**AGAS: A PERSONAL MEDICATION SCHEDULER MOBILE APPLICATION**

A Capstone Project Presented to the Faculty of the

College of Information Technology and Computer Sciences

University of the Cordilleras

In Partial Fulfillment

of the Requirements for the Degree

BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

by

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**APPROVAL SHEET**

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**ABSTRACT**

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7.1 **Rationale/Background of the Study**

In the past two years of the coronavirus COVID-19 pandemic, humanity was able to fully appreciate the saying Health is wealth. The government locked borders, implemented the wearing of face masks and face shields, and advised people to stay six feet apart as health precautions. The pandemic also gave rise to multiple health systems such as mobile contact tracing applications and vaccination databases. The researchers aim to contribute to this knowledge base. Antimicrobial resistance AMR is a problem that plagues world health Antibiotic misuse is one of the leading causes of AMR. It includes forgetting to take the medication at its scheduled time, not finishing the medication, and self-medication Cleaveland Clinic, 2021. Elderly people globally are currently facing an inability to understand the proper medication schedule.

7.2 **Summary**

The main objective of this study is to develop and design AGAS: A personal medication scheduler mobile app. This study aims to achieve the following:

1.to identify the information requirements of the proposed system; A personal medication scheduler;

2.to determine to architecture framework of the proposed system; A personal medication scheduler;

Abstract 4

3.to identify the features of the proposed system; A personal medication scheduler; and

4.to measure the extent of usability of the proposed system; A personal medication scheduler.

The researchers used Rapid Application Development (RAD)to developed a system also, to be enable to produced new knowledge. It allows the researchers to do the process until the usability of the system in short span of time.

7.3 **Findings**

The Finding of the study gathered and interpreted from survey questionnaire, document analysis and data analysis with the help of the conclusions are the following:

1.The researchers found out the requirements to provide on using the application are user information, medicine information, and software requirements to be able to utilize the system.

2.Using 4+1 model view the researchers determined the different scenarios included while using the mobile application called agas.

3.The researchers determined the needs of the end-user to use the agas mobile application and were able to develop features such as; pill view, alarm, image upload, chart, and it allows the users to customize based on their preference.

4.The SUS score of 69.39 is determined as a good status for user and it passed the usability testing of the system. As determined by the computation of SUS final score user able to use mobile application agas with trust.

7.4. **Conclusions**

The following conclusion comes from the finding of the objectives of the research study.

1.The researchers identified having a system that compiles different information of medicines, users themselves, and system can help to give accurate information to the end-user.

2.Using a flexible framework that enables us to look into different points of view can result in a reliable and useful mobile application. Efficiency of the application will increase through the help of a framework.

Abstract 5

3.The researchers developed features that allow the user to provide the needed medicine preferences such as the alarm, image, medicine description, and repetition of intake that relies on the user’s control.

4.The final SUS score of 69.39 is seen as good. According to the poll results, consumers believe that AGAS is a useful tool for managing daily medication usage. The user interface is not overly sophisticated and easy to use due to the smooth integration of all the different duties. The system's design was also consistent. Additionally, the system requires less support and supervision. Therefore, users were able to utilize the mobile application with trust very quickly.

7.5 **Recommendations**

The following recommendations derive from the conclusions and finding of the research study Agas: A Personal Medication Scheduler to help future researchers with similar study.

1.The researchers must have to understand the information provided by the both user and the system’s requirements.

2.The system architecture framework must be implemented to handle different circumstances occur to both users and the developers.

3.To elevate the abilities of the system efficiency. Researchers must develop more on customization based on the user’s preferences.

4.To test the usability of the system researchers must extend the gathering of information of the end-users. Use survey to extend data gathering for usability of the system.

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**A.M.D.J**

**M.C.C.L**

**J.P.V**

**DEDICATION**

The researchers would like to Give their greatest gratitude to their families, May this be a symbol of their hard work For letting their children enroll Amidst the troubling times To their friends and classmates, May this be a product of their support Helping the researchers to Gain courage through-out the whole Process in making this Capstone study. To aspiring mobile application developers, may this be a guide for them to continue Their dreams and aspirations and most of all, To Lord God Almighty, Glory to you Forever and ever.

**Alexander**

**Maricon**

**Jeremiah**

**TABLE OF CONTENTS**

Page

TITLE PAGE . . . . . . . . 1

APPROVAL SHEET . . . . . . . 2

ABSTRACT . . . . . . . . . 3

ACKNOWLEDGEMENT . . . . . . . 6

DEDICATION . . . . . . . . 8

TABLE OF CONTENTS . . . . . . . 9

LIST OF FIGURES . . . . . . . . 11

LIST OF TABLES . . . . . . . . 12

CHAPTER

1. INTRODUCTION

Background of the Study . . . . 13

Importance of the Study . . . . 46

Objectives of the Study . . . . 47

Definition of Terms . . . . 48

1. METHODOLOGY

Software Development Methodology . . 50

Scope and Delimitation . . . . 55

Data Gathering Techniques . . . 56

Sources of Data . . . . . 57

Software Development Tools . . . 58

1. FINDINGS OF THE STUDY

Table of Contents 10

Information Requirements of the System . 60

Architecture Framework of the System . 61

Features of the System . . . . 67

Extent of Usabilityof the System **. .** 76

1. CONCLUSIONS AND RECOMMENDATIONS

Conclusions . . . . . . 81

Recommendations . . . . . 83

REFERENCES . . . . . . . . 84

APPENDICES

A Communication Letter . . . . 97

B Invitation Letter . . . . . 98

C DOST Thesis . . . . . . . 99

D Questionnaire . . . . . . 100

E Acceptance Letter . . . . . 104

F Survey Sample . . . . . . 105

G Tabular Form of the Test Result . . 107

H Interview Transcript . . . . . 108

I User Manual . . . . . . 111

J Important Codes . . . . . 124

K SUS Computation . . . . . 126

L Documentation . . . . . . 127

CURRICULUM VITAE . . . . . . . 128

**LIST OF FIGURES**

Figure No. Figure Title Page

1 Rapid Application Development . . . 50

2 4+1 View Model . . . . . . 63

3 Class Diagram . . . . . . 63

4 Package Diagram . . . . . 64

5 Deployment Diagram . . . . . 65

6 Sequence Diagram . . . . . 66

7 Use Case Diagram . . . . . 67

8 Pills View . . . . . . 68

9 Alarm View . . . . . . 69

10 Add Task . . . . . . . 70

11 Repetition . . . . . . 71

12 Settings . . . . . . . 72

13 Image Upload . . . . . . 73

14 History View . . . . . . 74

15 Chart View . . . . . . 75

**LIST OF TABLES**

Table No. Table Title Page

1 SUS Template Questionnaire . . . 77

2 Frequency Count Table . . . . 79

3 SUS Interpretation . . . . . 80

Chapter 1

**INTRODUCTION**

**Background of the Study**

In the past two years of the coronavirus (COVID-19) pandemic, humanity was able to fully appreciate the saying “Health is wealth”. The government locked borders, implemented the wearing of face masks and face shields, and advised people to stay six feet apart as health precautions. The pandemic also gave rise to multiple health systems such as mobile contact tracing applications and vaccination databases. In this paper, the researchers aim to contribute to this knowledge base.

Antimicrobial resistance (AMR) is a problem that plagues world health (Murray et al., 2022). It occurs when germs like bacteria and fungi develop the ability to defeat the drugs designed to kill them. Hence, the germs are not killed and continue to grow (Centers for Disease Control and Prevention, 2022). Furthermore, AMR is cited to have effects on deaths, incidence, hospital length of stay, and healthcare costs.

Antibiotic misuse is one of the leading causes of AMR. It includes forgetting to take the medication at its scheduled time, not finishing the medication, and self-medication (Cleaveland Clinic, 2021).

Introduction 14

Elderly people globally are currently facing an inability to understand the proper medication schedule. Especially during this period of the COVID-19 pandemic when caretakers and medical assistants minimized contact with their clients. Also, the number of healthcare providers has decreased due to the risks of the pandemic. As a result of this situation, medication for the patients who are taking is not well-monitored.

According to LeBrun (2018), about two-thirds of Americans have a prescription medication, approximately 50% of people do not take their medications as prescribed. This is a phenomenon known as “medication non-adherence” (MNA), or “America’s other drug problem,” and it is the cause of a huge amount of unnecessary physical and emotional suffering, financial loss, and premature deaths that cost too many people precious time that they could have with their loved ones. Another term for medication non-adherence could be “the silent killer” because of the number of people it impacts with almost zero awareness.

Barriers to medication adherence are complex and varied, solutions have been developed from different studies. Including medicine scheduling applications with the help of the Internet of Things (IoT), different medicine applications existed to reduce the problems of unmonitored intakes of medicines.

Introduction 15

LoT is a technology that allows for online access to real-world things. It has several uses in the healthcare system and offers both patients and medical professionals answers. By enabling real-time monitoring of patient health, during which sensors gather data, it increases the efficiency of medical equipment. In order to remind patients who fail to take their medications on time, a system called MED-IoT (Medicine Confirmation System using Internet of Things) is proposed. The user of the MED-loT system must enter the prescription information via the website before the system can evaluate the weight of the medications before to consumption and then compute the weight of the medications once the patient has ingested the prescribed amount. The user is informed when the weight of the medication changes via an inbuilt buzzer mechanism and a 16-bit LCD display. The component known as the Load cell calculates this adjustment to the weight mechanism. When the weight of the medicine changes, the system will SMS the user to notify them (Thakkar et al., 2018).

Medicine scheduling is a process where a diagnosed or sick person is guided to take medicine on time to recover as fast as they can. It is a way to impose proper time management. This would help 6 lessen the risks and side effects of medicine misuse through the help of a mobile application that notifies the user to take his/her medication (Deleeuw, 2022).

Introduction 16

Today, medication non-adherence leads to 125,000 preventable deaths each year. Most people do not realize the risks of dying from medication non-adherence are about 10 times greater than dying from homicide, or about 30 times greater for those who are over the age of 50 and above (LeBrun, 2018).

In the earliest days, according to Arigo, et al (2019), behavioral medicine leveraged technology to increase the effectiveness of its interventions. The development of more robust partnerships between academic industries is the key to the future of digital health.

With the help of innovative medicine scheduling applications, the problem of antimicrobial resistance and chronic illnesses will lessen the risk of users suffering other illnesses.

Safi and Gerhard (2019) stated that the "acceptance and sustainability of technologies plays a considerable role for innovative health care apps". The widespread adoption of medical digital apps calls for governance and can enhance individualized healthcare solutions. Time management also is more important to improve the health of an individual.

Introduction 17

The study of Orcioni, et al. (2021) in medical adherence supported by mHealth and NFC suggested that patients be assisted in completing their therapies by using contemporary ICT tools like smartphones, NFCs, the internet, and web technologies. The implemented system offers a calendar that serves as a reminder of the presumptions, ensures that drugs are identified through NFC, and enables family members and medical personnel to check and manage therapy remotely in real-time. Additionally, the system offers centralized data on the patient's therapeutic situation, which is useful when selecting new, complementary therapies.

The health care industry has recently shown growing interest in digital technologies such as electronic health, mobile health, telemedicine, big data, and health apps. The adoption and viability of these technologies are crucial for creative health care apps. A study conducted by Safi, et al (2019) was able to chart the adoption of and experience with new digital technologies in Germany's medical industry.

Introduction 18

The field of health care technology and innovation has tremendous potential and is expanding rapidly. Institutions are increasingly turning to hackathons to come up with new ideas and inspire innovation. Medical systems can be changed and improved as a result of these events. However, for the careful development, implementation, and evaluation of any technological intervention, the ongoing participation of health care providers and researchers, in addition to developers and business-savvy entrepreneurs, is essential (Walker & Ko, 2016).

Hospitals, doctors' surgical centers, electronic health (eHealth) centers, and other related institutions' acceptance of new medical technologies and resistance to them are the subject of this study. Safi et al (2018) proposed a novel approach for determining the factors that influence patient and medical staff acceptance of and opposition to new technologies.

Both developed and developing nations are experiencing a rapid rise in the use of mobile phones in the medical field. The purpose of the study of Fadaizadeh et al (2022) was to compare and contrast the performance of the best mobile applications in terms of user satisfaction and medical content in Iran.

Introduction 19

Technology-enabled innovative approaches to healthcare delivery are expanding rapidly. Nationally, emergency department visits have continued to rise despite the Affordable Care Act's passage. Healthcare systems must come up with ways to handle these growing numbers while also providing high-quality care. New York Presbyterian Hospital has implemented a comprehensive enterprise-wide digital health portfolio in response to the shifting healthcare landscape. This portfolio includes the first mobile stroke treatment unit on the east coast and the first digital emergency care program in New York City's emergency department (Sharma, 2017).

One of the most contagious diseases of recent decades is SARS-CoV-2, the new coronavirus that causes COVID-19. The only thing that sets COVID-19 apart is the fact that everyone is getting it for the first time during this pandemic. In just a few months, the world has gone from being completely unaware to being overwhelmed by information. Understanding the virus's capacity for growth and transmission is the most pressing issue facing researchers. People are spending more time than ever before living and working in the digital environment as the world fights the global pandemic. This is driving the adoption of Artificial Intelligence (AI) to an unprecedented level, especially given that AI has already been shown to play a significant role in fighting COVID-19. Clinical research, precision medicine, biomedical discovery, and medical diagnostics are all becoming increasingly dependent on AI and data science. Due to their fundamental basis and connection to cognition, machine learning (ML) and its subsets, such as deep learning, are also referred to as cognitive computing (Dabla, 2021).

Introduction 20

Mycobacterium leprae is the bacterium that causes leprosy, which is also known as Hansen's disease (HD) or Morbius Hansen's disease (MHD). Rarely are the signs of leprosy identified. In point of fact, some symptoms can only be recognized after 20 to 30 years. Long-term health outcomes for leprosy patients have significantly improved since the introduction of multidrug therapy (MDT) and anti-inflammatory treatments. The medication, on the other hand, took a long time. Discipline in taking leprosy medication is necessary for managing leprosy in a healthy way. On the other hand, poor treatment management will result in disability and deformity that last a lifetime. Programmers have created a number of applications that are based on Android. It is anticipated that smartphone technology developed by Irawan et al (2022) will facilitate medication monitoring and reminders for patients.

Introduction 21

On another hand, Sahdney, R. (2016) studies the Smart OPD Framework, a new era in the digital healthcare initiative of Sir Ganga Ram Hospital. Sir Ganga Ram Hospital launched a Multi-Purpose Digital Health Card to provide patients with easy access to health care during July 2015. This initiative also complemented “Digital India” initiative by our Honorable Prime Minister of India. Dream for SGRH was to ensure that fast and secured access to vital health information, laboratory results, queue management, access to the appointment scheduling of the consultants and various clinical services, patient dashboard at the consulting room and other cost benefits to the patients are the key features in the interest of the improved patient care. Smart OPD Framework of SGRH is first of its Kind in India where hospital puts in a framework so that technology innovations may be quickly adopted and accommodated without much of change management problem challenges.

Introduction 22

Another study by Dunsmur et al. (2019) developed Postoperative Pain Management Mobile App (Panda) for children at home after hospital discharge. Parents or guardians are responsible for managing postoperative pain due to the focus on outpatient pediatric surgical procedures. Panda is a smartphone software that lets parents monitor their child's discomfort and medicine use while also sending out reminders for planned doses. The study's goal was to assess and improve Panda's usability and viability for usage at home based on parents' happiness and alert response adherence (reaction to any medicine notice within an hour).

Sun et al. (2018) tested the in-hospital usability and feasibility evaluation of Panda, an app for the management of pain in children at home. Children's postoperative pain is frequently neglected at home, resulting in sluggish functional recovery, inadequate oral intake, sleep disruptions, and behavioral changes. Panda is an app for smartphones that helps parents evaluate their child's pain and manage medications. Before testing the Panda app at home, the purpose of this study was to assess the app's usability and feasibility in a hospital setting.

Introduction 23

Enabling personalised medical support for chronic disease management through a hybrid robot-cloud approach was promoted by Fiororini et al (2016). Personal robots and information and communication technology may be essential for effectively managing chronic diseases and avoiding over-the-counter medications. They could provide seniors with reminders to help them live independently and improve their quality of life, especially if they have multiple chronic diseases (multimorbidity). In this context, this article proposes a hybrid robot-cloud service model for individualized medical support that is capable of providing adequate healthcare services. The technical viability and user acceptability of this service were evaluated through quantitative and qualitative testing. In the DomoCasa Lab (Italy), the service was tested on 23 older people between the ages of 65 and 86. The usability and acceptability of the proposed hybrid cloud solution were positively evaluated in this study, confirming that these innovative technologies can be utilized for active and healthy aging.

The routine of taking pills for medicines or health supplements has become commonplace in society. People frequently forget when to take their medications and when they should take them due to the frantic pace of daily life. The proposed system, Ibox: Smart Medicine Box with IoT application, of Nadzri et al (2020) is designed to assist such users in taking the essential medicine in the right proportion at the right time with the assistance of smart devices as medicine dispensers and their applications. An original and secure medicine product prototype is presented in this paper. In the meantime, the proposed Internet of Things application safeguards the privacy of user data while it is in transit and lets users keep track of the relevant statistics that will be connected to the Internet. It includes a NodeMCU for buzzer and notification-based medication reminders and is connected to the Blynk software for data logger storage and reminder setting.

Introduction 24

The thesis of Franzi (2016) aims to provide a low-cost, efficient, and simple-to-use embedded electronic device that can both communicate the monitored situation to family members, caregivers, or doctors and check to see if medication intake is carried out in accordance with the doctor's instructions. The prototype can be programmed into an existing wi-fi infrastructure network and built using RFID technology to locate the medical packaging in the appropriate box.

Introduction 25

Regardless of age, more and more people are having health issues as a result of their stressful lifestyles and attempts to keep up with the rapid pace of the world. As a result, the healthcare system has become a necessary component of every household. Getting effective and quick medical care becomes a need; consequently, a parallel effective and quick technique known as digital medicine must be adopted in addition to the general approach. It is a strategy that hospitals can use to give quick access to the healthcare services they offer. These include online video conferencing, emergency alerts for life-threatening illnesses or accidents, the uploading of medical reports with security measures required during consultations, online prescriptions, appointment scheduling, information about the closest hospitals and doctors, and life reminder systems to remind people to take their medications. Hence, Chandran et al. (2019) developed Digital Medicine, an android based application for health care system. Its goal is to make it easier for patients and doctors to communicate quickly and effectively by making their locations or distances known while using the program. The proposed application runs on Android-based mobile devices that connect to a server run by hospitals and communicates over the GSM and GPS networks.

Introduction 26

Lee et al. (2018) led the development and evaluation of culturally and linguistically tailored mobile app to promote breast cancer screening. Despite a significant breast cancer burden for Korean-American immigrant women, their cancer screening behavior is surprisingly poor and there are few interventions focused on this population. To promote breast cancer screening behavior among Korean-American immigrant women, a mobile multimedia messaging intervention (mMammogram) was developed. The study explores the impact of mMammograms on changes in the screening behavior of study participants and offers suggestions on how to improve the intervention for widespread dissemination and implementation in the community.

For the elderly population SMADE: Smart Medical Assist Device for Elders was developed by Samhitha et al. (2022). This study describes the design and operation of a sophisticated medical aid for the elderly. The Internet of Things (IoT) is gaining popularity due to its applications in numerous industries. The inability of the elderly population to comprehend the recommended medication schedule is a current problem. The pandemic made things more difficult than usual. Even the caregivers and medical assistants tend not to go outside to meet their patients, especially during this time. We researched no contact medical assistance and made that our primary goal, along with plans to give them appropriate medical intake scheduling and the benefit of tracking medication dosage. When manually entered, the research paper will handle the medication schedule from any location. It provides pharmacy and physician information so they can fully assess the status of medications for the elderly. The gadget measures how much medication is left and alerts when necessary.

Introduction 27

In general, online health communities give patients and their families a place to learn about illnesses, ask for and offer support, and connect with others going through similar experiences. In order to support and grow the online health communities, an architecture and implementation of an automatic medication dispenser was proposed by Suganya et al. (2019). With the help of this solution, doctors in the online medical community can recommend medications based on the health conditions of their patients as reported by those patients online. When the doctor and patient begin communicating, each user is protected by a special barcode. The medication can then be delivered using the nearby automatic pill dispenser after the barcode has been scanned. Storage as a Service is supported by the cloud.

Introduction 28

Corden et al. (2016) presented a mobile intervention to improve medication adherence and processes of care for treatment of depression in general medicine. Up to 20% of adults will experience major depressive disorder at some point in their lifetime. Most patients who are treated for depression take antidepressants prescribed by their primary care physician. Low rates of recovery are frequently the result of this. Patients who don't take their medications as prescribed, doctors who don't adjust dosages, and a lack of communication between patients and doctors are all examples of failure points in the care process that contribute to poor outcomes. During the first eight weeks of starting a new course of antidepressant therapy, this pilot study evaluated the viability of a systemic digital intervention (MedLink) intended to address failure points and improve treatment of depression in primary care among patients.

Design suggestions for an mHealth app to facilitate communication between pharmacists and the deaf community were developed by Jacob et al., 2021. Patients who are deaf or hard of hearing (DHH) often find it difficult to communicate with local pharmacists and use the healthcare system. In order to close the communication gap between community pharmacists and DHH patients, this study examined opinions on a proposed mobile health (mHealth) app's design and functionalities.

Introduction 29

Furthermore Gutierrez et al (2022) presented a systematic review of telehealth applications in hospital medicine. Even though telemedicine is widely used, acute inpatient services have taken longer to catch on. The COVID-19 epidemic, hospitalist shortages in remote and critical access hospitals, and growing interest in telehealth for acute inpatient services have all contributed to this. Promoting adoption and creating evidence-based strategies require a thorough understanding of the available research.

Humans make an effort to always maintain the health and fitness of their loved ones. What if they neglect to take their medication and end up getting sick as a result? As a result, the medical facility sees a lot of patients who need medication, making it challenging for us to remind each patient to take their medication at a certain time. The patient must be reminded to take their medication frequently using the traditional method. However, in this digital age, humans use machines to perform some tasks. Pill leftovers can be used in a variety of settings, including by patients at home, medical professionals in hospitals, and others. The paper of Mandakar, et al. (2021) demonstrates the operation of an advance pill remainder setup that can eliminate asymmetry in medication dosages and prompt patients to take their medications at the appointed time and in the prescribed quantity. With this method, users move from manual supervision to automated memory.

Introduction 30

There is a lack of research on the effectiveness of smartphone apps for increasing medication adherence in Asian populations with type 2 diabetes. Hence, Huang et al (2019) conducted a study to ascertain whether or not a multiethnic Asian population with type 2 diabetes could benefit from using a smartphone app to increase medication adherence and the clinical effects of doing so.

Hospitalization risk and healthcare costs are both influenced by medication adherence. Failure to take prescribed medications is a complicated and widespread issue in Malaysia. There are numerous reasons why patients do not take their medications as directed. Common problems include forgetting to take their medication on time, doubts about the effectiveness of the medication, concerns about side effects, difficulty taking the medication (especially with injections or inhalers), and the rising cost of prescribed medications. One of the many benefits of keeping track of a patient's medication intake is a reduction in medication costs and, consequently, insurance premiums. An application that uses a smart phone and a QR code to track medication is developed Nor et al (2016). A proof of work is required for each medication transaction to verify that the user took their medication on time. Each scan is regarded as proof of work because it is taken with a QR-Code reader and printed on medication labels. Our contribution is the development of a mobile app that can track medication intake and remind, educate, and warn users about their medications.

Introduction 31

In today's healthcare, medication administration outside of a patient's home has been identified as the most error-prone procedure. Medication errors have become the most common type of medical error because of erratic in-takes, drug-drug or drug-food interactions caused by unreconciled prescriptions, and the absence of in-take enforcement and monitoring mechanisms. The majority of medication administration errors occurred when patients used multiple prescription and over-the-counter medications at home with little or no instruction. Patients who are older or have been sick for a long time are more likely to make these errors. Wedjat, a smartphone application designed by Liu et al (2019) to assist patients in avoiding these errors, is presented in this paper. Wedjat can help its users remember to take their medications on time and keep track of their intake schedules so that healthcare professionals can review them later.

Introduction 32

A mobile application for medicine reminder of Bhanuse et al (2021) is a complete Android application with an automated notification device. It focuses on interactions between patients and medical professionals. Patients no longer want to forget their dose because they will be reminded to take it as prescribed by their doctor. Multiple medications and times can have notifications set up, including the date, time, and description of the medication. A notification will most likely be sent to the patient's preferred device via email or text message. They may be identified in relation to the patient's illness. Numerous clinical reminders have been developed that necessitate new hardware; however, our research has attempted to develop a device that is cost-effective, time-saving, and capable of assisting medication.

Introduction 33

A growing number of drugs are being developed to treat a variety of fatal diseases thanks to the most recent research in medicine and the pharmaceutical sciences. This has made it possible for people to live longer and healthier lives. As a result, more people are taking their medications, especially the elderly. It is very important to take the medications that doctors tell you to take at the right times of day and in the right amounts. Older people with disabilities appear to encounter this as a significant issue. Many older patients do not take their medications in the right amounts or at the right times because of forgetfulness or other issues. This reduces the benefits of treatments and raises mortality rates and healthcare costs. A mobile phone and cloud-based smart application have been developed to improve patient adherence, particularly for older people with disabilities, in order to find a solution to this issue. The application's novel feature is its use of a Cloud service to facilitate two-way feedback between older patients with disabilities and their doctors, allowing for the monitoring of medication adherence. The developed mobile phone-based medication reminder application of Mohammed et al (2018) for older people with disabilities should serve as a useful example for mobile application developers, and it should assist them in developing additional mobile applications for older people with disabilities.

Introduction 34

Improve medication adherence with the help of mobile applications. Pharmacists ought to be aware of the features that patients currently have access to as developers continue to enhance the capabilities of existing mobile applications. There aren't many studies out there that talk about which applications have the best features. The purpose of this study was to compare and select the best mobile application features for boosting medication adherence. We found 30 applications that did not meet any exclusion criteria and were written in English, related to medication, and last updated in 2014. RxNetwork, Mango Health, MyMeds, C3HealthLink, and HuCare are the top five applications discussed in detail (Haase, 2017).

Adults with chronic diseases frequently fail to take their medications as prescribed, which has negative consequences. Adherence-improving traditional interventions are complicated and rarely successful. Supporting medication adherence with mobile applications may be scalable (Peng, 2019).

Introduction 35

There are a growing number of apps for mobile phones that can help people take their medications more effectively and increase medication adherence (Santo et al, 2016). However, little is known about the features, quality, and effectiveness of these apps' differences. We were able to identify high-quality apps using the MARS instrument that were rated as having a high level of visual appeal and high-quality information, as well as being rated as being very interesting and entertaining, highly interactive and customizable, intuitive, and easy to use and navigate. The app stores have a lot of medication reminder apps; However, the majority of them were regarded as of low quality because they lacked numerous desirable characteristics. We were able to identify high-quality apps to be tested in a subsequent study that will provide evidence on the use of medication reminder apps to improve medication adherence through a methodical step-by-step process.

Applications for mobile health are used for a variety of purposes. Mobile application can be used by healthcare professionals and other users for specific tasks like diagnosis, information, prevention, treatment, and communication. An analysis of mobile health applications used by healthcare professionals and patients is presented by Pires (2020). This article's secondary objective is to determine whether these mobile health applications' results have a solid scientific foundation and whether they have been scientifically validated. Additionally, this study looked at the use of mobile health applications found in online application stores and references in the literature. In general, a significant portion of these applications for mobile health provide data regarding scientific validation. On the other hand, not all mobile health applications are validated. As a result, the main contribution of this paper is to provide a comprehensive analysis of the difficulties associated with the scientific validation of mobile health applications in terms of usability and user-perceived quality.

Introduction 36

The use of mobile health (mHealth) technology has made it easier for patients to receive care outside of hospitals and into their own homes. However, the legal ramifications of the proliferation of mHealth applications, or "apps," have been the subject of few studies. Policies pertaining to medical licensure, privacy and security, and malpractice liability all have an impact on these apps. For instance, the Health Insurance Portability and Accountability Act (HIPAA) of 1996 may only apply to certain applications. In a similar vein, the extent of a doctor's liability for malpractice if they cause harm to a patient as a result of inaccurate information provided by the patient's self-monitoring health app is unclear. The current federal regulations, legal issues surrounding health app oversight, and suggestions for enhancing app oversight are all discussed on a study by Yang and Silverman (2018).

Introduction 37

App security is a growing concern for public health. According to the evidence, users of apps face clinical risks. Quality can be improved by involving consumers, regulators, and healthcare professionals in development and testing. To improve outcomes, mandatory safety concerns reporting requirements were suggested by Akbar, et al (2019).

A wide range of measured outcomes suggest that mHealth applications aid in weight management. In most studies, there is enough agreement that mHealth apps are popular with patients and work to help them lose weight by changing how they eat and how much they exercise. An analysis of social validity indicators reveals a pattern in which greater use of mHealth applications is linked to better treatment adherence and, as a result, weight loss. Additionally, the study of Dounavi and Tsoumani (2019) emphasizes the need for additional empirical evidence regarding the function of social validity as a mechanism underlying the influence of mHealth app use on weight management practices. Weight maintenance and the generalizability of results to a larger population should be the primary focuses of subsequent research. Using Cochrane criteria, the current systematic review has highlighted the poor research quality of previous studies. In order to guarantee methodological rigor, evidence-based medicine standards should be adhered to.

Introduction 38

Medical applications (apps) have emerged as a result of technological progress. The contents of 44 travel medicine-related apps were evaluated, revealing that many were rarely updated and that several developers had no medical background. Travel medicine presents a chance for healthcare professionals to create apps (Seed et al., 2016).

Abstracts from 8116 studies were found in the search, and 102 studies were included in the systematic review. The remaining two-thirds of the studies assessed the app's functionality or participant interaction with the app, while approximately one-third of the studies evaluated apps as interventions. When used as self-management systems, measurement tools, or exercise or gait training interventions, some apps may have positive effects (Nussbaum, 2019).

Introduction 39

The timely and cost-effective execution of industrial production processes requires effective production management. The application of artificial intelligence technologies to production planning and scheduling has garnered more attention in recent years. However, scheduling research has typically been theoretical, focused on a narrow set of issues, and has not addressed how to adapt to unexpected circumstances. Algorithm reuse and the incorporation of knowledge-based technology into the organizational environment are encouraged by this framework. Additionally, it enables dynamic adaptation. It has been used by the authors to implement scheduling systems for the production of dye, pipeline fittings, and heart surgery (Sauer & Bruns, 2016).

In modern societies, a large population of elderly people has emerged as the average age of the population has increased recently. The widespread adoption of digital assistance systems, as well as the growing advancements in the fields of science, research, medicine, and technology, are all contributing factors to this phenomenon. In fact, more than half of people will be over 60 in 2040, according to some studies. Additionally, elders need assistance with daily tasks like housekeeping and medication adherence, as the prevalence of cognitive diseases of all degrees increases with age. The proposed system of Casciaro et al (2020) is a smart pill dispenser with a mobile app that can help elderly people and people who don't have a formal caregiver every day. A specific event, such as a medication shortage or nonadherence, is immediately communicated to the appropriate user. The objective is to guarantee the patient's adherence and the unofficial caregiver's ongoing monitoring. A proof-of-concept validation of the system and a description of the physical prototype are also included, in addition to a description of the proposed system architecture.

Introduction 40

The primary objective of the project of Bhati et al (2017) is to create a smart medicine box for patients and caregivers whose lengthy medication prescriptions make it difficult to remember. Additionally, elderly patients struggle to remember to take their medications on time, which can have a negative impact on their health and put them at risk for chronic conditions like diabetes, high blood pressure, difficulty breathing, heart problems, and cancer, among others. Based on these two issues, we developed a smart medicine box that addresses these issues by establishing a timetable for prescribed medications using pushbuttons in accordance with prescriptions. We witnessed these issues in hospitals and among people in our immediate environment who suffer from diseases of this kind.

Introduction 41

The demand for information technology in medicine and the need for higher-quality medical services both rise with population growth. The acute issues that plague modern healthcare are addressed in a variety of ways through the Smart Healthcare concept. Digital twins, the Internet of Things, and mobile medicine are among the technologies and approaches examined in this paper, as are the main issues in contemporary healthcare. In addition, Volkov et al (2021) will investigate the most important characteristics of the most recent platforms that are capable of supporting Mobile Health Applications. Last but not least, on the basis of our investigation, we will suggest the Smart Healthcare Platform concept, which is centered on resolving issues related to supporting the development of Mobile Health Applications, such as organizing user data access, management, and sharing.

Introduction 42

Only a small number of BCTs have been used in medication adherence apps, according to content evaluation. Based on perceived quality and usability, distinct user preferences emerged among apps with comparable content. To include more evidence-based BCTs in apps, psychologists and health technologists need to work together more. In addition, the findings of Carmody et al (2018) point to the necessity for app developers to take into account and incorporate the preferences of younger end users in order to enhance app engagement and quality for pediatric populations.

A mobile app to track mental health symptoms after trauma would likely be well received by victims, according to the study findings of Price (2016). In order to improve the software's usability, it was determined that personalized feedback to the user was essential. A system for tracking post-traumatic mental health symptoms was the subject of the current study's usability evaluation. The system was designed to be simple to use and to make it easier to send data quickly.

The review of Masterson Creber et al (2016) suggests that few apps meet predetermined quality, content, or functionality criteria. This demonstrates the need for additional refinement and mapping to evidence-based guidelines, as well as the potential for overall quality improvement in apps related to self-care and monitoring heart failure symptoms. The review’s objective of commercially available apps was to identify and evaluate the features of patient-facing mobile health apps that support self-care management and monitoring of heart failure symptoms.

Introduction 43

Older adults may be motivated to achieve health-related objectives by self-monitoring. The objective of the study by Steinert et al (2016) was to determine the advantages of older adults using a smartphone application for self-monitoring. Thirty senior citizens set their own health-related objectives. Participants were constantly reminded of their goals for four weeks. The subjective benefits were rated differently for different kinds of individual goals. The subjective advantages of a few features were significant. Only a small percentage of seniors use mobile self-monitoring applications at the moment. The user experience and barriers to this usage must be taken into account.

Introduction 44

Despite the fact that interventions varied greatly in design, content, and delivery, apps tended to improve medication adherence. The level of usability of apps asessed by Al-arkee et al (2021) is satisfactory; However, the app's usability and effectiveness characteristics are unclear. The identification of the essential active components of successful apps should be the primary focus of future large-scale studies. In addition, the study looks at how well apps work and how well health care professionals use them.

Older people tend to be less receptive to digital devices, despite their potential to prevent social isolation and loneliness, provide access to health care, and provide other benefits. Complex interfaces and perceived usefulness are frequently cited by elderly individuals as reasons why they do not utilize health-related ICT. There is a paucity of information regarding the preferences and interests of this particular population regarding tailored and customized technology; however, according to the existing body of literature; Both older users and caregivers believe that interactive and accessible design is the primary goal (Dos Santos, 2016).

Introduction 45

According to Debona et al (2019), with straightforward notifications and messages that encourage treatment adherence, technology can make health care easier. With the help of applications, life can dramatically change. If more applications emphasize prevention rather than just treatment, the benefits may be even greater.

In the healthcare industry, medication abuse among the elderly has become a major problem. People who have been given multiple medications at once and for an extended period of time are more likely to forget to take them on time or to take the wrong medicine at the same time. As a result, in order to assist them in taking the right medication at the right time, we suggest a pill dispenser with an alarm system. The medication dose is controlled by an infrared sensor and an Arduino microcontroller. The user's smart phone receives a pop-up notification when the alarm system is activated (Othman & Ek, 2016).

Caregiver-friendly stress-relieving techniques, just-in-time information, and resources can all be found in mobile apps. While many apps have features that have been shown to reduce caregiver burden and improve health outcomes, few offer emotional support. Mobile apps for caregivers can perform a variety of useful support functions by employing an evidence-based practice approach. In their mobile form, apps can serve a much larger portion of this extremely underserved population, enhancing their health and quality of life (Grossman et al., 2018).

Introduction 46

**Importance of the Study**

The primary beneficiary of this study are the patients who will personally use the system. The personal medication scheduler mobile application is the answer for better monitoring on intaking over-the-counter drugs. The result of the study will benefit the following:

To the patient. This shall help them in monitoring their in-take of over-the-counter and prescription drugs given by their healthcare providers.

To the healthcare provider. It shall provide a reliable tool to monitor the intake of over-the-counter and prescription drugs given to their patients, and to monitor the side effects of the given medicine.

To the medical institution. This study helps to give a concrete background of the patient’s health status. It will also provide an overview of the patient’s medical background, particularly drug intake.

To the researchers. This system and study shall broaden the knowledge of the researchers regarding mobile personal medication scheduler systems.

Introduction 47

To the future researchers. This study shall provide the insights on a personal medication scheduler using mobile application that they could use for the further development of similar systems for future researches.

**Objectives of the Study**

The main objective of this study is to develop and design a medicine scheduling application called Agas which aims to help facilitate intake of medicine. This app would notify the user about the intake schedule of the prescribed medicine. The study specifically aims to fulfill the following:

1. to identify the information requirements of the proposed system; A personal medication scheduler;

2. to determine to architecture framework of the proposed system; A personal medication scheduler;

3. to identify the features of the proposed system; A personal medication scheduler; and

4. to measure the extent of usability of the proposed system; A personal medication scheduler.

**Definition of Terms**

Introduction 48

Throughout this section the terms being used in the research will be emphasized and gives an accurate definition of the words and phrases that have been used.

Agas. Agas is a word comes from the Ilokano dialect which means medicine.

Antibiotic misuse. Antibiotic misuse is the event of patients taking medicine because of their own decisions to take medicine without prescription.

Antimicrobial resistance (AMR). Antimicrobial Resistance (AMR) a natural phenomenon that happens when bacteria are exposed to antibiotic medications where the bacteria resist the effects of antibiotics.

Architectural Framework. Architectural Framework is a framework that provides the information of the system including the ways to use the system.

Drug. A drug is a medical substance that has a physiological effect when ingested or introduced to the human body.

Medication non-adherence. Medication non-adherence is the event where patients are not taking the prescribed medicine properly.

Over-the-counter drugs. Over-the-counter drugs are the medicines that can be bought in the pharmacy without drug prescription.

Introduction 49

Prescription. A prescription is an order for medicine which a health care provider writes and is presented to a pharmacist who ensure the preparation and administration of the medicine.

Scheduler. A scheduler is a system that organizes and maintains timeliness.

Chapter 2

**METHODOLOGY**

This chapter presents the procedures on how this study obtained the data from various sources.

**Software Development Methodology**

The software development methodology represents a framework that is utilized to structure, plan, and manage the development process of a project (Sharma, 2020).

Figure 1.

Rapid Application Development (RAD)

Diagram

Description automatically generated

Requirements Planning. At this stage, the researchers, the research partner or application users, and the research panel communicated to determine the goals and expectations for the project as well as current and potential issues that would need to be addressed during the development stage.

The researchers planned to develop a user-friendly user interface (UI) to be used by the patients of the University of the Cordilleras Medical Clinic. After brainstorming, the research team consulted the possible users and key partner to come into terms of the goals and expectations to be met.

Methodology 51

User Design. After the scope of the project has been established, the researchers began developing the user interface. Prototyping, iterations of the prototype were made using the web tool Proto.io. The research team analyzed similar medical mobile applications. It helped the researchers to visualize the design of the Agas mobile application. Testing, the testing stage was completed with the help of the research panel. Through iterative testing, the development of the design is formulated and finalized for the simplicity of the theme and icons. Refining, developers decided to incorporate user customization of the application to further refine the features.

Construction. This stage transforms the design phase's beta systems and prototypes into the working model. During the construction stage, the programmers, coders, testers, and developers on the software development team collaborated to ensure that everything runs smoothly.

Researchers applied hard coded programming to build the design of the medicine scheduler. The features of the application are developed and tested by the researchers to further investigate the possible use of the features of the application.

Methodology 52

Cutover. The launch of the finished product takes place during this phase of implementation. It includes user training, data conversion, testing, and the switch to the new system. While coders and customers continue to look for system bugs, all final changes are made.

After the long development, developers deploy the system to the patients and UC medical clinic for the general use of the medicine scheduler application developed by the researchers.

**Design Thinking**

On this section, researchers applied the empathize, define, ideate and prototype stages on design thinking.

As the researchers immersed themselves into the community to search for user stories, they interviewed Anne, a 25-year old female from Taguig City. The first respondent suffers from coronary heart disease, asthma, and hypertension. Hence, she needs close monitoring of her medication. When she forgets to take her medication on time, her health suffers. Usually, she experiences a hard time breathing and improper blood circulation.

Our next key person in our design thinking is Ari, a 20-year-old female from Baguio City. In 2022, she developed oral antibiotics resistance. One of the factors why this antibiotic resistance happens is the misuse of antibiotics. If the patient forgets to take medicine for a day or more or stops treatment too soon, the bacteria might start reproducing and they may mutate to be increasingly more resistant to the medicine (Antibiotic Resistance, 2021). Hence, as a result, Ari had to be admitted and take her medication through an intravenous (IV) line which caused additional distress to the patient in both health and financial aspect.

Methodology 53

From these insights, the researchers concluded that patients need an efficient system to aid them in their medication. The ideal users of the system are characterized by the following: a.) have access to a mobile phone, b.) patients who need close monitoring of their health, and c.) clients of medical institutions.

By conducting observation from past problems in medications the research team is able to look forward to a solution that uses a mobile phone for close monitoring of clients of medical institutions. The goal of the research team is to create a medical application where patients can easily monitor their medication. The application aims to help patients avoid antibiotic resistance. It will also aim to contribute to a solution to the United Nations Sustainable Development Goal 3: Good Health and Well-Being.

Methodology 54

The research team brainstormed and then decided to produce a solution to the improper intake of medications and recording the information of the patient. By using the why analysis the research team locates the root of the problem. The application, AGAS, is designed for users to take advantage of the following value propositions: convenience, customization, and accessibility. The features of the application are further discussed in the prototype section.

The researchers developed a pills view to monitor medication with color legends to determine the taking of medicine. A page with medicine information will pop up which will display the different dosages to be taken. To efficiently schedule, the medication alarm was added to alert the user.

The research team conducted iterative testing during the application development period. Iterative Testing is a method in which a product is tested on users repeatedly, and by making use of the results after each test, the product is improved at different stages. The main motive is to make the product foolproof and market ready before its launch. It is a common practice in the field of user experience/user interface design (Chisel Glossary, 2021).

Methodology 55

**Scope and Delimitation**

The researcher designed and developed a mobile application aimed to focus on personal medication scheduling for the patients of the University of the Cordilleras (UC) Medical Clinic.

The researchers aimed to deploy the system to the students going to the UC medical clinic. The system covers the population of patients in the medical clinic.

Its main purpose is to identify the common problems of patient’s medicine intake and to propose a possible solution. This study considers every aspect of a patient’s personal information that has an impact on their health status. Each respondent will receive questions to answer during the interview. Furthermore, this study will focus on UC medical clinic patients.

The app runs on Android devices. It requires Android Operation System (OS) version 10 and above. The researchers chose the Android platform as it is one of the most-widely used mobile OS in the Philippines. The minimum system requirement is an Android phone with 2GB of random-access memory (RAM) and 32GB of read-only memory (ROM). To further encourage accessibility, the application does not require internet connection.

Methodology 56

**Data Gathering Techniques**

This chapter shows techniques used in gathering data which are commonly applied to interact with the respondents. The purpose of data gathering is to collect transparent, clear, accurate, and relevant data so that a set of requirements meet using different techniques in gathering of data.

Interview.Using a prepared set of questions, the researchers are to interview the patients of the UC clinic of. An interview will help the researchers to determine the usability of the application, especially for patients that needs a close monitoring of their medication intake.

Observation. Using this method of data gathering, there will be a direct observation on the users of the mobile application. It aims determine the effects of using a medicine scheduler for the UC medical clinic patients.

Survey. The survey will determine the usability of the application. Furthermore, a Likert scale will be used to support the statistical treatment of the data. The survey shall also identify the bugs or problems that will occur during the application testing. Lastly, it aims to accommodate the queries of the users.

Methodology 57

Document Analysis. This technique is used for understanding how information and ideas are presented formally, and knowing issue framing, among other things. Also, it is a systematic procedure to evaluate the data to be used. The document analysis will mainly focus on clinical registration forms and medicine prescription forms.

**Sources of Data**

On this section, the primary sources of data gathered are interview, survey, document analysis, and through observation.

The researchers will interview the individuals who are patients of the UC medical clinic. The ideal users are patients who are taking antibiotics and maintenance medication.

The researchers evaluated the medical record forms, specifically patient registration forms and medicine prescription forms. Prescriptions record aims to present the accurate information on medication intake such as generic drug name and dosage.

The researchers will be conducting survey and observation to the individuals who are using the system to monitor medicine intake. The survey data will be using Likert Scale for statistical treatment.

Methodology 58

**Software Development Tools**

To develop the system, the researchers utilized the following software development tools.

Android Studio**.** The software is Android’s official integrated development environment (IDE). It was purposely built for Android to provide a platform that enables an accelerated development cycle for high-quality applications for every Android device (Developers Android, 2022).

The researchers mainly used Android Studio to program the system and debug the errors that occurred. The tool is used to program the features of the application and make the features to function.

Photoshop**.** The design software is under the Adobe Creative Cloud Suite. It aims to provide an avenue to fix flaws, add effects, and mix up colors of photographs. Users can also draw, paint, doodle and dabble with digital brushes (Adobe, 2023).

The researchers utilized Photoshop to create the color scheme of the app and to design the different variations of the app logo.

Methodology 59

Canva. The design tool enables its users to create professional designs and to share or print them. It offers ready-made designs which users can customize. It offers a platform for teamwork. Multiple users can work on a single project at the same time. Furthermore, Canva allows users to easily present, download, schedule, and share designs (Canva, 2022).

The researchers designed pitch decks and low fidelity protype necessary in the proposal stages of the application using Canva.

Proto.io. The researchers used the tool to develop a partial user-interface of the system. The design of the system is partially developed with the help of this tool for testing the functionalities of the application.

Chapter 3

**FINDINGS OF THE STUDY**

This chapter presents the findings of the study. This discusses the information requirements of the system, architecture framework, features of the system, and measuring the extent usability of the system.

**Information requirements System**

On this section, the information requirements of the Agas personal medication scheduler mobile application will be identified. It will include user information requirements, and software system requirements.

User Information. User information requirements include the medication intake status, date and time of intake, dosage, brand, and the generic drug name. This section allows the users to provide the information they need to know on how to use and understand the primary features of the system. For hypothetical example, any user or patient coming from the UC clinic needs to take another set of medicine in a specific time, and for the records and visuality of the medicine the authorized persons in the UC clinic can take note of the patient's intakes.

Medicine Information. The system will allow the user to provide information of the medicine to help them to determine accurately the medicine they will be taking.

Finding of the Study 61

Software System Requirements. Software system requirements are the things needs to achieve before using the application such as; the minimum android versions android version 10.0, the minimum requirement for the RAM to run the system is at least 2 GB. Android versions below the minimum requirements will not be able to use the application, as a result the application will not be able to open or run. Since android version 10 and above can run the application there will be adjustments for the difference of android versions. Moving to the file size of the application, it consists of 12.27 MB.

**Architecture Framework of the System**

This section discusses the architecture framework of agas. Using the 4+1 View model which consists of the logical design of the application especially the Class Diagram, deployment diagram, and Sequence Diagram to elaborate how the application and its features work including the components and structure of the Agas medicine scheduler.

The Figure 2 Shows the 4+1 View Model which was utilized in the mobile application. The logical view is concerned with the capabilities provided by the system to end users.

Finding of the Study 62

The process view addresses the dynamic features of the system, discusses system processes and how they communicate, and focuses on the system's run-time behavior. Concurrency, distribution, integrator, performance, and scalability are all addressed in the process view.

The development view depicts a system from the standpoint of a programmer and is concerned with software management. The view is also known as implementation view. The physical view portrays the system from the perspective of a system engineer. It is concerned with the physical layer structure of software components as well as the physical connections between these components.

The scenarios represent interaction sequences between objects and processes. They are used to identify architectural aspects as well as to demonstrate and assess the design of the architecture. They also serve as a starting point for architectural prototype tests.

Figure 2

Finding of the Study 63

4+1 View Model

Graphical user interface

Description automatically generated with medium confidence

Class Diagram. To complete the application, device external storage is used. External storage served as the logical view of the mobile application.

Figure 3

Class Diagram

Diagram

Description automatically generated

Package Diagram. In this figure, packages demonstrated how it was utilized to organize model pieces of the proposed mobile application.

Finding of the Study 64

This also covers the mobile application's deliverables. It demonstrates how the classes were organized into packages. The Agas Package Diagram served as the development view of the application is shown in Figure 3.

Figure 4

Package Diagram

Diagram

Description automatically generated

Deployment Diagram. The figure shows nodes, the mobile devices, setting alarm for medicine, and notification of occurring alarm and medicine to be taken. The mobile application is an artifact on the mobile device. The second node is the setting up of an alarm for medicine and information. The third node is the notification of occurring alarm where the users will be alerted during the time settled for the medicine.

Finding of the Study 65

Figure 5

Deployment Diagram

Diagram

Description automatically generated

Sequence Diagram. It is a model that shows the process of a task or action from a use case. Figure 5 shows the AGAS Sequence Diagram.

Findings of the Study 66

Figure 6

Sequence Diagram

Diagram

Description automatically generated

Use Case Diagram. The use-case includes two actors, namely the patients of the UC clinic/ clinic personnel.

The patient/ clinic personnel perform the activity: selection of date, creating task, listing name of medicine, setting the number of medicines to drink, choosing the type of medicine, setting up the repetitions of the alarm, and the time to drink the medicine. It is the physical view of the application.

Figure 7

Findings of the Study 67

Use Case Diagram

Diagram

Description automatically generated

**Features of the System**

In this section, the features of the proposed system, namely Agas, are presented. These features are the essential part for the development of the mobile application Agas to let the user list a set of medicine to be taken and interact with the mobile application with ease.

Pills. This feature allows the user to closely monitor medication. Color legends and labels can be used to represent the habits in taking medication. Also, users notices if the medicine is taken the medicine name will be crossed out and if not, the medicine name will remain.

Findings of the Study 68

Figure 8

Pills View

Diagram

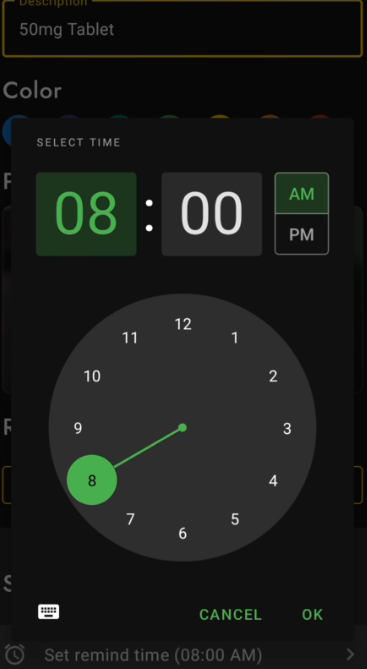
Description automatically generated

Alarm. The user is allowed to efficiently schedule their medication, the users may set an alarm through the application.

Findings of the Study 69

Figure 9

Alarm View



Add Task. Users are able to set the medicine information and the schedule for taking of medicine.

Findings of the Study 70

Figure 10

Add Task

A screenshot of a phone

Description automatically generated with medium confidence

Repetition. This feature will allow the user to set a certain range of date to take the medicine.

Findings of the Study 71

Figure 11

Graphical user interface, application

Description automatically generatedRepetition

Settings. This will allow the user to customize the notification of the alarm when it is occurring. Also, this will help the user to change the appearance of the time and date of the system.

Findings of the Study 72

Figure 12

Settings

Graphical user interface, text

Description automatically generated

Image Upload. This allows the user to upload the image of the medicine for visualization.

Findings of the Study 73

Figure 13

Image Upload

A screenshot of a cell phone

Description automatically generated with medium confidence

History. This will allow the user to look at the updates they have made in the past taking of medicine. It is also the home page of the application.

Findings of the Study 74

Figure 14

History View

Graphical user interface, application

Description automatically generated

Chart. This application will help the user to look onto the basic stats of their taking of medicine through the user of a pie graph.

Findings of the Study 75

Figure 15

Chart View

Chart

Description automatically generated

**The extent of usability of the system**

Findings of the Study 76

The researchers used the System Usability Scale (SUS) to identify the level of usability of the AGAS mobile application. SUS was developed and introduced on 1980 used extensively to evaluate the usability of the system. It is a tool that implemented easily to determine the usability of the system consuming less of the time. SUS used by the researchers to estimate and measure the user experience. SUS help to estimate the perceived worth of use of the mobile application, either as a developer, consumer of system, or as the end-user. SUS helps to evaluate any systems and application ranging from digital products. The SUS determines the software along with the effects, usefulness, navigation, learnability and efficiency.

The researchers used statistical metrics to evaluate the data collected from survey questionnaire respondents and the level of usability of the generated mobile app.

The Likert Point of Scale was used to interpret the data that was analyzed ranging from “Strong Disagree” to “Strongly Agree”.

Table 1

Findings of the Study 77

SUS Template Questionnaire

**Direction**: Please put (✔) on the following statements with your chosen answer for the level of agreement. Where 1 - Strongly Disagree and 5 – Strongly Agree

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **1** | **2** | **3** | **4** | **5** |
| 1.  I think that I would like to use this system frequently. |  |  |  |  |  |
| 2.  I found the system unnecessarily complex. |  |  |  |  |  |
| 3.  I thought the system was easy to use. |  |  |  |  |  |
| 4.  I think that I would need the support  of a technical person to be able to use this system. |  |  |  |  |  |
| 5.  I found the various functions in this system were well integrated. |  |  |  |  |  |
| 6.  I thought there was too much inconsistency in this system. |  |  |  |  |  |
| 7.  I would imagine that most people would learn to use this system very quickly. |  |  |  |  |  |
| 8.  I found the system very cumbersome to use. |  |  |  |  |  |
| 9.  I felt very confident using the system. |  |  |  |  |  |
| 10.I need to learn a lot of things before I could get going with this system. |  |  |  |  |  |

In SUS, a user's view of a "system's" usability is gauged via a 10-item questionnaire with a 101-point scoring system. A system may be anything that a human interacts with, including hardware, websites, voice user interfaces, mobile devices, commercial and consumer software programs, and mobile apps (Sauro, 2018).

Findings of the Study 78

To calculate an SUS score, the following steps are done (Will, 2023):

Step 1: Convert the scale into number for each of the 10 questions

Strongly Disagree: 1 point

Disagree: 2 points

Neutral: 3 points

Agree: 4 points

Strongly Agree: 5 points

Step 2: Calculate

X = sum of the points for all odd-numbered questions – 5

Y = 25 – sum of points for all even-numbered questions

SUS Score = (X + Y) x 2.5

Table 2

Findings of the Study 79

Frequency Count Table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| QUESTIONS | 1 | 2 | 3 | 4 | 5 | Average |
| 1.  I think that I would like to use this system frequently. | 2 | 4 | 12 | 26 | 18 | 12.4 |
| 2.  I found the system unnecessarily complex. | 13 | 21 | 19 | 8 | 1 | 12.4 |
| 3.  I thought the system was easy to use. | 0 | 3 | 17 | 23 | 19 | 12.4 |
| 4.  I think that I would need the support of a technical person to be able to use this system. | 16 | 12 | 20 | 8 | 6 | 12.4 |
| 5.  I found the various functions in this system were well integrated. | 0 | 1 | 13 | 29 | 18 | 12.4 |
| 6.  I thought there was too much inconsistency in this system. | 17 | 20 | 18 | 6 | 1 | 12.4 |
| 7.  I would imagine that most people would learn to use this system very quickly. | 0 | 1 | 15 | 26 | 20 | 12.4 |
| 8.  I found the system very cumbersome to use. | 18 | 24 | 16 | 3 | 1 | 12.4 |
| 9.  I felt very confident using the system. | 0 | 0 | 13 | 31 | 18 | 12.4 |
| 10.I need to learn a lot of things before I could get going with this system. | 16 | 14 | 15 | 9 | 8 | 12.4 |
| TOTAL AVERAGE |  |  |  |  |  | 12.38 |

To interpret the SUS score, the table below is taken into consideration:

Findings of the Study 80

Table 3

SUS Interpretation

|  |  |  |
| --- | --- | --- |
| SUS Score | Grade | Adjective Rating |
| >80.3 | A | Excellent |
| 68-80.3 | B | Good |
| 68 | C | Okay |
| 51-68 | D | Poor |
| <51 | F | Awful |

In Table 2, the final SUS score is 69.39 which is interpreted as good. Based from the answers of our respondents, the users agree that AGAS is a tool that can aid them in their daily medication intake. The user interface is not too complex and easy to navigate as all the various functions were well integrated. The design of the system was also consistent. Moreover, only minimal supervision or assistance is needed in using the system. Hence, the users were able to quickly gain confidence in operating the mobile application.

Chapter 4

**CONCLUSIONS AND RECOMMENDATIONS**

This chapter includes the conclusions gathered in this research study based on the chapter 3 with the findings. Also, recommendation given to future and current researcher with similar research study.

**Conclusions**

The following conclusion comes from the finding of the objectives of the research study.

1. The researchers identified the information that is used to the system. The information included are user information, medicine information, and software system requirements to allow the user to use the application on their gadgets. The system utilizes the external storage to avoid intruding the privacy of the end-users. Medicine information used to provide background for the medicine before taking to avoid resistance of the bacteria present to the user’s health.
2. The use of 4+1 view model architecture framework to develop user interface and functionality of the system. 4+1 view model gives a step-by-step process of the application to interact with the user and define how the system works. Upon using this architecture framework, the researchers are able to determine the different views between the end-users and the system itself. The framework standardizes the system design documents and make the design easy to understand and navigate. In utilizing the framework, it enables the researchers to easily determine the use of each function in different views.

Conclusions and Recommendations 82

1. The features are developed and functioned to the system properly such as the; Pills view, alarm, add task, Repetition, settings, and the system’s unique features which are the image upload, history, and chart view. These are the features developed and tested by the researchers to help the end-users.
2. The final SUS score of 69.39 is considered to be favorable. According to the survey results, the users agrees that AGAS is a tool that offers great assistance in daily medicine intake. Due to the seamless integration of all the different tasks, the user interface is not too complicated and simple to use. The system's design was likewise uniform. Furthermore, using the system only requires minimal assistance and monitoring. As a result, the users were able to operate the mobile application with confidence quite soon.

**Recommendations**

Conclusions and Recommendations 83

The following recommendations derived from the conclusions and findings of the research study Agas: A Personal Medication Scheduler to help future researchers with similar study.

1. Researchers must allow the user to provide different information included in the nature of the system. Researchers should include the prescription information of the medicine given to the user by a health care provider.
2. For the system architecture framework researchers should allow them to put themselves in the place of the user and identify the different circumstances that occur while using the mobile application called Agas.
3. The researcher must have a unique feature that allows user to visualize the medicine to be taken. System to be develop have to use a more efficient customization to be partnered with the user’s preferences.
4. To test the usability of the Agas mobile application researchers must extend their ability to gather information to the users who might accommodate the system. The researchers must have used a survey to extend the data and to measure the usability of the mobile application.

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**APPENDICES**

**Appendix A**

**COMMUNICATION LETTER**

Text, letter

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**Appendix B**

**INVITATION LETTER**

Text, letter

Description automatically generated

**Appendix C**

**DOST THESIS FORM**

Text, letter

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**Appendix D**

**QUESTIONNAIRE**

**The System Usability Scale (SUS)**

(By: Tullis and Stetson, 2004)

When a SUS is used, participants are asked to score the following 10 items with one of five responses that ranges from Strongly agree to strongly disagree.

* 1. Strongly Disagree
  2. Disagree
  3. Neutral
  4. Agree
  5. Strongly Agree

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **1** | **2** | **3** | **4** | **5** |
| 1.  I think that I would like to use this system frequently. |  |  |  |  |  |
| 2.  I found the system unnecessarily complex. |  |  |  |  |  |
| 3.  I thought the system was easy to use. |  |  |  |  |  |
| 4.  I think that I would need the support  of a technical person to be able to use this system. |  |  |  |  |  |
| 5.  I found the various functions in this system were well integrated. |  |  |  |  |  |
| 6.  I thought there was too much inconsistency in this system. |  |  |  |  |  |
| 7.  I would imagine that most people would learn to use this system very quickly. |  |  |  |  |  |
| 8.  I found the system very cumbersome to use. |  |  |  |  |  |
| 9.  I felt very confident using the system. |  |  |  |  |  |
| 10.I need to learn a lot of things before I could get going with this system. |  |  |  |  |  |

Text, application

Description automatically generated

Appendices 101

Graphical user interface, website

Description automatically generated

Appendices 102

Graphical user interface, text, application, email

Description automatically generated

Text

Description automatically generated with medium confidence

Appendices 103

Graphical user interface, text, application

Description automatically generated

Graphical user interface, text, application, chat or text message

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**Appendix E**

Text, letter

Description automatically generated**ACCEPTANCE LETTER**

**Appendix F**

**Graphical user interface, text, application, email

Description automatically generatedSURVEY SAMPLE**

Graphical user interface, text, application

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Graphical user interface, text, application, email

Description automatically generatedGraphical user interface, text, application

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Graphical user interface, text, application, email

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Appendices 106

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**Appendix G**

**TABULAR FORM OF THE TEST RESULT**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **1** | **2** | **3** | **4** | **5** |
|  | **Frequency** | | | | |
| 1.  I think that I would like to use this system frequently. | 2 | 4 | 12 | 25 | 18 |
| 2.  I found the system unnecessarily complex. | 12 | 21 | 19 | 8 | 1 |
| 3.  I thought the system was easy to use. | 0 | 3 | 17 | 22 | 19 |
| 4.  I think that I would need the support  of a technical person to be able to use this system. | 15 | 12 | 20 | 8 | 6 |
| 5.  I found the various functions in this system were well integrated. | 0 | 1 | 13 | 28 | 18 |
| 6.  I thought there was too much inconsistency in this system. | 17 | 19 | 18 | 6 | 1 |
| 7.  I would imagine that most people would learn to use this system very quickly. | 0 | 1 | 15 | 26 | 19 |
| 8.  I found the system very cumbersome to use. | 17 | 24 | 16 | 3 | 1 |
| 9.  I felt very confident using the system. | 0 | 0 | 13 | 31 | 17 |
| 10.I need to learn a lot of things before I could get going with this system. | 16 | 13 | 15 | 9 | 8 |

**Appendix H**

**INTERVIEW TRANSCRIPT**

A. Maintenance medicine patient (User)

**Interviewer**: Do you experience any microbial resistance before?

**Interviewee:** Yes

**Interviewer**: When it happens and what did you do to survive or avoid medicine resistance?

**Interviewee**: It during before I taken my maintenance for high blood pressure then my asthma also occurs until I self-medicate because I lost my prescription.

**Interviewer**: Are you aware this medicine resistance can happen, then what did you do about it?

**Interviewee:** yes, although it is a rough time for me to look for my prescription my private doctor suggested me to take more expensive medicine also when I came to a pharmacy, they will not let me take the medicine before because I have no proof of the medicine I am taking.

**Interviewer**: Do you consider looking for an application where you can put some images and it will notify you if you need to take a medicine?

**Interviewee:** Yes, also because it can be use in the pharmacy where some of the medicine needs a prescription or proof that you need the medicine.

**Interviewer:** Are you familiar AGAS this can help you to be more efficient and accurately take medicine?

**Interviewee:** No.

Appendices 109

**Interviewer:** it is an alarm where you can store some of medicine images or medicine prescription can you consider it to help you?

**Interviewee:** Yes.

**Interviewer:** Why do you think so?

**Interviewee:** As you said there would be an image upload to store medicine prescription.

A. REGARDING THE FEATURES OF THE SYSTEM

**Interviewer**: Are the features of our application is useful or not?

(Yes, No, Maybe)

**Interviewee:** Yes.

**Interviewer:** does the system itself suits its features

**Interviewee:** Yes, especially it could help maintenance medicine takers

**Interviewer:** what do you think of the design, features, and navigation?

**Interviewee:** these features are worth it and it implies some intervals while taking medicines.

**Interviewer:** is there any problems with the app?

**Interviewee:** So far there is no problem.

B. UC Head Doctor interview

**Interviewer:** ma’am can you consider our application to help you on medicine histories of students?

**Interviewee:** Yes, but there should be a privacy with thespecially there are some medicines that they used personally

**Interviewee:** does your application consider any confidentiality?

Appendices 110

**Interviewer:** yes ma’am, our application is hard coded connected to sqlite and in only use the cellphone storage and no admin accounts are included with our application since we consider the confidentiality and privacy of our users

**Interviewee:** Ok then this application you are offering with us is very helpful and useful since as our college develop tools and systems need to be integrated within our facility.

**Interviewer:** okay maam then can we deploy our application then can you be our key partner for our system?

**Interviewee:** Yes, there will be no problem with that and hoping to use your system here in clinic soon

**Appendix I**

**AGAS USER MANUAL**

**Diagram, text

Description automatically generated with medium confidence**

**INTRODUCTION –** When you open the app for the first time you will be directed into our small introduction of the app. Below the screen you can see 2 arrows, If you click the right arrow facing downwards, the introduction screen will be skipped and you will be directed to our home menu. If you click the right arrow the introduction screen will scroll to the next introduction screen. There are 4 parts of introduction screen and after that you will be directed to the home menu.

Diagram

Description automatically generated

**HOME MENU –** This is the home menu on our application. Inside the home menu you can see the navigation bar and Add Pill button below the screen. When you press the Add Pill button you will be directed to the another screen of the app which you will set your reminders. The navigation bar has 3 categories. Pills is where you can see your medicine that you set to remind you. History is where you can see when did you take your medicine and lastly Settings of our app where the user can change there notification sounds, application theme and reminder settings.

Appendices 112

Graphical user interface, application

Description automatically generated

**ADD PILL –** When you press Add Pill button on the home menu you will be directed here. You can see 6 categories. Medicine Name, Medicine Description, Color, Photo, Reminders and Intake Options. Medicine Name is where you will input your medicine name by clicking the text box and start typing. Same concept on how you will input your medicine description. Color will help the user to navigate there medicine on the history menu. Reminders is where the user can set there time and how many medicine or pills that they will take on one take. Lastly Intake options is where the user can set on how they will drink there medicine if it’s everyday, duration or custom intervals.

**A screenshot of a phone

Description automatically generated with medium confidence**

**ADDING IMAGE –** If you want to add an Image of your medicine that you want to remind you, you will click the image icon and you will be ask to choose if you want to take a picture of your medicine or if you have already the picture or the image of that medicine you can click gallery and upload your image to the app.

**A picture containing text

Description automatically generated**

Appendices 113

**TAKING A PICTURE –** If you click the camera you will be directed to your phone camera. Once you will take a picture of your medicine press your shutter button on your screen.

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**PICTURE HAS BEEN TAKEN –** If you have already pressed the shutter button you will be directed here by pressing X you want to try again to take another picture of that medicine and by pressing check you will be directed to the editing screen of the image.

Appendices 114

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**EDITING IMAGE –** After taking a picture of your medicine and clicking check mark icon on the previous step, you will be directed here if you want to edit your image. After editing your image or you don’t want to edit your image press the check icon on the top right of your screen

**Graphical user interface, application

Description automatically generated**

**Image uploaded –** Once your done editing your image you can see that the background of the photo icon is the medicine that you have uploaded.

**Graphical user interface, application

Description automatically generated**

Appendices 115

**Set a Reminder –** If you click Add Reminder a window will be pop out below the screen and there are 3 categories. Reminder time, amount and save reminder. You can set many reminders on one day by just clicking Add Reminder. If you are done editing the time and amount of pills or medicine that you will take just click save reminder and that pop out will automatically close and you will see the reminder that you set below the Reminders title

Graphical user interface, application

Description automatically generated

**Set a Reminder Time –** If you click the Set reminder time a clock will be shown on the screen. The user can adjust the time by adjusting the needle of the clock or if the user clicks the keyboard icon below the clock, the user can input the numbers of the clock manually. If you have already set the time that you will take your medicine just click OK.

Appendices 116

Graphical user interface

Description automatically generated

**Set Amount –** If you click the Set Amount a pop out screen will be shown. The user will swipe left and right. Swipe left will be increasing by 0.25 and swiping right will be decreasing by 0.25. After setting an amount just click OK and Save Reminder. Your reminder time and amount is already set!.

Graphical user interface, application

Description automatically generated

**Intake Options –** Lastly by setting up your reminder is the intake options. Intake options can be set into Everyday, Duration and Custom Intervals. If you choose Everyday the app will remind you everyday on the same time that you set on the Reminders category. Duration is where the app will remind you on how many days that you set. Custom Intervals is when the app will remind you on how many days that you will drink that medicine and how many days that you will not drink that medicine.

Appendices 117

Graphical user interface, application

Description automatically generated

**Intake Options –** Duration and Custom Intervals have Reminders or Instructions on how the reminder works when you choose one of them. Reminders or Notice label are being shown below.

Text

Description automatically generated

Appendices 118

Graphical user interface, text

Description automatically generated

**Change how many days –** By clicking the label you can set how many duration days, days active and days inactive by swiping left and right. Swiping left will increase the number and swiping right will decrease the number. After setting the days click OK!.

Graphical user interface

Description automatically generated

Appendices 119

Graphical user interface, application

Description automatically generated

**Saving –** Once you finish setting up your reminder click the floppy disk icon or the Save icon itself below. Your reminder is now placed and shown on the home screen after you saved your reminder

Graphical user interface, website

Description automatically generated

Appendices 120

A screenshot of a computer screen

Description automatically generated with medium confidence

A screenshot of a cell phone

Description automatically generated with medium confidence

**History –** On the history page you can see you overview of the medicines that you set to remind also the charts. The charts are shown how many percent did you take your medicine and how many percent that you missed your medicine. These charts are real time update if you confirm or mmissed the medicine that you will take it will automatically update the charts

Appendices 121

Graphical user interface, application

Description automatically generated

**History of the medicine–** If you click the medicine reminder in the history that you set, you will see all the time that the app has reminded you and what time did you take or did not take the medicine. Also it also shows the date that you have taken it. The format of the date is Day – Month.

Appendices 122

**Settings –** In the settings menu the user can set the application behaviour by setting how many minutes that you want to delay your medicine that you will drink.

Reminding Again feature will remind the user every minute on how many minutes did the user set on the remind again after.

Set Notification options is where the user can customize the alarm tone and the vibration of the phone when alarmed.

Application Theme can be set into dark mode or light mode.

Lastly will be the About this application. Inside will be the video walkthrough of the app itself.

Text

Description automatically generated

Appendices 123

Graphical user interface

Description automatically generated

**Notification or Alarm –** The app will let you know if it is time to drink your medicine. Notification bar will pop out on your Notification panel. The notification panel of the reminder shows the image of the medicine that you will be taking or drinking and inside the application there is a confirm button on top of your screen when the reminder is been triggered.

A picture containing graphical user interface

Description automatically generated

**Appendix J**

**IMPORTANT CODES**

Reminder

**Text

Description automatically generated**

History

Text

Description automatically generated

Image Picker

Appendices 125

Text

Description automatically generated

Text

Description automatically generated

**Appendix K**

**SUS Computation**

Background pattern

Description automatically generated

**Appendix L**

**A person holding a cell phone

Description automatically generated with low confidenceDOCUMENTATION**

**Two people looking at a cell phone

Description automatically generated with medium confidence**



**CURRICULUM VITAE**

|  |  |  |  |
| --- | --- | --- | --- |
| **Alexander Matthew D Jimenez**  - DF-041 Road 2 Triniville Subdivision Bahong, La Trinidad Benguet  ( 09432557498  : jimenezalexandermatthew104@gmail.com | | | A person wearing a white shirt and green tie  Description automatically generated with medium confidence |
|  | | | |
| **EDUCATIONAL ATTAINMENT** | | | |
| **Tertiary** | **: Bachelor of Science in Information Technology**  **: Web Development Track**  **:** University of the Cordilleras  : Gov. Pack Rd., Baguio City  **:** Expected Date of Graduation: September 2023 | | |
| **Secondary(Junior High)**  **Secondary(Senior High)** | **: Our Lady of Mount Carmel Montessori**  **:** Camdas Subdivision, Baguio City  : March 2018  : Perfect Attendance  : **University of the Cordilleras**  **: BSIT Animation**  **:** Gov. Pack Rd., Baguio City  :  :ICT Week 2nd Runner Up | | |
| **Primary** | : Our Lady of Mount Carmel Montessori  : Camdas Subdivision, Baguio City  : March 2014  : Loyalty Award | | |
| **SKILLS AND QUALIFICATIONS** | | | |
| * Knowledgeable in SAP ERP System Configuration * Knowledgeable in CISCO LAN Switches and routers, installation and configuration (CCNA1 to CCNA 4) * Strong verbal and personal communication skills * (include IT certifications if any, e.g. CISCO Certified Network Associate) | | | |
| **SEMINARS and TRAININGS ATTENDED** | | | |
| * DevFest 2022   November 28, 2022  University of the Cordilleras   * Let’s Get Connected: A Beginner’s Guide towards the Information Age   January 6, 2023  Zoom Webinar | | | |
| **PERSONAL INFORMATION** | | | |
| Date of Birth | | : January 4 2002 | |
| Age | | : 21 years old | |
| Height | | : 5’8” | |
| Weight | | : 108 kgs. | |

Appendices 129

|  |  |  |  |
| --- | --- | --- | --- |
| **MARICON CLYDE C. LIWAN**  Appendices 130  - #153 Liteng Pacdal, Baguio City  ( +63.907.910.0732  : mariconliwan@gmail.com | | | A picture containing text, clothing, suit, posing  Description automatically generated |
| **EDUCATIONAL ATTAINMENT** | | | |
| **Tertiary** | **: Bachelor of Science in Information Technology**  **: Web Technology Track**  **:** University of the Cordilleras  : Gov. Pack Rd., Baguio City  **:** Expected Date of Graduation: September 2023 | | |
| **Secondary(Senior High)**            **Secondary(Junior High)** | **:** STI College Baguio  **:** Private Rd., New Lucban, Baguio City  : April 2020  : With Honors  : Best in Communication Arts  : Best in Work Immersion  : Rizal National High School  : Gibraltar Rd., Baguio City  : April 2018  : With High Honors  : Editor-in-Chief, Official English School Publication  : Proficiency Award in Araling Panlipunan  : Proficiency Award in English | | |
| **Primary** | : Rizal Elementary School  : Gibraltar Rd., Baguio City  : April 2014  : Journalist of the Year 2014 | | |
| **SKILLS AND QUALIFICATIONS** | | | |
| * Knowledgeable HTML, CSS, C#, Java, PHP, SQL, Javascript, and Python * Knowledgeable in frameworks Laravel and Shopify * Strong verbal communication and leadership skills * Citizenship Advancement Training (CAT) I Course (2017-2018) | | | |
| **SEMINARS and TRAININGS ATTENDED** | | | |
| * DevFest 2022 by Google Development Group Baguio               November 2022  University of the Cordilleras   * Pinoy Science Star Camp   November 2-4, 2022  Sheraton Hotel, Pasay City   * Filipino Patriot Scholar Values Formation Program   August 2020  Baguio City   * DevFest 2020 by Google Development Group Baguio   2020  Baguio City   * DevFest 2019 by Google Development Group Baguio   2019  University of Baguio | | | |
| **PERSONAL INFORMATION** | | | |
| Date of Birth | | : May 2, 2002 | |
| Age | | : 20 years old | |
| Height | | : 4’11” | |
| Weight | | : 40 kgs. | |

Appendices 131

|  |  |  |  |
| --- | --- | --- | --- |
| **JEREMIAH P. VELORIA**  - AD 12 Central Buyagan L.T.B.  ( +63.948.150.7024  : jeremiahveloria9@gmail.com | | | A person wearing a red shirt  Description automatically generated with medium confidence  Appendices 132 |
|  |  | | |
| **EDUCATIONAL ATTAINMENT** | | | |
| **Tertiary** | **: Bachelor of Science in Information Technology**  **: Web Development Track**  **:** University of the Cordilleras  : Gov. Pack Rd., Baguio City  **:** Expected Date of Graduation: May 2015 | | |
| **Secondary (Senior High)** | **: Cordillera Career Development Colleg**e  **:** Western Buyagan, Baguio City  : June 2020  : With honor  : Perfect attendance  : Loyalty award | | |
| **Secondary (Junior High)** | **: Cordillera Career Development Colleg**e  **:** Western Buyagan, Baguio City  : June 2018  : Perfect attendance  : Loyalty award | | |
| **Primary** | : Buyagan Elementary School  : Central Buyagan, Benguet  : March 2014  : Salutatorian | | |
| **SKILLS AND QUALIFICATIONS** | | | |
| * Knowledgeable in SAP ERP System Configuration * Knowledgeable in CISCO LAN Switches and routers, installation and configuration (CCNA1 to CCNA 4) * Strong verbal and personal communication skills * (include IT certifications if any, e.g. CISCO Certified Network Associate) | | | |
| **SEMINARS and TRAININGS ATTENDED** | | | |
| * DevFest 2022   November 28, 2022  University of the Cordilleras   * FreeCodeCamp 2021               November 26, 2021              University of the Cordilleras | | | |
| **PERSONAL INFORMATION** | | | |
| Date of Birth | | : December 28, 2000 | |
| Age | | : 22 years old | |
| Height | | : 5’11” | |
| Weight | | : 82 kgs. | |

Appendices 133