

**DESIGN AND DEVELOPMENT OF A WEB-BASED APPOINTMENT SYSTEM WITH OCR
DOCUMENT SCANNING AND BIOMETRIC VERIFICATION FOR PEDIATRIC CLINICS
IN ANGELES CITY**

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ABSTRACT

This study focuses on the design and development of a web-based appointment system integrated with Optical Character Recognition (OCR) document scanning and biometric verification for pediatric clinics in Angeles City. The proposed system aims to address common challenges in pediatric clinic appointment management, including lengthy registration processes, manual encoding of patient information, and difficulties in verifying patient identities. Through a centralized web-based platform, parents or guardians can register patients, schedule appointments, submit required documents, and receive appointment information online. The integration of OCR technology enables the system to extract relevant information from uploaded documents, reducing repetitive data entry and minimizing encoding errors. Biometric verification is incorporated to provide an additional layer of identity verification and help ensure that patient records are associated with the correct individual.

Keywords: Web-Based Appointment System, Optical Character Recognition (OCR), Biometric Verification, Pediatric Clinics, Document Scanning, Patient Information Management

SECTION I — INTRODUCTION (THE PROBLEM AND ITS SETTING)

1.1 Introduction

In recent years, digital technologies have become more prevalent in the healthcare sector as a means of improving the quality-of-service delivery and the way healthcare services are managed, as well as making them easily accessible. One aspect of healthcare that can be digitalized is the appointment making process in pediatric clinics, where making appointments in an efficient manner and putting down correct information of the patients is essential. Traditional appointment making methods may require personal registration of the patient, involve paper documents and face-to-face processing, which can lead to delays and increased administrative work. In order to overcome various issues related to the traditional appointment making methods and waiting times, Mendoza et al. (2020) invented a web-based appointment system named “InstaSked” for the Perpetual Help Medical Center Outpatient Department.

The use of digital healthcare systems remains relevant for the Filipino context. De Mesa et al. (2024) investigated the acceptance of electronic health records in urban, rural, and remote areas of the country. Overall, the study revealed that people showed high intentions to use electronic health records and that self-efficacy is a major factor relevant to their intention to use this technology. Such findings highlight the importance of taking users into account about their abilities to deal with digital healthcare systems when designing and deploying health information technologies.

Efficient methods for managing patient information and health records are also essential in pediatric health institutions. Tiongson and Kummer (2020) created a Rural Health Unit Decision Support System with Mapping to help resolve issues experienced with records management and manual operations in a rural health unit in the Philippines. The system

includes decision-support and record management, thereby showing the utility of information technology in the improvement of operations and management of healthcare organizations.

Optical Character Recognition (OCR) serves as another technological advancement that can aid in the digitalization of health records. Research conducted by Heidenreich et al. evaluated the performance of an OCR system in a real-life clinical environment utilizing a pediatric encounter form. Their evaluation showed an overall accuracy of 92.4% in recognizing characters, and the OCR based system was determined to be around three times quicker than conventional data-entry systems. Hence these findings suggest that OCR technology has the capacity to help in the conversion of information from physical clinical documents into a digital format.

Authentication and identity verification are important in the development of healthcare information systems as those systems may include patients' private data. Khan et al. (2022) analyzed different ways of authenticating users in Internet of Medical Things-enabled healthcare systems and emphasized the importance of authentication as a method of securing healthcare systems. Likewise, Grindrod et al. (2018) researched a number of methods of authentication for mobile health apps and discovered that different methods of authentication differ in terms of their reliability, speed, error rate, and usability. Therefore, based on the aforementioned studies, it is possible to conclude that two aspects- security and usability- should be taken into account while implementing authentication methods in healthcare technologies.

Based on the identified needs and findings from previous studies, the present study proposes the development of a web-based appointment system that integrates OCR document scanning and biometric verification for selected pediatric clinics in Angeles City. The proposed system will combine appointment scheduling, extraction of relevant information from submitted documents, and user identity verification into a single platform. Through this integration, the system aims to support a more organized appointment process and reduce the amount of manual data entry required from clinic personnel.

1.2 Background of the Study

The use of digital technology has been increasing in the healthcare industry in relation to improving healthcare services and management. For pediatric clinics, appointment scheduling and patient information management play an important role, but there might still be some manual procedures in the process such as manual registration of patients, paperwork, and transactions made in person.

According to the previous research, digital technology has been able to enhance the healthcare process. Mendoza et al. (2020) designed a web-based appointment system while Amonelo et al. (2022) created a pediatric appointment system. Moreover, other researchers have investigated digital patient records, document scanning technology using Optical Character Recognition (OCR), and patient authentication.

But, these technologies have been investigated and used independently. Thus, the current study designs a web-based appointment system that will include appointment scheduling, OCR document scanning technology, and biometric verification for pediatric clinics in Angeles City.

1.3 Objectives of the Study

- **General Objective:**

The research is intended for creating a web-based appointment system that includes OCR document scanning and biometric authentication for pediatric clinics in Angeles City.

- **Specific Objectives:**

1. To create a web-based appointment system that would allow the guardian/patient to schedule an appointment with the pediatric clinic.
2. To create an OCR document scanning module that would be capable of extracting relevant information from the patient documents either uploaded or scanned.
3. To create a biometric authentication module to authenticate the authorized user.
4. To create a centralized system that will incorporate all these components in one system.
5. To automate the process of scheduling appointments and patient documents processing/scanning.
6. To evaluate the created system in terms of its functionality and effectiveness for appointment and patient information management of pediatric clinics.

1.4 Scope and Limitation of the Study

This study focuses on the design and development of a web-based appointment system with OCR document scanning and biometric verification for selected pediatric clinics in Angeles City. The proposed system aims to make appointment scheduling more convenient for patients

or their guardians and help clinic staff manage appointment requests, schedules, and submitted documents in one platform.

The system will include an online appointment scheduling feature that allows patients or their guardians to request appointments without personally visiting the clinic just to arrange a schedule. This is related to the studies of Amonelo et al. (2022) and Gonzales et al. (n.d.), which explored the use of digital systems for healthcare appointment management.

It will also include Optical Character Recognition (OCR) to help extract information from scanned documents or images, reducing the need for manual data entry. However, the accuracy of the extracted information will depend on the quality and clarity of the submitted documents. Clinic staff may still need to review and correct information when necessary.

Another feature of the system is biometric verification, which will serve as an additional method of checking user identity. This is related to the authentication methods discussed by Khan et al. (2022) and Courtney et al. (n.d.). However, biometric verification may be affected by the available hardware, sensor quality, and verification conditions. The system will also need to consider the privacy and security of sensitive patient and biometric information.

The study will be limited to appointment management and related document processing for selected pediatric clinics in Angeles City. It will not include medical diagnosis, treatment recommendations, online consultations, or emergency medical services. The system is intended to support clinic appointment management rather than replace the services provided by doctors and other healthcare professionals.

Furthermore, the system will require internet access and compatible devices, such as computers, tablets, or smartphones. Users with limited internet connectivity or without access

to suitable devices may experience difficulties using the system. Integration with existing hospital systems, government health databases, and other external healthcare platforms will also not be included unless specifically approved as part of the project requirements.

Overall, the study will focus on developing and evaluating a system that combines online appointment scheduling, OCR document scanning, and biometric verification to support a more organized appointment management process. Its implementation and evaluation will be limited to the selected pediatric clinics and the features included in the approved system requirements.

1.5 Significance of the Study

To Parents and Guardians. The web-based system removes the need to queue physically for appointments, similar to the convenience shown by the PedCon consultation system (Amonelo, Cailles, & Sadsad, 2022) and the InstaSked scheduling system (Gonzales et al.). OCR scanning also reduces the need to manually re-encode immunization records and prescriptions (Heidenreich et al.; Smith et al.), while biometric verification offers a faster, more secure alternative to passwords (Courtney et al.).

To Clinic Staff and Administrators. Automating scheduling and document handling reduces clerical workload and encoding errors, consistent with efficiency gains reported in local health unit and healthcare communication systems (Tiongson et al.; Joaa & Ibtida), freeing staff to focus more on patient service.

To Pediatricians. Digitized, OCR-extracted records make patient information easier to access during consultations, supporting the usability and adoption factors identified in EHR studies across Philippine healthcare settings (Sarmiento et al.), which can lead to faster, better-informed clinical decisions.

To the Local Health Sector of Angeles City. The study supports the broader shift toward smart, technology-driven healthcare delivery, aligning with trends in AI-first and CRM-oriented healthcare systems (Chauhan, Manju K., et al.), showing that even small specialty clinics can benefit from digital transformation.

To Data Security and Privacy Advocates. Since the system handles sensitive pediatric records, biometric verification strengthens authentication and protects patient data, supported by research on authentication in IoT-enabled healthcare systems (Khan, Din, Majali, & Kim, 2022) — critical when guardians act on behalf of a minor.

To Future Researchers. This study adds to Philippine health informatics literature on appointment systems, OCR, and biometric security (Amonelo et al., 2022; Sarmiento et al.; Tiongson et al.), serving as a reference for future related work.

To the Researchers. The study allows the proponents to apply and strengthen their skills in system design, OCR integration, and biometric security within a real-world healthcare context.

1.6 Definition of Terms

The following terms are defined to provide a clearer understanding of the concepts used in this study:

Appointment System. A computerized system that allows patients or their guardians to schedule, reschedule, and manage appointments with a healthcare provider.

Biometric Verification. The process of verifying a person's identity by comparing their biometric characteristics with previously registered biometric information.

Authentication. The process of confirming the identity of a registered user before allowing access to their account or authorized functions of the system.

Verification. The process of checking whether the information provided by a user corresponds with the information contained in their submitted identification document or registered records.

Clinic Personnel. Individuals responsible for administrative and healthcare-related duties in a pediatric clinic, including appointment management, patient registration, and document processing.

Document Scanning. The process of capturing a physical document using a scanner or camera and converting it into a digital image.

Optical Character Recognition (OCR). A technology that recognizes text from scanned documents or images and converts it into machine-readable data.

Pediatric Clinic. A healthcare facility that provides medical services primarily to infants, children, and adolescents.

Patient Information. Personal and appointment-related information collected and processed by the system for the purpose of managing healthcare services.

Web-Based System. A software application that can be accessed through a web browser using an internet-connected device without requiring the main application to be installed locally on the user's device.

Guardian. A parent or legally responsible individual who may schedule appointments and provide information or documents on behalf of a pediatric patient.

Patient Record. A collection of information associated with a patient that may include identification details, appointment information, and submitted documents.

SECTION II — LITERATURE REVIEW

2.1 Introduction to the Review

This chapter presents a review of relevant literature and studies related to the design and development of a web-based appointment system with Optical Character Recognition (OCR) document scanning and biometric verification for pediatric clinics. The review focuses on studies concerning healthcare appointment management, electronic health records and patient information management, OCR technology, and authentication and biometric verification methods.

The reviewed literature provides a technological and research foundation for the proposed system. Studies on web-based appointment management systems demonstrate how digital technologies can support the management of healthcare appointments. Research on healthcare information management systems provides insights into the use of technology for managing patient information and health records. Studies on OCR technology provide a foundation for the automated extraction of information from scanned documents and images, while research on authentication and biometric verification provides a basis for implementing methods of verifying user identities in healthcare systems.

Several studies have examined the use of web-based systems for healthcare appointment management. Gonzales et al. (2020) developed the “InstaSked” web-based appointment scheduling system for the Outpatient Department of Perpetual Help Medical Center. Similarly, Amonelo et al. (2022) developed PedCon, a pediatrician consultation and appointment system in Siniloan, Laguna. These studies demonstrate how web-based systems can be applied to improve appointment management and provide a basis for the appointment scheduling component of the proposed system.

The review also examines the use of digital healthcare information systems in the Philippine context. De Mesa et al. (2024) studied the acceptance and willingness of healthcare professionals to use

electronic health records in various areas of the Philippines. Their findings provide insight into the importance of user acceptance when developing and implementing healthcare information systems. Tiongson and Kummer (2020) also demonstrated the use of information technology in healthcare records management through the development of a decision support system for a rural health facility in Nueva Vizcaya.

For the OCR component of the proposed system, Heidenreich et al. conducted a study on the use of OCR technology in a clinical environment involving pediatric encounter forms. Their findings showed that OCR technology could be used to capture structured clinical data and reduce the time required for data entry. Other studies on healthcare OCR have also examined the conversion of information from images and paper-based documents into digital records. These studies provide a basis for considering OCR as a means of reducing manual data entry in healthcare information management.

The review further examines authentication and biometric-related technologies used in healthcare applications. Khan et al. (2022) provided a survey of authentication approaches in Internet of Medical Things-enabled healthcare systems and emphasized the importance of authentication in protecting connected healthcare environments. Grindrod et al. (2018) evaluated different authentication methods in mobile health applications and examined their usability and reliability. These studies provide a basis for considering identity verification as an important component of healthcare information systems.

Overall, the reviewed literature demonstrates the use of digital technologies in appointment scheduling, healthcare information management, OCR-based data processing, and authentication. By examining these related studies, the researchers can identify existing approaches, technologies,

findings, and limitations that can inform the design and development of the proposed web-based appointment system. The review also provides a foundation for integrating appointment scheduling, OCR document scanning, and biometric verification into a single system for selected pediatric clinics in Angeles City.

2.2 Review of Related Literature and Studies

Appointment Scheduling Systems

Appointment scheduling is an important part of healthcare because it helps clinics organize their patients and available schedules. In some clinics, appointments may still require patients to contact or visit the clinic before they can get a schedule. Using a web based system can make this process easier because patients can request an appointment online.

A related study by Amonelo et al. (2022) developed **PedCon**, a pediatrician consultation and appointment system in Siniloan, Laguna. The system was created to support pediatric consultations and appointments while also considering the security of patient information. This study is related to the present research because both focus on using technology to make pediatric healthcare services more organized and accessible.

Another related study is **InstaSked**, a web based appointment scheduling system developed for the Perpetual Help Medical Center Outpatient Department. The system was designed to help patients schedule appointments and assist healthcare personnel in managing them. The study shows how an online appointment system can help organize the scheduling process.

These studies are useful references for the appointment scheduling feature of the proposed system. However, the proposed study will include other features such as OCR document scanning and biometric verification.

Electronic Health Records and Digital Healthcare

Managing patient information is also an important part of healthcare. Electronic health records allow information to be stored digitally instead of relying only on physical documents. This can make information easier to organize and access when needed.

Sarmiento et al. (2024) studied the acceptance of electronic health records in urban, rural, and remote healthcare settings in the Philippines. Their study looked at how healthcare workers use and accept electronic health record systems. The study shows that users should be considered when developing and introducing new healthcare technologies.

This is related to the proposed research because clinic staff will also be using the system. The proposed appointment system should be simple and easy to understand so that clinic staff can manage appointment requests, schedules, and patient information without adding unnecessary difficulty to their work.

Tiongson et al. also developed a **Rural Health Unit Decision Support System with Mapping**. Their study shows how information technology can be used to support healthcare workers and organize healthcare related information. Although their system has a different purpose, it provides an example of how technology can be applied to improve healthcare operations.

Optical Character Recognition in Healthcare

Optical Character Recognition, commonly known as OCR, is a technology that allows computers to recognize text from scanned documents or images. This technology can be useful in healthcare because patients may need to submit identification cards and other documents.

Heidenreich et al. studied the use of an OCR system in a real world clinical setting. Their work provides an example of how OCR can be applied to healthcare related tasks where information needs to be taken from documents and converted into digital information.

Another study titled **Application of Optical Character Recognition Technologies in Health Data Management** also discusses the use of OCR for handling health related information. These studies provide support for using OCR as part of a healthcare information system.

In the proposed system, OCR will be used to help extract information from submitted documents. The information will still need to be checked by clinic staff because the results may not always be accurate, especially when the submitted document is blurry or difficult to read.

Authentication and Biometric Verification

Security is important when developing a healthcare system because patient information should only be accessed by authorized users. Authentication is one way of checking whether a user is allowed to access a system.

Khan et al. (2022) discussed different authentication methods used in Internet of Things enabled healthcare systems. Their study explains the importance of authentication in protecting healthcare systems and information from unauthorized access.

Courtney et al. also studied authentication options for mobile health applications. Their research shows that the authentication method should consider the needs and experience of the users. These studies are related to the proposed research because biometric verification will be included as one of the features of the system. It will provide an additional way to verify the identity of users. Since biometric information is sensitive, the system will need to handle this information carefully and consider user privacy and security.

Online Healthcare Communication

Technology can also help improve communication between patients and healthcare providers. Joaa and Ibtida developed a **Healthcare Communication and Online Report Delivery Management System** that focuses on using an online platform for healthcare communication and report delivery.

This study is related to the proposed research because the proposed system will also provide an online platform for patients or their guardians. Users will be able to submit appointment requests without having to visit the clinic just to arrange a schedule.

Healthcare Information Systems

The **Rural Health Unit Decision Support System with Mapping** by Tiongson et al. is another example of how technology can be used in healthcare facilities. The system was designed to provide information that can assist healthcare workers in performing their tasks.

Although the purpose of this system is different from the proposed appointment system, it shows that digital tools can be designed according to the needs of healthcare workers. This is important for the

proposed study because the system should be useful not only for patients and guardians but also for clinic staff.

2.3 Conceptual Framework

Conceptual framework is the outline that describes how the research will be conducted and what methods are used in order to reach the objectives set forth in the study. In particular, it shows the way the proposed web-based appointment system will be designed using appointment scheduling, OCR document scanning and biometric verification components. Thus, the concept serves as a tool that helps to identify the key inputs, processes and outputs of the research.

The Input will include the needs and requirements of the selected pediatric clinics related to appointment management, patient information and submitted documents. It will also comprise three major system components – appointment scheduling, OCR document scanning and biometric verification. All these inputs are determined according to the identified problems and objectives of the research.

The Process refers to the design, development, integration, testing, and evaluation of the suggested system. The developers will apply the Agile Development Model with Scrum-iterative process wherein the various parts of the system will be developed, tested, and improved through each iteration. In particular, the appointment scheduling part will enable patients or guardians to make appointments, the OCR part will enable the extraction of relevant data from the submitted documents. The biometric identification part will add an additional step of identification of authorized users. This way, all these components will be integrated into one web-based system.

The Output of the framework will be a working web-based system for appointment management in selected pediatric clinics in Angeles City. Such a system should be able to improve the process of appointment management, to decrease the manual data entry, to help manage patient documents, and to perform additional user identity verification.

2.4 Synthesis

The reviewed literature and studies collectively highlight three major themes relevant to the present study: appointment scheduling automation, OCR-based document processing, and biometric authentication in healthcare systems.

Studies on appointment scheduling, such as PedCon (Amonelo, Cailles, & Sadsad, 2022) and InstaSked (Gonzales et al.), demonstrate that web-based scheduling systems significantly reduce patient waiting time and streamline clinic operations. However, these systems primarily focus on the booking process itself and do not integrate document digitization or biometric security features, leaving a gap in end-to-end automation from identity verification to record management.

Research on electronic health record adoption (Sarmiento et al.) and decision support systems for rural health units (Tiongson et al.) reveals that usability, accessibility, and data organization are critical factors determining whether healthcare workers and patients embrace digital health systems. These studies emphasize the importance of well-designed, user-friendly interfaces but do not specifically address manual data entry. A persistent bottleneck can be reduced through automated document processing.

This gap is addressed by studies on OCR technology in healthcare (Heidenreich et al.; Smith et al.), which show that OCR can effectively extract and digitize handwritten or printed medical documents,

reducing encoding errors and administrative workload. Similarly, the CRM and AI-first architecture study (Chauhan, Manju K., et al.) and the healthcare communication and report delivery system (Joaa & Ibtida) illustrate how automation and intelligent data handling improve overall healthcare service delivery. However, none of these OCR- and AI-focused studies were specifically designed for or tested within a pediatric clinic setting, where document types (e.g., immunization records, growth charts) and user needs differ from general adult healthcare contexts.

On the security dimension, studies on authentication in mobile health applications (Courtney et al.) and authentication in IoT-enabled healthcare systems (Khan, Din, Majali, & Kim, 2022) establish that biometric verification offers stronger and more convenient identity confirmation than traditional password-based methods, particularly across different user age groups. These studies, however, focus on authentication in general health applications rather than in the specific context of guardian-managed pediatric records, where an additional layer of accountability is needed since the patient (a minor) cannot independently verify their own identity.

Taken together, the literature shows strong individual advancements in scheduling automation, OCR document processing, and biometric authentication, but no existing study combines all three into a single, integrated system tailored specifically for pediatric clinics. This study addresses that gap by developing a web-based appointment system that unifies OCR document scanning and biometric verification, specifically designed for the pediatric care context in Angeles City, where guardians manage appointments and records on behalf of their children, and where clinic-level digitization remains limited compared to larger hospital systems.

SECTION III — METHODOLOGY

3.1 Research Design

This study will employ a **developmental research design**, following the **Design and Development Research (DDR)** approach, since the primary output of the study is a functional artifact, specifically a web-based appointment system integrating OCR document scanning and biometric verification for selected pediatric clinics in Angeles City. This research design is appropriate because the study focuses on designing, developing, and evaluating a system intended to address the identified needs in appointment scheduling and patient information management.

The study will also incorporate a **descriptive research design** during the evaluation phase. This will allow the researchers to gather and describe feedback from the intended users of the system, including clinic personnel, pediatricians, and parents or guardians. The evaluation will focus on the system's functionality, usability, and effectiveness in supporting appointment scheduling and patient information management. A structured questionnaire may be used as the primary data-gathering instrument for the evaluation, subject to validation by appropriate evaluators.

Research Locale. The study will be conducted in selected pediatric clinics within Angeles City, Pampanga. The selected clinics will serve as the setting for the development and evaluation of the proposed web-based appointment system.

Respondents of the Study. The respondents will include selected clinic personnel, pediatricians, and parents or guardians who are intended users of the proposed system. Their feedback will be used during the evaluation of the system's functionality, usability, and effectiveness.

Research Instrument. A researcher-made questionnaire will be used as the primary data-gathering instrument during the evaluation phase. The questionnaire will be designed based on the objectives

and intended functions of the proposed system and will be subject to validation before its use in the study.

3.2 System Development Methodology

The proposed system will be developed using the Agile Development Model, specifically a Scrum-based iterative approach. This methodology is appropriate for the proposed system because it consists of three major functional components: appointment scheduling, OCR document scanning, and biometric verification. These components can be developed, tested, and refined incrementally throughout the development process.

The Agile development process for this study will consist of the following stages:

1. Requirements Gathering and Planning. The researchers will identify the functional and non-functional requirements of the proposed system based on the objectives and intended users of the study. The requirements will cover appointment scheduling, document processing through OCR, biometric verification, user management, and the integration of these functions into a centralized system.

2. Sprint Planning and System Design. The gathered requirements will be organized into a product backlog and arranged according to priority. The team will then design the system's database architecture, user interface, and overall workflow, after which the backlog will be divided and organized into sprints based on the complexity and importance of each task.

3. Development and Sprint Execution. The system will be built across the sprints. The first component to be developed will be appointment scheduling, followed by the OCR document scanning

component, and finally the biometric verification component. Each implemented function will be improved and finalized before development moves on to the next component.

4. Sprint Review and Testing. As soon as each sprint is completed, the implemented functions will undergo testing, contributing to error detection, issue identification, and problem resolution before the next sprint begins.

5. System Integration. After the major components have been developed and individually tested, they will be integrated into a single centralized web-based appointment system. The integration will ensure that the appointment scheduling, OCR document scanning, and biometric verification components work together as intended.

6. Final Testing, Deployment, and Review. After system integration, the complete system will undergo final testing to verify its overall functionality and identify remaining issues. Once the required improvements have been completed, the system may be deployed in the selected setting for evaluation. The results and feedback gathered during the evaluation will be used to identify possible improvements to the system.

3.3 Requirement Specification and Analysis

In this section, the functional and non-functional specifications for the proposed web-based appointment system will be covered. These specifications are developed based on the objectives outlined in Chapter I and the requirements of the user groups such as clinic staff, pediatricians, and parents/guardians.

Functional Specifications:

Appointment Scheduling Module

The system must allow users to register and login.

The system must allow users to book, reschedule, or cancel appointments.

The system must allow clinic staff to see and manage appointments.

The system must show the available appointment slots based on the clinic schedule.

OCR Document Scanning Module

The system must allow users to upload or scan documents.

The system must extract the text from uploaded and scanned documents and take advantage of the OCR technology.

The system must allow clinic staff to check and edit the extracted text before saving it to the patient's file.

Biometric Verification Module

The system must allow users to enter their biometrics at the time of registration and check them during the login or appointment check-in.

The system must deny the access to users with biometrics that can't be verified.

Centralized System Management

The system must compile and combine appointment records, files, and the information of users into one single database/record.

The system must grant the administration of the clinics the right to operate the user accounts and levels of access (e.g., administration levels, receptionist, physician).

Non-Functional Specifications:

Usability. In order to ensure usability, the system must have an interface that can be used by all users with different technical levels of knowledge, as well as people who have never used such a system.

Performance. The system must process appointment requests and OCR document extraction within an acceptable response time under normal usage conditions.

Security. The system must protect sensitive patient information and biometric data through appropriate access controls and data protection measures.

Reliability. The system must remain consistently available and functional during clinic operating hours, with minimal downtime.

Compatibility. The system must be accessible through standard web browsers on computers, tablets, and smartphones.

3.4 System Design Specification

The proposed system, “**Design and Development of a Web-Based Appointment System with OCR Document Scanning and Biometric Verification for Pediatric Clinics in Angeles City,**” is designed to help pediatric clinics make their appointment process more organized, convenient, and easier to manage.

The system will allow patients to register and log in to their accounts, provide their required information, and request an appointment through the website. Patients can also submit their required documents using the OCR document scanning feature. This feature will help the system read and collect important information from the documents, which can lessen the need for manual data entry.

The system will also include biometric verification to help confirm the identity of the patient or authorized user. This can provide an additional step in verifying patient information during the appointment process.

For clinic staff, the system will provide an administrative side where they can view and manage appointment requests. Staff can check patient information, review submitted documents, and approve, update, reschedule, or cancel appointments when needed. The system will also keep appointment and patient records in a database so that authorized staff can easily access and manage them.

The system will be accessed through a web browser and will use a server and database to process and store information. Basic security features such as user login, access control, and secure handling of records will also be included to help protect patient information.

Overall, the system is designed to make the appointment process easier for both patients and clinic staff by combining online appointment scheduling, OCR document scanning, and biometric verification in one web-based system.

3.5 Implementation

The Implementation phase covers the actual deployment and rollout of the Web-Based Appointment System with OCR Document Scanning and Biometric Verification within the target pediatric clinic setting in Angeles City. This phase translates the finalized design into a fully operational environment used by clinic staff, pediatricians, and parents/guardians.

3.5.1 System Deployment

The completed system will be deployed on a web server accessible to the clinic's front-desk staff, physicians, and patients' guardians through standard web browsers. The database, containing patient records, appointment schedules, and OCR-extracted documents, will be hosted securely to ensure data availability and integrity. The biometric verification module will be integrated with compatible input devices (e.g., fingerprint scanner) installed at the clinic to authenticate registered users during login and appointment check-in.

3.5.2 Data Migration and Initial Setup

Prior to full rollout, existing patient records and clinic schedules (if any, in paper or spreadsheet form) will be encoded or scanned into the system using the OCR module to populate the initial database. Clinic staff accounts will be created with appropriate access levels (e.g., administrator, receptionist, physician), and initial biometric enrollment will be conducted for authorized personnel and returning patients/guardians.

3.5.3 User Training and Orientation

Clinic staff and pediatricians will undergo a hands-on orientation covering system navigation, appointment management, OCR document uploading and verification, and biometric enrollment procedures.

3.5.4 Full-Scale Rollout and Monitoring

Once staff are trained and initial data is migrated, the system will be implemented for regular clinic operations. Continuous monitoring will be conducted during the initial weeks of deployment to observe system performance, biometric authentication accuracy, and OCR extraction reliability, allowing the researchers to promptly address any operational concerns and ensure the system meets its intended objectives.

3.6 Testing and Evaluation

The developed web-based appointment system will undergo testing and evaluation to determine whether its functions perform as intended and meet the requirements identified in the research problem and objectives.

Testing will involve checking for errors, technical problems, and other issues that could affect the performance of the system. This will be carried out throughout the development process, particularly after the development of each major component and after these components are integrated.

The system's major components: appointment scheduling, OCR document scanning, and biometric verification will each be tested individually before integration. For the appointment scheduling module, the researchers will test whether users can effectively register, log in, request appointments, and manage their appointment information. The OCR document scanning module will be tested to determine whether it can accurately extract relevant information from uploaded or scanned documents. The biometric verification module will be tested to determine whether it can accurately verify the identity of authorized users. Once each module has been tested individually, integration testing will be carried out to ensure that all components function correctly as a single system.

For the evaluation phase, selected clinic personnel, pediatricians, and parents or guardians will be asked to use and assess the system. A researcher-made questionnaire will be used to gather their feedback regarding the system's functionality, usability, and effectiveness. The questionnaire will be based on the objectives and intended functions of the proposed system and will be validated before use.

The results of the testing and evaluation will be used to determine whether the system performs according to its intended functions and whether it can effectively support appointment scheduling and patient information management. Feedback from the users will also help the researchers identify areas that may still need improvement, and any identified issues will be addressed through appropriate revisions to enhance the system's overall performance and usability.

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