



## Pojok Statistik Virtual Improvement: Development of Online Consultation and Scientific Articles Modules

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**Abstract.** With a commitment to improving statistics literacy in Indonesia, BPS Statistics Indonesia built a Pojok Statistik. Pojok Statistik is a collaborative service between BPS Statistics Indonesia and Universities initiated to answer the needs of academics and students for statistics. Due to the effects of the pandemic and the increasing interest from students, a virtual version of Pojok Statistik (Pojok Statistik Virtual) was built to meet all the needs of the offline version. However, the features are still limited and do not represent the criteria of the Pojok Statistik Offline. From the results of interviews with the Pojok Statistik Team, several plans exist to improve the Pojok Statistik Virtual, including adding online consultation and scientific articles modules. Therefore, this study aims to add online consulting service features and scientific articles modules to the Pojok Statistik Virtual. The system development process uses the Prototyping Methodology. System evaluation is conducted by black-box testing and usability testing using the USE Questionnaire. The evaluation results show that all functions in both modules are running and functioning properly. The usability test results using the USE Questionnaire reveal that these two features are feasible or usable to support the statistical needs of academics and students.

### 1. Background

Statistics must be understood by its users, both policymakers and the people who use the data. The way to understand statistics is by doing statistical literacy. According to Gal [1], statistical literacy refers to people's ability to interpret and critically evaluate statistical information and discuss or communicate their reactions to statistics. Lukman and Wahyudin [2] researched the level of statistical literacy in Indonesia. The results of the 114 undergraduate students surveyed showed a significant difference between the average statistical literacy scores of students who had studied basic statistics and those who had not. Student's ability to interpret and critically evaluate statistical information is relatively high. However, their ability to discuss or communicate their reactions to statistics is still low due to students' low attitudes and beliefs toward statistical information. Meanwhile, research by Setiawan and Sukoco [3] shows that undergraduate students can understand descriptive statistics but have difficulty describing these statistics through data visualization.

With a commitment to improving statistical literacy for undergraduate students, BPS Statistics Indonesia, the official statistical data provider in Indonesia, built Pojok Statistik (Statistical Corner). Pojok Statistik is a collaborative service between BPS and universities as a service center and statistical promotion in the university environment, which was initiated to answer the needs of academics and



students for statistics. Activities at Pojok Statistik include the Promotion of Statistics, Statistics Consultation, and Statistics Education.

Pojok Statistik has been established in several universities. However, due to the effects of the pandemic and the increasing interest from undergraduate students, a virtual version of Pojok Statistik (Pojok Statistik Virtual) was built to complement the Offline Pojok Statistik. Pojok Statistik Virtual has been operating since November 2, 2021, and comes with several running features, such as the Promotion of Statistics through the Infographic Gallery, Videographic Gallery, and Statistics Education. However, the existing features are still very simple and cannot fully represent the Offline Pojok Statistik. Therefore, it is necessary to develop several additional modules so that this Pojok Statistik Virtual has more value.

Based on interviews with the Pojok Statistik's Team, several further features need to be developed, such as online consultation, statistics education, user management, scientific article features, and video graphics features. From some of the features mentioned, this research aims to develop online consultation service features and scientific article management features. Consultation service is one of the main features of the Offline Pojok Statistik. However, this feature is not yet available in the Pojok Statistik Virtual. Considering that BPS Statistics Indonesia wants to improve the statistical literacy of undergraduate students, developing this Online Consultation feature is essential. In addition, the Scientific Articles feature is also important to provide information about relevant scientific articles, mainly about statistics. This feature will accommodate abstracts of published scientific papers from various journals with the consent of their respective authors.

## 2. Related Works

### 2.1. *Pojok Statistik (Offline) and Pojok Statistik Virtual*

Based on interview with Pojok Statistics Team, there are three main activities of the Pojok Statistik Offline, namely Promotion of Statistics, Statistics Consultation, and Statistics Education. But not limited to these three activities, the Offline Statistics Pojok also organizes other activities such as joint research, writing scientific papers in scientific journals, and fostering 'Desa Cantik'. Human Resources involved in the Pojok Statistik Offline are divided into the Pojok Statistik Officer and the Statistics Agent. Pojok Statistik Officers are employees of the provincial or district/city BPS Statistics Indonesia, while Statistics Agents are students appointed by the Pojok Statistik coordinator lecturer to be involved in various service activities at the Pojok Statistik. From the human resources already mentioned, there are three roles: the coordinator, supervisor, and operator. Pojok Statistik officers can act as coordinators, supervisors, or operators. While the Statistics Agent only acts as an operator.

Pojok Statistik Virtual (PSV) is currently divided into two types: PSV Frontend and PSV Backend. PSV Frontend is a part of the PSV website that displays content and activities in the Pojok Statistik. This PSV Frontend can be accessed publicly without the need to log in first. Meanwhile, PSV Backend is part of the PSV website that manages content and users. PSV Backend can only be accessed by the admin. In the PSV Backend, general procedures are usually carried out by the super admin and admin levels, such as initiating a new locus, entering and updating content, and monitoring.

In the PSV Frontend section, visitors will initially be directed to the home page with navigation buttons connected to each feature. Several features can be accessed without having to log in first, such as the infographic and video graphics galleries. Apart from these features, other features require login access. If the visitor is already registered, the visitor only logs in with the registered email and password. Meanwhile, visitors need to register first if they do not have an account on PSV. The advantage of having an account on PSV is that users can favorite content that can be recorded on their respective profile pages. Users can also see the history of which statistics education activities they have participated in or will participate in.



## 2.2. Previous Studies

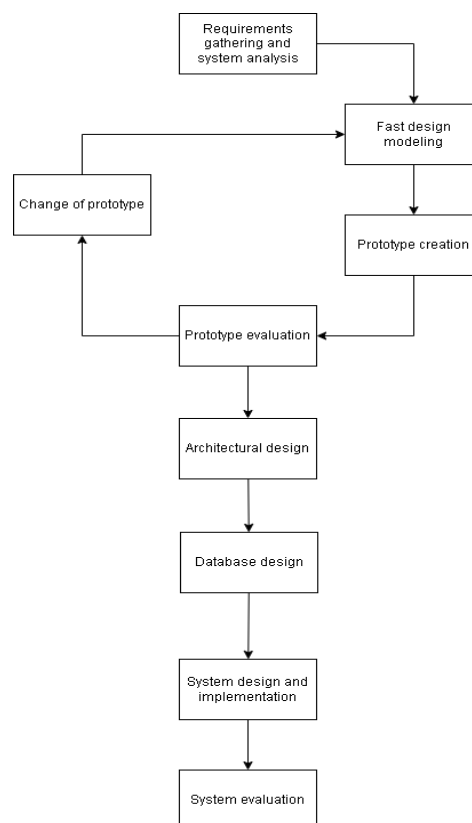
Several studies are used as the reference for this research. First, research [4] that focuses on providing optimal services in managing student final assignments by improving the performance of information systems through prototyping methodology. Next, in the study [5], Manuhutu and Wattimena developed a website-based academic consultation information system. This research is related to the author's research, which is a consultation service. According to those two research, the same method is used in this research, the prototyping methodology.

Building on prior research, Bahar [6], extensively elucidated how the management of scientific articles that were initially managed conventionally became more modern with the development of information technology. This study aligns and is also used as reference of this research to develop the scientific article modules.

At the final stage of systems development, system evaluation needs to be done to assess the feasibility of features that have been developed. For the system evaluation methodology, this research follows usability testing using the USE Questionnaire conducted in [7]. Usability testing with this USE Questionnaire can provide an evaluation of developers from end users. Research [7] also explains how to use the usability test and its analysis so that it can be used as reference material for the author.

## 3. Research Methods

The Pojok Statistik Virtual (PSV) systems developed in this research are limited to online consultation services and scientific articles features. The system development method used in this research is the Prototyping Methodology. According to [8], the prototyping methodology is a system development method that performs the analysis, design, and implementation phases simultaneously, and the three steps are carried out repeatedly in one cycle until the system is complete. The stages of system development in this study refer to research [4] with some adjustments. The research stages are described in Figure 2 below.



**Figure 2.** Stages of system development



The first step of developing the system was collecting and analyzing the requirements. System requirements were analyzed by collecting information through literature studies and interviews with the Pojok Statistik's Team. Use case diagrams were made to describe the results of the system requirements analysis. The use case diagram acted as the reference to design the system prototypes.

The prototype formed in this research was a mid-fidelity type prototype with a wireframe model. The wireframe model prototype was created with the help of the Figma tool. The prototype cycle was carried out twice. Evaluation of system designs and prototypes was conducted by showing the results of modeling and prototypes to the Pojok Statistik Team. If there was still an evaluation of the prototype, then the creation of program code could not be done until the results of the prototype evaluation have been approved. Changes to the prototype were made if there were still errors or discrepancies in the prototype proposed by the researcher to the Pojok Statistik's Team.

After the prototype was approved, the next step was to design the system architecture, which was how to connect the client and server. After that, the database design was carried out by creating an Entity Relationship Diagram (ERD) to see the data flow of each process. This stage also included activity diagrams and sequence diagrams design. Meanwhile, the general system implementation used the MVC (Model View Controller) concept. It was assisted using the Laravel Framework on the backend and Bootstrap and Javascript for the front end.

In the last stage, systems were evaluated using black-box and usability tests with the USE Questionnaire. The questionnaire was distributed to the Pojok Statistik Team and several student samples as the end users. The evaluation aimed to see how feasible these features were used. Four dimensions were measured in the usability test: Usefulness, Ease of use, Ease of learning, and Satisfaction. The score calculation process used a Likert scale from 1 (strongly disagree) to 5 (strongly agree).

## 4. Results and Discussion

### 4.1. System requirements analysis

As is known, the Pojok Statistik Virtual (PSV) should be built based on the Pojok Statistik Offline (PSO). Based on the results of interviews with the Pojok Statistik Team, the purpose of developing PSV itself is to represent all activities in PSO and carry out activities that cannot be done face-to-face. However, when viewed from the current system, not all activities in the PSO can be accessed in the PSV. A comparison between the activities in PSO and the features available in PSV can be seen in Table 1.

**Table 1.** Comparison of activities in PSO and features in PSV.

	Pojok Statistik Offline	Pojok Statistik Virtual
Promotion of Statistics	Available	Available
Statistics Consultation	Available	Not available
Statistics Education	Available	Not available
Scientific article collection	Not available	Not available

The analysis and comparison table above shows that online consulting services and scientific article features are needed in Pojok Statistik Virtual. Besides, the account registration system needs to use email with the respective campus domain for the need for an introduction to the features of online consulting services.

Meanwhile, non-functional needs can be analyzed using the PIECES framework. Six aspects are analyzed in the PIECES framework: Performances, Information, Economics, Control, Efficiency, and Services. However, in the analysis of this study, the authors only used three aspects, namely Performance, Information, and Services.



1. Performance: New features are needed to improve the system’s performance, such as consultation activities that can be appropriately recorded in the database and scientific article features that filter articles as required. In addition, the online consultation feature also makes service availability longer (not only during working hours), allowing students to consult anytime and anywhere.
2. Information: In the current PSV, there is a lack of information flow. There is little interaction with users, so the developer does not know to what extent users are satisfied with the information provided on PSV. The information users obtain will increase with the addition of online consultation services and scientific articles. Data on consultation services will be the basis of users’ needs about the statistics of each region so that it can be the basis of policy for further development. The addition of scientific article features will provide information about statistical science for students and academics.
3. Services: Currently, the services at PSV are not optimal, limited to the sober information uploaded by the admin. If the online consultation feature and scientific articles are developed, the service process and information presentation to consumers will become more varied. And it will be an added value for the Pojok Statistik if the services provided are maximized.

4.2. Proposed prototype

This research has two prototype cycles, each in the form of use case diagrams and wireframes. The final prototype results are based on the evaluation results from the Pojok Statistik Team shown in Figure 3, Figure 4, Figure 5, and Figure 6.

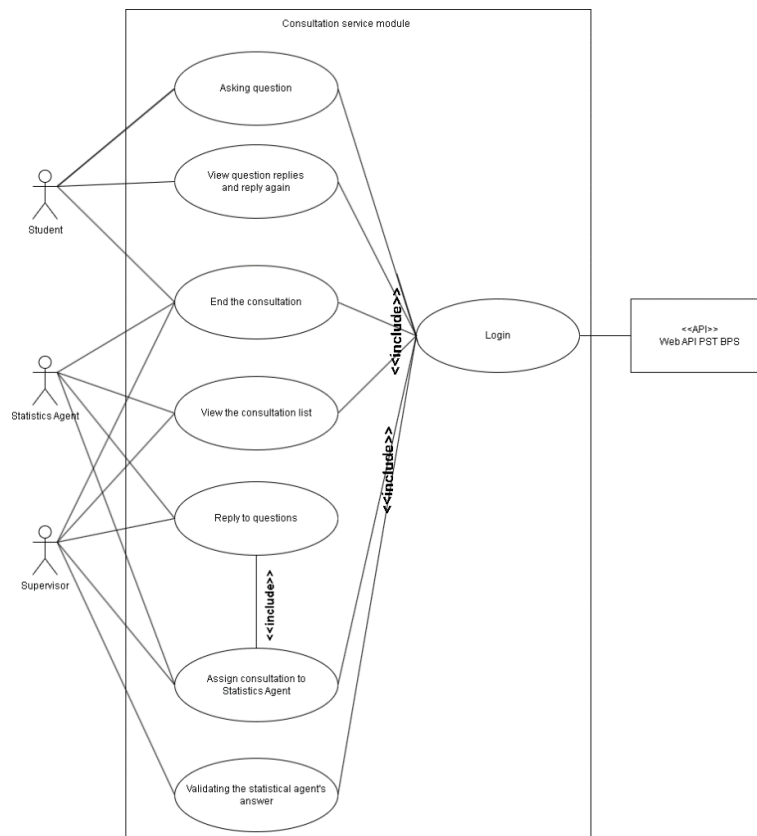


Figure 3. Use case diagram of online consultation module

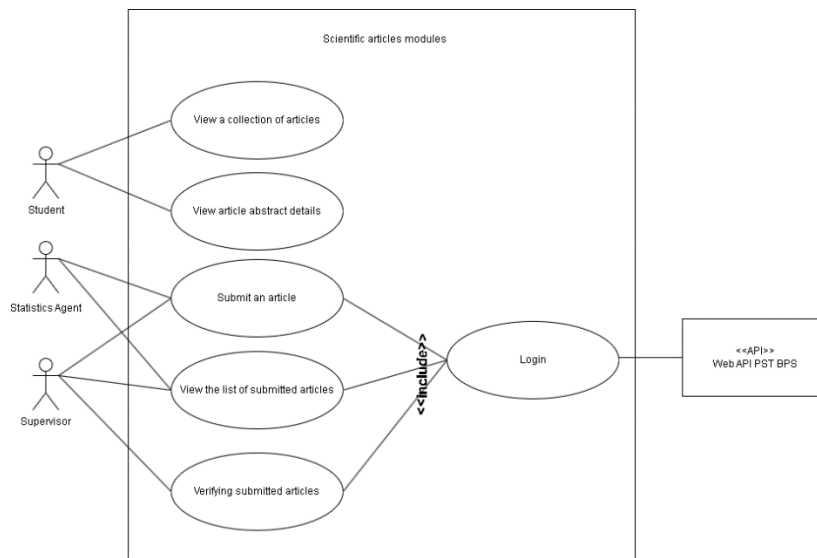
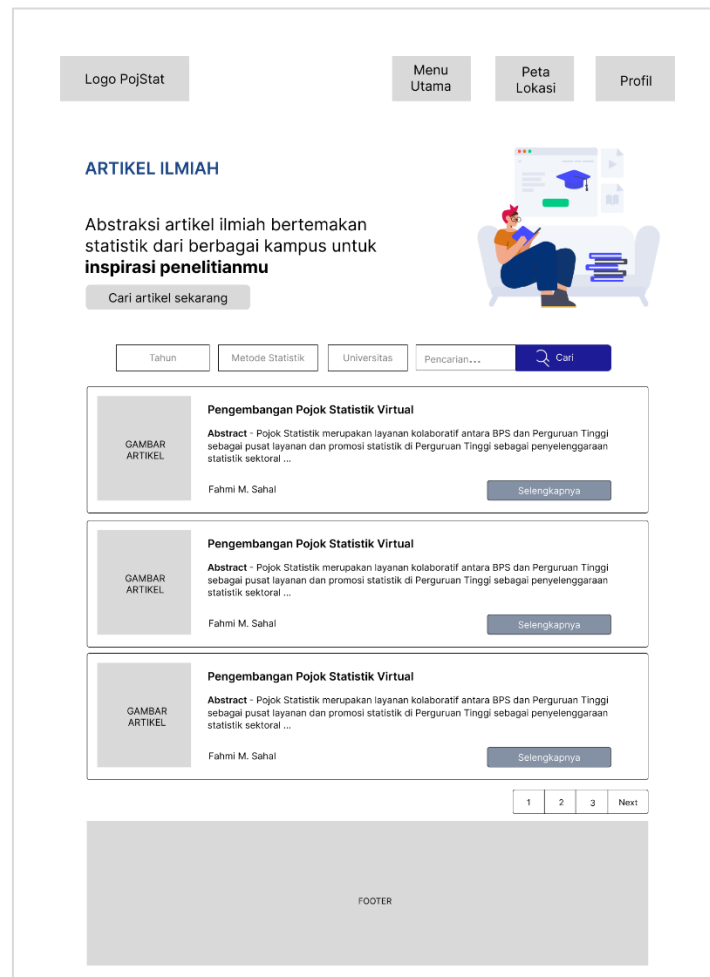


Figure 4. Use case diagram of scientific articles module



Figure 5. Wireframe of online consultation feature



**Figure 6.** Wireframe of scientific article feature

From the use case diagram, it can be seen that there are three actors involved, namely students, statistics agents (operators), and supervisors. The flow of the development of this system is as follows:

1. **Online Consultation Module:** Students create consultations by asking questions on the consultation page. Each question will be assigned to a statistics agent by the supervisor on duty as the coordinator. After the agent is set, the agent must serve and answer the question. If the agent doubts the answer, the agent can ask the supervisor to validate the response. Then, if the agent takes a long time to answer, the system will mark the consultation in red, and there is an 'email' button to send an email notification to the serving statistics agent. Every incoming message will automatically have an email notification for agents and students.
2. **Scientific Article Module:** Users can see a list of scientific articles and abstract details without requiring a login. Actors who can input an article are operators and supervisors. Operators can only submit a report with supervisor approval. Meanwhile, if the supervisor inputs an article, the article can be displayed immediately.

#### 4.3. Architectural design

The architecture design consists of client and server components. Clients can access the website either by mobile or by desktop/laptop. However, it is highly recommended that clients access it using a desktop/laptop because the display is more optimal. At the same time, the server consists of a database and PST API (for login). The whole process of managing the system architecture uses the Laravel framework. The system architecture design can be seen in Figure 7.

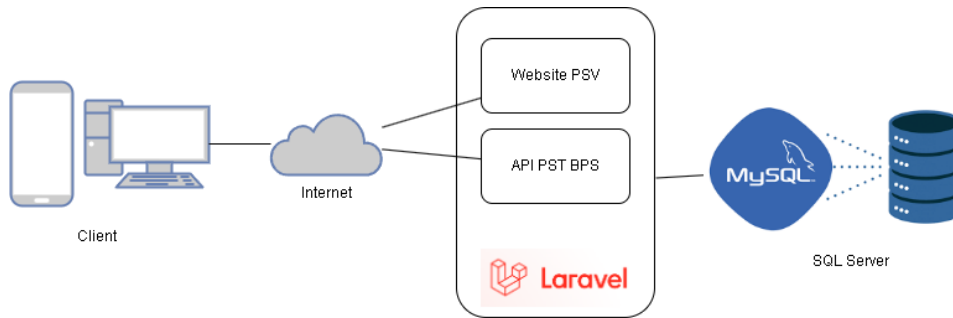


Figure 7. System architecture design

4.4. Database design

The database design here only includes tables related to the developed modules: online consultation and scientific articles. Other tables from existing Pojok Statistik are not included in the diagram. The database design is shown in Figure 8.

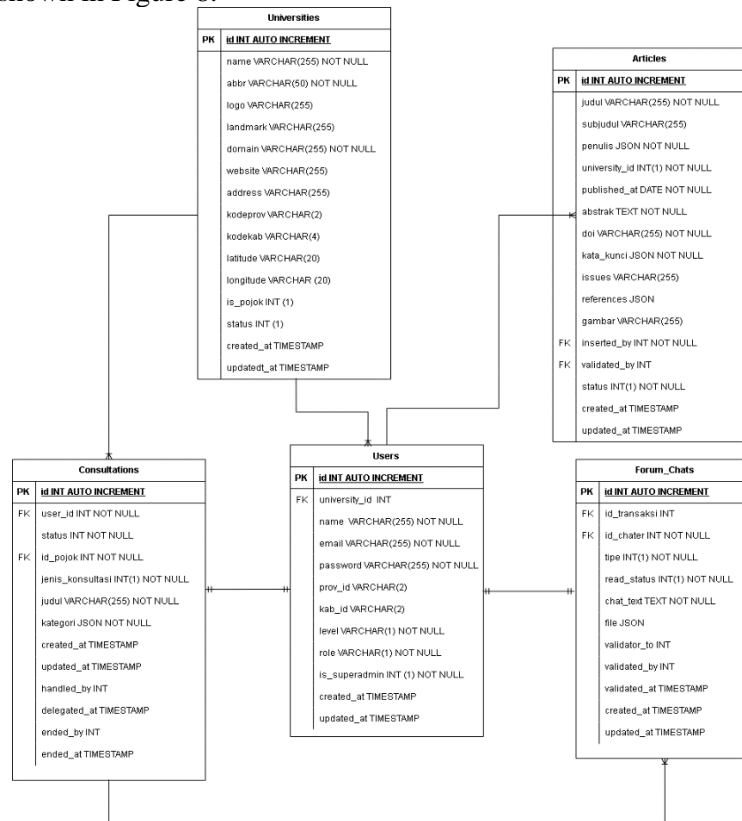


Figure 8. Database design (Entity Relationship Diagram)

4.5. System design and implementation

System design is done by designing activity and sequence diagrams for each use case. The first time a user visits PSV, the page that will be seen first is the home page. On that page, several cards show the features available on the PSV, such as Statistics Consulting, Scientific Articles, etc. Unlike the other features, the consultation feature is exclusive, that is, only for students whose university has a Pojok Statistik in it because the resources that serve consultations only exist for universities with a Pojok Statistik. After logging in, eligible students can access the consultation page. As for the scientific article





feature, users do not need to log in to access it. The implementation of the home page, the consultation page, and the article page are shown in Figure 9, Figure 10, and Figure 11 below.

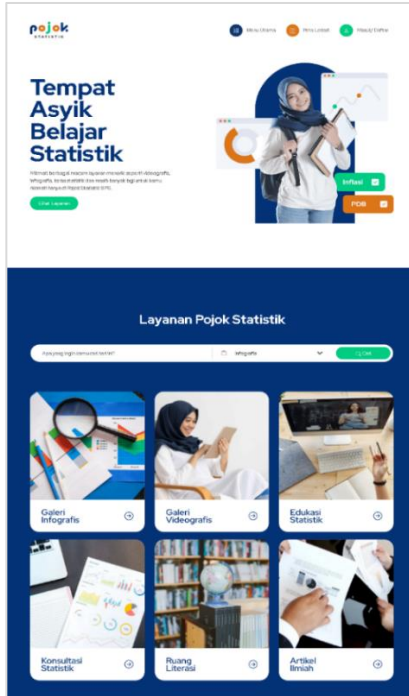


Figure 9. Home page implementation

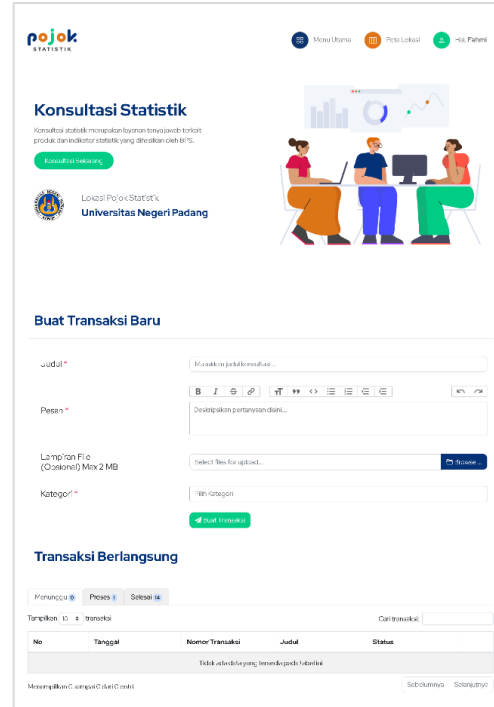


Figure 10. The consultation page

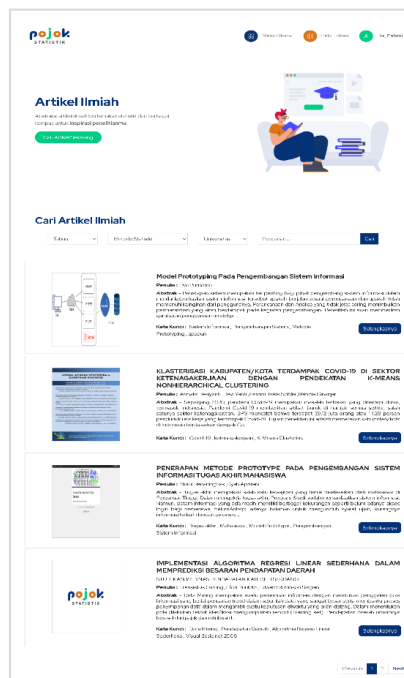


Figure 11. The scientific article page

Figure 10 shows the consultation page, one of the applications of the ‘asking questions’ use case. The ‘ask a question’ use case flow is described through the activity and sequence diagrams in Figures 12 and 13 below.

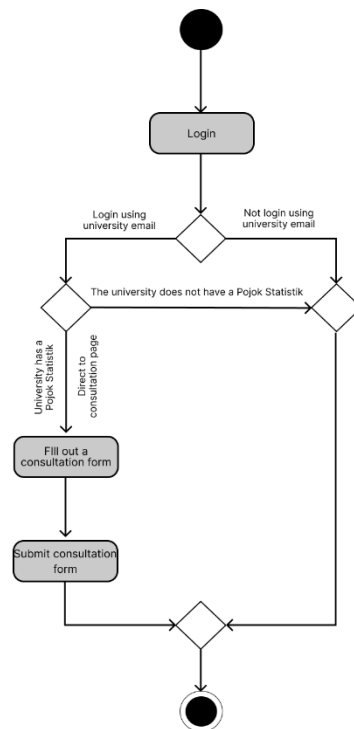


Figure 12. Activity diagram for the use case ‘ask a question’

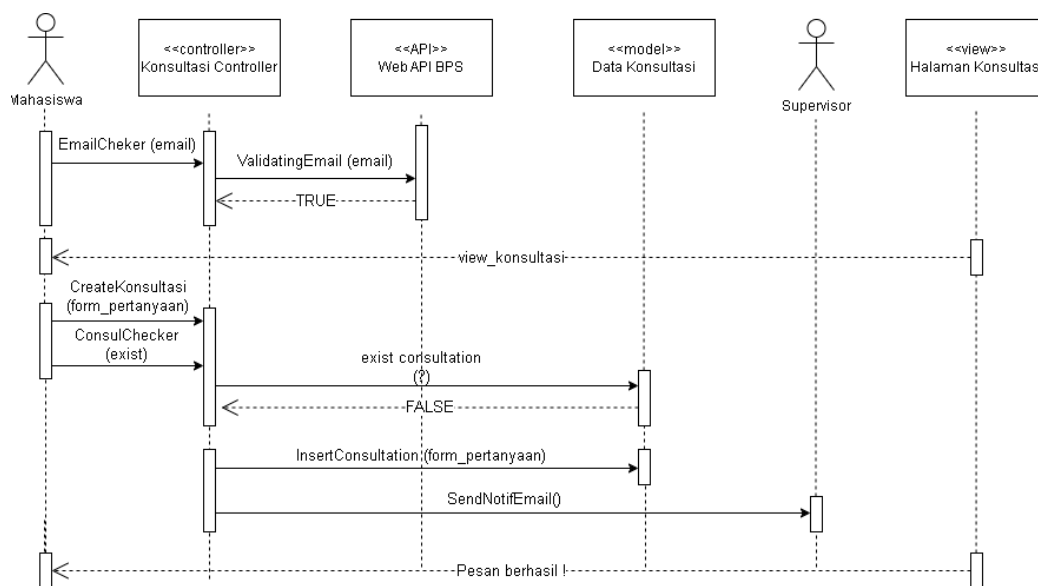


Figure 13. Sequence diagram for the use case ‘ask a question’

When accessing the consultation page, the student account will be checked by the system to see whether the university the student has a Pojok Statistik or not. If it does, then the student can access the page. After entering the consultation page, students can provide questions by filling in the existing form with the title, message, file attachment (optional), and category.

The account checking process is done via the PST API through the EmailChecker() function because this login feature uses the PST API, which can be used for several PST applications. The question form handling process is managed by the CreateConsultation() function. Students can only ask a question



once until the consultation process is complete, which is handled by the ConsulChecker() function to check whether the consultation can be created or not.

#### 4.6. System evaluation

System evaluation in this study uses black-box testing and usability testing using the USE Questionnaire. The results of the black-box testing showed that from the 12 use cases of the online consultation module and scientific articles, all functions ran well and produced the appropriate output. From the usability test, 38 respondents filled out a questionnaire of 35 undergraduate students and 3 BPS Statistics Indonesia employees from Pojok Statistik's Team. As a result, the development of this feature received a score of 89.96%, which means that these two features are 'Very Feasible' to be used and implemented.

### 5. Conclusion

Developing the Pojok Statistik Virtual system by adding online consultation modules and scientific articles can give more value to the existing Pojok Statistik Virtual. The system evaluation results using black-box testing and usability testing using the USE Questionnaire show good results. In black-box testing, all the features in the planned use case are functioning and running well. Then, the usability test results with the USE Questionnaire show that online consultation features and scientific articles get the 'Very Eligible' category. Improvement of Pojok Statistik Virtual by adding two modules of online consultation and scientific articles can support the purposes of BPS Statistics Indonesia to provide the needs of academics and students for statistics and to increase statistical literacy, especially among students.

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