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Application of the Waterfall Method in Information System for State-owned inventories Management Development

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Abstract: Information technology development brings a very broad impact on human life. Needs of fast and precise and adaptive information system information is needed in this modern era when everything needs to be fast. As one work unit under the government agency, a faculty has State-owned inventories to support all activities to carry out the Tri Dharma or the higher education pillars, especially in the field of education. The state-owned inventories or devices are available such as monitors, printers, LCD, mouse, etc. For continuity of this educational process, the state-owned inventories must be maintained and managed. Therefore, in this research, with the aim of helping the state-owned inventories management in a faculty, the researchers will develop an information system to document the state-owned inventory records inventories in the faculty of computer science at UPN Veteran Jakarta. The information system was built using the waterfall method and u the PHP programming language and MySQL database running on a server. This information system provides features to manage users, manage components, access system logs, access system settings, manage devices, manage the location, and access reports. The system that has been developed has also passed the eligibility assessment for all aspects of both visual communication aspects, software engineering aspects, and usability aspects.

Keywords: Information System; Model View Controller; State-owned inventories Management; System Development Life Cycle; Waterfall Method;

INTRODUCTION

Information technology development brings a very broad impact on human life (Arista et al., 2021; Falih et al., 2021). Information can process fast by using information technology (Arista, 2022). All activities require fast and accurate information as a basis for decision-making (Arista et al., 2022). There is a growing need for information (de Vries, 2020). Information that needs to be processed is getting bigger and more complex (Gao, 2022). With the help of technology and the development of a tool, information system development become more advanced (Bellanova & Glouftsios, 2022; Sharofoviya Olimov, 2022)

The Model View Controller (MVC) concept is one of the knowledge developments to help develop information systems (Azharandi et al., 2022). With this MVC concept, information system development could be developed in accordance needs of the user's information system development and be able to adapt the development in the organization. Needs of fast and precise and adaptive information system information is needed in this modern era when everything needs to be fast (Jamaan & Arnellis, 2021). Faculty of computer science (FIK) Universitas Pembangunan Nasional Veterans Jakarta (UPNVJ) as one work unit under the government agency, has State-owned inventories to support all activities to carry out the Tri Dharma or the higher education pillars, especially in the field of education. The state-owned inventories or devices are available in FIK such as monitors, printers, LCD, mice, etc.

For continuity of this educational process, the state-owned inventories must be maintained. Thus, it is easy to get identified where they are located when needed. Information about State-owned inventories which is required at the faculty of computer science at UPN Veteran Jakarta now is related to properties that are owned by government agencies or in state institutions. There are large quantities of State-owned inventories in our institution. The institution which owns state-owned inventories has full responsibility to manage and maintain those state properties. So far, the documentation and data collection of State-owned inventories in the faculty of computer science at UPN Veteran Jakarta is still being carried out manually using paper. This condition resulting some

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difficulties in making reports for the state-owned inventories's location and availability in each room, as well as difficulty to detect broken properties. Therefore, in this research, the researchers will develop an information system to document the state-owned inventories records for helping the management of the state-owned inventories in the faculty of computer science at UPN Veteran Jakarta.

LITERATURE REVIEW

Government Regulation of the Republic of Indonesia Number 27 of 2014 Article 1 Paragraph (1), explains that State-owned inventories is all goods purchased or obtained at the expense of the State Budget or derived from other legitimate acquisitions. Thus the State-owned inventories Management and Accounting Information System (SIMAK BMN) is an inventory system, administration or a series of procedures that regulate the procedures for reporting the conditions and value of BMN transactions of organizations in order to produce information for the purposes of management and accounting of state assets that are controlled (Yanto & Muammar, 2021).

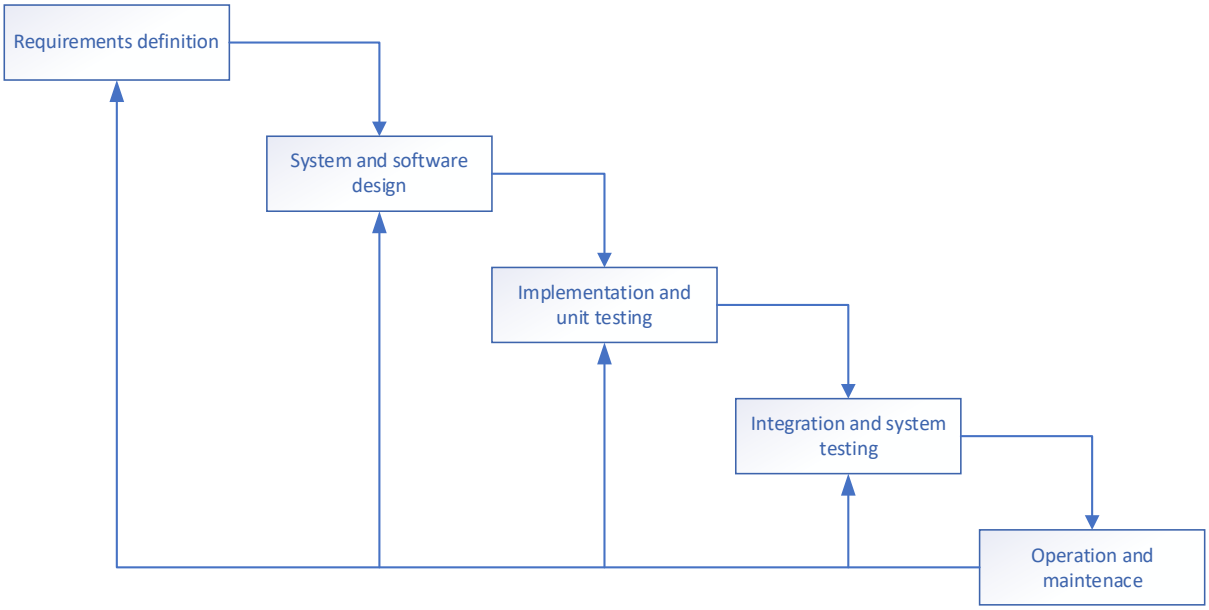

Fig 1. Waterfall Method

The software development model introduced by Winston Royce in the 70s is a simple classic model with a linear system flow — the output from the previous stage is the input for the next stage. Development with this model was the result of the adaptation of hardware development since at that time there was no other software development methodology. This highly structured development process makes the potential losses due to errors in the previous process very large and often expensive due to the swelling cost of redevelopment.

The Waterfall method is a sequential software development process, in which progress is seen as continuing to flow down (like a waterfall) through phases of planning, modeling, implementation (construction), and testing (Mirajdandi et al., 2021). In its development, the waterfall method has several successive stages: requirements (needs analysis), system design (system design), Coding & Testing, Program Application, maintenance.(Tristianto, 2018)

a. Requirement (needs analysis).
   In this case, it is an analysis of the needs of the system. Data collection in this stage can be conducting a study, interview or literature study. An analysis system will dig up as much information as possible from the user so that a computer system will be created that can perform the tasks desired by the user. This stage will produce a user requirement document or it can be said to be data related to the user's wishes in making the system. This document will be a reference for the analysis system to translate into programming languages.
b. Design System (system design)
   The design process will translate the requirements for the needs of a software design that can be estimated before coding is made. This process focuses on: data structures, software architectures, interface representations, and procedural details (algorithms). This stage will produce a document called software requirements. It is this document that the programmer will use to carry out his system creation activities.
c. Coding & Testing (writing syncode program / implemention)

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Coding is the translation of design in a language that can be recognized by a computer. Performed by a programmer who will translate the transactions requested by the user. It is these stages that are the real stages in working on a system. In a sense, the use of computers will be maximized in this stage. After the coding is complete, testing will be carried out on the system that has been created earlier. The purpose of testing is to find errors in the system and then it can be corrected.

d. Program Implementation / Testing (Integration & Testing)
This stage can be said to be final in making a system. After analyzing, designing and coding, the finished system is used by the user.

e. Operation & Maintenance
The devices that are being delivered to customers will definitely undergo changes. The change could be due to an error because the software has to adjust to a new environment (periperal or operating system), or because the customer needs functional developments.

Model-View-Controller or MVC is an architecture in the design of web-based applications that divides the *web* application into 3 parts. The three parts are the *model*, *view*, and *controller*. *The model* is the part that regulates the data needed by the application, *the controller* is the part that regulates *the view* that needs to be displayed and also sets the required *model*, and *the view* is the part that is in charge of displaying information in the form of a visual display to the application user according to the instructions by *the controller*. The author uses the *Model-View- Controller* architecture because the *Model-View-Controller* architecture separates the application logic from the application view. This makes it easier for writers to create applications. An overview of the *Model-View-Controller* architecture can be seen in figure 2, while the *model-view-controller* architecture workflow in the codeigniter framework can be seen in figure 2.1(Supit et al., 2020).

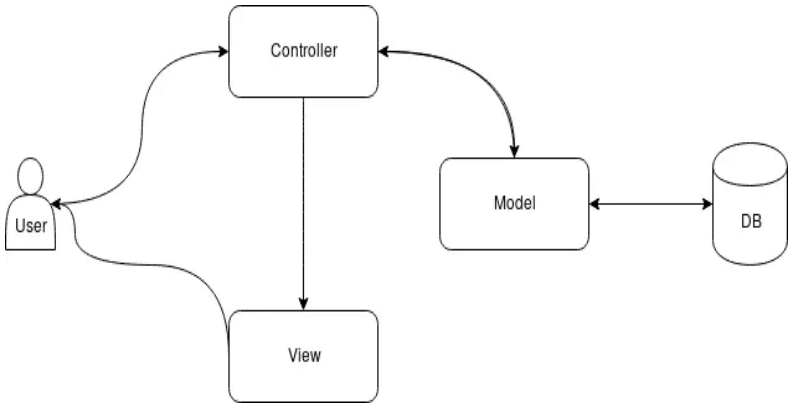

Fig 2. Model-View-Controller Architecture

METHOD

The object of research in this is the state-owned inventories in the Faculty of Computer Science UPN Veteran Jakarta. The types of data collected by this study are primary and secondary data. Primary data is data that the researcher collects directly from the object under study, while secondary data is data collected through references to reading books that are closely related to the study of the problem under study. The source of data needed in this study was obtained from the FIK UN Veteran Jakarta.

The data collection methods carried out in the study are:

a. Interview
Data collection through direct communication with the personnel subsection involved with the object under study. Researchers try to get information by conducting direct questions and answers with office employees and staff.

b. Observation
In addition to conducting interviews, researchers also observe directly on the object under study and study problems in the office that are closely related to the management of State-owned inventories

c. Literature Studies
Conduct a search for materials that support the resolution of the problem through books, the Internet and other information media related to the problem being discussed.

The System Development Method that researchers will use in this study is to use the *Waterfall System Development Life Cycle (SDLC)* method. The waterfall development model is suitable for generic systems or software, meaning that the system can identify all its needs from the start with general specifications and is

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suitable for software that has the goal of building a system from scratch that collects system requirements to be built (Rachma & Muhlas, 2022)

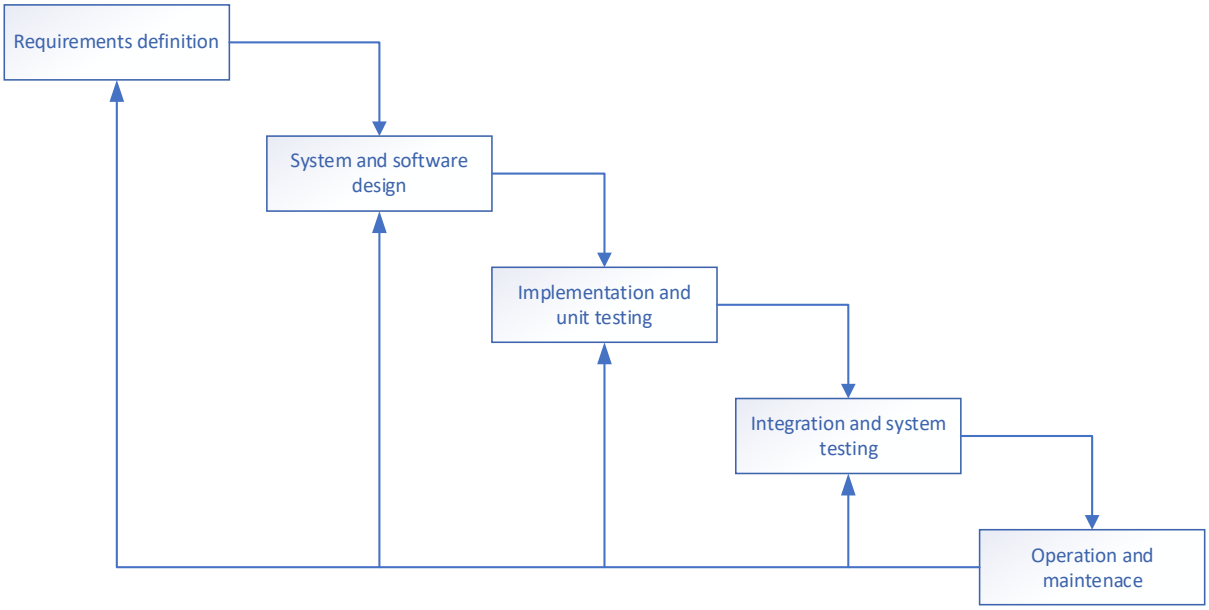

Fig 3. Waterfall Stages

The stages of the *Waterfall System Development Life Cycle (SDLC)* are:

a. Requirements Definition
This stage is to communicate with users to understand the system of managing state-owned inventories expected by users. Information is obtained through interviews, observations, literature studies, or discussions. The information obtained will be analyzed to find the need for the system to be built.

b. System Design
This stage is to create a system design based on the results of the analysis. The design system includes User interface Design, Program Design, and Data Design. The results of this system design help system developers determine the *appropriate hardware* expected and assist in defining the overall system structure.

c. Implementation and Unit Testing
The next stage is to carry out the implementation from the design stage to the programming or *coding* stage. At this stage, each unit is developed and tested for functionality referred to as *Unit Testing*.

d. Integration and System Testing
At this stage, testing of each of the features and functions of the system is carried out to find out whether the system is appropriate or not.

RESULT

The requirements definition stage was carried out after conducting observations and interviews with several officers who manage the state-owned inventories at the Faculty of Computer Science UPNVJ. Based on the results of observations in the Faculty of Computer Science UPNVJ, there were several problems identified, namely the documentation still using paper to keep the properties information. The state-owned inventories website application designed in this research was created to overcome the problem of using conventional paper where it is wasteful to use paper which is not in line with the goals of the university program to implement the "Go Green Campus" to reduce paper use and some difficulties in making reports for the state-owned inventories' location and availability in each room, as well as difficulty to detect broken properties.

This website has two types of users, namely super admin and assist admin. Super admin has more advantages in access rights than some menu features where none can be accessed by assist admin. Then the super admin can also access the menu feature to display a list of activity logs carried out by all users and can also add new users. The assist admin or admin support has the right to use the basic features according to the function of this web application, namely, to display the device management, location management, and information.

The needs of each user role in the application are identified in table 1 below:

Table 1. System Requirements

No	System Requirements → feature menu	Super admin	assist admin or admin support

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No	System Requirements → feature menu	Super admin	assist admin or admin support
1	Home	√	-
2	User management	√	-
3	Component management	√	
4	System log	√	-
5	System settings	√	-
6	Device management	√	√
7	Location management	√	√
8	Report	√	√
9	Sign out	√	√

Based on the results of the identification of problems and needs, the researchers continued to design the system to be developed. The design stage provides a product description model that will be made from the analysis of problems and needs. At the design stage, the processes carried out include the design of use case diagrams and database design. The use case diagram of the state-owned inventories FIK UPNVJ information system is shown in Figure 4.

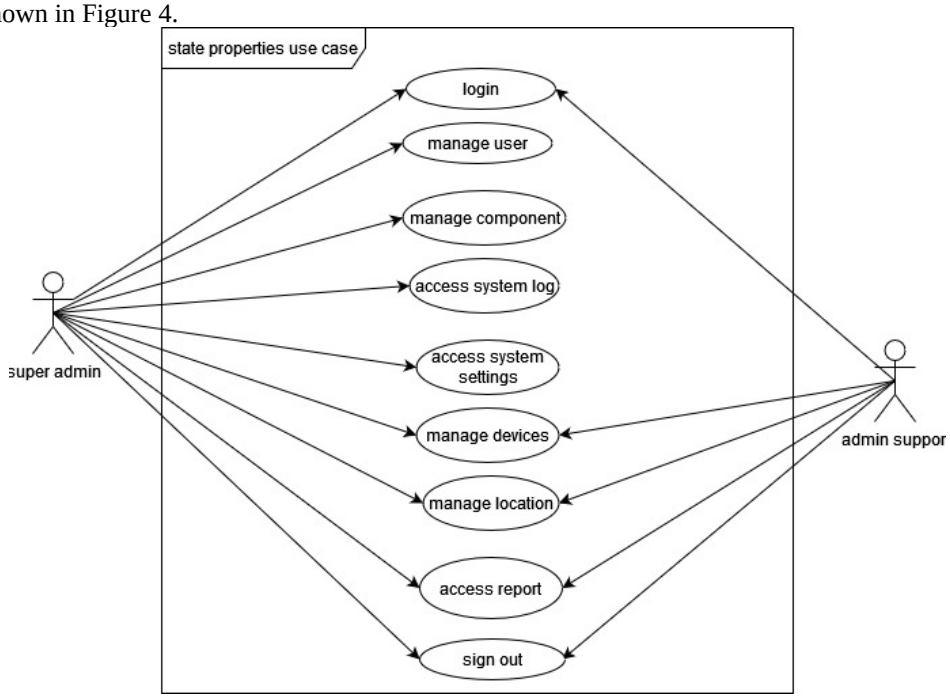

Fig 4. use case diagram of the state-owned inventories FIK UPNVJ information system

For the database design of the state-owned inventories FIK UPNVJ information system, it can be seen in Figure 5. In the database design, interrelated tables are created. In general, the tables created are tables to (1) manage user data: users and user_privileges (2) manage devices: device_type and component (3) manage locations: location, location_building, location_details, and location_floor access rights, (4) manage system: system_logs and system_settings.

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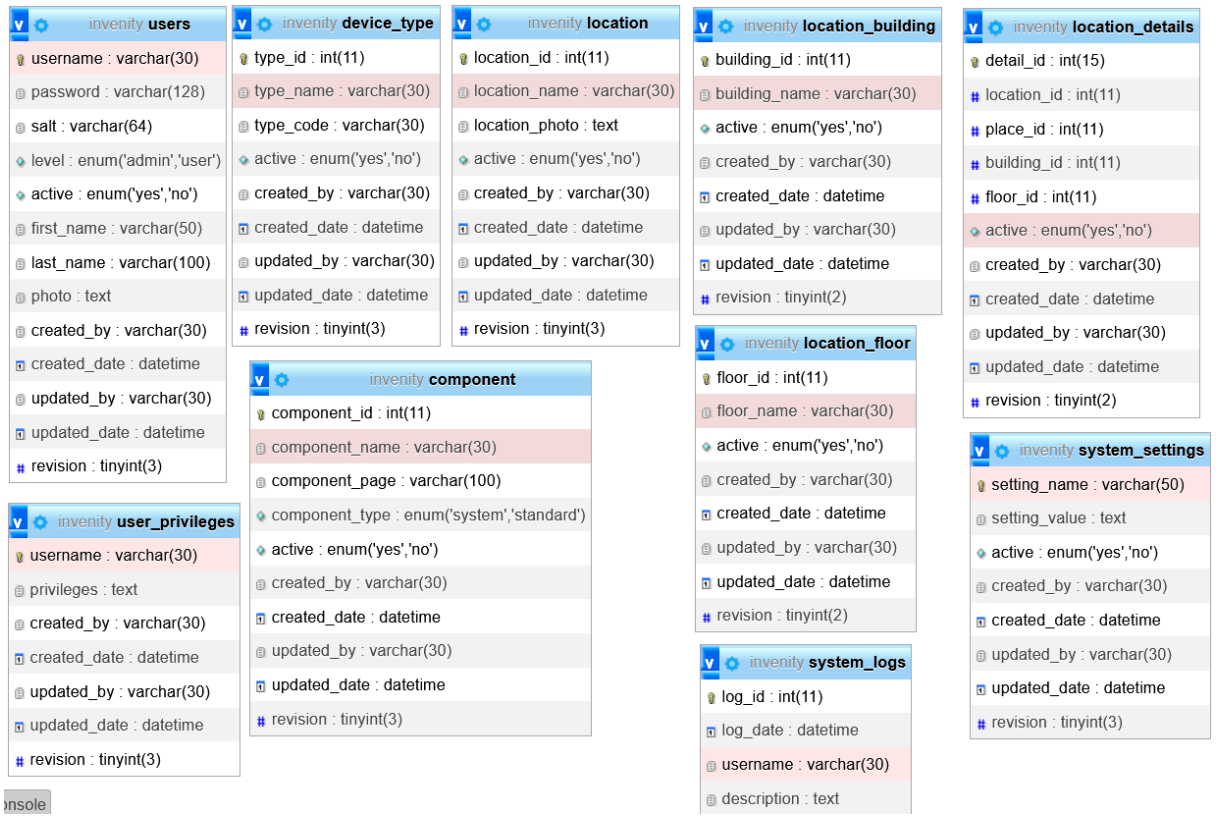

Fig 5. database design of the state-owned inventories FIK UPNVJ information system

Furthermore, implementation is carried out where at this stage it is necessary to ensure compliance with system requirements from the results of the previous design stages. In Figure 6 you can see the default login page of the state-owned inventories FIK UPNVJ information system. This page will be displayed when a visitor uses the website. Visitors are asked to log in to determine whether visitors are allowed to enter or not. If a visitor does not have a user account, the visitor cannot use the system.

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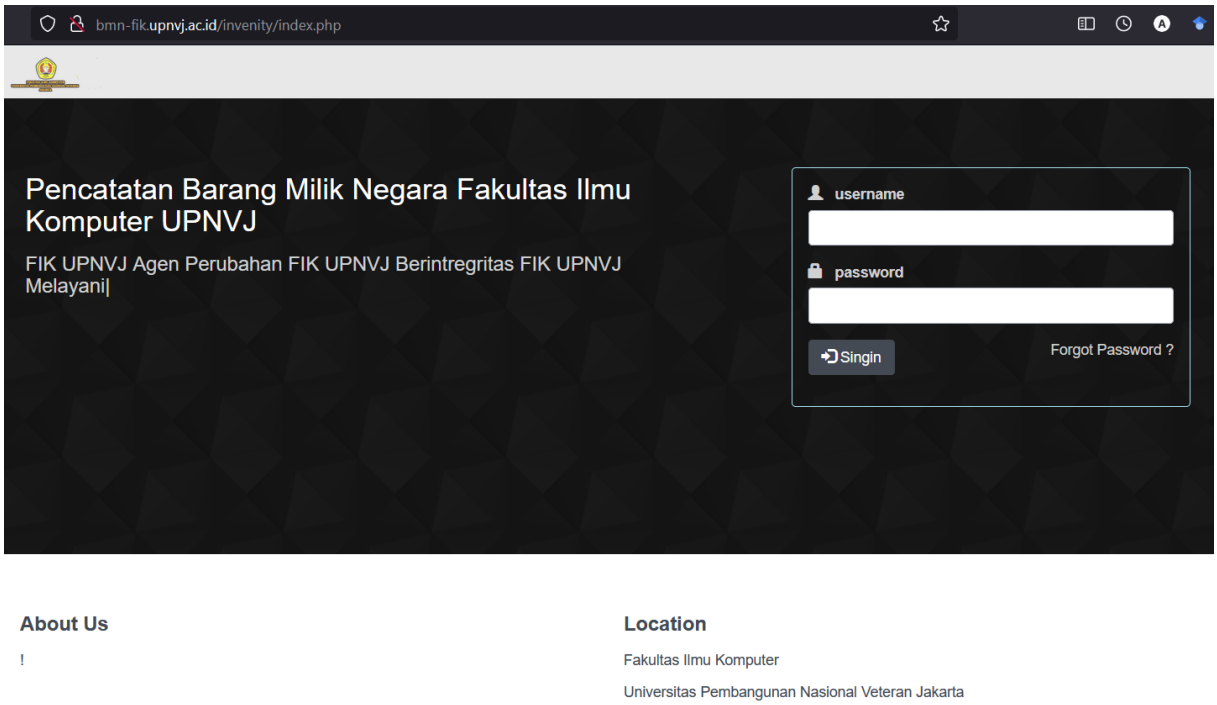

Fig 6. default login page of the state-owned inventories FIK UPNVJ information system

In Figure 7 you can see the home page of the state-owned inventories FIK UPNVJ information system. This page will be displayed when a visitor success enters the website. On this page, users are welcome by a dashboard that represents the number of device's condition from all to new, in use, damaged, repaired, and discard.

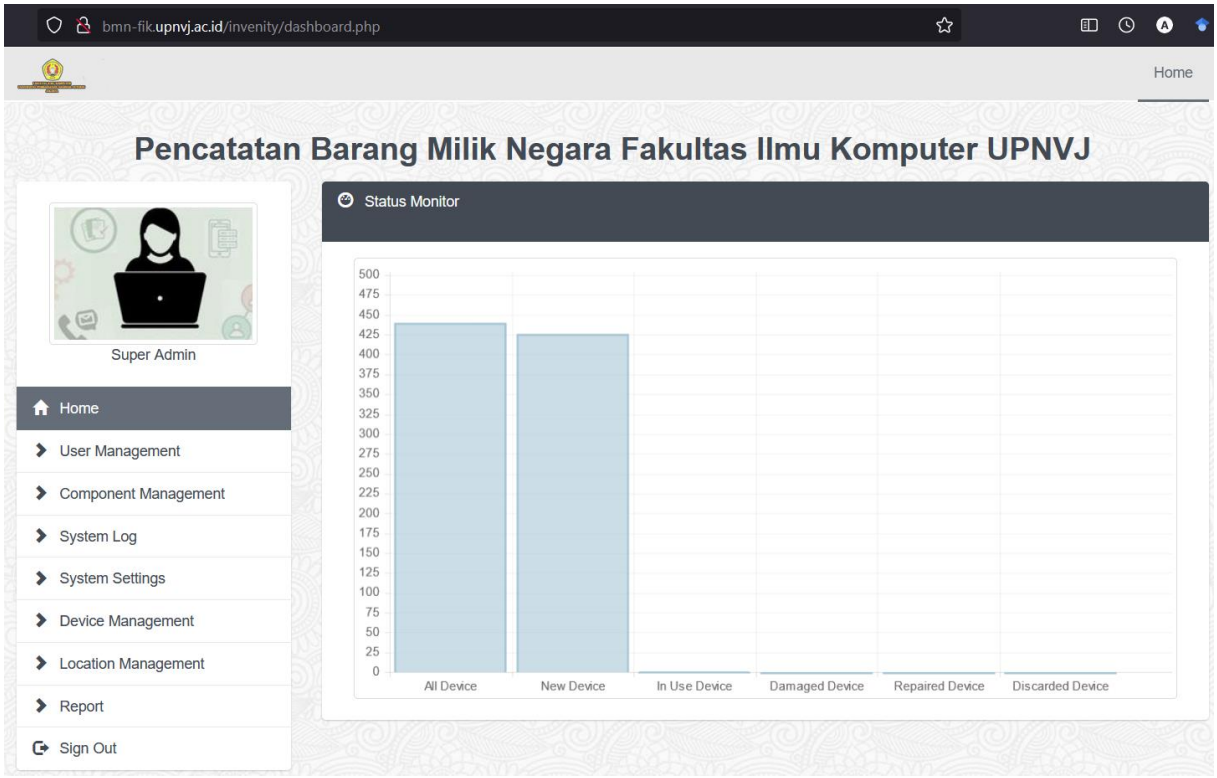

Fig 7. The home page of the state-owned inventories FIK UPNVJ information system

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In Figure 8 you can see the Device management page of the state-owned inventories FIK UPNVJ information system. This page will be displayed tables of the device list. The details of the list contain three columns namely device name, total device, and action.

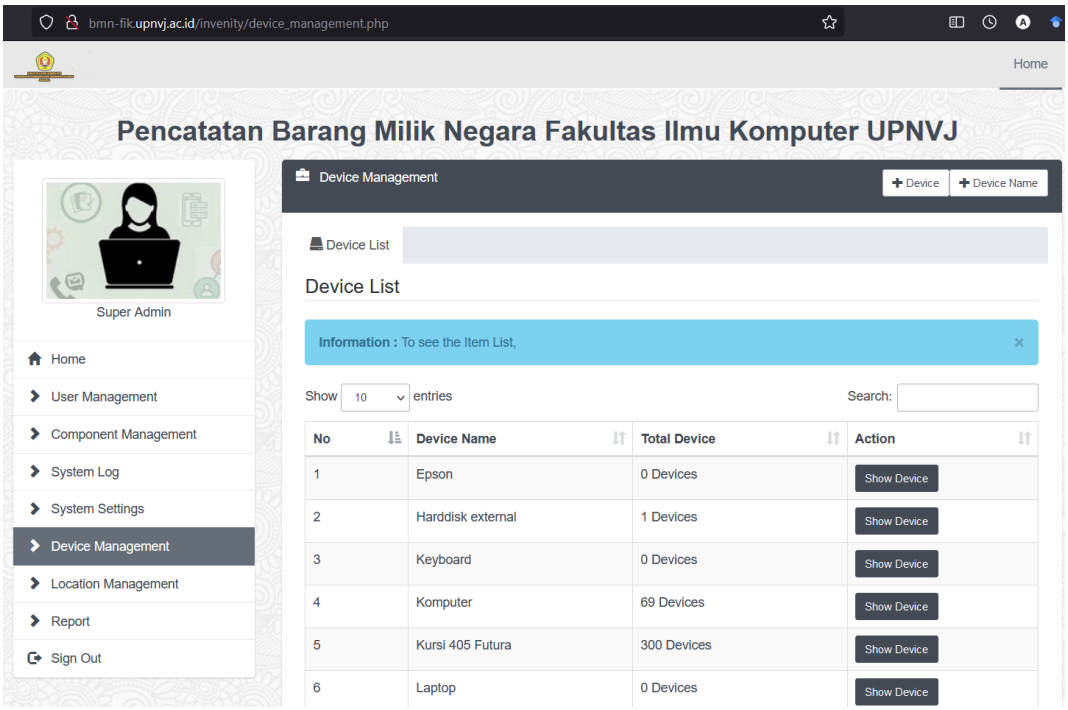

Fig 8. Device management page of the state-owned inventories FIK UPNVJ information system

In Figure 9 you can see the Location management page of the state-owned inventories FIK UPNVJ information system. This page will be displayed tables of the location list. The details of the list contain six columns namely name of the room, place, building, floor, active and action.

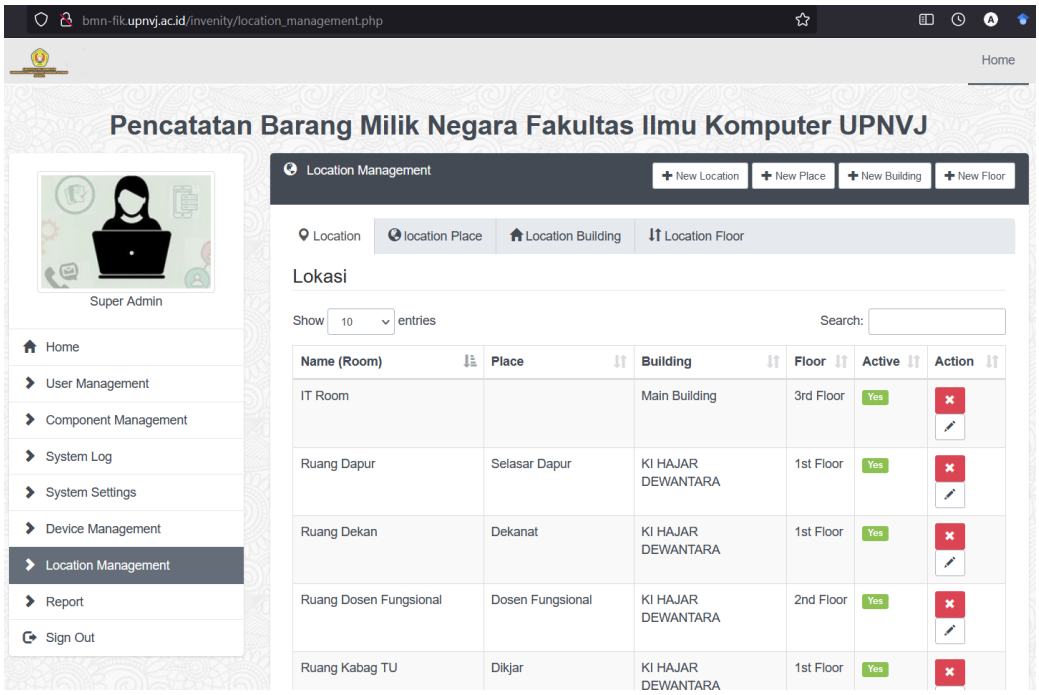

Fig 9. Location management page of the state-owned inventories FIK UPNVJ information system

In Figure 10 you can see the Report menu page of the state-owned inventories FIK UPNVJ information system. This page will be displayed reports based on the location, place, building, and device type. The example of the

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report based on location is represented in Figure 11. The report contains nine columns namely no, code, type, brand, model, serial number/BMN, color, location, and status.

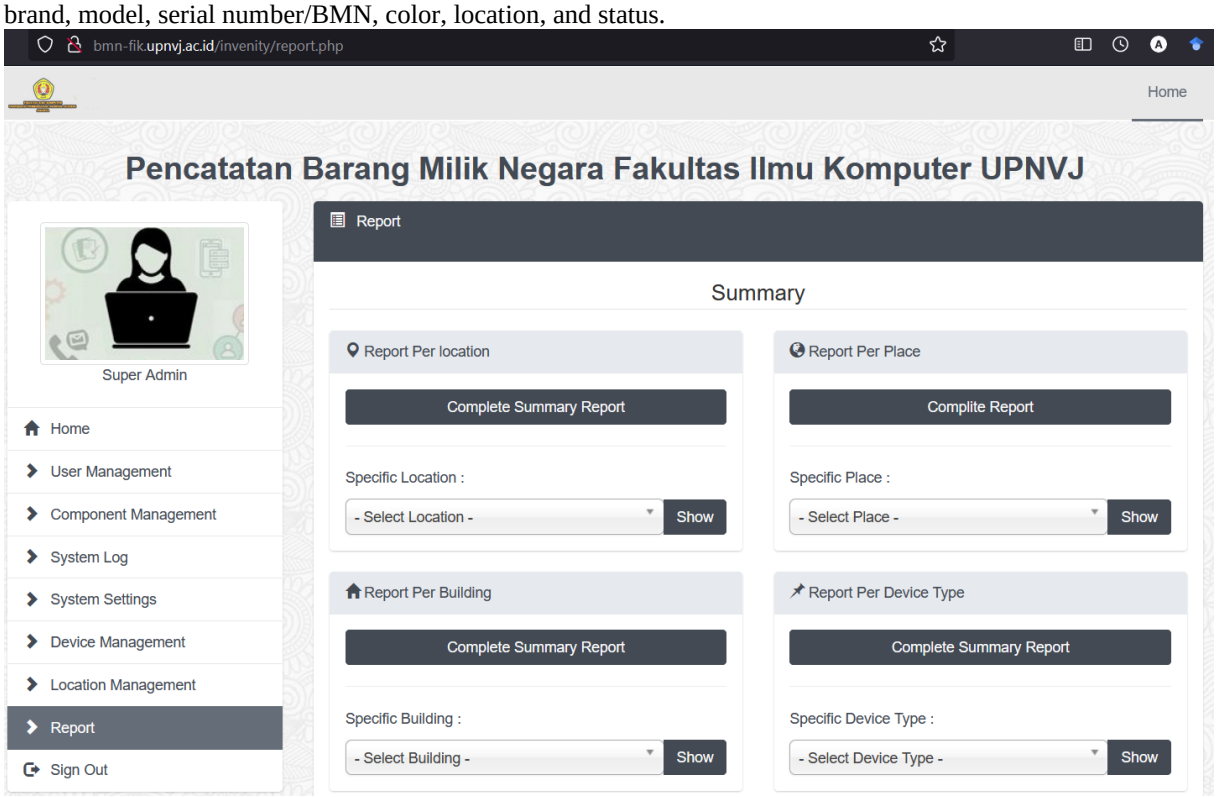
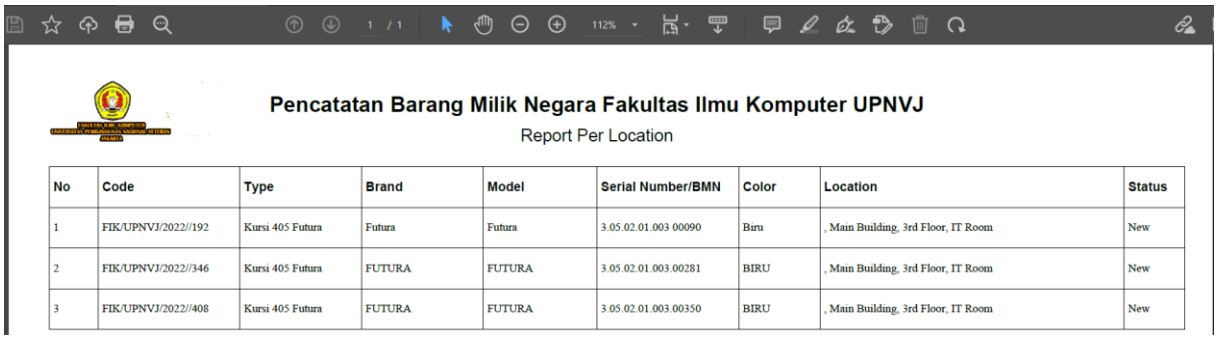


Fig 10. Report menu page of the state-owned inventories FIK UPNVJ information system



Pencatatan Barang Milik Negara Fakultas Ilmu Komputer UPNVJ

Report Per Location

No	Code	Type	Brand	Model	Serial Number/BMN	Color	Location	Status
1	FIK/UPNVJ/2022//192	Kursi 405 Futura	Futura	Futura	3.05.02.01.003 00090	Biru	, Main Building, 3rd Floor, IT Room	New
2	FIK/UPNVJ/2022//346	Kursi 405 Futura	FUTURA	FUTURA	3.05.02.01.003.00281	BIRU	, Main Building, 3rd Floor, IT Room	New
3	FIK/UPNVJ/2022//408	Kursi 405 Futura	FUTURA	FUTURA	3.05.02.01.003.00350	BIRU	, Main Building, 3rd Floor, IT Room	New

Fig 11. Report page of the state-owned inventories FIK UPNVJ information system

Table 2. Testing Data Aspects of Use (Usability)

No	Respondent	Total	Category
1	Officer 1	84	Very acceptable
2	Officer 2	81	Very acceptable
3	Officer 3	89	Very acceptable
4	Officer 4	90	Very acceptable
5	Officer 5	86	Very acceptable
Average		86	Very acceptable

Table 2 is a user assessment of state-owned inventories FIK UPNVJ staff. The average result of the assessment of the six staff users obtained a value of 86 which is in the interval x 75 which means that it is in the 1st category, namely "Very Eligible". This state-owned inventory system from all aspects of usability aspects, the

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product is said to be very feasible to use. This is in line with previous research conducted by Hamka et al. (Hamka & Effendi, 2019) which has a feasibility value of 79% which means it is very feasible to use.

DISCUSSIONS

The use of computerized technology for recording state-owned inventories can make it easier to record incoming devices that will be distributed to other work units. In addition, it also makes it easier for admins to make minutes of receiving devices and storing data in a more computerized manner. Admin also no longer has difficulty in tracking data on borrowing goods that have been done. With the application of the inventory of devices, making management of devices can be faster and more accurate. This condition is in line with the previous research (Sumaryanto & Sumarna, 2022).

CONCLUSION

The Web-based system of the state-owned inventories of the Faculty of Computer Science UPNVJ has been successfully built and is able to carry out the processes that have been designed. From the results of the user assessment of this system, officers who manage the state-owned inventories agree that "this system is eligible" for all aspects of usability aspects. Suggestions can be done to develop features by completing the barcode or QRcode so that simply check the properties detail.

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