

# TELECONSULTATION FOR MEDICAL DOCTORS

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## ABSTRACT

*This paper examines how impactful the implementation of teleconsultation is to a small medical clinic that struggles to manage its patients. To respond to this issue, the researchers created a responsive web-based teleconsultation and inventory system according to the client's needs, in doing so, digitalizing their current system to stay relevant in today's time. Through a survey conducted after the system was completed, users tested and determined the relevance and usability of the system. The results show that the system is working as intended, and it will be both a help and an innovation for the medical clinic it was created for. This study proves that, especially in these times of crisis, technological innovation is needed to assist in continuing the day-to-day processes of medical institutions for a sense of efficiency.*

## KEYWORDS

*Teleconsultation, Telemedicine, Inventory management system, Web consultation*

## 1. INTRODUCTION

With the current pandemic affecting the whole world and the alarming increase in the number of coronavirus cases in the Philippines, people have a more challenging time doing their day-to-day activities. COVID-19 has brought drastic changes in the daily routine of millions. From working in the offices or onsite, employees are now reporting for work from their homes, and students are now doing online classes. The public health crisis has severely affected the economy due to reduced productivity, loss of life, business closures, trade disruption, and decimation of the tourism industry (Pak et al., 2020). Aside from the socioeconomic consequences of COVID-19, the pandemic has put a substantial burden on the health sector as well.

Because of the increasing number of COVID-19 cases in our country, medical doctors and healthcare providers, in general, are faced with tremendous difficulties at work to deal with the prevailing health crisis. There has been a decrease in the workforce, hospital beds, and other health resources, making it harder for Filipinos to seek immediate help. Because of mandatory social distancing, priority was given to COVID-19 patients in hospitals. Outpatients or patients with cases other than COVID-19 were given an alternative to in-visit consultation, teleconsultation.

Teleconsultation, also known as telehealth or remote consultation, as described by the Pan American Health Organization, refers to “interactions between a clinician and a patient to provide diagnostic or therapeutic advice through electronic means.” Despite being widely known abroad, teleconsultation is an emerging field in medicine in the Philippines; therefore, there is only a limited number of published literatures on teleconsultation. Although teleconsultation was introduced as a more convenient alternative to in-visit consultation, it will still be used even after

the pandemic ends. With this, the researchers aim to create a web-based system for teleconsultation that everyone can widely use.

## 1.1. Purpose and Description

GoldCare Multi-specialty Clinic (GCMC) is a patient-oriented quality health care service. The clinic consists of medical doctors with different specialties like Pediatrics, Obstetrics and Gynecology, Internal medicine, General and minimally invasive surgery, and Otolaryngologists or E.N.T. that help and cater to patients with different conditions.

GoldCare Multi-specialty Clinic (GCMC) is a multi-specialty clinic located in Golden City Imus Cavite. The clinic was founded by a group of doctors with different specialties. The clinic is open Monday – Saturday by booking an appointment through their Facebook page, meaning no booking, no consult. The clinic's problem is that sometimes the doctors cannot accommodate some of their patients with a same-day booking in the clinic because the Facebook notification does not pop up or does not notify them. They also have duties in other hospitals, which can be quite far from the clinic. So, the researchers proposed a system that will help them handle their patients in a better and more convenient way.

### 1.1.1. Organizational Chart

The organizational structure of the GoldCare Multi-specialty Clinic (GCMC) is basically being led by the medical doctors, who are also the owners of the clinic and in charge of managing the online check-ups, followed by the Admin/Secretary, the one who receives and assists the patients, and who manages the patient record. The last one is the staff, the one who works under the supervision of the doctors.

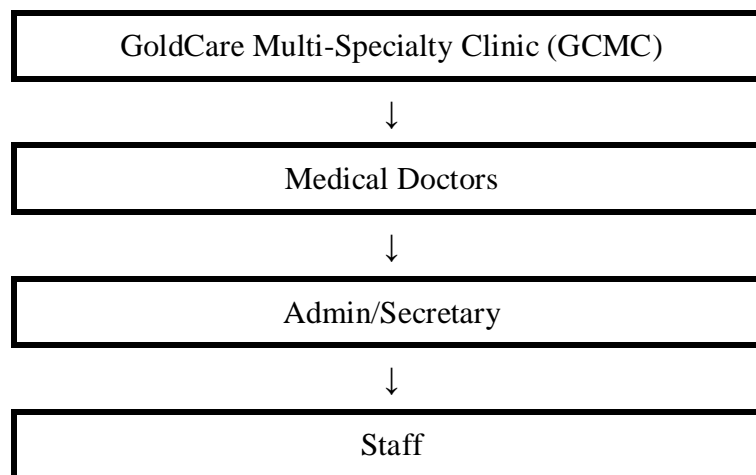


Figure 1. Organizational Chart

## 1.2. Project Context

The researchers created a teleconsulting system that helps people talk and consult with experienced medical doctors specializing in different medical fields based on patient conditions.

Teleconsultation for medical doctors is a healthcare platform that helps people communicate with medical professionals to help and manage their health and conditions at any time and any place.

The system has a responsive web application which makes things more convenient for the user. The system consists of two primary users, which are the patient and the doctor.

In using the application, the patient needs to register for his/her account, and once it is done, they can now log into our website application and use it. And by then, the patient can start booking the consultation, but the patient can still choose the specialization of a doctor based on his/her conditions. After that, the patient needs to pay for the consultation through the GCash QR code and needs to input the GCash reference number that the admin will verify; after the verification, it will notify the doctor that he/she has a booking; once confirmed the patient can go to the video call menu which will be the consultation time. By then, the doctor can now make diagnoses and records of the patients, which will be saved on a database for a record for his/her next consultation. The doctors can also issue prescriptions, laboratory requests, and medical certificates depending on the patient's request.

### **1.3. General Objectives**

To create a responsive web-based teleconsultation system and inventory system that will help people talk and consult with experienced practitioners specializing in different medical fields based on their condition, as well as computerize their workflow to allow for more efficiency in their day-to-day processes.

- Design and develop a responsive web-based teleconsultation system for doctors and patients to serve as a safer alternative to in-visit consultation.
- Efficiently provide a medical evaluation to patients with non-life-threatening conditions.
- Develop an inventory system that essentially computerizes their entire system pertaining to medical resources that the clients are offering in their clinics like Flu vaccine, Pneumonia shot, Typhoid shot, anti-rabies shot, and Measles shot; though these resources will be available for walk-in patients only, payment through these medical resources will be received by the admin on the clinic. Moreover, to shelf their old pen-and-paper approach and improve their efficiency in operating their clinic.
- Provide simple analytics by means of a sentiment analysis model, present after calls and appointments as a measure for improvement in different aspects of their operations.
- Evaluate the system using FURPS Model.

### **1.4. Scope and Delimitations**

The project would comprise the following:

#### **1.4.1. Registration**

Patients need to give their credentials, such as their basic personal information, to successfully register and create an account. The credentials given upon registration will only be used and seen by the owner of the account and the Doctor.

#### **1.4.2. Booking Scheduling**

This module is for the booking schedule of the patient. The patient can choose their date and time of scheduling. Then the system will validate the occupied time on a specific date to avoid multiple schedules on that particular day. The system will automatically recommend a doctor for

those patients who do not have an idea which doctor fits their condition, although patients may still have a choice in choosing their doctor. The patient can choose to request for E-Laboratory, E-Prescription, and E-medical certificate that will be issued by the doctor. Services like Vaccine shots will only cater for visit consultation. Once the patient successfully booked a schedule, the system will notify the admin to validate the payment; once validated, it will notify the doctor that he/she has a schedule at this time of the day.

#### **1.4.3. Notifications**

There will be a notification so that the system can notify the patient and the doctors if there is a reminder and schedule of consultation. The System can notify within the system.

#### **1.4.4. Patient Management Records**

This is where the patient information will be stored. Doctors will only be able to view the credentials that are only relevant and needed for the consultation. The doctors can add and manage a patient that will be saved on a database to access the patient's records for future consultations easily.

#### **1.4.5. Patient Diagnosis Records**

This is where all the patient diagnosis records will be stored. In this module will be saved the previous consultation report of the patient. The diagnosis records can be used for the next teleconsultation of the patient to give more information about the past conditions of the patient so that the doctor can evaluate more and give the proper prescriptions.

#### **1.4.6. Doctor Management**

This area will showcase the different doctors and their respective specializations so that patients can see their information and choose a doctor that will fit their conditions.

#### **1.4.7. Medical Evaluation**

All medical doctors are experts with their specializations that will accommodate and handle the patient's condition and needs. So, all medical evaluation on each consultation is guaranteed to be professionally evaluated. Patients can also request e-laboratory and e-prescriptions. E-medical certificates will be automatically generated by the system after the consultation.

#### **1.4.8. Communication**

During the virtual consultation with the medical doctor. Video calls are supported to talk and assess the patient's condition easily.

#### **1.4.9. Reports (Print)**

The system will show how many patient consultations were made; it will also showcase the age and gender range of the patients. The reports will also show data on the illnesses and medical conditions common among the patients using the application. It will also show the time with the most and least number of patients doing teleconsultation.

#### **1.4.10. Dashboard**

A dashboard that would display data trends on medical resources that the clients are offering in their clinics like Flu vaccine, Pneumonia shot, Typhoid shot, anti-rabies shot, and Measles shot. The dashboard will also showcase customer needs, like the most prescribed medicine for a certain diagnosis. The dashboard will show how many users, patients, and doctors are registered in the system. It will also show how many total appointments and new queries the system had.

#### **1.4.11. Pricing**

This will showcase the rates of the medical doctors so that the patients have an idea of how much is the price per consultation.

#### **1.4.12. Payments**

The patient can choose in our pricing menu and pay online through GCash. After payment, the system will notify the admin to validate the patient's payment. The patient needs to pay first before the consultation, meaning NO PAYMENT, NO CONSULTATION policy. No Cancellation and Refund, but patients will be allowed to change their booking schedule 2 hours prior to their scheduled consultation, but it will not be an exact day consultation; hence it will be scheduled the next day or depending on the patient.

The delimitations of the project are:

#### **1.4.13. Consultation for Life-Threatening Situations**

The system will not be able to cater to patients with life-threatening situations. These patients with health conditions that pose a severe risk to their lives need immediate care and must go to the hospital immediately.

#### **1.4.14. Doctor availability on the client's premise**

Another delimitation is the doctor's availability when a patient is around and they are occupied. Doctors cannot refuse incoming clients, so patients in line will be in the queue while waiting for an available doctor.

## 1.5. Conceptual Framework

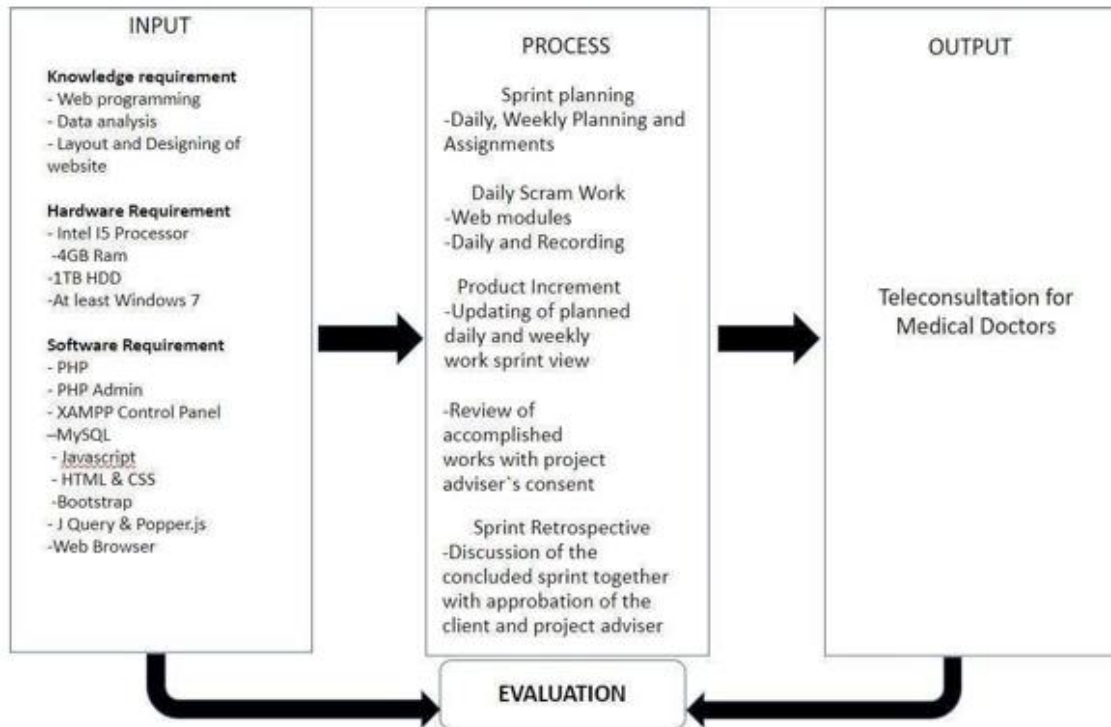


Figure 2. Conceptual framework diagram

## 1.6. Significance of the Study

The results of this study will be beneficial to the persons involved in the development of the project and for future researchers who might decide to take on a similar project.

**To the client.** A doctor is a professional who practices medicine, which is concerned with promoting, maintaining, or restoring health through the study, diagnosis, prognosis, and treatment of diseases, injury, and other physical and mental impairments. One of the doctor's goals is to cure and take care of the sick and prevent people from getting sick through check-ups and consultations. Furthermore, with this pandemic, hospitals and clinics are fully occupied, and with that, the researchers' study would help the doctors and patients by making a teleconsultation platform that will serve as a safer alternative to in-visit consultation. And help the doctors manage and organize their patients virtually.

**To the Future Researchers.** Future researchers will benefit from this proposed project as a reference to help and guide them to develop a much better Teleconsultation System.

## 1.7. Definition of Terms

- **Check-up** – an examination of somebody, especially a medical one, to ensure that you are healthy. (Oxford Dictionary, 2019)
- **Client** – a person who uses the services or advice of a professional person or organization. (Oxford Dictionary, 2019)

- **Consultation** – the act of discussing something with somebody before deciding it. (Oxford Dictionary, 2019)
- **COVID** – is a disease caused by a coronavirus that was first reported in 2019 and became a pandemic. (Oxford Dictionary, 2019)
- **Proponent** - an individual supporting a concept or course of action. (Oxford Dictionary, 2019)
- **Users** - persons or things that uses. (Oxford Dictionary, 2019)
- **Telecommunication** – communication over long distances by radio, phone, televisions, satellite, etc. (Oxford Dictionary, 2019)

## 2. REVIEW OF RELATED LITERATURE AND STUDIES

This chapter focuses on reviewing related literature, studies, and systems that are present in the market today. These were researched, collected, and cited to prove that the proposed system is feasible and is in use in the market today.

### 2.1. Foreign Literature

With the rise of the global virus pandemic first reported in December 2019, the world has been dramatically affected, especially in the industries of airlines, oil and gas drilling, restaurants, leisure facilities, and life and health insurance. The COVID-19 pandemic also caused a direct impact leading to a decline in the economy, affecting the agricultural, tourism, education, and health sector, and threatening the livelihood and wellbeing of millions of people.

At present, the pandemic still poses significant challenges in the health sector worldwide. With this, the researcher aims to find an alternative to in-visit consultations that the professionals in the health sector may utilize using a web and mobile application for virtual consultation known as teleconsultation.

In a study entitled Teleassistance and Teleconsultation Using Smartphones and its Contribution in Clinical Progress of Oral and Maxillofacial Surgery by Singh et al., the importance of and the services a smartphone can provide were explained. The researcher described it as a mobile device with the combined function of a cellular phone and a computer, with options such as voice, text, multimedia messages, camera, and e-mail providing effective communication between specialties for the management of patients. Its application in cranio and maxillofacial surgery opened a new way for medical professionals in preoperative planning and treatment. The researcher mentioned that with the evolution of technology, it is possible to develop new ways to deliver healthcare services to patients remotely via teleconsultation using smartphones.

The researcher said that the first live transmission of surgery through the internet was accomplished in 1996 at the university hospital of craniomaxillofacial and oral surgery in Vienna. In 2002, Jacob et al. also compared conventional radiology and digital radiology in the diagnosis of maxillofacial features and showed an 86% sensitivity of diagnosis using the telemedicine system. The researcher said that there are two types of telemedicine systems: 1) a live interactive system that operates in real-time and includes a monitor and a camera, and 2) store and forward technology using e-mail and photographic images. The researcher concluded that smartphones are helpful in consultation, diagnosis, treatment, and follow-up in remote areas.

In a study entitled Evaluation of Teleconsultation System in the Urological Patient during the COVID-19 Pandemic, patient satisfaction with teleconsultation as an alternative to face-to-face care was evaluated using a survey via telephone. Even though some patients required assistance from family members in teleconsultation, the respondents reported a high level of satisfaction with teleconsultation offering continuous care to urological patients during the pandemic. In addition, the researcher reported that optional telematic assistance in selected patients needs to be re-evaluated.

In dealing with patients, some mode of trust is required to consign their health status to practitioners. A study conducted by Alzahrani et al. found that routine check-ups for Saudi Arabian students in the USA had low rates of use. They quote, "Saudi Arabian citizens are known to suffer from high rates of preventable chronic diseases, which is among the top causes of death and disability in the country." Throughout the study, they found that there were five factors that affected the willingness of participants to attend routine check-ups past the age of 18 which were trust in the care provided, belief in the importance of said check-ups, health insurance, and having chronic conditions, or being physically active. It is seen from their study that having trust in the system and both its importance and use directly affects how they approach medicine. In another study performed by Abdullah et al. in Riyadh, SA, two hundred eighty-eight participants of four hundred fourteen knew about routine check-ups, and even less than that regularly do them. The two biggest preventing factors their study found were "lack of time" and "laziness," while the two biggest reasons they do it were "health concern" and "worry about chronic illness." The application of telemedicine would allow for remote access to practitioners and would go a long way in countering the preventive factors barring it from widespread use. It is abundantly clear that without the proper infrastructure to build the foundation for telemedicine, it will be challenging to execute on a nationwide scale.

## 2.2. Local Literature

With the current pandemic in the Philippines, people have a more challenging time visiting the hospital for consultation and seeking medical attention immediately. Aside from safety reasons, there has been a shortage of resources and a decrease in the availability of the workforce due to the rising number of COVID-19 cases. As an alternative, professionals are using teleconsultation to attend to their patients even in their own homes. While widely known and used in foreign countries, teleconsultation is an emerging technological field in our country, with only a few published literatures on its use in different medical fields and patients' satisfaction using teleconsultation.

In a recent article entitled Telemedicine Services in the University of the Philippines Health Service during the COVID-19 Pandemic: A Two-week Process Documentation and Analysis, telemedicine processes, good practices, and areas for improvement were observed. The telemedicine services of the University of the Philippines Health Services (UPHS) include virtual triage or tele-triage, teleconsultation for COVID and non-COVID19 patients, and telemonitoring.

Quantitative data were collected using e-mail, phone hotlines, and Online Consultation Request and Appointment (OCRA) System. Patients contacted the hospital using the hotline numbers for teletriage. Researchers concluded that teleconsultation, tele-triaging, and telemonitoring using phone calls, short messaging service (SMS), e-mails, and online consultation via the OCRA system could be utilized to screen, follow up, monitor, conduct consultations, and offer health services as an alternative to in visit consultations during the pandemic.

In a study entitled Tele-Ophthalmology Practices and Attitudes in the Philippines in Light of the COVID-19 Pandemic: A Survey, a total of 327 local ophthalmologists responded and reported



that there had been an increase from 53% to 90% in the use of teleophthalmology in our country since the pandemic. At present, social media messaging is reportedly the most used modality in teleophthalmology. Nevertheless, most of the respondents still expressed their willingness to continue using teleophthalmology applications for consultations and interpreting photographs, even though many of the respondents were not confident in the existing telemedicine applications available to them at the time of the survey. The researcher reported that telemedicine proved valuable in remote triaging, monitoring of cases, and virtual consultations. There was also a significant reduction in patient load in hospitals after shifting from face-to-face outpatient consultations to teleconsultation. In conclusion, the majority of the local ophthalmologists who responded to the survey believed that the role of teleophthalmology would be more significant in the future and that teleophthalmology will still be incorporated in their practice as physicians even after the pandemic.

### **2.3. Foreign Studies**

Coronavirus, also known as COVID-19, is the worst virus in history and has altered our world's perception. This pandemic condition has had a global impact on all industries. Businesses have no choice but to confront a slew of new difficulties, including E-commerce, online buying, and even teleconsultation, which encourages people to stay at home and limit their outings to prevent the virus from spreading. Everyone must adjust to a way of life they had never considered or envisioned. Until now, the pandemic has posed a considerable challenge to the global health sector. Medical professionals can conduct consultations with their patients via teleconsultation as an alternative to face-to-face meetings.

Silva et al. (2021) found that telemedicine can benefit vulnerable people in their confinement and facilitate the continuum of care in pandemics in their study "COVID-19 Remote Consultation Services and Population in Health Inequity-Concentrating Territories: A Scoping Review." It has the potential to save time and reduce the number of visits to health facilities. During the COVID-19 pandemic, their evaluation attempted to highlight initiatives for gauging the satisfaction of vulnerable populations with teleconsultation services provided by public and private health care providers in their localities. There are a few systematic researches on the perspectives of persons most affected by health disparities. As a result, the researchers have included assessments of teleconsultation-based services provided to socioeconomically disadvantaged and clinically vulnerable groups around the world, emphasizing COVID-19 surveillance, treatment, and prevention.

The qualitative analysis revealed two categories from their selected studies for full-text reading and critical appraisal: telehealth evaluation and services during COVID-19 and the attitudes of vulnerable populations. Information is disseminated mostly through television and social media. Although teleconsultations are convenient and cost-effective for patients, the majority still choose in-person treatment at primary care clinics over online treatment.

Another study was conducted by Cook et al. (2016) in Cambridgeshire, UK, where a small sample size of patients were subjects of a study defining factors that influence the decision to use telehealth and telecare service. Among the forty participants, twenty-eight people continued to use the service throughout the study, three rejected its usage outright, and another nine stopped using it after a variable amount of time. The study showed that engaging the population was the most significant barrier barring the extensive use of telemedicine because there is a populace known to have a distrust for technology – the older generation. One needs to have a positive attitude and a need for technology to influence the decision to use telemedicine. In using the service, three key factors were identified for it to be considered: usability, the usefulness of

equipment, and threat to identity and independence. Fig. 1 below shows the methodology by which eligible users to be featured in the study were determined.

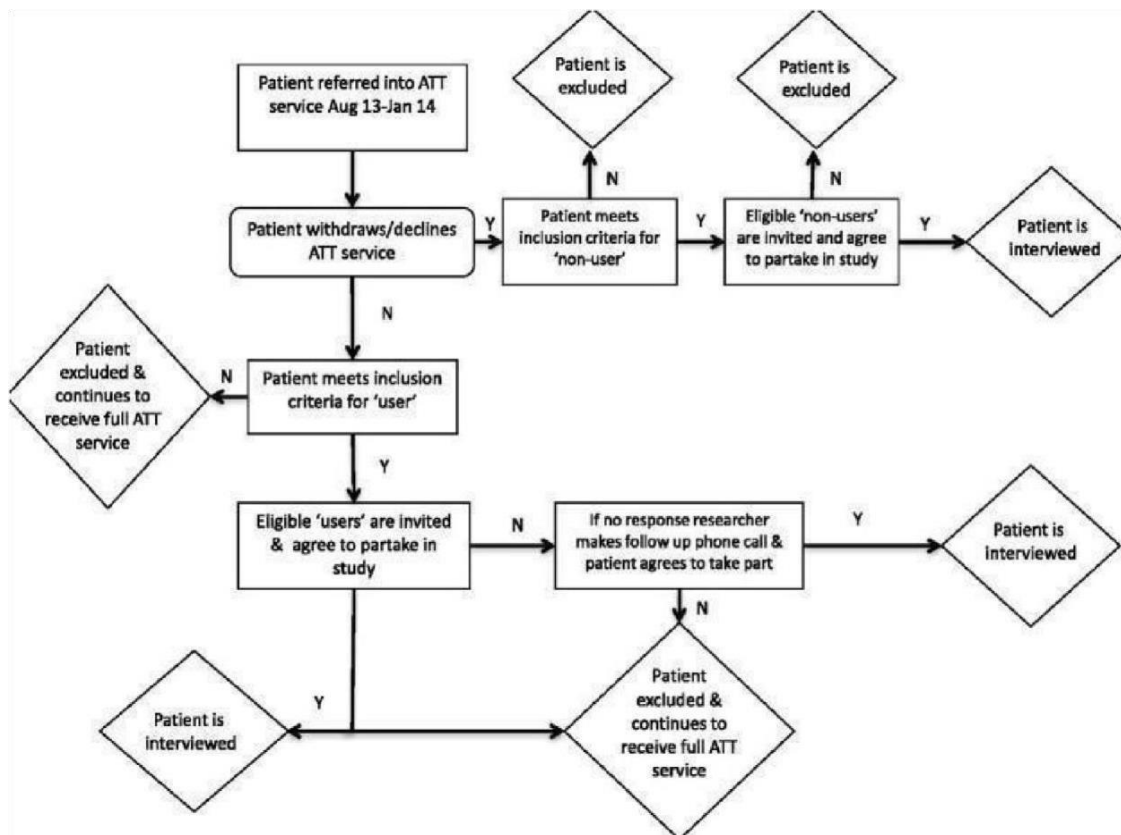


Figure 3. Recruitment pathway for 'users' and 'non-users'

In South Africa, it is evident that implementing a health and medicine network would be beneficial. Telemedicine first came to South Africa in 1997, but nowadays, only 34% of telemedicine sites are still in use. A study conducted by Cilliers and Flowerday found that this was the case not only in South Africa but in many developing countries as well. Through a quantitative survey approach and application of the UTAUT (unified theory of acceptance and use of technology) model, they determined that health workers did find value in telemedicine and health information systems, but there was a lack of knowledge and awareness regarding telemedicine. Hence, users decide against using the system in favor of familiar grounds. In some areas, the ratio of doctor to patient is 1:1300, and in some rural areas, it goes as high as 1:100 000. Increasing awareness and knowledge on how to use it and its benefits and comfort in using it through extensive usage is needed to implement it properly.

## 2.4. Local Studies

Networking is another vital issue that must be addressed in telemedicine. In an archipelago like the Philippines, there are many remote areas and rural communities where both medical care and medical knowledge are increasingly inadequate compared to their urban counterparts. Having a stable network where those in the medical field can comfortably consult and communicate with each other is crucial to providing the proper healthcare to our fellow Filipinos away from urban civilization. In a study performed by Pasco (2016), he found that rural physicians who have not

experienced telemedicine readily welcomed its possibility, while those who have had firsthand experience were only too ready to describe the faults they encountered with it.

In a focus group discussion, Pasco surveyed the communication experiences of the physicians in different situations: Most would consult with their peers, who would presumably not have much experience either due to them having roughly the same educational knowledge from their studies. Few others would communicate with specialists they have met in their training. Moreover, others would refer their patients to other resident specialists with more knowledge of their medical care, which would more likely simply pass the patient over to a said specialist. The majority of his findings determined the inefficiency of the communications infrastructure present in the Philippines and the lack of internet or signal in many rural areas, leading to communications delays. The majority of physicians who have attended the training the study organized had neglected to utilize telemedicine in favor of a speedy resolution to their patients' cases, which only serves to drive home the fact that the lack of telemedicine and its use is due to the lack of communications efficiency in the current infrastructure in the Philippines.

### **3. METHODOLOGY**

#### **3.1. Requirements Analysis**

The requirement analysis considers the information and the data gathered by the group. The gathered data is the source for utilizing and making solutions for the problems that were found by the group.

The gathered information and data serve as a medium and basis for developing the system. The system helps doctors and patients with quick and convenient access to medical care.

#### **3.2. Operational Feasibility**

The proposed system helps the medical doctors handle their patients; it provides fast and convenient access to medical care and reaches more patients due to a decrease in geographical barriers, and provides a safe, interactive system between doctor and patient.

Patients can also request e-laboratory e-prescriptions, and after consultation, e-medical certificates will be automatically generated by the system.

#### **3.3. Technical Feasibility**

The website application was developed using Adobe Photoshop, PHP, PHPAdmin, XAMPP, MySQL, Javascript, Popper.js, jQuery, HTML, CSS, and Bootstrap to produce its targeted features. The following requirements below are necessary to accomplish the proposed system and ensure that it runs well without any problems.

Hardware Requirements
Monitor
Mouse
Keyboard
Camera
Microphone
Central Processing Unit (CPU)
Modem
Power Supply
Ram: 4GB or Higher
Hard Drive/ Solid State Drive; 256 GB or Higher
Software Requirements
At least Windows 7
Web Browsers

Figure 4. Minimum system requirements

### 3.4. Schedule Feasibility

The illustration illustrated the expected period time for the entire development cycle of the project, starting from the documentation and initial system development stage up to project deployment. The system development is evaluated from August 2021 to August 2022.

PBL2	August 2021				September 2021				October 2021				November 2021			
Task	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4
CLIENT SEARCHING																
CHAPTER 1																
CHAPTER 2																
CHAPTER 3																
MOCK DEFENSE																
PBL3	January 2022				February 2022				March 2022				April 2022			
Task	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4
SYSTEM DESIGN																
SYSTEM BUILD																
SYSTEM TESTING																
DEFENSE																
PBL4	May 2022				June 2022				July 2022				August 2022			
Task	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4
User Testing																
User Review																
Final Defense																
Project Deployment																

Figure 5. Development cycle

### 3.5. Economic Feasibility

Costs are unavoidable when making a task without spending is tough. The researchers showcase the two different types of costs which are tangible and intangible. The tangible type is the one that is quantifiable, while the one that is non-quantifiable is intangible.

#### 3.5.1. Tangible Benefits

- Cuts patient costs by reducing travel time and expenses.

- Profit gain for medical doctors since more clients can reach them via teleconsultation due to decreased geographical barriers offered by the system.
- Higher referral rate because the system helps link patients to doctors easily online.

### 3.5.2. Intangible Benefits

- Provide fast and convenient access to a medical care
- Reach more patients due to a decrease in geographical barriers offered by the system.
- Provides a safe, interactive system between medical doctor and patient
- Reduces patients no-shows
- To reduce the risks posed by the necessary patient traffic in the clinics and hospitals.
- Decrease exposure to different contagious diseases in hospitals and clinics.

### 3.6. Project Design

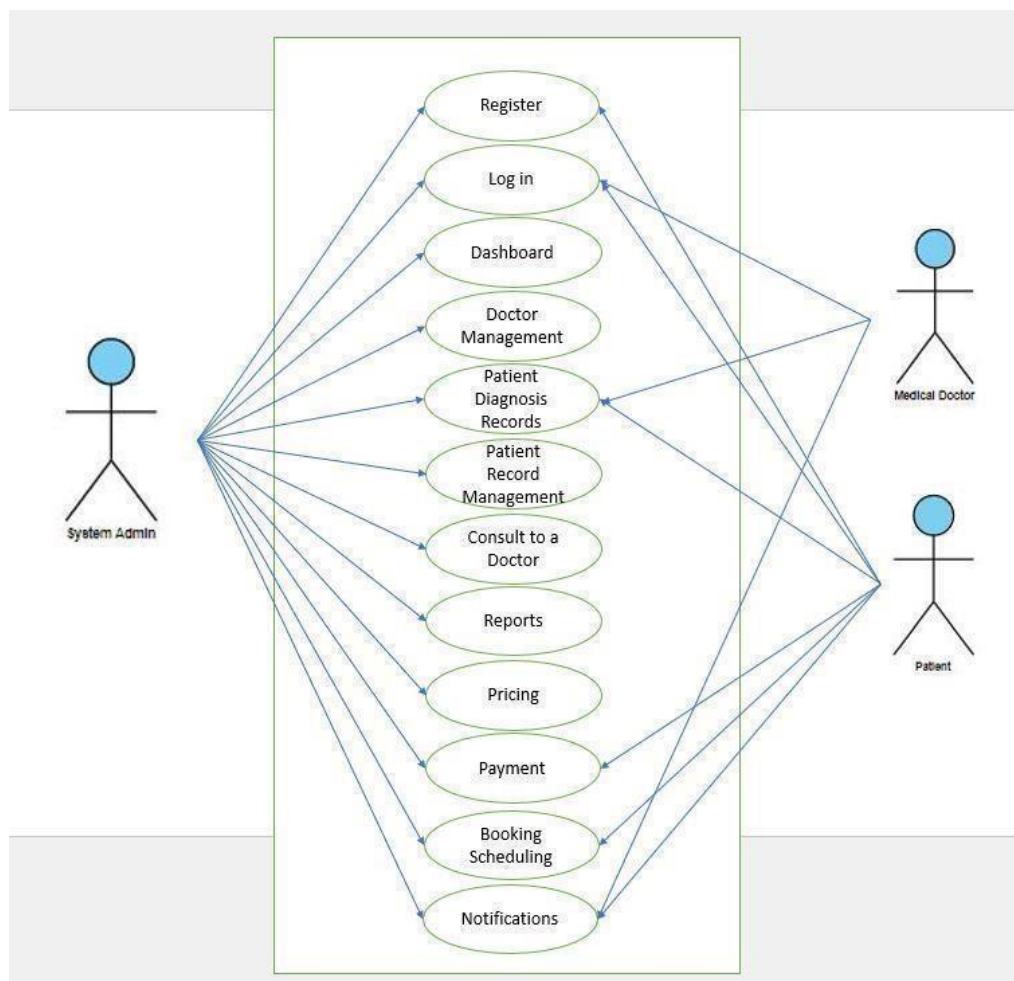


Figure 6. Use case diagram

The diagram illustrates all users who will utilize the system. The diagram contains use cases that define a particular usage of the actors. The researchers used this to specify what features are in the system that can be used by the client.

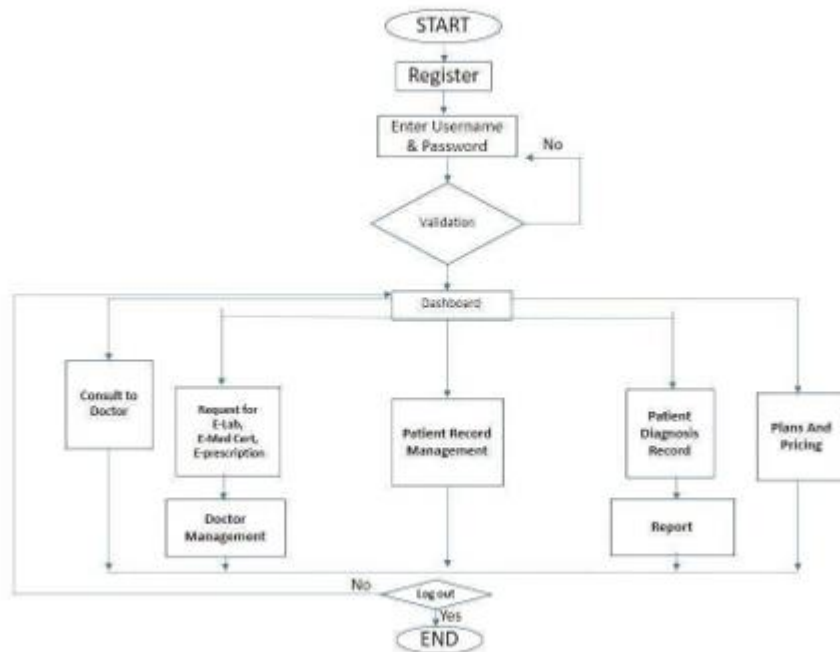


Figure 7. Registration process flow

The diagram illustrates the workflow of the system. The user will input username and password; once the input has been validated, it will proceed to the dashboard, where the user will see the Consult to a doctor, Request for e-laboratory, e-prescriptions, e-medical certificates, Patient Record Management, Patient Diagnosis Records, and Plans and Pricing.

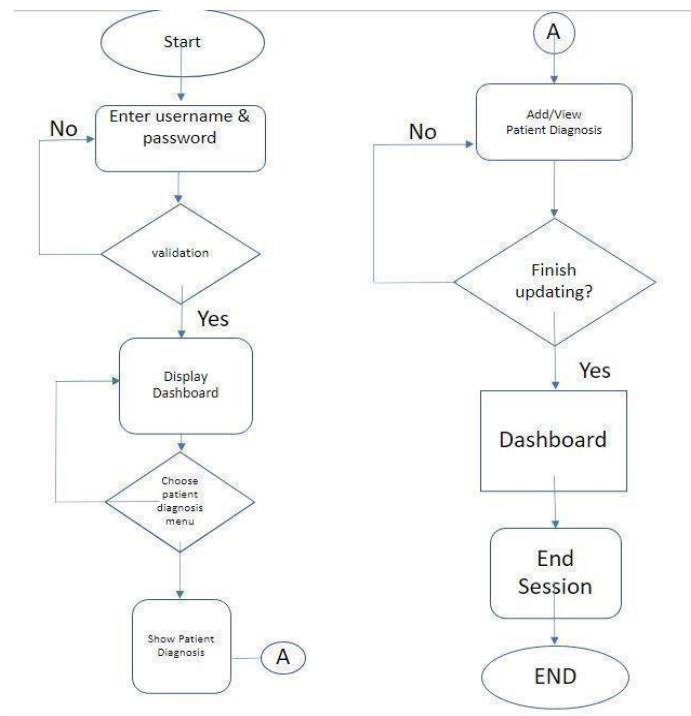


Figure 8. Patient diagnosis records process flow

The flowchart illustrates the Patient Diagnosis Records process flow of the system. But only the system admin can delete a certain record. Patients can only add and view his/her photos and records of the diagnosis.

### 3.7. System Architecture

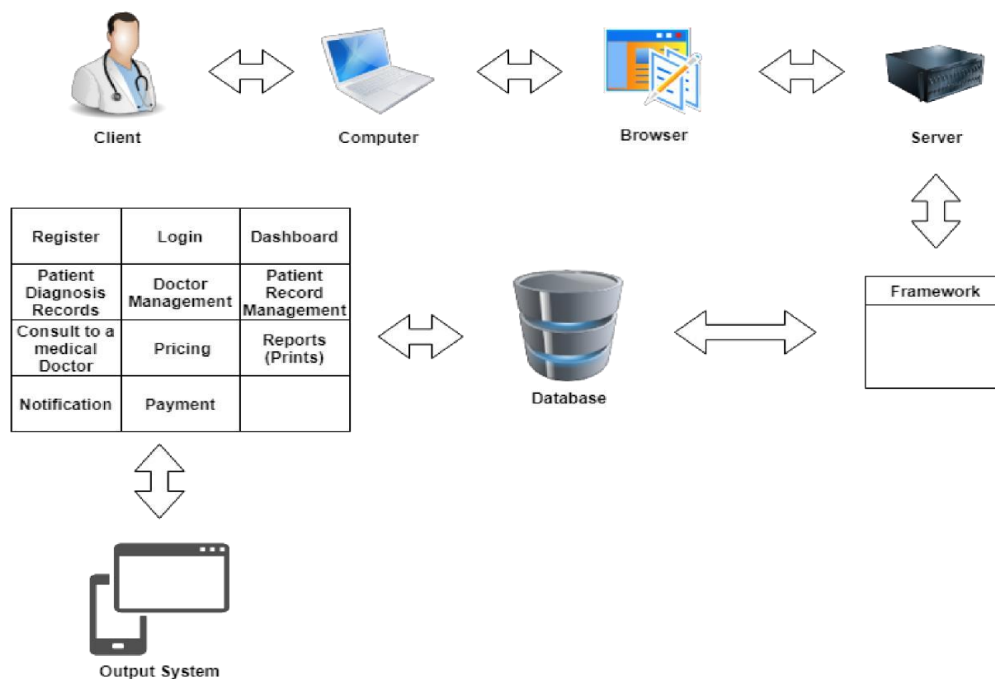


Figure 9. System architecture

The system architecture demonstrates how the process of the system works. The client uses the system on a browser; then, it will be forwarded to the webserver. Using the encoded data, it will be redirected to the system developed by the researchers with an interface customized by the client. The information needed in the system will be put within the database system. With that, the client will use the modules developed within the framework that will generate a working output system.

### 3.8. Project Development Model

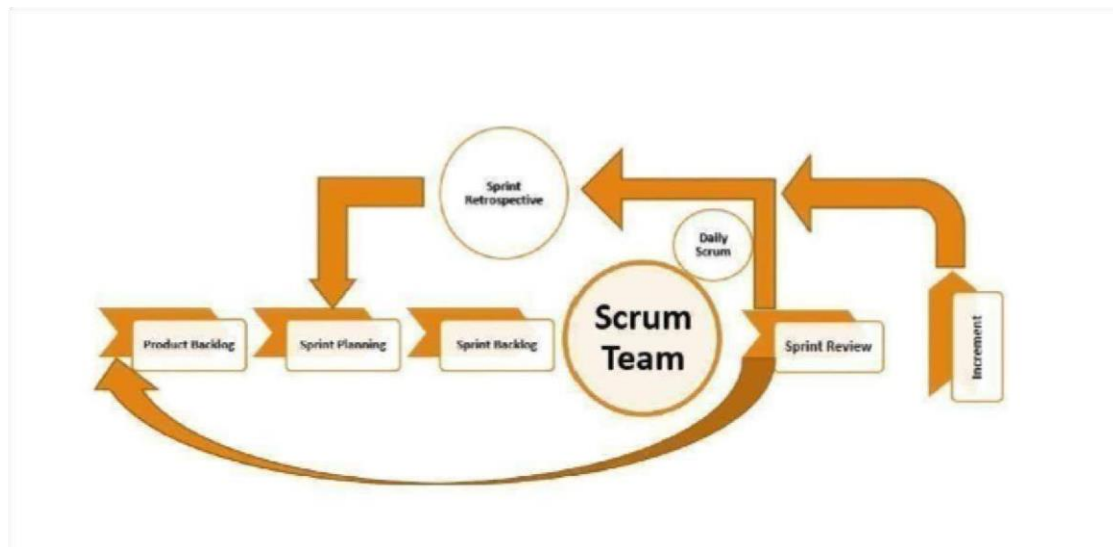


Figure 10. Development model

Scrum is the chosen methodology that the group is utilizing. With the challenge of working in online classes, different free periods, and not seeing each other, scrum is the best methodology for the researchers. With the use of sprints and our group's teamwork during the duration of working on the project, the outcome would exactly be the same if other methodologies were to use. The researchers chose Scrum because we are confident enough that we will be working and helping each other together through communication efforts. But we all know that even though what methodology was chosen, without communication efforts and helping and working together, the outcome will just be a failed project.

### 3.9. Data Gathering

Data gathering is one of the essential parts of research because it provides the needed information that the researchers can analyse and observe the client's problems and hope to provide solutions to the found problems.

The researchers interviewed the client to gather some data and will continue to ask and gather more information about their clinic and the problems they are going through to develop the system. The researchers keep in touch with the client through phone calls and Facebook chats. The researchers used surveys for the patients, including other people, for the data-gathering technique. This helped the researchers collect and analyse the necessary information for the modification of the system.



### 3.10. Software Testing

Software testing is necessary to examine if the system meets all the needed criteria and requirements of the user. This is also to ensure that the system will run without any problems. The software testing will also help identify different system problems, like errors and bugs, and fix those problems and issues.

The researchers used the Alpha and Beta testing to examine the system to ensure that the system would be working as intended. The Alpha testing consists of White box testing, which examines the system's structure to find different issues, and after a series of White box tests, the researchers proceeded to use the Black box testing. Black box testing ensures that the system's functional requirements are achieved. Black box testing aims to fix unwanted issues that were missed out in White box testing. There was a series of tests by the users to ensure that the system was working properly and smoothly. And lastly, the User Acceptance Testing. This is the most crucial test because there will be a series of tests with the client to ensure that the system and its features are ready and working properly before turning it over for the client's business operations.

### 3.11. Sampling Technique

The Convenience Sampling Technique is the method of choice in selecting respondents for this study. Convenience Sampling method is non-probability sampling. This is the easiest sampling technique because the researchers can get a convenient respondent meaning all subjects are invited to participate. With this kind of technique, the researchers can easily finish their data collection in a short period and can identify and formulate a better solution to the problem.

### 3.12. Statistical Treatment

Statistical treatment is significant to utilize the data in the proper form. It is essential to ensure that the data collected can be translated to draw appropriate conclusions based on the survey.

**Weighted Mean Formula shows the formula to compute the weighted mean.**

$$\bar{\sum}_w i = \frac{\sum w_i \sum X_i}{\sum w_i}$$

Where:  $\sum$  = Sample Mean

W = Weight given to the Correspondent

X = Number of Correspondents

**Percentage Formula shows the formula to compute the percentage.**

$$\% = \frac{f}{N} \times 100$$

Where: % = Percent

f = Frequency

N = Number of Cases

**Likert Scale.** The researchers used the Likert Scale survey sample to measure the agreement as it is one of the most reliable ways to measure respondents' agreement with various statements.

Table 1. Likert Scale

Scale	Range	Interpretation
4	3.26 -4.00	Strongly Agree
3	2.51 -3.25	Agree
2	1.76 -2.50	Disagree
1	1.00 -1.75	Strongly Disagree

## 4. RESULTS AND DISCUSSION

### 4.1. Evaluation Results

The researchers conducted a survey for Goldcare Multi-Specialty Clinic (GCMC) with regards to their proposed system through online means via Google forms. The survey consists of three distinct portions: the user side, the doctor side, and the admin side. Within each section are survey questions that pertain to the following criteria: Functionality, Usability, Reliability, Performance, and Supportability. There were thirty-nine respondents in the survey performed by the researchers.

Table 2. Interpretation table for Survey Questionnaire Results

Scale	Range	Interpretation
5	5	Strongly Agree
4	4.00-4.99	Agree
3	3.00-3.99	Neither Agree or Disagree
2	2.00-2.99	Disagree
1	1.00-1.99	Strongly Disagree

The researchers have elected to evaluate the system through a 5-point Likert scale for the respondent's evaluation survey, as seen in Table 1. The scale ranges from 1 to 5, with 1 being the lowest, equivalent to Strongly Disagree, 2 as Disagree, 3 as Neither agree nor disagree, 4 as Agree and 5 as the highest, equivalent to Strongly Agree.

Table 3. Summary of Evaluation

USER SIDE		
	Mean	Verbal Interpretation
Functionality	4.63	Agree
Usability	4.5	Agree
Reliability	4.6	Agree
Performance	4.66	Agree
Supportability	4.58	Agree
DOCTOR SIDE		
	Mean	Verbal Interpretation
Functionality	4.69	Agree
Usability	4.66	Agree
Reliability	4.73	Agree
Performance	4.67	Agree
Supportability	4.64	Agree
ADMIN SIDE		
	Mean	Verbal Interpretation
Functionality	4.69	Agree
Usability	4.66	Agree
Reliability	4.69	Agree
Performance	4.59	Agree
Supportability	4.54	Agree

The Summary of Evaluation for our user experience testing entitled Teleconsultation for Medical Doctors User Experience Survey is shown in Table 3. The above table depicts the weighted average of the choices users picked after giving the system a test run. Through all three sides of the system, users have rated the system averaging a four out of five. The researchers designated five categories for judging each section of the system, Functionality, Usability, Reliability, Performance, and Supportability. Each section was received positively with a verbal interpretation of Agree for each category.

Table 4. Overall Evaluation

	Mean	Verbal Interpretation
Functionality	4.67	Agree
Usability	4.61	Agree
Reliability	4.67	Agree
Performance	4.64	Agree
Supportability	4.59	Agree
	Mean	Verbal Interpretation
Goldcare MultiSpecialty Clinic	4.636	Agree

The Overall Evaluation of the survey for our user experience testing entitled Teleconsultation for Medical Doctors User Experience Survey is shown in Table 2. The system has an overall weighted mean of 4.636, which verbally translates to “Agree.” The users who took the survey have collectively agreed that the system measures up in terms of functionality, usability, reliability, performance, and supportability. Based on the scale the researchers have prepared for the evaluation, the system has passed the overall evaluation and is ready for use by the client.

## 5. CONCLUSION

This chapter summarizes and concludes the expected output in creating a Teleconsultation for Medical Doctors for the client GoldCare Multi-Specialty Clinic (GCMC). Before creating the system, the clinic struggled with handling its customers as their way of receiving appointments and requests was through Facebook, which was largely unreliable due to the inconsistency of Facebook notifications. Besides that, they were also hard-pressed to be available at all times for the patient, as they had tenure at other hospitals and managed the clinic during their off-hours. After thoroughly examining the difficulties the doctors and the clinic were experiencing, the researchers came up with the idea of a teleconsultation and management system for the clinic.

By developing this system, the end goal was to provide efficient and fast service to customers from the doctors and be able to connect remotely to increase convenience for both doctor and patient. This is especially useful in this time of pandemic to reduce contact and maintain a confidential consultation between doctors and patients.

In the past chapter, the researchers devised a way to gauge the system's effectiveness by having users give it a test run. It was seen from the results that the testers have essentially rated the system within the range of 4-5, verbally translating to the “Agree” rating. Therefore, it is concluded that the system is indeed efficient and will be useful to the client. In completing the system, the researchers have fulfilled the objectives the system set out to do.

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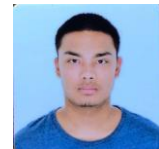
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