

E-Ticketing System and Integration with Third Parties Scrum-Based

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Abstract— SCRUM is a software development life cycle that will work with collaboration to produce products quickly but still provide quality. By using SCRUM, it will increase productivity and increase mutual trust, togetherness, responsibility, ideas communication and creativity of team members. The stakeholder's expectation to build an e-ticketing system fits with the agile nature of SCRUM. Every process in SCRUM must run well starting from data collection, needs analysis, making product backlog, making sprint backlog, daily scrum meeting, sprint review until sprint retrospective must be carried out to achieve success. The applications built in this research will run on web browsers, android and API designs to be integrated with other applications. The research was conducted for two months by working on three product backlogs, then each product backlog would be broken down into three sprints. The results obtained in the study were able to answer the question of the problem that was built with the conclusion that the product owner's ability to communicate with stakeholders and daily scrum meetings was necessary in determining success in SCRUM.

Keywords— e-ticketing, Sinar Jaya, SCRUM, API, mobile, floor plan, seats, analysis, Traveloka, redbus

Abstrak— SCRUM merupakan siklus hidup pengembangan perangkat lunak yang akan bekerja dengan kolaborasi untuk menghasilkan produk dengan cepat namun tetap memberikan kualitas. Dengan menggunakan SCRUM akan meningkatkan produktivitas dan meningkatkan rasa saling percaya, kebersamaan, tanggung jawab, komunikasi ide dan kreativitas anggota tim. Harapan pemangku kepentingan untuk membangun sistem e-ticketing sesuai dengan sifat gesit SCRUM. Setiap proses dalam SCRUM harus berjalan dengan baik mulai dari pengumpulan data, analisis kebutuhan, pembuatan product backlog, pembuatan sprint backlog, daily scrum meeting, sprint review hingga sprint retrospective harus dilakukan untuk mencapai kesuksesan. Aplikasi yang dibangun pada penelitian ini akan berjalan pada web browser, android dan desain API untuk diintegrasikan dengan aplikasi lain. Penelitian dilakukan selama dua bulan dengan mengerjakan tiga product backlog, kemudian setiap product backlog akan dipecah menjadi tiga sprint. Hasil yang diperoleh dalam penelitian mampu menjawab pertanyaan dari permasalahan yang dibangun dengan kesimpulan bahwa kemampuan product owner untuk berkomunikasi dengan stakeholders dan pertemuan scrum harian sangat diperlukan dalam menentukan keberhasilan dalam SCRUM.

Kata kunci— e-ticketing, Sinar Jaya, SCRUM, API, mobile, denah lantai, kursi, analisis, Traveloka, redbus.

I. INTRODUCTION

Information technology growing rapidly parallel with the development of internet. Indonesian government make some regulation for encourage companies to follow technology. Regulation Department Of Transportation Republic Of Indonesia Number Pm 15 Year 2019 informs every transportation company to issue electronic tickets and passenger manifests. Based on these regulations, each transportation company must have its own e-ticketing system or can cooperate with existing e-ticketing systems such as tiketux.com.

PT. Sinar Jaya Megah Langgeng is a transportation company that prioritizes long trayek from city to city or island to island in Indonesia. PT. Sinar Jaya Megah Langgeng has 36 years of experience and is one of the biggest companies in the transportation sector. PT. Sinar Jaya Megah Langgeng has many agents from Lampung to Sampang Madura. PT. Sinar Jaya Megah Langgeng requires an e-ticketing information system starting from ticket sales to agent deposits. There are a lot of fictitious sales reports or ticket pricing outside the predetermined limits. The information system built is expected to minimize fraud in the field.

In this research also will design about API e-ticketing for collaborating with third party agents such as Traveloka and Redbus. E-ticketing system will use SCRUM method because of the needs of PT. Sinar Jaya Megah Langgeng who wants to create an e-ticketing system in a short time due to demands from the government. SCRUM is considered to be able to fulfill the request of PT. Sinar Jaya Megah Langgeng because of its agile and fast nature. In addition, the development team needs 9 people and have expertise in their respective fields according to the needs of SCRUM. Rapid project development requires continuous inspections that can be analyzed through daily scrum meetings. Based on this, SCRUM is considered to be the most feasible method compared to other software development methods.

The following are research about ticketing system that have been previously written which have similarities and became a reference in the preparation of this study. From previous search there not have any discussion about ticket sales by displaying mockups of seats. Seat mockups are needed so that passengers know the desired seat location.

Writer	Result of research
Naila, Ajith dan Muhammad Murshid M.A. [11]	The system created does not issue physical tickets and manifests. All transactions are recorded in the application and the conductor must scan the qrcode present in the application as proof of the passenger manifest.
Wahyudi [21]	The method used in system development is the waterfall method. Does not issue physical tickets and does not explain about ticket redemption because it is a case study for the concert seat system and there is no manifest.
Neli Nailul Wardah [22]	The method used in system development is the waterfall method. And the system created does not issue physical tickets and manifests, all transactions are carried out via the web.
Della Fauziah, Fajar Pradana, Achmad Arwan [3]	The method used in system development is the waterfall method. The study did not go into more detail about ticket sales. The research discusses algorithms in finding route optimization.
Oky Septian [18]	The method used is the waterfall method. No physical tickets are issued as all transactions use the app. Not discussing ticket exchange.
I Gede Totok Suryawan dan Ary Wira Andika [19]	The method used is the SCRUM method using 7 sprints. The application built is not an e-ticketing application but is similar to reservation and booking for tour vehicles.
Bienderil and Achmad Kodar [5]	The method used is the SCRUM method using 13 sprints. The application built is not an e-ticketing application but a reservation for massage services
Ahmed Ibrahim dan Azman B Ta'a[4]	The method used is the prototyping method using the Phonegap Framework. There is no seating sketch display when booking tickets.
Oloyede, M.O, Alaya S.M dan Alaya S.M [12]	The research does not discuss the system development method and only discusses ticket bookings without a schedule or seat availability.

II. METHOD

A. Software Development Life Cycle (SDLC)

SDLC is a process of designing a system that always moves like a wheel that goes through steps such as planning, analysis, design, implementation, and maintenance. Then the system will return to the planning stage if it is deemed inefficient to implement [9].

B. Agile

Agile is a collaborative technique between an iterative and evolutionary approach by using documents formal form in relation to building software that is of good quality in terms of cost and at the right time according to changing needs [15].

C. SCRUM

SCRUM is a system development method technique that was first created by Jeff Sutherland in 1993. SCRUM is a framework or methodology for developing product management and is a work pattern where everyone in the team is faced with ways to solve complex adaptive problems and at the same time being challenged to create products with the highest value productively and creatively [20].

SCRUM also is a methodology that follows an Agile approach or principles. SCRUM is a framework of responsive software development for product management or application development that focuses on strategy, flexible product development where a team works and is divided into units to achieve common goals [13]. SCRUM is based on empirical process control theory or empiricism that is Transparency, Inspection, and Adaption [17].

D. Scrum Flows

SCRUM has complex stages that can affect the final result of system development. The stages in SCRUM are as follows product owner create product backlog, then product owner and scrum master will create sprint planning based on product backlog. Every member in tim scrum then will develop the product called as sprint. The sprint will be closed with a sprint review to see if the sprint was successful or not [13]. To monitor sprint development team must organize daily scrum meeting that has a time limit of 15 minutes. This event is held every day during the sprint. In this event, the development team makes a work plan for the next 24 hours [17].

E. Application Programming Interface (API)

Application Programming Interface or commonly called API is a collection of commands and functions that allow a system to interact with other systems. The API also functions as a bridge to make it easier for developers to use software infrastructure to rebuild the infrastructure [16]. APIs are used to build distributed software systems whose components are interrelated but separate [1].

F. Representational State Transfer

Representational State Transfer or commonly referred to as REST is a form of web standard architecture that uses the HTTP protocol to exchange data. REST is often used in building multiplatform applications using APIs. This is because in addition to having good performance, the use of REST is fast and easy in data exchange and communication [2]. The output of REST common called as JavaScript Object Notation or s JSON which is a format that consists of structured information and is generally used to transmit data between the server and the client [10].

G. E-ticketing

E-ticketing is a way to document the travel process of passengers without issuing ticket papers. All information regarding passenger and travel data is stored digitally [6]. E-ticketing is made to make it easier for passengers to book tickets and to help admins and drivers with their daily tasks. The e-ticketing system runs online to make it easier or easier to buy bus tickets or travel information [14]. E-ticketing also an application on the web that allows passengers to check seat availability, purchase tickets, and pay for tickets online [11].

III. RESULTS AND DISCUSSION

In making the system for PT. Sinar Jaya Megah Langgeng, first a SCRUM team must be formed with roles and tasks performed by the SCRUM team in developing the e-ticketing system as follows

TABLE 1 SCRUM TEAM ROLE

Role	Position	Task
Product Owner	Project Manager	Receive requests from clients and make a priority scale on the product backlog that is made to be carried out by the SCRUM team, establish good relationships with stakeholders.
Scrum Master	Scrum Master	Train, educate and manage the Scrum team so that the rules in SCRUM can be applied during the system development period and arrange for the daily scrum meeting to run



Role	Position	Task
Development Team	Backend Developer 1	Create backend functions for third party agents
Development Team	Backend Developer 2	Creating functions on the backend for the e-ticketing system
Development Team	FrontEnd Developer 1	Creating a dynamic user interface, integrating the user interface with the functions provided by the backend developer
Development Team	FrontEnd Developer 2	Creating a dynamic user interface, integrating the user interface with the functions provided by the backend developer
Development Team	Mobile Developer	Creating user interfaces on mobile and connecting with functions provided by backend developers
Development Team	UX Designer	Creating user interfaces on mobile and connecting with functions provided by backend developers
Development Team	Tester	Testing the features that have been developed by the developer

In designing the e-ticketing system at PT. Sinar Jaya Megah Langgeng, the author uses the research method in the picture as follows:

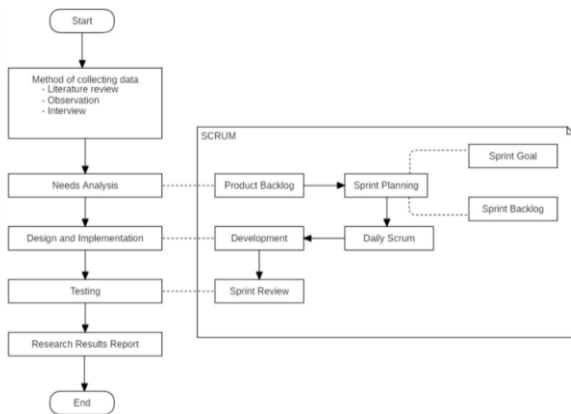


Fig. 1. Research methodology

The e-ticketing system developed aims to create an effective management of ticket sales transactions carried out by agents of PT. Sinar Jaya Megah Langgeng, which previously still made sales transactions using manual tickets. the modules that will be developed are the schedule and departure planning module, the ticket sales module and the deposit module as well as cash inflows.

Each module will be done in 1 product backlog and each product backlog will be done in 1 sprint. Product backlog Departure schedule planning will be carried out for a duration of two weeks with a sprint goal of being able to make a schedule based on the selected filter for one calendar month, Product backlog of ticket sales will be done within one month with the sprint goal API function for third party agents has been completed and sales can operate on android and browsers to printing electronic tickets. Product backlog of deposits and cash inflows will be done within two weeks with a sprint goal of receiving money from agents.

TABLE 2 SPRINT SCHEDULE AND DEPARTURE PLANNING

ID	Description	Days	Programmer
J01	Master permission function	1	Backend Developer 1
01	Master permission view	1	Frontend Developer 1
J02	Master user function	1	Backend Developer 1
J02	Master user view	1	Frontend Developer 1
J03	Login function	1	Backend Developer 1
J03	Login view	1	Frontend Developer 1
J04	Master terminal function	1	Backend Developer 2

ID	Description	Days	Programmer
J04	Master terminal view	1	Frontend Developer 2
J05	Bus class master function	1	Backend Developer 1
J05	Bus class master view	1	Frontend Developer 1
J06	Bus type master function	1	Backend Developer 1
J06	Bus type master view	1	Frontend Developer 1
J07	Mockup master function	2	Backend Developer 2
J07	Mockup master view	3	Frontend Developer 2
J08	Tripcode master function	2	Backend Developer 1
J08	Tripcode master view	2	Frontend Developer 1
J09	Departure generate from tripcode function	3	Backend Developer 2
J09	Departure generate from tripcode view	4	Frontend Developer 2
J10	Departure list and update function	2	Backend Developer 1
J10	Departure list and update view	2	Frontend Developer 1
J11	Function for get departure data	1	Backend Developer 2
J11	Function for export departure data	2	Backend Developer 2
J11	Report loadfactor view	1	Frontend Developer 2
Total		9	Frontend Developer 1
		8	Frontend Developer 2
		9	Backend Developer 1
		9	Backend Developer 2

Table 3. Sprint Sales

ID	Description	Days	Programmer
T01	Price rate master function	4	Backend Developer 2
T01	Price rate master view	4	Frontend Developer 2
T02	Display from access	3	Frontend Developer 1
T03	Departure schedule for agent function	2	Backend Developer 2
T03	Departure schedule for agent view	3	Frontend Developer 2
T04	List available seat plan function	2	Backend Developer 2
T04	Sketch and list available seat view	5	Frontend Developer 2
T05	Function to get ticket prices when there is a combination of boarding point, drop point and bus class	3	Backend Developer 1
T05	Display departure information and prices from search combinations	3	Frontend Developer 2
T06	Functions for sales	4	Backend Developer 2
T06	Display for sales of spare tickets and seats	5	Frontend Developer 2
T07	Function to get ticket data	2	Backend Developer 1
T07	Automatic display and print when opening ticket view	5	Frontend Developer 1
T08	Third party agent master function	2	Backend Developer 1
T08	Third party agent master display and menu	3	Frontend Developer 1
T09	Function for departure info based on parameters sent	2	Backend Developer 1
T10	Function to place order on API	2	Backend Developer 2
T11	Function to cancel booking tickets that have expired	2	Backend Developer 2
T12	Function to view seat availability	2	Backend Developer 2
T13	Function to change order status if there is a payment request	2	Backend Developer 2
T14	Function to cancel ticket	3	Backend Developer 1
T14	Function to cancel ticket	8	Frontend Developer 1
T15	Create application with default browser	6	Mobile Developer
T16	Bluetooth printer settings	5	Mobile Developer
T17	Bluetooth printer settings	4	Backend Developer 1
T17	Print the printer if the url contains the word print_ticket	8	Mobile Developer



T18	Function to get sales data	2	Backend Developer 1
T18	Function to export sales data	2	Backend Developer 1
Total		19	Frontend Developer 1
		20	Frontend Developer 2
		20	Backend Developer 1
		20	Backend Developer 2
		19	Mobile Developer

TABLE 4 DEPOSIT SPRINT AND CASH INFLOW

ID	Description	Days	Programmer
S01	Ticket claim function	2	Backend Developer 1
S01	Ticket claim display	2	Frontend Developer 1
S02	Close sales function and create manifest	4	Backend Developer 2
S02	Display close sales and manifest strook	3	Frontend Developer 2
S03	Deposit function	2	Backend Developer 2
S03	Agent deposit display	2	Frontend Developer 2
S04	Function get deposit list for resume	1	Backend Developer 1
S04	Display of deposits via resume	3	Frontend Developer 1
S05	Function get deposit data	2	Backend Developer 1
S05	Display of deposit print and autoprint	3	Frontend Developer 1
S06	Printer format API for manifest	1	Backend Developer 1
S06	Print manifest if the url contains the word print_manifest	5	Mobile Developer
S07	Printer format API for deposits	1	Backend Developer 1
S07	Print the deposit if the url contains the word print_setoran	5	Mobile Developer
S08	Function to get deposit and resume data	1	Backend Developer 1
S08	Function to export deposit and resume data	1	Backend Developer 1
S08	Display for deposit data reports and resumes	2	Frontend Developer 2
S09	Function to get commission data	2	Backend Developer 2
S09	Function to export commission data	2	Backend Developer 2
S09	Display for commission data report	2	Frontend Developer 1
S10	Function to get passenger data	1	Backend Developer 1
S10	Function to export passenger data	1	Backend Developer 1
S10	Display for passenger data reports	2	Frontend Developer 2
S11	Function to get loadfactor data	1	Backend Developer 1
S11	Function to export loadfactor data	1	Backend Developer 1
S11	Display for loadfactor data report	1	Frontend Developer 2
Total		10	Frontend Developer 1
		10	Frontend Developer 2
		10	Backend Developer 1
		10	Backend Developer 2
		10	Mobile Developer

At this stage the Scrum team begins to create applications based on the sprints that have been set. In the development process using the Trello application to control the tasks that have been done. In Trello, a sprint panel and a develop, checking, need to change, question and discussion, commit and completed panel will be created. programmers can move items in the sprint panel into the develop panel when they are in progress. If the programmer has finished creating a function, then the programmer is obliged to move the

finished item into the checking panel to be checked by the tester after deploying the work to the development server. If it passes the check, the tester can move the item to the commit panel.

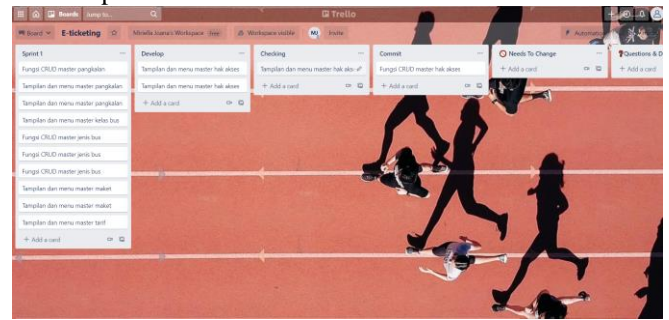


Fig. 2. Trello application

The SCRUM Master is then tasked with deploying the commits to the production server. If it does not pass the check, the tester will enter the item into the needs to change panel and the programmer can move the item to develop to be reworked. A sprint is declared successful if the sprint panel is empty and all items have entered the completed panel. If there are still items hanging, then the sprint will be declared failed. After the sprint is successful, the SCRUM team can repeat the same process on the Sprint 2, Sprint 3 panel. Trello is an option for monitoring work besides being free, Trello can also be viewed via a browser and can contain information, both text, attachments and images. So that the items in the work panel can be fully described in Trello. The flow of the development process can be seen below

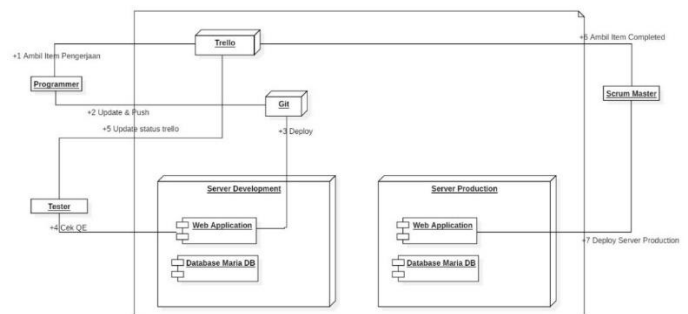


Fig. 3. Development process

The daily scrum meeting process is carried out by holding a meeting using google meet between the SCRUM team and the SCRUM master at 4 pm every day. Meetings are held virtually because WFH is often applied within the company. The duration of the meeting is approximately 15 minutes. The things that were discussed in the meeting were:

1. What has been done on the D day. In this discussion, it can be seen the work carried out by each member of the SCRUM team, whether they meet the deadline in Trello or not, also know what features can be tested by the tester.
2. What obstacles are encountered in the execution of the task. This is intended to provide information to the SCUM master about what obstacles are encountered. The SCRUM master is then tasked with finding ways to minimize the obstacles that occur. The existing constraints are not discussed in detail in the daily scrum meeting because of course it will take time and make the work ineffective.



3. Questions to be discussed for working on the next day's task. If it can be answered quickly, it will be discussed in the meeting. However, if it is technical and feels time consuming, it will be discussed personally with the SCRUM master.

In a sprint review, everyone on the SCRUM team gets together and discusses the results of the sprint. Users are also invited to take part in a sprint review to discuss what has been completed. From the sprint review, ideas or opinions will usually appear that might add to or adjust existing functions. All opinions will be recorded and may be entered into the next sprint.

The duration of the sprint review can last as long as 3 hours. In the sprint review, Scrum team members will directly provide demos directly through the application or the users themselves who use the application. All features that are completed and can be used according to what the user wants will be recorded as increments.

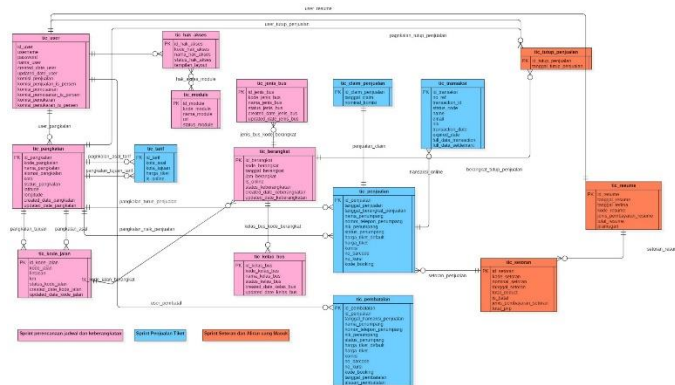


Fig. 4. ERD system

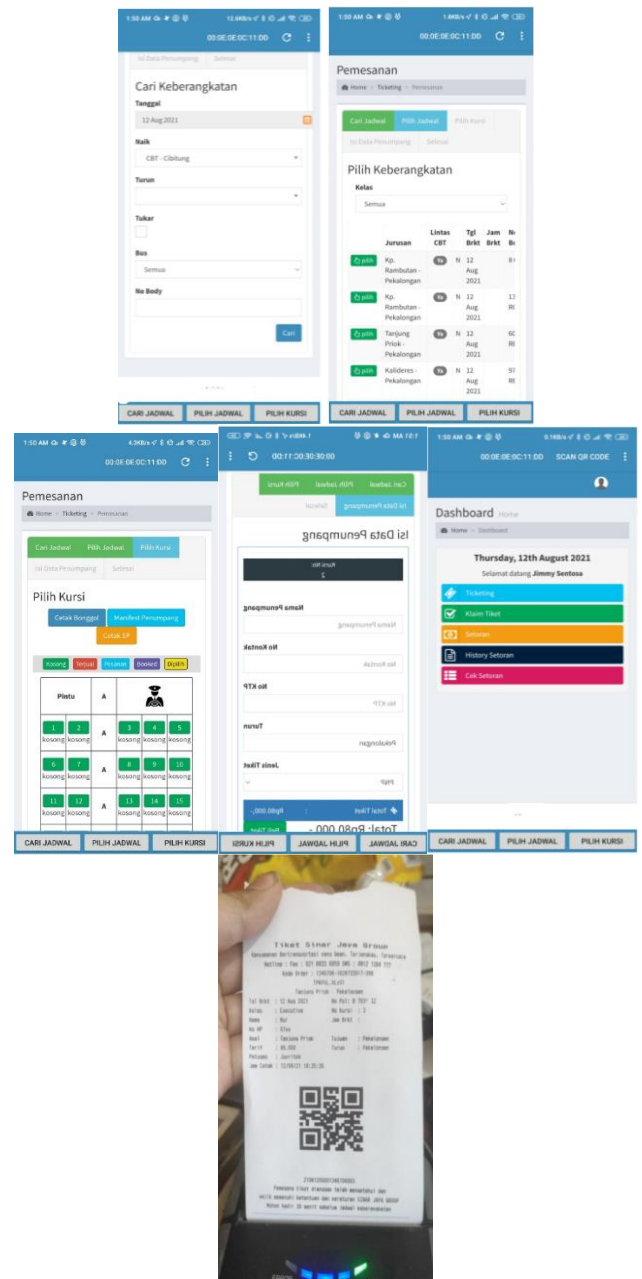


Fig. 5. Result of program

An API will be designed which has the following scheme to make sales

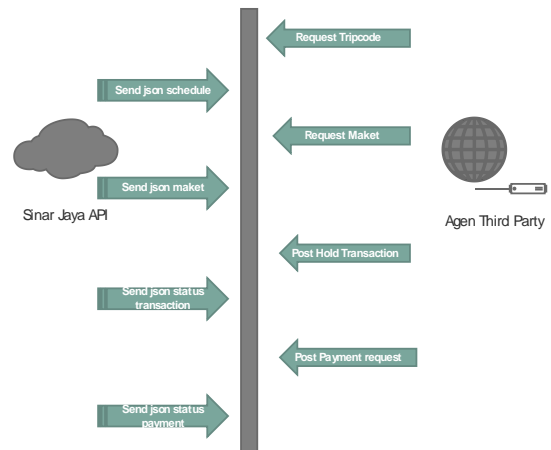


Fig. 6. API Process



Table 5. E-Ticketing Api Method

Method Description	Jenis Method	End Point
Method get jadwal	GET	/api/jadwal
Method get denah maket	GET	/api/kursi
Method hold transaction	PUT	/api/tiket
Method payment	POST	/api/payment

IV. CONCLUSION

From this research, the following conclusions can be drawn:

1. Development of the e-ticketing system of PT. Sinar Jaya Megah Langgeng can be done using the SCRUM method. This study uses 3 product backlogs with each product backlog being carried out in one sprint duration. During the development stage, the development team used the Trello application as a project management application and for the deployment process, the author used the GIT application. With this application, the product owner can monitor the performance of the SCRUM team and the SCRUM master can see problems if there are tasks that are past the deadline. The author uses his own human resources consisting of one product owner, namely the author himself, one SCRUM master, two backend developers, two frontend developers, one mobile developer, one UX designer and one tester in system development.

2. To support the planning carried out in this research, all needs and goals must be understood by the SCRUM team. Needs analysis with user stories is quite helpful because the purpose of the application can be seen from there. Daily scrum meetings must always be held to monitor the performance of the SCRUM team and daily scrum meetings will minimize obstacles in the work because things that slow down can be analyzed by the SCRUM master to be minimized. The daily scrum meeting must run effectively with a duration of around 15 minutes so that the time used can be focused on project development. A sprint retrospective at the end of the sprint also needs to be done to analyze problems that arose during the previous sprint to be able to work on the next sprint better. The product owner's ability to seek information and liaise with stakeholders by conveying ideas and confirming needs during sprint work are skills that are needed to achieve increments.

ACKNOWLEDGMENT

To implement SCRUM in software development requires commitment and responsibility and the product owner must know the capabilities of everyone in the development team. During the sprint review process, the most effective way to determine whether a sprint was successful or not is to involve the user directly. So that users can provide suggestions or input for the features being worked on.

For further research, it is expected to take user subjects who have many wishes and comments and can answer any plans that can be used to minimize risk and whether development techniques using SCRUM can deal with such stakeholder characteristics.

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