, the researchers recommended that this study could serve as a first step for gynecologists in developing the easiest way to schedule. Future researchers were encouraged to investigate the benefits and drawbacks of the system and its effects on patients and gynecologists. Understanding this research could assist future researchers in developing better systems

INTRODUCTION

The coronavirus 2019 (COVID-19) pandemic made women fearful of socializing, particularly pregnant women who were at greater risk of acquiring diseases (Schwartz and Graham, 2020). These women had difficulty accessing medical care, including visits to their Ob-Gyn, who specialized in female reproductive health, pregnancy, and childbirth, as well as some general health care services. As a result, hospitals needed to find new ways to manage outpatient appointments to ensure that patients received the necessary care, including monitoring their health and medication.

To address these challenges, researchers proposed an online reservation application that would allow pregnant women to book appointments and minimize their exposure to COVID-19, while also enabling doctors to manage patient flow and reduce the risk of infection. This system is particularly important for pregnant women, whose unborn babies could be at risk if the virus spread. By implementing such a system, clinics could minimize patient numbers, locate COVID-19-positive individuals easily, thereby protecting the health and well-being of all patients and staff.

In summary, the COVID-19 pandemic made it difficult for pregnant women to access medical care, including visits to their clinics. Clinics and hospitals needed to find new ways to manage outpatient appointments and ensure that patients received the necessary care while minimizing their exposure to the virus. An online reservation application could be a helpful tool for both patients and doctors, enabling them to manage patient flow and reduce the risk of infection while protecting the health and well-being of all involved.

LITERATURE REVIEW

An online system, also known as a web-based system, is accessible over the internet and runs on a web server that provides access to a group of related web pages. The internet helps link millions of computer networks worldwide, allowing users to access information stored on other computers from a distance (Gillis, 2020). The healthcare industry is moving towards the use of an online appointment booking system due to public demand for a better healthcare system (Idowu, Adeosun, & Williams, 2014). This advancement can also be attributed to some alarming number of missed appointments.

The patient appointment system has been in place for a long time, with appointments being scheduled via fax, phone, or email. However, with the increase in internet penetration, the healthcare industry has been moving towards an online appointment booking system. The system is complex, representing the patient appointment time in the healthcare center and controlling the patient waiting time based on the type and duration of the patient appointment. This kind of platforms aimed to manage the doctor's time, reduce the patient's waiting time, reduce the doctor's idle time, reduce the nurse's idle time, and improve the quality of service in the healthcare industry.

The appointment system had always been set up so that the doctor's time can be maximized. However, it has been crucial to value everyone's time equally, as not everyone had the same amount of time to spend on something. Thus, the appointment system should be more productive and sensitive to ensure that no

one can be adversely affected. With advancements in the field of information technology, the appointment booking system had the potential to provide efficient, dependable, and timely access to health services.

According to Kwadwo, Kusi, and Rutherford (2019), appointment systems are particularly challenging to manage in the medical field, but online systems can help reduce patient waiting times. The researchers in this related project created a dashboard for patients to make appointments and designed a flowchart for the appointment process (Akinode & Oloruntoba, 2017). Zhang, Yu, Yan, Hu, and Gourea's (2012) reservation system is also discussed, which includes categories for system monitoring, customer form submission, and approval. In this study, the researchers proposed a diagram for user information and booking management for online appointment creation (Badawi & Alshabanah, 2018).

In the proposed facility reservation system conducted by previous authors, users had to register first before performing reservation activities (Alkhaldi, Aldossary, Alsmadi, Al-Marashdeh, Badawi, Alshabanah, & Alrajhi, 2018). Users could then log in to the system or create a new account by filling out a registration form. Technology played a significant role in this study as the researchers aimed to assess how much the online reservation system could help individuals. The appointment system has been crucial in facilitating a patient's visit to a medical clinic. These reviewed materials contributed to understanding the present project even better.

In summary, online appointment and reservation systems offer numerous benefits, including reducing wait times and increasing productivity for medical professionals. The studies discussed in this passage highlighted the importance of designing effective systems and the challenges associated with doing so.

Statement of the Problem

In general, this study aimed to design, develop, and assess an Ob-gyn Clinic Online Scheduling System.

Specifically, it sought to answer the following questions:

1. How may the Ob-gyn Clinic Online Scheduling System may be design and develop based on the stages of Software Development Life Cycle model which include
 - 1.1. Planning;
 - 1.2. Analysis;
 - 1.3. Design and prototyping;
 - 1.4. Coding and testing;
 - 1.5. Operations and maintenance; and
 - 1.6. Feedback?
2. How may the IT experts assess the technical aspects of the developed system based on the ISO 25010 standards which include
 - 2.1. Functional suitability;
 - 2.2. Reliability;
 - 2.3. Usability;
 - 2.4. Performance efficiency;
 - 2.5. Compatibility;
 - 2.6. Security;

- 2.7. Maintainability; and
- 2.8. Portability?
- 3. How may the system be assessed by the end-users based on the quality of use in consideration of the selected ISO 25010 criteria which include
 - 3.1. Functional suitability;
 - 3.2. Reliability; and
 - 3.3. Usability?

METHODOLOGY

The study utilized the developmental research design (Richey, 1994) to create the Online Ob-Gyn Clinic Online Scheduling System. This approach is commonly used in the instructional design and technology field to develop new products and processes, validate existing practices, and generate knowledge. Because the research aimed to construct and assess a system, using this design was the most suitable approach, particularly for assessing changes over a prolonged period of time.

The researchers conducted the study in Science City of Muñoz, Nueva Ecija, Philippines, and used purposive sampling to select the respondents. The study involved pregnant women and IT experts as respondents, and Table 1 provides the frequency and percentage distribution of these respondents.

Table 1. Distribution of the Respondents

Type of Respondents	Frequency	Percentage
IT Experts	10	33.33%
End Users	20	66.67%
Total	30	100.00%

The researchers modified two existing sets of instruments to suit the context of the study in order to assess the technical features and quality of the system. Prior to collecting any data, they sought informed consent from the respondents and provided them with all relevant details about the system. The instrument was administered through Google Forms. The researchers ensured that the collected data were treated with utmost care, confidentiality, and anonymity. The information gathered was exclusively used for this study.

RESULTS AND DISCUSSION

The Design and Development of Ob-Gyn Clinic Online Scheduling System Based on the Stages of Software Development Life Cycle.

A. Planning Stage

In the planning stage of a software development project, the leader works together with the team to develop the technical design, task list, resource plan, communications plan, budget, and initial project schedule. They also assign roles and responsibilities to the project team and stakeholders. This stage is an iterative process that may occur again during the project's duration. In the software development life cycle, the researchers estimated the project duration before deciding whether or not to proceed. Figure 1 depicts the Gantt chart of the created system, which was used to develop an online timetable for pregnant women. The

researchers aimed to create a study paper by brainstorming and hard work to devise a simpler method.

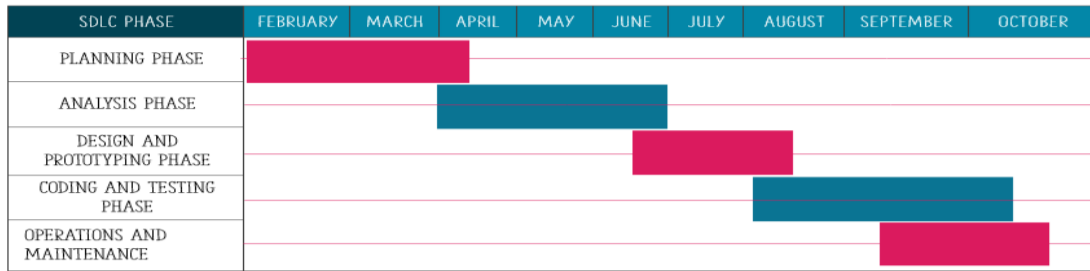


Figure 1. Gantt Chart of Activities

B. Analysis Stage

In order to build the system, the researchers collected the necessary information during a three-month period from April to June 2022. To fully comprehend and analyse the crucial activities and processes involved in the system, the researchers created various process diagrams. These diagrams included data flow diagrams (DFD) and use-case scenario diagrams, which demonstrated how information was transferred between external entities and the system's processes and data stores, as well as how activities related to each external entity. A process diagram is a visual representation of the processes that handle information exchange between a system and its environment. The DFD illustrated the movement of information between external entities and the system's processes and data stores, while the use-case scenario diagram provided insight into how activities corresponded to each external entity within the system. By creating these diagrams, the researchers gained a comprehensive understanding of the system's key activities and were able to gather the necessary information to successfully build the proposed system. Figure 2 shows the use-case diagram of the developed system, while Figure 3 presents the Context Diagram.

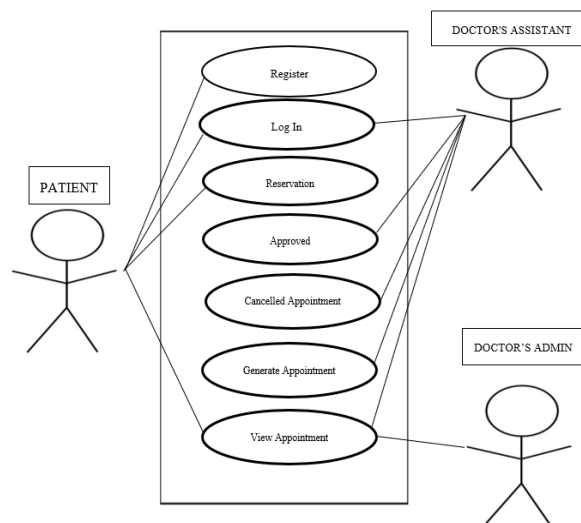


Figure 2. Use-Case Diagram

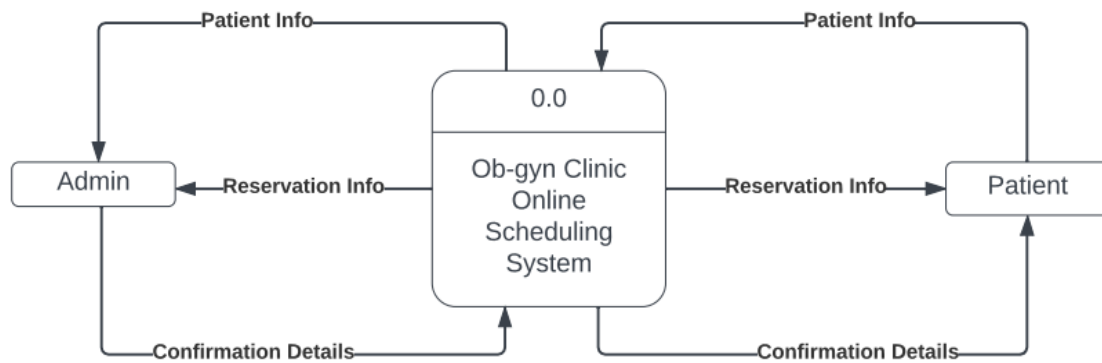


Figure 3. Data Flow Diagram – Context Level

C. Design Stage

In software development, two major areas of focus are front-end and back-end. The former pertains to designing and creating the visual elements and features that users interact with on a website, while the latter deals with data storage and organization behind the scenes. As described, this stage of development involved the creation of an entity relationship diagram and the use of MySQL, PHP, and JAVA as back-end databases to facilitate data storage and organization. On the other hand, front-end development is primarily concerned with designing and implementing website features that are visible and accessible to users. This involves creating user interfaces, navigation menus, and other interactive elements that facilitate user engagement. With the growth of online businesses and e-commerce, front-end development has become a crucial part of web development, as it enables companies to create visually appealing and easy-to-use websites that attract and retain customers.

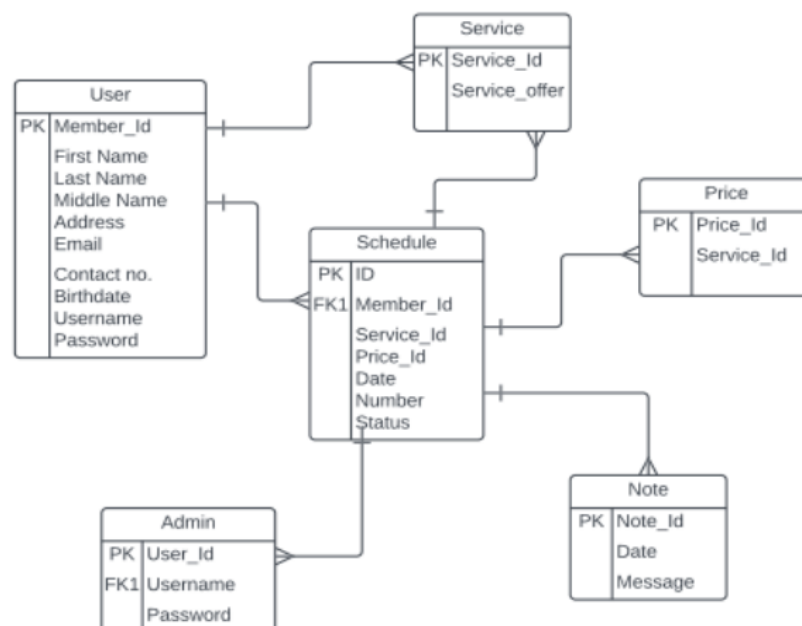


Figure 4. Entity-Relationship Diagram

D. Coding and Testing Stage

During the coding and testing stage of software development, researchers evaluated whether the code and programming met the client's requirements. While it was impossible to eliminate all errors, the testing stage could reduce the number of failures. The Ob-Gyn Clinic Scheduling System underwent non-functional testing, including performance, reliability, and usability. For example, researchers tested how many people could log into the system simultaneously. Through usability testing, users were able to interact with the system and prepare inputs and outputs with ease. Additionally, reusability testing determined whether the system could be adapted for use in other applications, which was a component of functional testing.

Reliability testing was an essential part of the software development process and continued throughout the system's lifespan without failure. Usability testing ensured that the user could learn and operate the system with simple interactions. Reusability testing helped determine the system's versatility and whether it could be used in different applications. Together, these non-functional testing methods helped ensure that the software met the necessary requirements and operated correctly. While some errors might still have occurred during the testing stage, addressing them before release could reduce the likelihood of significant issues in the future.

The following figures present the sample user interfaces of the developed system.

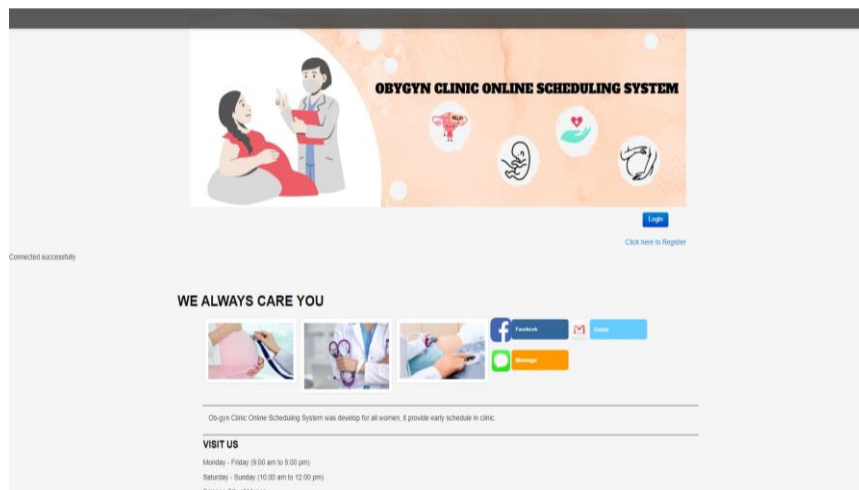


Figure 5. Sample Landing Page

Service Offer	Price
Ultrasound	500.00
Prenatal Check-up	300.00
Infertility	200.00
Colposcopy	400.00
Congenital Anomaly scan	800.00
Laparoscopy	500.00
Maternal and newborn care	1000.00
Minimally Invasive Surgery	900.00
Pap smear	700.00
STI testing	800.00
blood work	700.00

Figure 6. Sample Appointment Page

E. Operation and Maintenance Stage

The researchers in this stage focused on various types of maintenance, including corrective, adaptive, perfective, and preventive maintenance. Corrective maintenance aimed to restore the system when a problem was identified by a user or an IT expert. On the other hand, adaptive maintenance was utilized to ensure the system's longevity and compatibility with other websites. Preventive maintenance involved applying updates and adding new features that enhanced the system's performance and user experience. The primary objective of preventive maintenance was to keep the system updated and prevent equipment failure, ultimately ensuring the system's security.

To summarize, the researchers' focus in this stage was to carry out different types of maintenance, such as corrective, adaptive, perfective, and preventive maintenance. Corrective maintenance addressed issues by restoring the system, while adaptive maintenance was implemented to ensure the system's longevity and compatibility with other websites. Preventive maintenance aimed to keep the system updated and prevent equipment failure, ultimately ensuring the system's security. Additionally, the researchers also added new features that enhanced the system's performance and user experience during preventive maintenance.

Assessment on the Technical Quality of the Developed System Made by IT Experts

Table 1 presents the evaluation of the developed system's technical quality by IT experts. The assessment outcomes were significant in providing the researchers with valuable insights into the experts' opinions on the system's technical aspects.

Table 2. Assessment on Technical Qualities of Online Ob-Gyn Clinic Scheduling by IT Experts

Criteria	Mean Rating	Verbal Interpretation
Functional Suitability	3.63	Strongly Agree
Reliability	3.50	Strongly Agree
Usability	3.59	Strongly Agree
Performance Efficiency	3.57	Strongly Agree
Compatibility	3.66	Strongly Agree
Security	3.61	Strongly Agree
Maintainability	3.62	Strongly Agree
Portability	3.60	Strongly Agree
Overall Mean	3.60	Strongly Agree

The table presents the assessment results of the technical qualities of an online obstetrics and gynecology (Ob-Gyn) clinic scheduling system by IT experts. The system was evaluated based on eight criteria, namely functional suitability, reliability, usability, performance efficiency, compatibility, security, maintainability, and portability. The mean rating for each criterion ranges from 3.50 to 3.66, with an overall mean rating of 3.60. All criteria received a "Strongly Agree" verbal interpretation, indicating that the IT experts highly agreed that the system met the technical standards.

From the assessment results, the researchers gained valuable insights into the IT experts' perspectives on the technical qualities of the online Ob-Gyn clinic scheduling system. The high mean ratings and verbal interpretation of "Strongly Agree" for all criteria suggest that the system performed well in meeting the technical requirements. The results imply that the system's technical qualities are highly satisfactory and align with the IT experts' expectations.

The assessment results have significant implications for the online Ob-Gyn clinic scheduling system's development and implementation. The system's high technical quality ratings suggest that it is well-designed, reliable, efficient, and secure. These qualities can contribute to a positive user experience and enhance the overall quality of healthcare service delivery. The results also suggest that the system is highly compatible, maintainable, and portable, which can facilitate its integration with other healthcare systems and ensure its long-term sustainability.

Assessment on the Quality of Using the Ob-Gyn Clinic Scheduling System Made by End-Users

Table 2 presents the findings of the assessment conducted by end-users on the quality of using Ob-Gyn Clinic Scheduling System. These results provided valuable insight into how the end-users perceived the quality of the project developed by the researchers.

Table 3. Assessment on Quality of Using the Ob-Gyn Clinic Scheduling System by End-Users

Criteria	Mean Rating	Verbal Interpretation
Functional Suitability	3.30	Strongly Agree
Reliability	3.30	Strongly Agree
Usability	3.33	Strongly Agree
Overall Mean	3.31	Strongly Agree

Table 3 presents the assessment results on the quality of using the Ob-Gyn Clinic Scheduling System by end-users. The mean rating for functional suitability, reliability, and usability is 3.30, indicating a strongly agree rating. The overall mean rating is 3.31, which also indicates a strongly agree rating. These results suggest that the end-users perceive the Ob-Gyn Clinic Scheduling System as highly suitable, reliable, and usable.

The high mean ratings in all three criteria, as well as the overall mean rating, indicate that the end-users are highly satisfied with the Ob-Gyn Clinic Scheduling System. The strong agreement on functional suitability, reliability, and usability suggests that the system meets the end-users' needs and expectations. These positive ratings also imply that the system is easy to use and reliable, which can lead to increased efficiency in the clinic's operations. The high satisfaction ratings of the end-users indicate that the Ob-Gyn Clinic Scheduling System is meeting its intended purposes effectively. These positive results can have significant implications for the clinic, including increased productivity and efficiency in scheduling appointments. Furthermore, the satisfaction of the end-users can also contribute to the system's sustainability and continuous improvement, as they are more likely to provide feedback and suggestions for further enhancements. Ultimately, the positive assessment results can lead to improved patient satisfaction and overall clinic performance.

CONCLUSIONS AND RECOMMENDATIONS

Based on the study's findings, two conclusions were drawn. First, the Ob-Gyn Clinic Online Scheduling System was developed using the software development life cycle (SDLC), which involves seven stages, including planning, analyzing, designing and prototyping, coding and testing, and operations and maintenance. Second, the IT expert's assessment of the system's technical aspect found that it meets the requirements specified in ISO 25010, which includes functionality, suitability, reliability, usability, performance, efficiency, and portability.

In terms of functionality, suitability, reliability, and usability, the Ob-Gyn Clinic Online Scheduling System meets the end-user requirements established by ISO 25010 software. These findings suggest that the system is effective and efficient in meeting the end-users' needs and expectations. The utilization of SDLC in developing the system also implies that the development process followed a systematic and well-organized approach, which can lead to increased efficiency and effectiveness. These conclusions have significant implications for

the clinic's operations and can contribute to improved patient satisfaction and overall clinic performance.

The findings of this study provide the basis for the following recommendations. Firstly, gynecologists can utilize the existing study as a starting point in developing a simple and efficient way to schedule pregnant women for checkups. However, it is important to consider the study's limitations, such as the smaller sample size and the lack of information about the participants' qualifications, when interpreting the results.

Secondly, future researchers are encouraged to conduct further investigations to explore the benefits and drawbacks of the scheduling method proposed in this study. They can also delve deeper into the effects of this method on both patients and gynecologists. By gaining a better understanding of this research, future researchers can improve upon the existing knowledge and potentially develop more effective scheduling methods. Therefore, this study can serve as a valuable reference for future researchers in this field.

ACKNOWLEDGEMENT

The researchers wish to express their gratitude to the respondents whose participation was crucial to the completion of this study. Additionally, they extend their sincerest appreciation to their college instructors and professors who provided guidance and support throughout the system's realization.

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