



ITS64604 Principles of Software Engineering

ASSIGNMENT 1

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GROUP PROJECT: 20%

Instructions to students:

- The assignment should be attempted in groups of 5 students.
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Table of Contents

| | |
|--|--------------|
| 1.0 INTRODUCTION..... | 3 |
| 1.1 Vision..... | 4 |
| 1.2 Mission..... | 5 |
| 2.0 PROBLEM STATEMENT..... | 6-7 |
| 3.0 SOLUTIONS..... | 8-10 |
| 4.0 IMPACT OF SOLUTION..... | 11-14 |
| 5.0 BUSINESS VIABILITY AND FEASIBILITY STUDY..... | 15-17 |
| 6.0 SYSTEM REQUIREMENTS..... | 18 |
| 6.1 Requirement Elicitation Gathering..... | 18 |
| 6.2 Client's Requirements..... | 19 |
| 6.3 Scope..... | 20-21 |
| 6.4 Functional Requirements..... | 21-22 |
| 6.5 Non Functional Requirements..... | 22-25 |
| 7.0 ARCHITECTURAL OVERVIEW..... | 26-29 |
| 8.0 SYSTEMS ANALYSIS AND DESIGN..... | 30-37 |
| 9.0 SUGGESTED DELIVERABLES HANDWORK PLANS..... | 38-39 |
| 10.0 CONCLUSION & FUTURE ENHANCEMENTS..... | 40 |
| 11.0 REFERENCES..... | 41-42 |
| 12.0 CONTRIBUTIONS PORTIONS AND MARKING SCHEME..... | 43-45 |

1.0 Introduction

Approximately 24% of Malaysia's population resides in rural areas where access to specialised medical care is limited (Centers for Disease Control and Prevention [CDC], 2024). Not to mention, during the pandemic, Malaysia saw a 60% increase in telemedicine consultations (USA Facts, 2021), highlighting the potential. Although Telehealth and Telemedicine are terms people often believe to be interchangeable, they are not. Telemedicine, to put it simply, refers to remote real-time clinical services. Telehealth, on the other hand, refers to a wider broader spectrum that encompasses not only services constricted to doctor-patient care (telemedicine), but also non-clinical services like medical education, administration and training.

While the first usage of telemedicine is unclear and often a topic for debate. Some argue the first recorded instance of telemedicine occurred in the late 1950s when two-way video communication was utilised at the University of Nebraska for transmitting the results of neurological examinations, while others argue that the first application of telemedicine quickly took place after the invention of the telegraph in 1844. What is agreed upon, however, is that the term (telemedicine) was coined by an American named Thomas Bird in the 1970s. According to Curogram, he described telemedicine as, "The practice of delivering medical care over a distance using telecommunications technology" (History of Telemedicine, 2022).

In 2020, we saw that the COVID-19 pandemic created a massive boom in the acceleration of the adoption of telemedicine, with usage increasing by over 700% in the early months of 2020 as healthcare systems sought to maintain care while minimising in-person contact (Weiner et al., 2021). In 2024, telemedicine continues to be a major part of healthcare, offering remote solutions and remedies to persistent healthcare access issues. In Malaysia, telemedicine can play a crucial role in increasing accessibility to medical services across both urban and rural areas of the country. This also serves as a device to decrease the gap between urban and rural healthcare services and qualities. al of future digital health solutions.

1.1 Vision

Our vision is to create a more technologically literate and health-conscious Malaysia. This objective aligns with 3 (three) SDGs (Sustainable Development Goals):

- Sustainable Development Goal 1: No Poverty
- Sustainable Development Goal 3: Good Health and Well-being,
- Sustainable Development Goal 10: Reduced Inequalities

According to the United Nations, the Sustainable Development Goals are the blueprint to achieve a better and more sustainable future for all. They address the global challenges we face, including those related to poverty, inequality, climate change, environmental degradation, peace and justice. These 17 goals are interconnected and the UN aims to achieve each one before 2030.

- SDG 1: No Poverty
 - Teleme Contribution: Teleme connects patients to medical centres, making it cheaper and easier for them to stay healthy so they're able to work, enabling them to earn money to support themselves and their families.
- SDG 3: Good Health and Well-being,
 - Teleme Contribution: Teleme is a telehealth platform. It acts as a bridge between medical centres and patients, ensuring medical related services can be accessed remotely, less expensively and more conveniently.
- SDG 10: Reduced Inequalities.
 - Teleme Contribution: Teleme provides better equitable and efficient access to quality medical care to underserved rural areas, decreasing the gap between urban and rural healthcare services.

1.2 Mission

Telehealth platforms provide a vehicle for people to take back control of their health. Building on that foundation, we intend to further improve telehealth platforms to help rural communities around Malaysia foster a less intimidating and convenient relationship with modern technology and the Malaysian healthcare infrastructure.

2.0 Problem Statement

Despite the modern era, the integration and acceptability of telehealth and telemedicine platforms in daily life still encounter considerable challenges in Malaysia. Despite the potential benefits, people are nevertheless cautious and apprehensive about these technologies, limiting telehealth's general acceptance and efficacy. While it is normal that people would be cautious about online platforms that handle sensitive information, resolving these issues is critical to the successful promotion of healthcare accessibility across Malaysia.

- **Users' Scepticism and Concerns**

A big challenge in the face of telehealth services is the consumers' cynicism and anxiety about the safety and security of these platforms. A study by Gordon et al. (2020) discovered that patients questioned the quality of care offered via telehealth more regularly as opposed to regular in-person appointments. Furthermore, worries regarding data privacy and the confidentiality of personal health information contribute to the users' hesitation when it comes to telehealth services. (Gordon, S. H., Berwick, D. M., & Davis, K. M., 2020).

Moreover, according to a survey conducted by Kruse et al. (2017), 47% of patients expressed discomfort with telehealth platforms, primarily due to security concerns and perceived impersonal nature of virtual consultations (Kruse, C. S., Krowski, N., Rodriguez, B., Tran, L., Vela, J., & Brooks, M., 2017). This shows how cautiously telehealth as a whole is looked at.

- **Technical Training and Support**

According to Scott Kruse et al. (2018), he found that it was common that the majority of both healthcare staff and patients need more training and support systems to use telehealth technology. This problem is especially noticeable in the more rural regions, where digital literacy levels may be lower.

Correct and proper use of telemedicine technology involves appropriate training and support for both healthcare staff (practitioners, administrators, etc...) and patients. Worryingly, telehealth platforms also have bad reputations. Most are considered to be slow and outdated,

therefore often defective. The complexity of the design of telehealth systems may hinder the platform's full potential.

- **Telehealth and Telemedicine Platform Engagement Concerns**

Despite the potential benefits, many telehealth platforms have struggled with limited user engagement and traffic, while receiving generally favourable reviews and ratings online. Several aspects contribute to this problem, including the aforementioned issues.

Furthermore, a lack of knowledge and ineffective marketing methods may play a role. According to a McKinsey & Company analysis (2020), telehealth systems require extensive advertising and user education initiatives to increase engagement and certainty among potential users. Also, Teleme seldom advertises. Instead, it depends on word-of-mouth.

3.0 Solution

Teleme, a Malaysian start-up telehealth platform, was brought to market in 2016 when 3 friends (Dr Aqeel, Mark Choo, Dr Hoh Hon Bing) decided to put their heads together and sat down to solve a solution caused by a shared problem during doctor visits: long clinic wait hours. Focusing on efficiency and convenience, Teleme now provides a variety of online services, including but not limited to: online video consultations, prescription services, health screenings, appointment reminders and personal health records, reducing the necessity for travel and enhancing overall healthcare accessibility.

If done honestly and responsibly, Malaysia can improve and expand its healthcare infrastructure by using telehealth technology to provide high-quality medical services more accessible to its citizens. While Teleme is already known as a small but reliable telehealth platform, like many things, features can be edited and more can be added to improve.

To solve the challenges faced under “Problem Statement”, several features and updates can be implemented:

- **On Users' Scepticism and Concerns,**

- Implement 2-step verification checkpoint after login.
- Arrange regularly scheduled security system maintenance and updates.

- **On Technical Training and Support;**

- Setting up public forums for practitioners and users,
 - This forum will enable patients to enquire with large groups of practitioners all at once. This provides a trustworthy second opinion, more advice and/or recommendations for remedies or specialising doctors.
 - This also enables the user to cut-out time spent travelling entirely, as they have access to a whole council of doctors at their fingertips, all in one place.

- Setting up social support and community forums,
 - This forum acts as a space for users to support each other, share their experiences, advice and knowledge.
- **On Telehealth and Telemedicine Platform Engagement Concerns,**
 - Increasing user accessibility by UI
 - Personalization Settings - Where users are allowed to adjust font sizes, colour themes, and more according to their personal preferences and needs, enhancing the accessibility of the website.
 - An “Elder-Friendly” UI mode is implemented - Where settings of the platform is customised to have generally bigger texts, no fine print, fewer options so that interface intuitivity is improved, a closed but obvious support chat window that also allows calls and other elements that may make communicating with technology easier for the less technologically-savvy elders.
 - Increasing user accessibility by UX
 - Voice Recognition Feature - To assist users who may struggle with or cannot use traditional input devices, the voice recognition feature allows users to navigate the website, search for information, and book services using voice commands.
 - Multilingual Support and Translation - Provides non-English speakers with an option to switch languages online or access real-time translation features.

- Resource Download Area // Tech support - Offers health and medical resources such as dietary recommendations, exercise guides, disease prevention, etc., in various formats (such as PDF, audio) where possible.
 - Tech Support Resource Download Area - Offers short courses on how to use the website/app. Instructions are succinct and direct with simple English.
- **Furthermore, additional features can be added:**
 - One-Click SOS Emergency Button - A prominently placed SOS button, especially for older adults, could provide peace of mind by directly connecting them to emergency medical services when needed. This One-Click SOS Emergency Button has the option to automatically alert +999 (Malaysian Emergency Response Services), +991 (Ambulance, medical emergency services) and/or the user's emergency contacts.
 - "Voice-Call" Only Options during Online Consultations - Add only 'voice-call' option on online consultations for patients unwilling/unable to do video calls for whatever reason.
 - AI-powered Customer Service - Uses AI technology to answer user inquiries and provide user support, particularly useful during peak times or emergencies. When the conversation between the AI and user gets too complicated, a human technician/administrator takes the place of the AI.

These solutions aim to solve a problem that many different platforms have tried solving using various approaches. Whilst It does not solve a new problem, it takes an existing solution and improves upon it, as explained above. It is not a completely innovative solution, as there have been a large number of improved telehealth and telemedicine platforms with the sole purpose of connecting remote users to medical services with similar features.

Whilst the intuitivity of user interfaces on telehealth and telemedicine is often ignored, efforts have been made to improve in that front, however slight.

4.0 Impact of Solution

The updates and innovations on the TeleMe platform are undoubtedly focused on improving the user experience and the actual help provided by the platform. If these solutions are well-considered and closely aligned with real-life needs, they will undoubtedly be of great assistance to users of the platform. The added functionalities will have a significant impact on the healthcare service industry, not only affecting the targeted user group seeking consultations for serious and complex diseases but also extending to a broader audience, enabling timely responses for minor ailments.

A more convenient and straightforward user interface can significantly attract elderly individuals to use the platform. It provides a platform for thorough discussions on complex and difficult diseases, reducing the time and money spent by users and enhancing their satisfaction with the user experience. Instant emergency medical service connections provide users with greater peace of mind, increasing their trust in the platform. The application of AI tools significantly enhances service efficiency. In short, I think these upgrades of the platform functions will be more novel and perfect. From a practical point of view, we improve the functions with the user's mentality and actual use effect, and combine many more cutting-edge technical ideas.

Table 4.1: SWOT table of similar platforms/companies

| | Strengths | Weaknesses | Opportunities | Threats |
|-------------|---|---|---|--|
| Mayo Clinic | Excellent medical reputation: As a world-renowned medical institution, it has high credibility and brand value. | High cost: Services are costly and may not be suitable for all patients. Geographical restrictions: Physical medical services are | Digital transformation: Further development of online healthcare and remote consultation services. Global | Fierce competition: Facing competition from other top healthcare institutions and platforms. Policy changes: |

| | | | | |
|-------|---|---|--|--|
| | <p>Rich professional resources: a wide range of medical expertise and expert teams.</p> <p>Comprehensive services: Provide comprehensive medical services, including diagnosis, treatment, research, etc.</p> | <p>mainly concentrated in the United States, and it is relatively difficult for international patients to access services.</p> | <p>expansion: Expand international markets and increase global visibility through online platforms.</p> | <p>Changes in medical policies and insurance reimbursement rules may affect operations.</p> |
| WebMD | <p>Rich medical information: provide massive medical information and health resources, the user group is huge.</p> <p>High brand awareness: As a leader in</p> | <p>Information accuracy: Some users question the accuracy and reliability of their medical information.</p> <p>Lack of personalization : Unable to provide personalised</p> | <p>User engagement: Increase user engagement and community features to increase user engagement.</p> <p>Partnerships: Work with healthcare organisations and insurance</p> | <p>Information overload: Users can be confused by too much information.</p> <p>Increasing competitors: More and more professional medical information platforms have</p> |

| | | | | |
|--------|--|--|---|--|
| | <p>medical information platform, it has a high brand awareness.</p> <p>Diversified content forms: including articles, videos, interactive tools, etc., rich user experience.</p> | <p>medical advice, more universal information.</p> | <p>companies to provide more authoritative content.</p> | <p>emerged, increasing the competitive pressure.</p> |
| Zocdoc | <p>Convenient appointment: Provide convenient doctor appointment service, users can easily find and make an appointment with a doctor.</p> <p>User rating system: Users can view doctors' evaluations and ratings to help make</p> | <p>Dependent on doctor registration: The number and quality of doctors on the platform depend on the registration of doctors.</p> <p>Cost issues: Higher fees for some services and doctor appointments limit the use of some users.</p> | <p>Dependent on doctor registration: The number and quality of doctors on the platform depend on the registration of doctors.</p> <p>Cost issues: Higher fees for some services and doctor appointments limit the use of oMarket expansion:</p> | <p>Increased competition: Facing competition from other medical booking platforms and integrated medical service platforms.</p> <p>Data privacy issues: User data security and privacy protection require continuous</p> |

| | | | | |
|--|--|--|--|-----------------------------------|
| | <p>better choices.</p> <p>Multi-channel coverage: A wide selection of medical specialties and doctors.</p> <p>hu</p> | | <p>Expand services in more regions and countries to increase the user base.</p> <p>Technology enhancement:</p> <p>Leveraging technology to improve platform functionality, such as adding telemedicine services.</p> | <p>attention and improvement.</p> |
|--|--|--|--|-----------------------------------|

5.0 Business Viability and Feasibility Study

1-Technical Viability

Technology Stack:

- Frontend: ReactJS – for more responsive elements and interactions.
- Backend: Node. Node. for server-side scripting using js and Express for scalability.
- AI/ML Integration: Diagnosis with Python for Artificial Intelligence-Based Recommendations in Personalized Healthcare Using TensorFlow.
- Cloud Infrastructure: Amazon Web Services for cloud infrastructure as a service.
- Security Protocols: Data encryption and transmission and the HIPAA compliance to protect electronic protected health information.

2-Technical Feasibility:

- Proven Technologies: The technologies used by Teleme are common and have been found to be very effective and can be widely applied.
- Development Talent: The most suitable project team includes a mix of developers, data scientists, and medical professionals.
- Scalability: And to meet the higher performance to handle the large and growing number of users without causing degradation of services during peak hours.

3- Economic Viability

Market Analysis:

- Growing Demand: And as for the global telemedicine market it is projected to reach \$185. The global beverages market is estimated to reach \$2173 of 6 billion growing at a CAGR of 23 in 2026. 5% from 2021 to 2026.
- Target Audience: The consumers Teleme' target includes rural and under served areas and busy working class people and those who want the convenience of healthcare at their hands.

4-Revenue Streams:

- Subscription Model: Consolidated monthly fees: payment for individual patients and healthcare practitioners.
- Consultation Fees: Fee schedule of \$52 per visit for each telemedicine consultation.
- Partnerships: Clinical care management relationships between health facilities and insurers and drug companies.

5-Cost Analysis

- Development Costs: Expenses in creating and commissioning a software application project.
- Operational Costs: Cloud provider bills for its services, maintenance of the services provided, support for the customer, and regarding the marketing of the services offered.
- Marketing and Sales: Promotions and public relation with budget for public relations and promotional programs.

6-Return on Investment (ROI):

- Revenue Projections: If the company were to sign up 10,000 subscribers in the first year at an average of \$50 per month then the first year figures could be in excess of \$6 million.
- Break Even Analysis: The first year will be heavily loss-prone despite the costs to develop and operate the proposed restaurant being approximated at \$3 million.
- Long-term ROI: As the user base develops and operational efficiencies increase RI will increase rapidly as well to the point that a 30-40% profit is anticipated in the first 3-5 years.

7-Right to Life and Reasonable Application for Commercial Use.

- Current Market Trends

- Telemedicine Adoption: The pandemic of COVID-19 indicates that telemedicine has already become quite an ordinary means of healthcare provision.
- Technological Advancements: The increased use of AI and cloud-based technologies makes telemedicine platforms more efficient and reliable.

8-Future Potential:

- Expansion Opportunities: Potential to enter other developing markets and the possibilities to work with other healthcare solutions like wearable devices or EHR systems.
- Regulatory Support: Growing government assistance and regulations that favour the implementation of telehealth services.

Teleme is a technically successful and economically sustainable telemedicine model that has strong opportunities for growth in the tele democratic economy. Showing a solid technological base, profitable business model and strong market potential, Teleme can be a target for investment with high rates of return. Our SWOT analysis clearly shows that Teleme is not a far-fetched idea but merely a practical approach to the future of healthcare.

6.0 Systems Requirements

6.1 Requirements Gathering & Elicitation

Documenting requirements gathering, elicitation, and client requirements is essential for the creation of Teleme, an online platform that links users with doctors, pharmacists, and health labs. By doing this, the project scope is guaranteed to be explained well, and the development is in line with stakeholders' expectations.

Stakeholder Identification :

One of the most important phases in gathering requirements for the Teleme platform is identifying all relevant stakeholders. The main stakeholders in the platform's success are end users (patients), healthcare practitioners (doctor, specialist), pharmacists, health labs, and the administrative staff. Each of these groups has specific needs and expectations that need to be understood and fulfilled.

A user-friendly interface, secure access to medical records, accessible appointment scheduling, reliable communication with healthcare professionals, and fast delivery of prescription medicines and test results are all necessities for end users. In order to successfully manage patient contacts, doctors require capabilities that allow them to schedule and conduct video consultations, access and update patient information, prescribe medicine, and manage patient care. Pharmacists need tools to check and dispense medications, communicate with patients and other healthcare providers, manage electronic prescriptions, and even offer consultation services. Health labs must be able to take test orders, schedule appointments, process tests, and report the results accurately and securely.

System analytics, user management tools, billing and payment processing functions, and customer service capabilities are all necessary for administrative staff to have access to. In order to create a broad, user-friendly platform that provides excellent online healthcare services, it is very important to understand these various needs.

6.2 Clients Requirements :

The second most important step is obtaining full details on stakeholders' requirements, preferences, problems, and expectations and conducting complete surveys and interviews with them. In order to gather both qualitative and quantitative data, this method requires communicating with members of each stakeholder group directly, including end users (patients), medical professionals, pharmacists, health labs, and administrative staff.

The expectations of end users may be revealed, along with those of healthcare practitioners, pharmacists, health labs, and administrative staff. Healthcare practitioners may need to consider workflow requirements and integration with electronic health records, while pharmacists may have concerns about prescription management and communication. Finally, pharmacists may have views on system accessibility and productivity.

By identifying essential features for each group, the analysis of this data helps in the creation and development of the Teleme platform, making sure that it fulfils a variety of requirements and allows the offering of online healthcare services of the finest quality. The feedback of stakeholders is continuously gathered during development to further validate needs and improve the platform.

6.3 Scope Definition

The Teleme platform aims to develop a comprehensive online healthcare ecosystem connecting patients with practitioners, pharmacists, and health labs. Including all of the features and functionalities that will be present in Teleme platform, creating project boundaries, and controlling stakeholder expectations are all part of defining the platform's scope :

| Features | Description |
|--|--|
| User registration and authentication | For patients, physicians, chemists, and administrative staff, secure sign-up, login, and profile maintenance |
| Finding doctors and appointment scheduling | search for doctors, go through profiles, and use reminders to keep track of appointments. |
| Video Consultation and chatting with doctors | WebRTC and Socket.io for real-time video consultations and communications. |
| Electronic Prescriptions and Pharmacy Orders | Electronic prescriptions can be issued and viewed, and orders can be fulfilled with pharmacy |
| Lab Test Scheduling and Results Access | Plan lab tests, get notifications, and securely access the findings. |

| | |
|---|--|
| Health Records Management and Secure Data Sharing | Use encryption to store, organise, and distribute electronic health records |
| Administrative Dashboard and Analytics | Tools for managing user roles, monitoring activities, and generating reports |

6.4 Functional Requirements (Table)

Functional requirements highlight the specific behaviours and functionalities that the system must have in order to accomplish its goals. They explain what needs to be done by the system in order to fulfil user requirements and fulfil its intended function. The following are some possible examples of Teleme platform functional requirements:

| Functional requirements | Explanation |
|--|---|
| User registration and profile management | By giving their login credentials and submitting their personal information, users should be able to create an account. |
| Appointment Scheduling | Patients should be able to search for medical professionals, see when they are available, and make appointments for checkups or treatments. |

| | |
|--|---|
| Video consultant and chat with doctors | Video call conversations and chats between patients and doctors should be supported by the platform, allowing for online consultations. |
| Electronic Prescriptions | Patients should be able to electronically get pharmaceutical prescriptions from doctors that can be fulfilled by pharmacies. |
| Lab test booking and results | Patients should be able to access their test results online and healthcare providers should be able to arrange laboratory tests for their patients. |
| Secure data sharing | Patients and healthcare professionals should be able to share sensitive information, such as medical records, securely through the platform. |

6.5 Non-functional Requirements (Table)

Non-functional requirements :

However, non-functional requirements outline the characteristics of the system's operation, focusing on topics like security, compliance, usability, and performance. They specify the requirements for quality and restriction that the system must meet. The following are few examples of non-functional requirements for the Teleme platform:

| Non-functional requirements | Explanation |
|-----------------------------|---|
| Usability | <p>The platform should have an intuitive user interface that is easy to navigate for users with varying levels of technical expertise. This includes uncomplicated workflows, menus, and easily accessible help resources.</p> |
| Reliability | <p>The system needs to function as designed and be continuously available. This means maintaining time to a minimum and making sure the system can tolerate errors and recover gracefully</p> |
| Performance | <p>Requests should be processed quickly by the system, and it should react fast to user activities. This includes quick access to test results and medical information, no lag during video consultations, and speedy online website loading.</p> |

| | |
|-------------|--|
| Security | <p>Sensitive patient data must be protected by the platform from hackers, violates, and other security risks.Strong data encryption access restrictions,safe authentication procedures, and obeying to appropriate regulations and laws, such as the GDPR (General Data Protection Regulation) and HIPAA (Health Insurance Portability and Accountability Act), are all part of this. In the healthcare industry, security is essential for maintaining regulatory compliance and safeguarding patient privacy</p> |
| Scalability | <p>Without experiencing a decline in performance, the system needs to be able to manage a growing volume of users, data, and transactions. The ability of the platform to expand to accommodate demand from more users, healthcare providers, or features and services is provided by scalability.</p> |
| compliance | <p>Upgrading, expanding, and maintaining the system should be simple. This requires well organised code, a modular architecture, and full documentation. The ability of the system to adjust over time, adding</p> |

| | |
|--|---|
| | new features and effectively removing errors or issues with security is known as maintainability. |
|--|---|

Create a complete requirements document by compiling all the data that was collected. The team uses this document as an essential tool to make sure that the needs and expectations of all stakeholders are defined properly. It helps to match the project with the defined scope and priorities by providing information on the Teleme platform's features and functionalities. Stakeholders, use cases, functional and non-functional requirements and technical specifications are all included in the requirements document. It helps in preventing errors and ensures that the development process continues on track by offering a detailed and well organised description of what the system must achieve.

• 7.0 Architectural Overview

Platform and System Architecture:

- Platform: Teleme uses the latest web and mobile technologies to build a cloud-based telemedicine platform that extends to the user globally as a peerless, efficient, and secure service. Amazon Web Services and hospitals have been considered the preferred platform providers for its cloud data infrastructure and compliance with healthcare standards.

System Architecture:

- The architecture structure for Teleme is component based, follows the principles of SOA and ensures compatibility with other healthcare technologies for future expansions.

Modules: Designing UI (User Interface).

- Frontend Framework: ReactJS
- Mobile Development: React Native: The future of cross platform mobile application development?
- UI Components: Re-usable software modules for various user interfaces like patient portal, doctor features, and administrative tools.

Backend Services Module

- Backend Framework: Node. js with Express. js for implementing the logic for backend tasks.
- Database: MongoDB for the implementation of a flexible, scalable, and high performance NoSql database.
- Authentication: OAuth 2. 0 for secure authentication and authorization.
- Data Storage: Amazon S3 for storing the patients health records, images, other data.

- AI/ML Module

- Machine Learning Frameworks: Artificial intelligence and machine learning for the identification of disease, tracking of patients and making treatment decisions.
- - Natural Language Processing (NLP): NLP libraries to manipulate and get insight into the medical data and patient's queries.

Communication Module

- Video Conferencing: Video Telemedicine using WebRTC for remote patient consultations.
- Messaging System: Socket. io for real time synchronous discussion features.
- Notification System: Incorporation of other services such as Twilio SMS and email systems

Security Module

- Data Encryption: All data transferred over the internet as well as data that is stored will be encrypted using AES-256 standard.
- Compliance: The platform must comply with the regulations on data privacy and security as stipulated by the Healthcare Insurance Portability and Accountability Act and the General Data Protection Regulation.
- Audit Logs: Making it possible to record audit logs for every action made and every data request made by a user.

API Gateway and Integration Module: Using Oracle Service Bus.

- API Gateway: AWS API Gateway for RESTful Web Services.
- External Integrations: The use of application programming interfaces and software development kits for accessing services such as EHR systems, connected medical devices, and payers.

Extensibility and Evolution

- Modular Design: The system is a modular structure and it can be easy to upgrade, replace or scale the individual components. This modularity allows the continuous improvement and evolution in the use of new technologies and adaptation of the next requirements.
- APIs and SDKs: Teleme has a complete set of endpoints and software development kits through which users can build or create an activity on the platform.
- Microservices: The backend is designed in terms of microservices with one service being responsible for managing users, providing appointments, billing, and so on. This approach provides great flexibility for scaling and deploying services.

- DevOps Practices: The platform follows DevOps principles, such as continuous integration and continuous delivery, automated testing, and monitoring, in order to achieve fast development cycles and high-quality releases.

Technologies and Resources Used:

- Frontend Technologies:
- ReactJS
- React Native
- HTML5, CSS3, JavaScript (ES6+)

Backend Technologies:

- Node.js
- Express.js
- MongoDB
- AWS (EC2, S3, RDS, Lambda) and Others.

AI/ML Technologies:

- Python
- TensorFlow
- Scikit-Learn
- Natural Language Toolkit (NLTK)

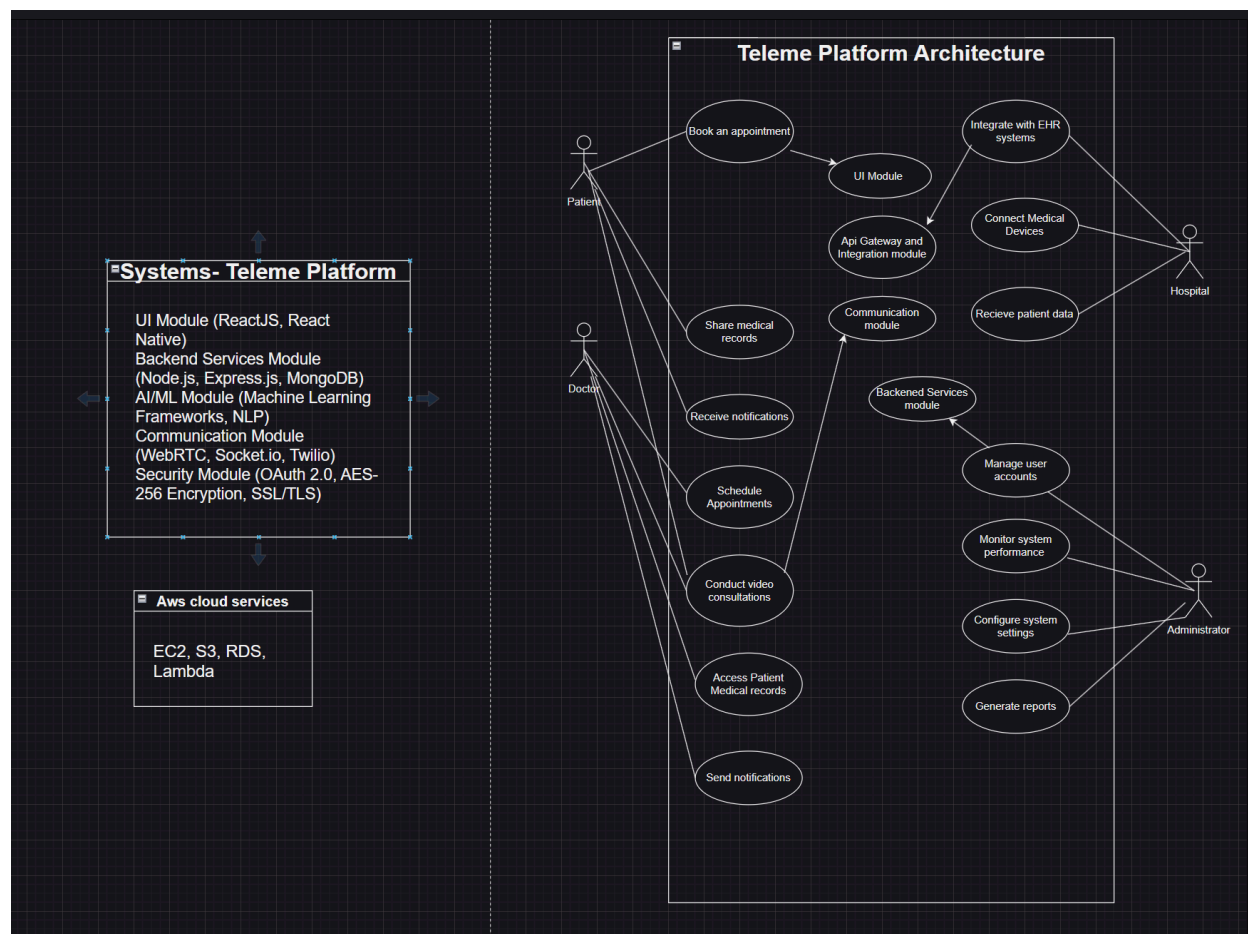
Communication Technologies:

- WebRTC
- Socket.io
- Twilio

Security Technologies:

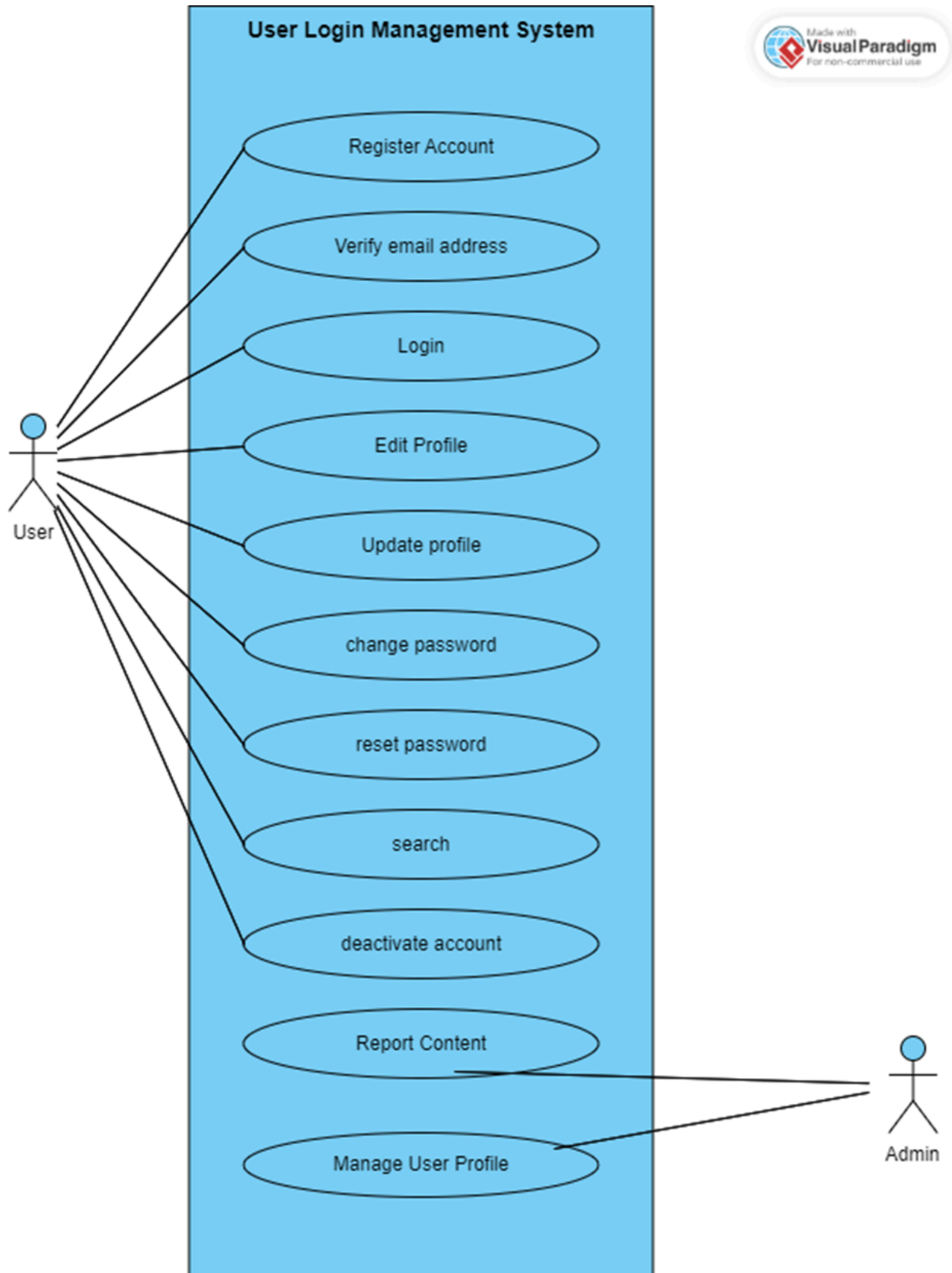
- OAuth 2.0
- AES-256 Encryption
- SSL/TLS

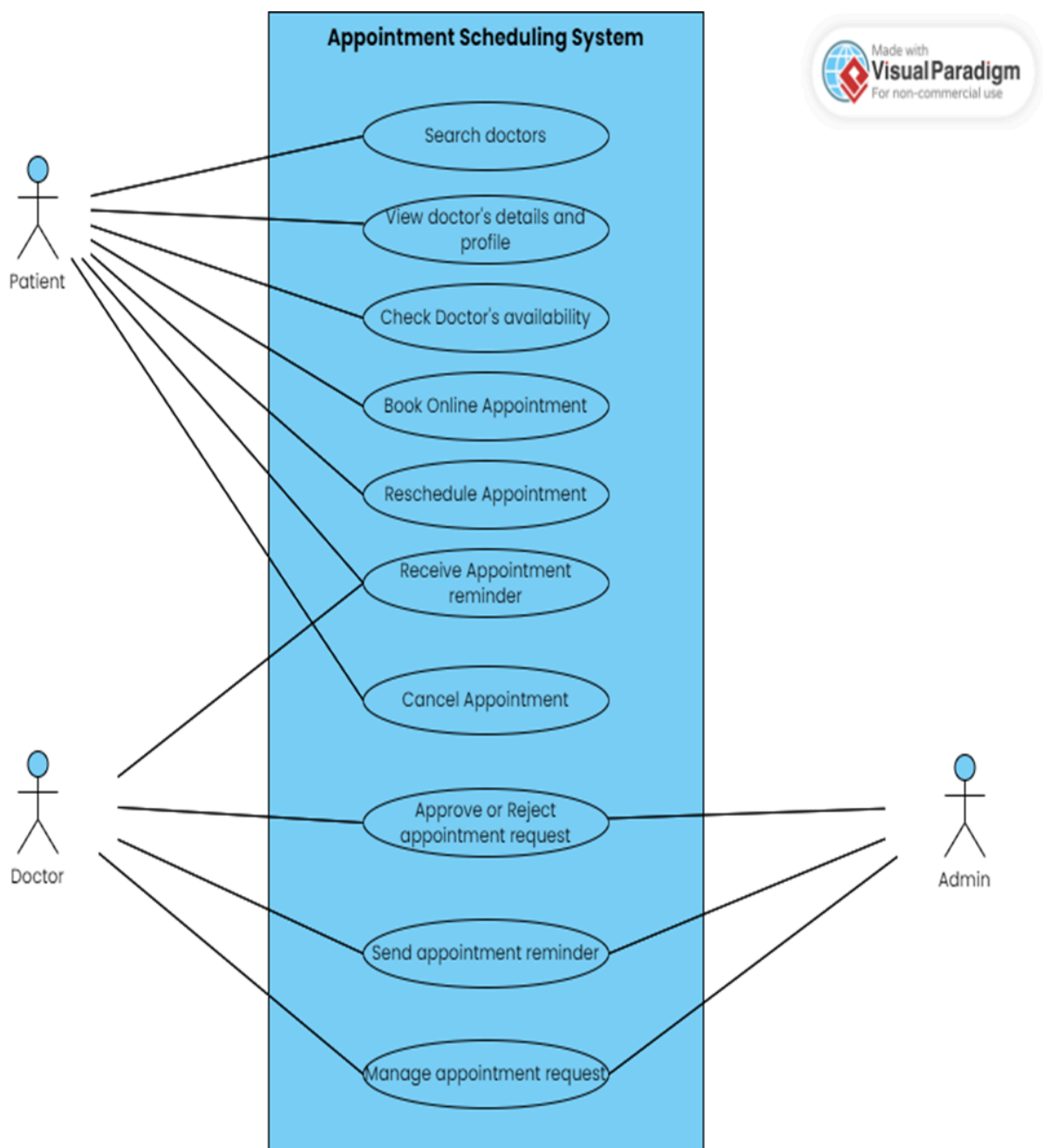
The design of Teleme had a scalable architecture and the ability to be evolved. Still this way Teleme's cloud-based platform, open APIs, microservices, and a secure environment make it possible to ensure flexibility, scalability, and compliance with the health care standards. This architectural solution not only satisfies present technical and business conditions, but also enables future growth and innovation in the field of telemedicine for Teleme.

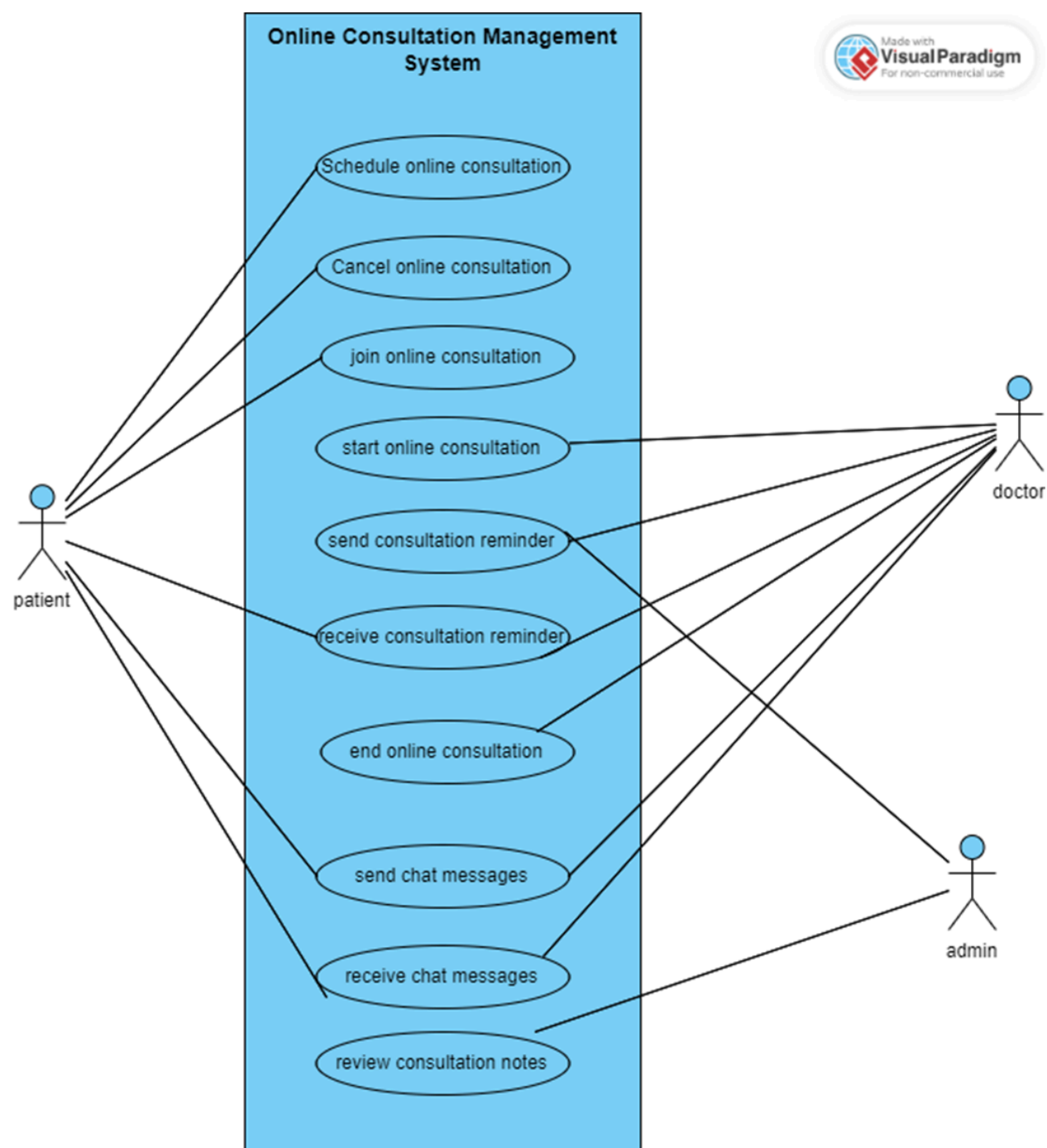


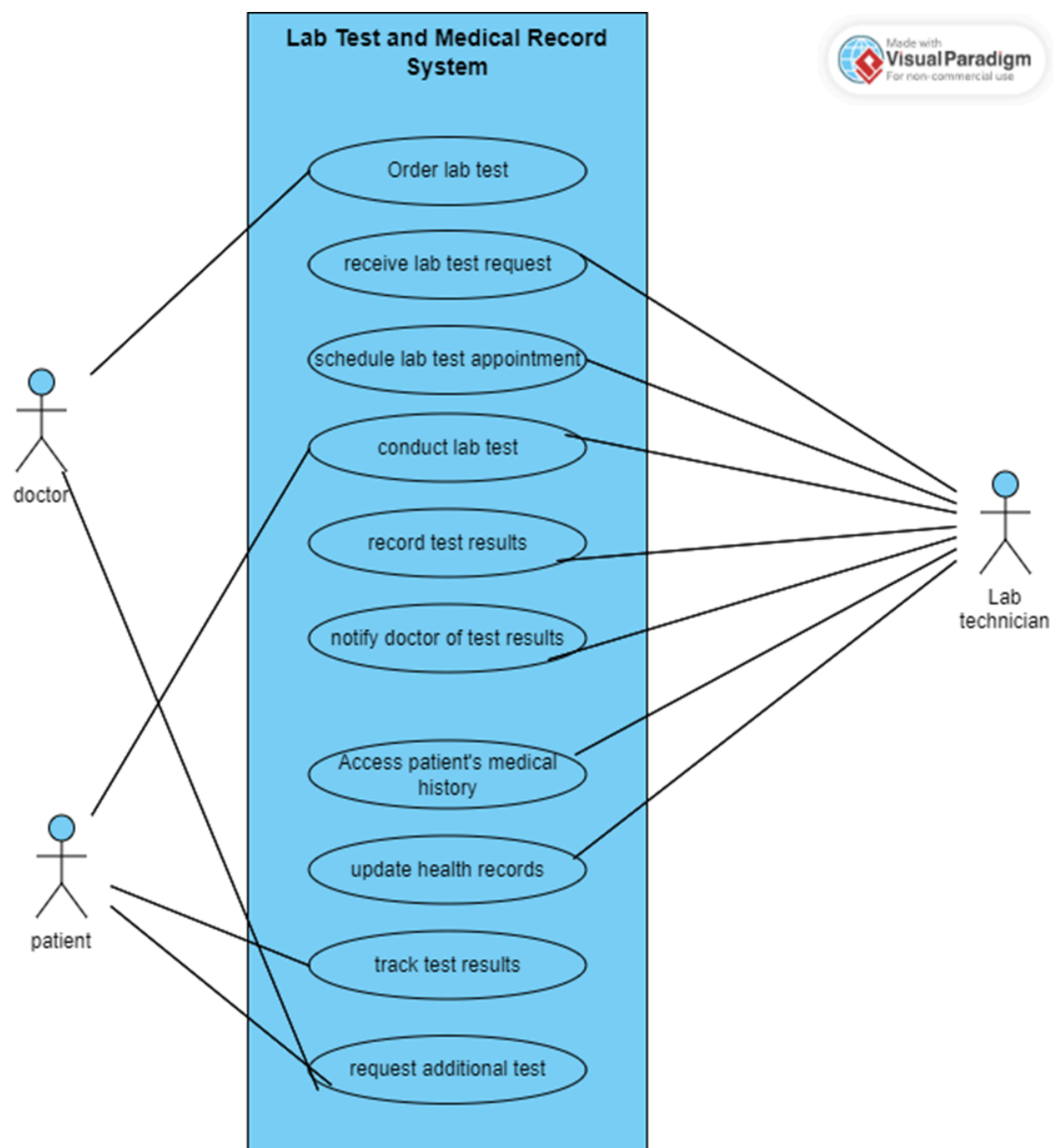
8.0 Systems Analysis & Design

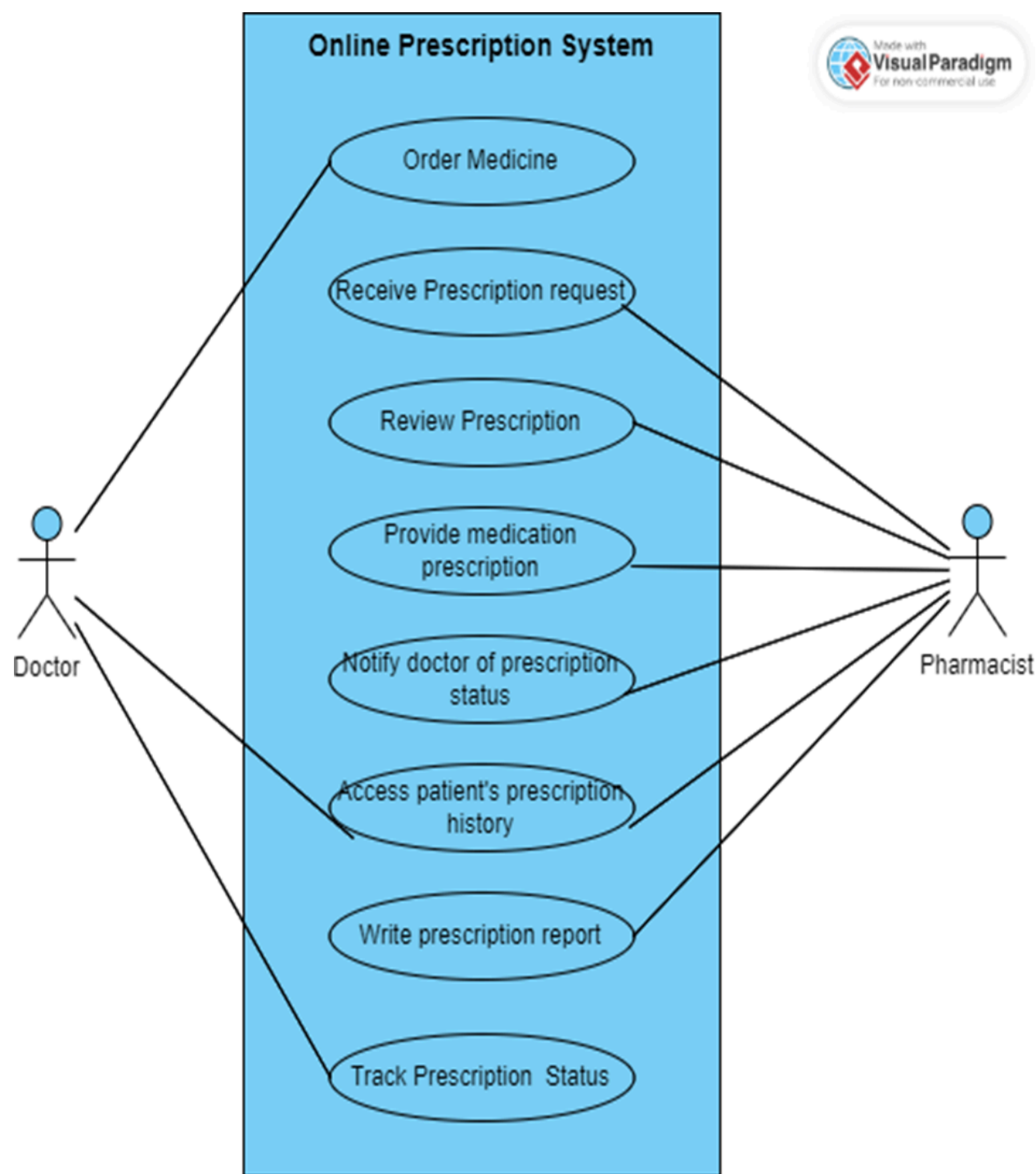
8.1 Use Case Diagrams





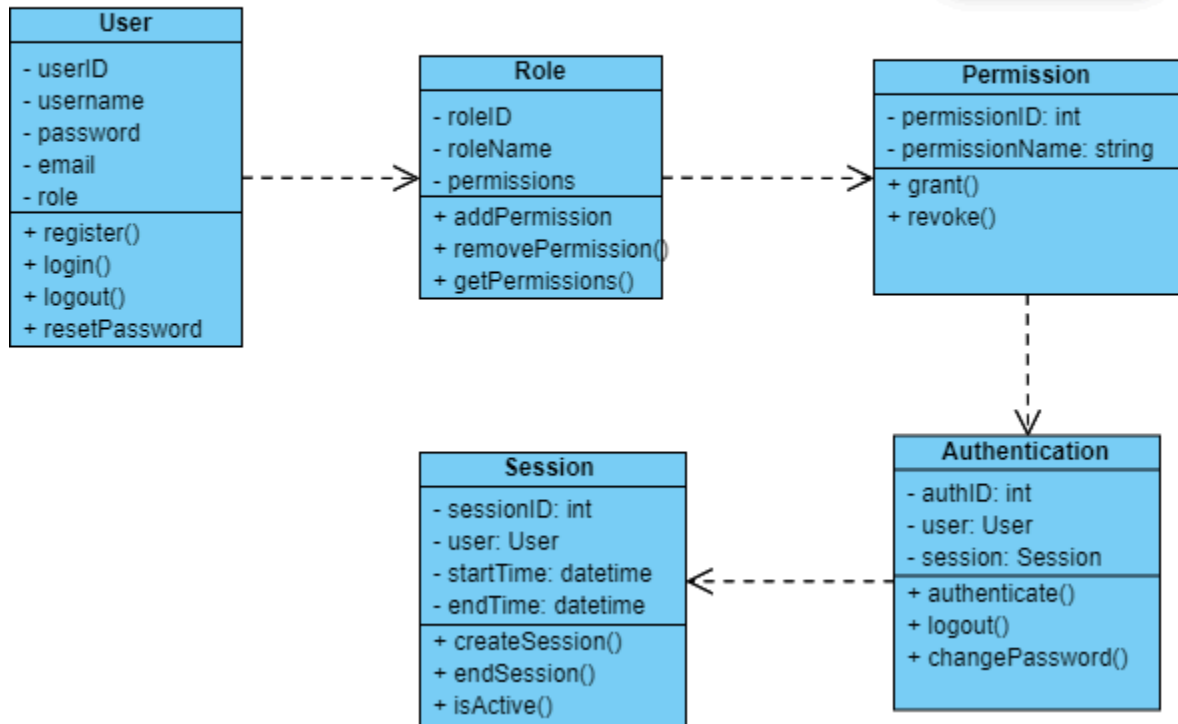






8.2 Class Diagram (UML, 3)

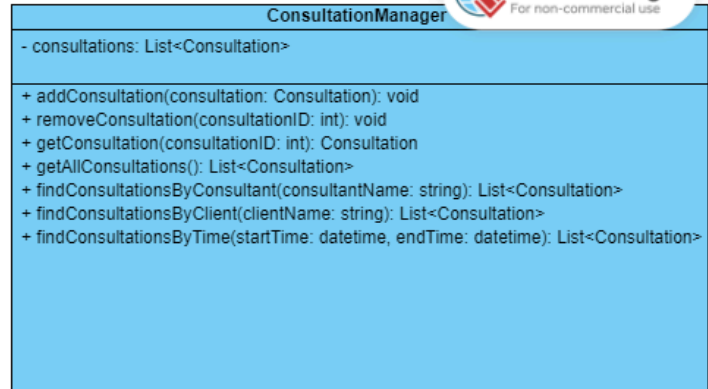
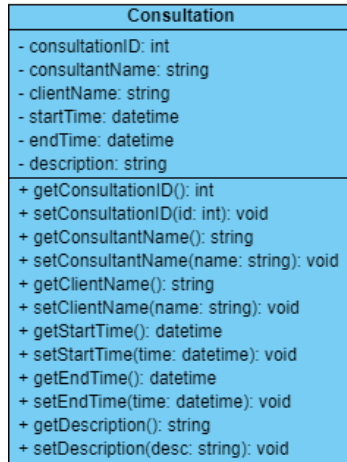
User login and authentication System



Appointment Scheduling System

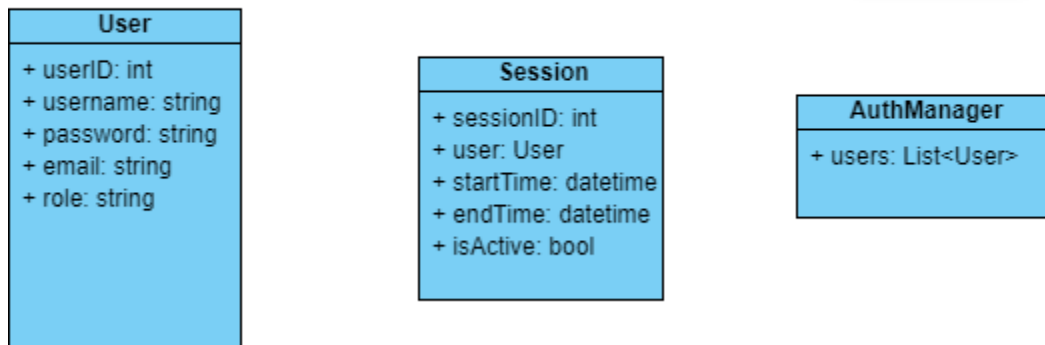


Consultation Management System

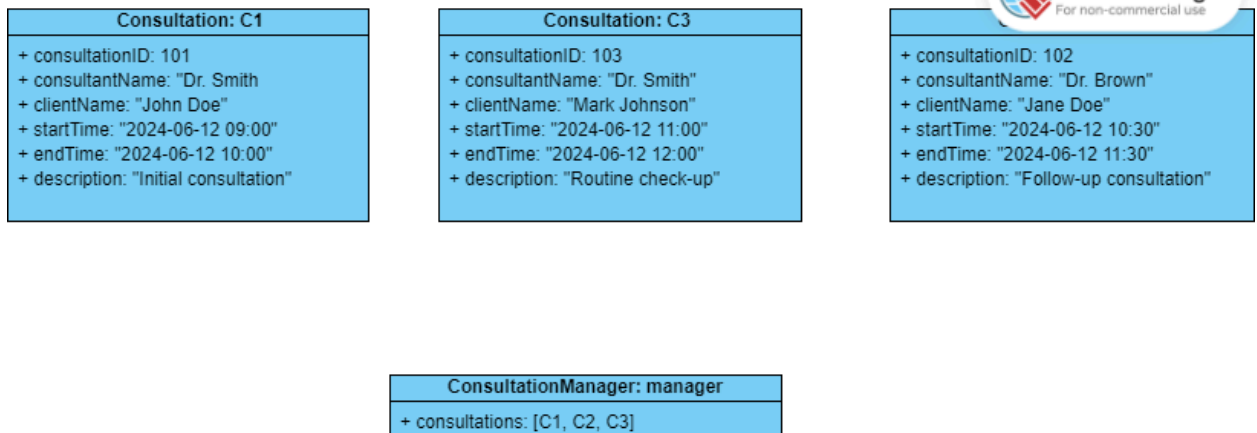


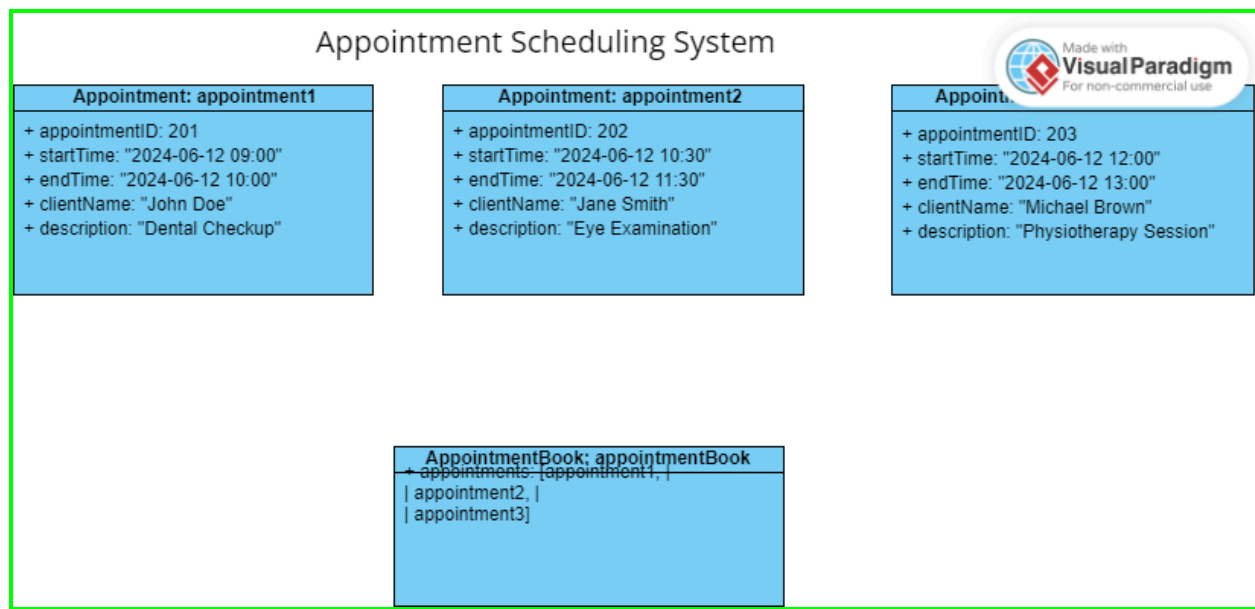
8.3 Object Diagram (UML, 3)

User login and authentication Sys



Consultation Management System





9.0 Suggested Deliverables and Work Plans

1.Deliverables:**Architectural overview :**

- Prepared technical documentation that covers architecture and deployment aspects of the project.
- Included flowcharts , diagrams , data models and any other relevant information .

Non-functional Requirements :

- Organise the repositories by components or modules .
- Set up Git repository to store script code and configuration files .

Report :

- .Generate test reports that document test cases, test results, and any issues encountered
- Include both unit tests and integration tests

User Guides and Manuals:

Develop user guides for end users and administrators ,support teams .

2. Work plan:**Define phases:**

- Break down the project into phases .
- Allocate time and resources for each phase.

Task Allocation:

- Assign tasks to team members based on their expertise.
- Use project management tools to track progress.

Timeline Sharing :

- 1 meeting to gather requirements
- 2 meeting to design and architecture
- Every wednesday testing and QA

Iterative Approach :

- Use an iterative approach (e.g., Agile, Scrum) to refine the plan based on feedback and changing requirements.
- Regular sprints or iterations allow for flexibility and continuous improvement.

Conclusion & Future Enhancement

In general, our plan is to improve and update the functions of the medical service platform based on the actual experience. We specifically analyse the service sector and technical level and give solutions, in order to improve the user experience and expand the visibility of the platform, while combining the emerging technology to reduce some costs as much as possible.

In the future, we will learn from competitors as much as possible and strive for win-win cooperation between the two sides. For example, we lack the resources of international doctors and the lack of disease resources. Opportunities are always to be found in the demand, we should be more in the customer use of the process of inquiry and investigation, constantly looking for problems and solutions to the problem. We hope that our platform can be the first thing that users can think of and use when they have medical service needs, which also requires us to have enough intimate and complete functions and enough influence. This is the goal, but also the direction of improvement.

10.0 References

- Altexsoft, 2023. Altexsoft.
Available at:
<https://www.altexsoft.com/blog/functional-and-non-functional-requirements-specification-and-types/>
- Centres for Disease Control and Prevention (CDC) (2024) 'Rural Health in Malaysia', [Online]. Available at: <https://www.cdc.gov/malaysia/ruralhealth> (Accessed: 16 May 2024).
- Curogram (2022) 'History of Telemedicine: An Overview', [Online]. Available at: <https://www.curogram.com/articles/history-of-telemedicine> (Accessed: 16 May 2024).
- GeeksForGeeks, 2018.
Available at:
<https://www.geeksforgeeks.org/software-engineering-requirements-elicitation/>
- Gordon, S. H., Berwick, D. M. & Davis, K. M. (2020) 'Evaluating the quality of care in telehealth services', Journal of Telehealth and Telecare, 26(4), pp. 239-246. doi: 10.1177/1357633X20933122.
- Kruse, C. S., Krowski, N., Rodriguez, B., Tran, L., Vela, J. & Brooks, M. (2017) 'Barriers to telemedicine and challenges in patient engagement', Journal of Medical Internet Research, 19(9), e300. doi: 10.2196/jmir.7553.
- Kruse, S., Krowski, N., Rodriguez, B., Tran, L., Vela, J. & Brooks, M. (2018) 'The need for enhanced training in telemedicine', Journal of Health Communication, 23(5), pp. 445-451. doi: 10.1080/10810730.2018.1469658.
- McKinsey & Company (2020) 'The rise of telehealth: How to increase engagement and user certainty', [Online]. Available at: <https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/the-rise-of-telehealth-how-to-increase-engagement-and-user-certainty> (Accessed: 16 May 2024).
- Singla, C., 2020. GeeksforGeeks.
Available at: <https://www.geeksforgeeks.org/functional-vs-non-functional-requirements/>
- Software, j., n.d. Jama Software.
Available at:
<https://www.jamasoftware.com/requirements-management-guide/requirements-gathering-and-management-processes/a-guide-to-requirements-elicitation-for-product-teams>

- United Nations (no date) 'Sustainable Development Goals (SDGs)', [Online]. Available at: <https://www.un.org/sustainabledevelopment/sustainable-development-goals> (Accessed: 16 May 2024).
- USA Facts (2021) 'Telemedicine usage during the COVID-19 pandemic in Malaysia', [Online]. Available at: <https://www.usafacts.org/reports/telemedicine-covid19-malaysia> (Accessed: 16 May 2024).
- Weiner, J. P., Bandeian, S., Hatef, E. & Lans, D. (2021) 'Increased use of telemedicine during the COVID-19 pandemic', BMC Health Services Research, 21, Article 342. doi: 10.1186/s12913-021-06256-5.

