Android-Based Doctor E-Consultation Application Using Scrum

Rendy Andika[1)*], Ilka Zufria[2)], Triase[3)]
[1)2)3)]Universitas Islam Negeri Sumatera Utara
[1)]rendyndika@gmail.com, [2)]ilkazufria@uinsu.ac.id, [3)]triase@uinsu.ac.id

Abstract: The standard service hospitals provide for their patients is a doctor's consultation. However, many patients need help accessing this service due to having to go to the hospital, queuing, and long waiting times. So that patients no longer have difficulty accessing consulting services, we need a system that can speed up consulting activities. The system development method used in Android-based e-consulting applications is the Scrum method. The system development process is somewhat accelerated using the Scrum methodology because all development activities require planning and timing for each sprint, starting with sprint planning, continuing through the daily scrum, sprint review, and sprint retrospective, which is repeated at each sprint to avoid delays in application development. By offering consultation services online, this system allows patients to access existing facilities and more efficiently supports the improvement of consulting services at existing hospitals, especially in Indonesia.

Keywords: Application, E-consultation, Agile, Scrum, Android

INTRODUCTION

Information technology is increasingly ingrained in everyday life. Increasing the effectiveness and efficiency of human operations is an influence on the development of information technology. It is possible to provide information quickly and precisely using technology for communication. Technology-based consulting services are a rapidly growing application of information and communication technology in support services. (Kurniawati, 2019)

One of the Military Hospitals belonging to the Indonesian Navy in the Belawan area is RSAL. Dr. Komang Makes Belawan. To help prospective patients, this hospital offers several integrated services, including Emergency Room, Children's Poly, Surgery, Ophthalmology, and others. However, based on observations, many services have yet to be handled optimally, such as consultation services between patients and doctors, where patients usually need to travel directly to the hospital. The patient must bear the length of the doctor's consultation process and additional costs related to re-examination (Haryanto et al., 2016). In addition, socialization around health issues is also uneven, as seen from the many cases of the Coronavirus currently circulating, the need to get information on doctors' schedules in person, and so on. While many people need health information and do not want to be constrained by hospital opening hours, the delivery of health information is limited to when hospitals are open (Ayuninghemi & Deharja, 2017)

Services at RSAL. Dr. Komang Makes must be improved considering the problems that arise by implementing technology in its consulting activities, which will later make it easier for patients to consult because it can be done online anytime, anywhere, and without waiting for the clinic or hospital to open In addition, the COVID-19 epidemic was still raging when the research was conducted, which limited people's mobility and required a quick response to any problems. We need the proper system development framework or techniques to build and implement systems that will address these challenges more quickly. Scrum is a popular systems development methodology because it is an adaptable, iterative, fast, flexible, and successful approach intended to provide substantial added value quickly (Hadinata & Nasir, 2017) Many studies have been conducted on this subject, with "E-Consul Application Service Development" being one of them (Ayuninghemi & Deharja, 2017). The application is not real-time but allows the patient to consult by sending several questions through the electronic consultation application, and the administrator then responds to these questions. In this study, patients can communicate in real time according to the doctor's practice schedule. Therefore, it is necessary to design a system that makes it easy for patients to consult with the desired doctor online and in real-time, referring to the background that has described some of the difficulties that patients in treatment activities with doctors often experience. The goal is to save time and effort between the patient and the doctor.

*name of corresponding author

Several problem formulations were put forward against the background described: (1) What is the scrum system development methodology used to create an Android-based doctor e-consultation application? (2) How do you make an Android-based doctor consultation application to connect patients and doctors for online or real-time consultations?

The problems in this discussion have several limitations, including: (1) Users and doctors carry out consultation activities via online chat on the application to be built. However, the user must ask to start the conversation and get the doctor's approval. Users can only request chat times that are by the doctor's schedule. (2) Users can take advantage of the doctor's appointment feature offline according to the doctor's schedule availability (3) The application displays the schedule availability for each doctor at RSAL. Dr. Komang Makes Belawan through the application to be built. (4) Via the app's hotline dial, patients can call the on-call hospital ambulance staff to transport them to their chosen location. (5) The study concentrates on consulting ordinary patients (patients without BPJS participant status). (6) The Scrum model and Agile techniques are used in the design process. (7) The final output of this research is a mobile application for User and Doctor roles that is made using the React Native Library and Firebase. Meanwhile, cloud functions are created using node js with the express js framework, and the Administrator section is created using the web-based Vue and Firebase Libraries.

The research objectives to be achieved are: (1) Using the Scrum method as a system development approach while creating an Android-based doctor's e-consultation application. (2) Making an Android-based online doctor consultation application at RSAL. Dr. Komang Makes Belawan. Patients will find it easier to check their health because it can be done online and anywhere.

LITERATURE REVIEW

Consultation is an activity or process between two or more people between the consultant and the client. The client requires assistance from consultants to help solve problems that clients face. The consulting approach has several characteristics as follows:

1. Substantive consultation (supported by the introduction of a knowledge bar).
2. Consulting is goal-oriented and often has different goals related to work.
3. A set of variables and related rules governs consultation.
4. Process-oriented consulting, including collecting data, recommendations, solutions, and support.
5. Consultation is essentially triadic (three parties)

Consultation based on ideology, values, and ethics (Rahman, 2019)

While medical consultation is a procedure in which there is a request to health care providers to review the medical history patient, examine the patient's condition, and make further recommendations for patient care and treatment. Medical consultation can also be interpreted as a meeting between doctor and patient to take preventive measures and stop the development of various diseases, especially for patients' high risk. Getting an early diagnosis of the patient's condition to prevent the possibility of disease can be even more dangerous. (Solutions, 2016)

Regarding Agile development, Agile development is a set of requirements-based software design and development methods, methodologies, and solutions through collaboration and teamwork. (Wulan, 2016). The problem with using traditional software development methods is that they require onerous processes such as:

1. The project plan must be completed in advance.
2. Written software requirements
3. Fully design that meets written requirements.
4. Build software code that meets all written and design requirements.
5. Fully test the software and check if it meets the requirements and design (Eric J. Braude & Bernstein, 2016)

In this way, agile development seeks to address the problem software development such as:

1. Software has unpredictable and ever-changing requirements. In addition, user requirements often change over the course of a project.
2. Overlapping design and development makes it difficult to predict how far a design will last before development.
3. Analysis, design, implementation and testing of unpredictable systems according to plan and desire. (Ahmad et al., 2020)

Scrum is an actual implementation of an agile framework in project management for an iterative software development process. Scrum focuses on generating high scores in a short amount of time. It is a team-oriented method of assigning specific roles and establishing short-time boxes called sprints in which the system gradually develops and produces a differentiated product. Scrum is considered one of the best and most frequently used ways. The popularity is because it is considered simple and because it focuses on software management.

*name of corresponding author

METHOD

In this study, several working methods were used, one of which was the method of collecting data using qualitative methods, the stages of data collection were in the form of observation, interviews, and literature review. The system development method used the agile method, namely the scrum model..

The stages of the qualitative research method used in this study were observation, interviews, and literature review.

a. Observations

Researchers at RSAL made observations. Dr. Komang Makes Belawan. Observations were carried out in the medical record section, whose job was to record doctors' schedules and other related medical record activities, as well as direct observation of a sample of informants from specialist doctors and patients. This is to the notion of observation. Namely, observation requires regular and logical thinking in addition to careful observation. (Atika & Tarigan, 2014)

b. Interview

One way of collecting data by talking directly to sources is through interviews. Interviews were conducted with Mrs. Susi Erlina Simbolon, who oversaw the medical records department; Mrs. Laura Pandia, an assistant for a Skin Specialist; and Mrs. Ros, a sample of informants from the patient's side.

c. Literature review

The literature review is data collection which includes digesting and exploring information related to the subject matter, whether in books, journals, or theses.

Meanwhile, regarding the system development method used, this research uses agile software development methods using the Scrum model. Agile development is a set of requirements-based software design and development methods, methodologies, and solutions through collaboration and teamwork (Wulan, 2016). Scrum is an actual implementation of an agile framework in project management for an iterative software development process. This scrum focuses on producing high scores quickly (Rodríguez et al., 2019; Schmidt, 2016). The following stages will be carried out in the research:
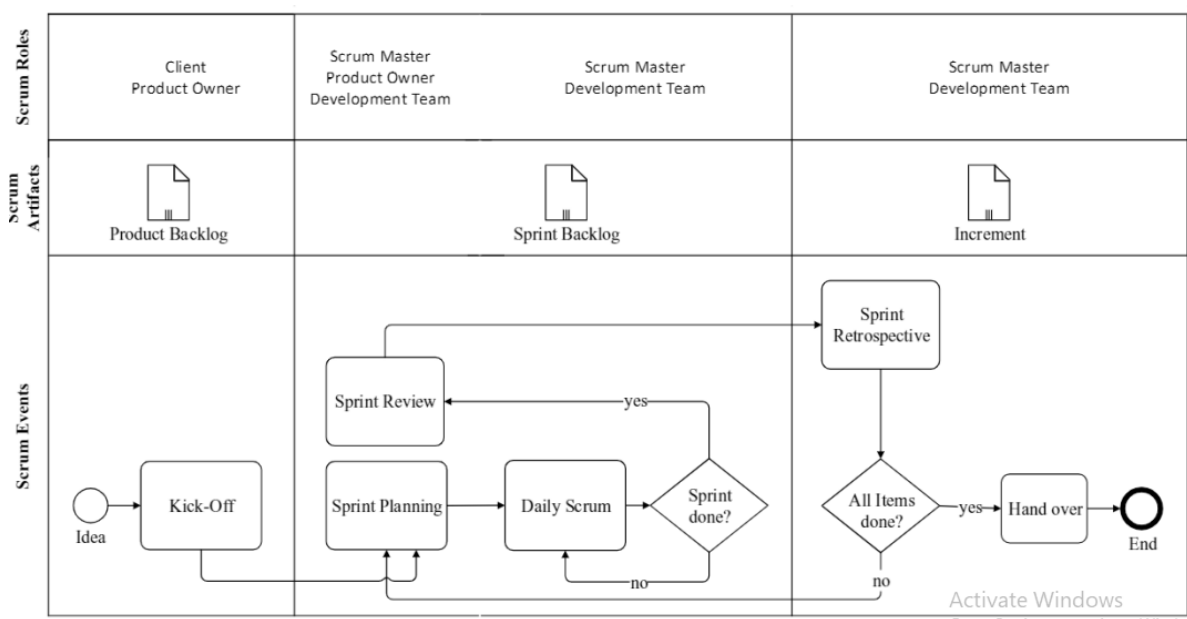

Fig. 1 Scrum model framework (Streule et al., 2016)

a. Product Backlog

At this stage, the details of priority features are prepared to be included in the system to be built.

b. Sprint Backlog

At this stage, the activities to be carried out in meeting the needs that have been prepared at the backlog stage, with a predetermined duration of realization, are carried out.

c. Sprint

Represents a time frame of less than 30 days for software development projects to be completed and put into an environment where they can be used by users or put into production.

d. Working Increment of The Software

*name of corresponding author

At this stage, a review process is carried out by the end user in order to get feedback on the application being developed which will then be repaired and then a review process will be carried out again until the application meets the qualifications of the end user (Sauda et al., 2019)

The following is a summary of the framework arranged in the form of a flowchart:
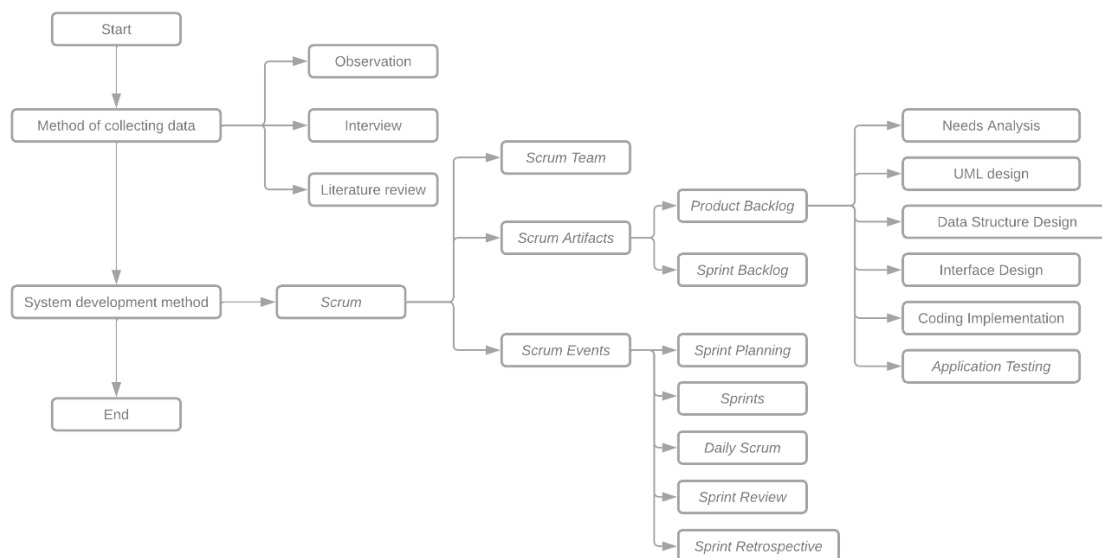

Fig. 2 Thinking Framework

RESULT

Based on the results of observations that have been made, a solution is needed that can overcome problems related to the lack of optimal hospital services for patients. Here are some solution points that can be implemented:

1. A process is needed that can provide patients with information related to consultation activities without the patient having to come to the hospital.
2. It takes a process that can minimize queuing activities in the consultation process.
3. A process is needed that can provide comfort to patients regarding consultation activities.

At the system design stage, a flow map is needed to describe in general how the system will be built; below is the flow map of the Android-based doctor e-consultation application:
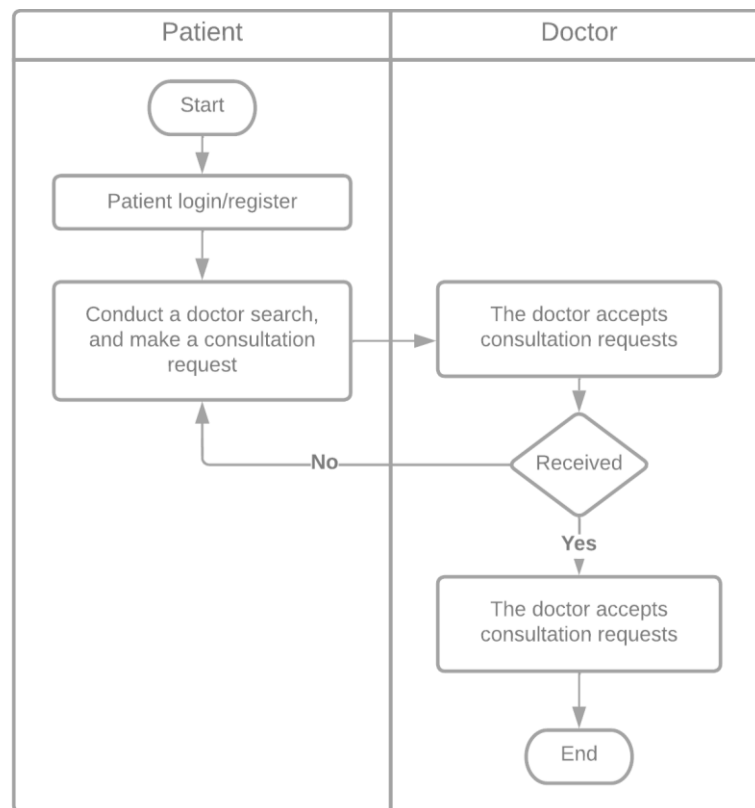
*name of corresponding author

Fig 3 Proposal system flowmap

A. Product Backlog

The product backlog is the only source of demand for any modifications that need to be made to the product (Schwaber & Sutherland, 2017). In this study, a product backlog was compiled in the form of a list of activities to be carried out to complete this research.

Table 1. List of Product Backlog

No	Name	Estimated time	Notes
1	Patient Login Feature	3 Day	
2	Patient Registration Features	3 Day	
3	Feature Show Doctor's Schedule List	3 Day	
4	Features of Making an Online Consultation Request	3 Day	
5	Appointment Making Feature	3 Day	
6	Features of Changing Patient Profile Data	3 Day	
7	Chat feature	3 Day	
8	Integration of All Patient Chat Data	3 Day	
9	Doctor Login Feature	3 Day	
10	Integration of All Doctor Chat Data	3 Day	
11	Consultation Request Reject Feature	3 Day	
12	Integration of All Patient Appointment Data	3 Day	
13	Reject/Cancel Appointment Request feature	3 Day	
14	Change Doctor Profile Data feature	3 Day	
15	Administrator login feature	3 Day	

*name of corresponding author
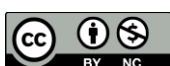
16	Manage Admin Data (CRUD) Features	3 Day	
17	Physician Data Management (CRUD) Features	3 Day	
18	Manage Data Attendants (CRUD) Features	3 Day	
19	Manage Article Data (CRUD) Features	3 Day	
20	Features Doctor's Notes on Patients	3 Day	
21	Preparation of system workflows	4 Day	
22	Preparation of system wireframes	4 Day	
23	Unified modeling language (UML) design	4 Day	
Total		72 Day / 6 Sprint	

B. Sprint Backlog

At this stage, time is defined, minimum viable product, and task grouping.

    a) Sprint time

        Based on the estimates that have been made, it takes 12 weeks to complete the product, or it means 6 sprints, because usually the span of time in 1 sprint is around 2 weeks.

    b) Defining the minimum viable product (MVP) of the product

        Based on the features taken from the product backlog items, at this stage a list of features will be developed to reach the Minimum Viable Product (MVP) stage.

    c) Defining the sprint backlog plan

        At this stage a grouping of tasks will be carried out based on the existing product backlog, the following is the sprint backlog plan that has been designed.

The following is a list of sprint backlogs that have been compiled, namely regarding the grouping of tasks

Table 2. Sprint Backlog

Stages	*Produck backlog item*
Sprint 1	UML Design, System Workflow Preparation, System Wireframe Preparation
Sprint 2	Patient login feature, patient registration feature, display doctor's schedule list feature, feature for making online consultation requests
Sprint 3	Appointment Making Feature, Changing Patient Profile Data Feature, Chatting Feature, Integration Feature of All Patient Chat Data
Sprint 4	Doctor Login Feature, Integration of All Doctor Chat Data, Reject Consultation Request Feature, Integration of All Doctor's Appointment Data
Sprint 5	Reject/Cancel Appointment Request Feature, Change Doctor Profile Data Feature, Administrator Login Feature, Admin Data Management (CRUD) Feature
Sprint 6	Doctor Data Management Feature (CRUD), Attendants Data Management Feature (CRUD), Article Data Management Feature (CRUD), Doctor Record Feature for Patients

C. Sprint Planning

S Sprint planning is planning the estimated time for work to be done in each sprint. Besides that, in this phase, the developer breaks down the items in the sprint backlog into smaller tasks.

Table 3. Sprint Planning

Tanggal	Tahapan	*Sprint Backlog Item*
18 October 2021 – 31 October 2021	Sprint 1	Compile patient application workflow, prepare doctor application workflow, Compile website administrator workflow, create wireframe based on patient application workflow, create wireframe based on doctor application workflow, create wireframe based on website administrator workflow, design Unified Modeling Language (UML), compile Database Design,

*name of corresponding author

		compile Interface Design.
1 November 2021 – 14 November 2021	Sprint 2	Patient login page display design, Creating database documents for user data purposes, Login page implementation, Patient register page display design, Register page implementation, Doctor list display design, Doctor list page implementation, Doctor detail display design, Doctor detail page implementation, Display design chat rooms, Implementation of online consultation requests, Design of the main patient page display, Implementation of the main page, Design of the onboarding page display, Implementation of the onboarding page
15 November 2021 – 28 November 2021	Sprint 3	Appointment request page display design, Appointment request page implementation, Appointment list page display design, Appointment page implementation, Profile page display design, Profile page implementation, Patient and doctor chat process implementation, Message page display design, Message page implementation
29 November 2021 – 12 December 2021	Sprint 4	Doctor login page display design, Doctor login page implementation, Doctor message page display design, Doctor message page implementation, Appointment page display design, Appointment page implementation, Doctor, and patient chat process implementation, Consult rejection process implementation.
13 December 2021 – 26 December 2021	Sprint 5	Appointment cancels page display design, Appointment cancels process implementation, Doctor profile page display design, Doctor profile page implementation, Administrator login page display design, Administrator login page implementation, Admin data manage page display design, Admin data manage page implementation
27 December 2021 – 9 January 2022	Sprint 6	Design of doctor data manage page display, Implementation of doctor data manage page, Design of ambulance officer data manage page display, Implementation of ambulance officer data manage page, Article data manage page display design, Implementation of article data manage page, Diagnostics results page display design, Results page implementation diagnosis.

D. Sprint Review

In this study, the sprint review phase was also carried out, along with the results of the sprint review of each completed sprint. From working on system workflows, workflow refers to the complete or partial automation of business processes when tasks, documents, or information are passed from one participant to another with specific actions based on a set of procedural rules (Astrininditya et al., 2018). At this stage, the developer compiles the basic flow of the application, namely the activities the user can carry out. Users can use the following activities: account registration, logging in, displaying user information, making online consultation requests if a doctor is available, making appointment requests with the doctor in question, and displaying all messages/consultation history that has been carried out. After designing the workflow, the wireframing stage is carried out, namely the stage in sketching the framework of the system pages to be built. The following is the result of the wireframing that has been made:
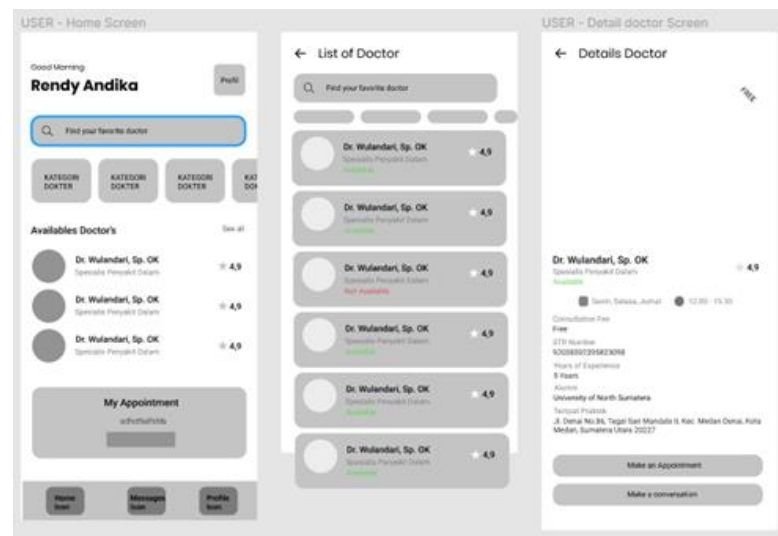
*name of corresponding author

Fig 4 System wireframe on the patient

In the process of making a system, a diagram is needed to define requirements related to the process. A use case diagram is a diagram made to show the interweaving of the elements involved in making an application (Samsudin et al., 2019). The following is a diagram showing what activities users can perform:
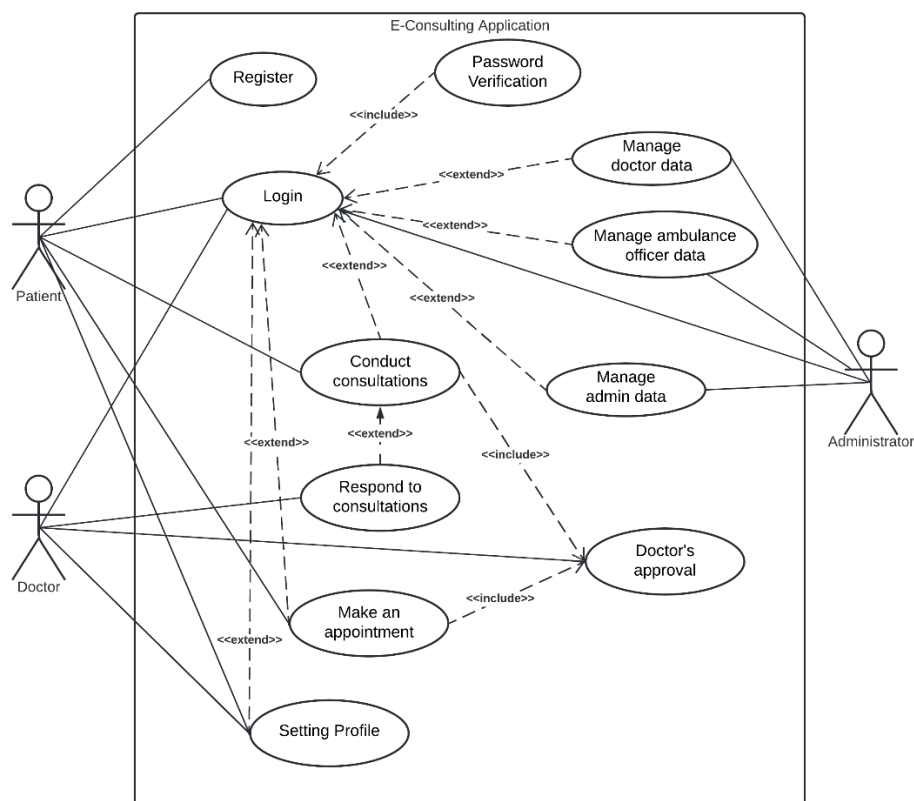

Fig 5 Usecase Diagram

In addition to the use case diagram, a diagram is also needed that defines the user's activities. Activity diagrams describe logic, business processes between actors, use case workflows, and activities in use cases (Mulyani, 2016).
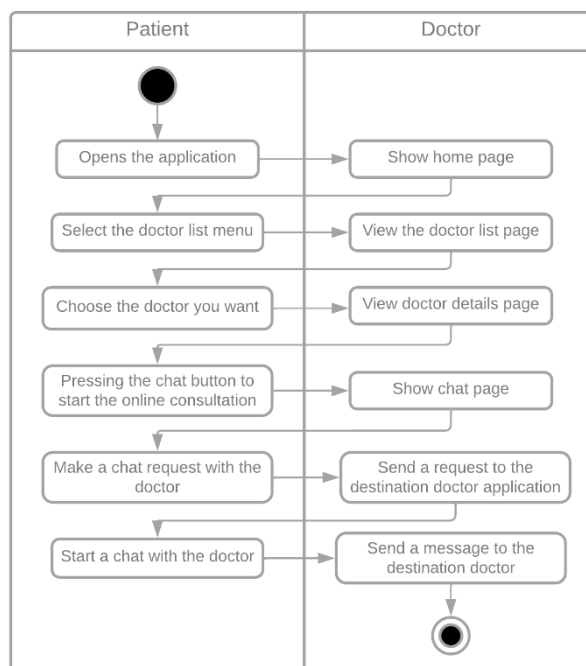
*name of corresponding author

Fig 6 Consultation Process Activity Diagram

Figure 6 describes the activity when the patient wants to undergo an online consultation with a doctor, starting with the patient opening the application, then looking for the desired doctor through the doctor's schedule list menu. If available, the patient can immediately request a consultation, and the patient must wait for approval from the doctor concerned to start the consultation process.

The class diagram is no less important than defining other diagrams. Because the most popular type of diagram is the class diagram, which helps us understand the class structure of a system. In the system design model, class diagrams display class relationships and an overall picture of each class (Kusuma & Yosrita, 2016). The following is a class diagram design for an Android-based e-consulting application:
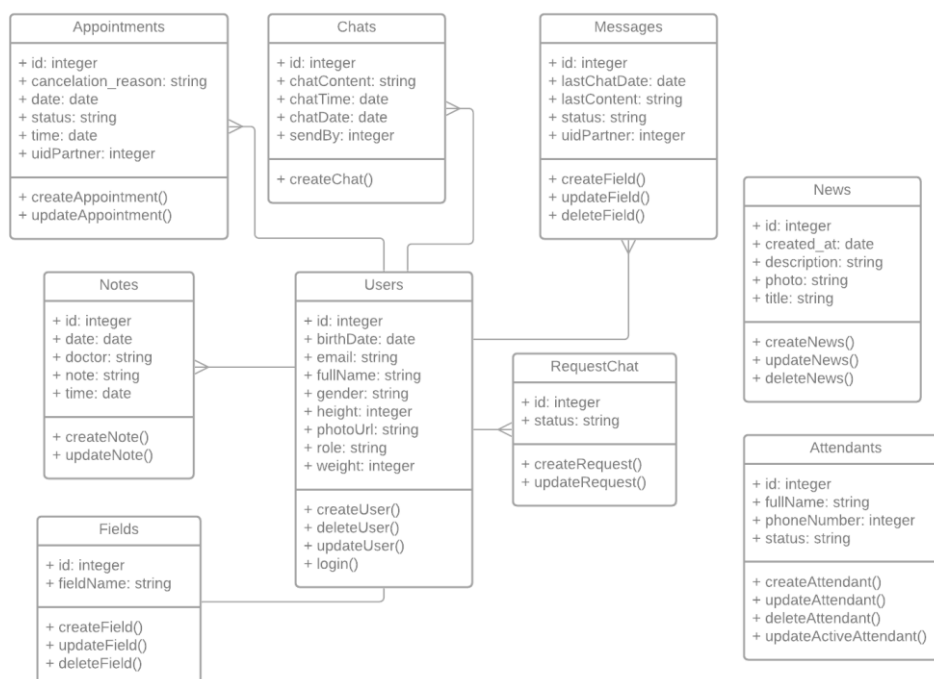

Fig 7 Class Diagram

*name of corresponding author

After completing all stages of planning, the next stage is implementation. Implementation is a step taken to convert the design results into a system that can be used. Following are the results of the implementation of this study:
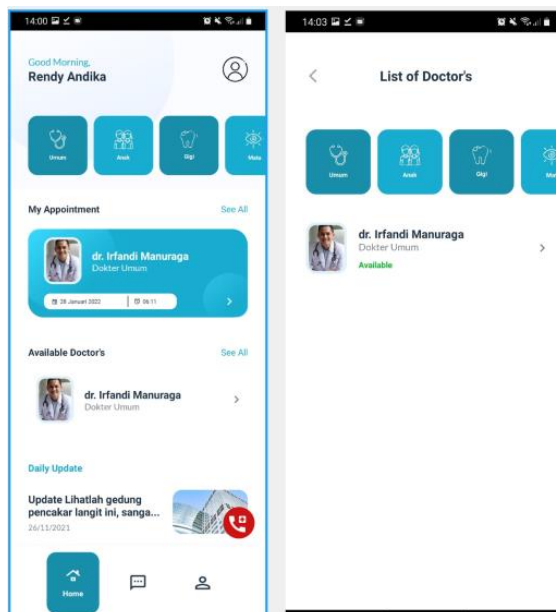

Fig 8 Main page and list of doctors

Figure 8 is the main page containing several sections that users can use, starting from a list of available doctor categories, several appointment lists, several available lists of doctors, and several available articles. On the doctor list page, the user can see a list of available doctors for that day.
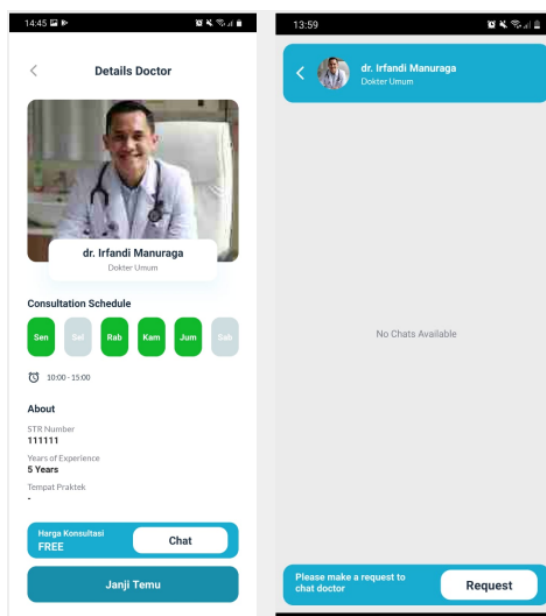

Fig 9 Doctor details page and chat room

Figure 9 shows the display when the user has selected the desired doctor through the doctor list page. The doctor's detail page contains some brief information about the selected doctor. At the end of the page, there is an option to do an online consultation or make an appointment directly with the doctor in question.

*name of corresponding author

Fig 10 Chat room page when accepted

At this stage, the user can already use the chat feature with certain doctors through a request process for the doctor. If the doctor accepts the patient's consultation request, then the chat column can be used immediately.

DISCUSSIONS

Based on the evaluation and testing of the e-consultation application at RSAL. DR Komang Makes can conclude that the process of consulting at the hospital can increase the effectiveness and efficiency of the process. This shows that the implemented Scrum implementation has been successful as a framework in making the system quickly and on time so that it can process application development quickly for clients.

CONCLUSION

E-consultation application at RSAL Dr. Komang Makes by applying the Scrum development method has been realized well and quickly, so this is the conclusion of the research carried out in the preparation of this scientific article referring to the research objectives. All development activities require planning activities and time in each sprint, starting from sprint planning, daily scrum, sprint review, and sprint retrospective, which are carried out iteratively for each sprint so that there are no delays in application development. To present real-time features in the consultation process in an Android-based electronic doctor consultation application, the React Native framework is used as a mobile application development and uses a database from Firebase.

REFERENCES

Ahmad, I., Borman, R. I., Fakhrurozi, J., & Caksana, G. G. (2020). Software Development Dengan Extreme Programming (XP) Pada Aplikasi Deteksi Kemiripan Judul Skripsi Berbasis Android. *INOVTEK Polbeng - Seri Informatika*, *5*(2), 297. https://doi.org/10.35314/isi.v5i2.1654

Astrininditya, R., Yaqin, M. A., & Zaman, S. (2018). Workflow Repository Menggunakan RDF. *Konferensi Nasional Sistem Informasi 2018*, 304–309.

Atika, T. A., & Tarigan, U. (2014). Prosedur Penerbitan Surat Keputusan Pensiun Pegawai Negeri Sipil pada Badan Kepegawaian Daerah Deli Serdang. *Jurnal Ilmu Pemerintahan Dan Sosial Politik*, *2*(1), 18–29. http://ojs.uma.ac.id/index.php/jppuma

Ayuninghemi, R., & Deharja, A. (2017). Pengembangan Layanan Aplikasi E- Konsul. *Prosiding Seminar Nasional Hasil Penelitian Politeknik Negeri Jember*, 266–272. https://publikasi.polije.ac.id/index.php/prosiding/article/view/797/559

*name of corresponding author

Eric J. Braude, & Bernstein, M. E. (2016). Software engineering: modern approaches. In *Waveland Press, Inc.* Waveland Press, Inc.

Hadinata, N., & Nasir, M. (2017). Implementasi Metode Scrum Dalam Rancang Bangun Sistem Informasi Penjualan (Study Kasus : Penjualan Sperpart Kendaraan). *Jurnal Ilmiah Betrik*, *08*(01), 22–27.

Haryanto, Riyani, N., Napitupulu, J. T., & Manurian, W. (2016). Pemodelan E-Health Pada Klinik Untuk Proses Konsultasi Dokter dan Penjualan Obat. *Sinergi*, *3*(2), 121–130.

Kurniawati, W. (2019). *PERANCANGAN MODEL E-KONSULTASI (Studi Kasus: Assessment Center Indonesia PT Telekomunikasi Indonesia)*. UNIVERSITAS PASUNDAN.

Kusuma, A. M., & Yosrita, E. (2016). Aplikasi Buku Digital Bidang Teknologi Informasi Berbasis Android Mobile Pada Perpustakaan Bppki Surabaya Badan Litbang Kementerian Kominfo Application of Information Technology Digital Book Based on. *Aplikasi Buku Digital Bidang Teknologi Informasi Berbasis Android Mobile Pada Perpustakaan Bppki Surabaya*, *5*(2), 57–70.

Mulyani, S. (2016). *Analisis dan Perancangan Sistem Informasi Manajemen Keuangan Daerah: Notasi Pemodelan Unified Modeling Language (UML): ISBN 978-979-19906-1-5: Vol. Edisi Ke-2*. Abdi Sistematika.

Rahman, A. (2019). *IMPLEMENTASI LAYANAN KONSULTASI DALAM MENGATASI STRES KERJA PEGAWAI DI LEMBAGA PEMBINAAN KHUSUS ANAK (LPKA) KLAS II PEKANBARU*.

Rodríguez, P., Mäntylä, M., Oivo, M., Lwakatare, L. E., Seppänen, P., & Kuvaja, P. (2019). Advances in Using Agile and Lean Processes for Software Development. *Advances in Computers*, *113*, 135–224. https://doi.org/10.1016/bs.adcom.2018.03.014

Samsudin, S., Irawan, M. D., & Harahap, A. H. (2019). Mobile App Education Gangguan Pencernaan Manusia Berbasis Multimedia Menggunakan Adobe Animate Cc. *Jurnal Teknologi Informasi*, *3*(2), 141. https://doi.org/10.36294/jurti.v3i2.1009

Sauda, S., Oktaviani, N., & Bunyamin, M. (2019). Implementasi Metode Scrum Dalam Pengembangan Test Engine Try Out Sertifikasi. *JISKA (Jurnal Informatika Sunan Kalijaga)*, *3*(3), 70. https://doi.org/10.14421/jiska.2019.33-07

Schmidt, C. (2016). *Agile software development teams*. Springer International Publishing.

Schwaber, K., & Sutherland, J. (2017). Panduan Scrum. *Imperial Journal of Interdisciplinary Research (IJIR)*, *2*(12), 293–298. https://www.scrumguides.org/docs/scrumguide/v2017/2017-Scrum-Guide-Indonesian.pdf

Solutions, P. (2016). *Medical Consult vs. Medical Clearance*. Solutions, Professional. https://www.profsolutions.com/industries/physicians/insurance/risk-management/medical-consult-vs-medical-clearance/

Streule, T., Miserini, N., Bartlomé, O., Klippel, M., & De Soto, B. G. (2016). Implementation of Scrum in the Construction Industry. *Procedia Engineering*, *164*(June), 269–276. https://doi.org/10.1016/j.proeng.2016.11.619

Wulan, R. (2016). PENGEMBANGAN KONFIGURASI MODEL ANALISIS ARSITEKTUR AGILE PADA PERUSAHAAN BISNIS IT ONLINE (Studi kasus Lazada dan Bhineka.com). *Faktor Exacta*, *9*(2), 166–177. https://journal.lppmunindra.ac.id/index.php/Faktor_Exacta/article/view/796

*name of corresponding author