DESIGN AND DEVELOPMENT OF WEB-BASED INFORMATION SYSTEM FOR OFFICE STATIONERY PROCUREMENT MANAGEMENT

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Abstract— Office Stationery (ATK) is an item used to do written work such as paper, books, ink, pencils, pens, paper clamps, and others. ATK is a supporting tool that has an important role in implementing the administrative function of a company or agency. The management of ATK procurement in the Bogor Agricultural Institute (IPB) is under the coordination of the Directorate of Infrastructure, Facilities, and Campus Environmental Security (DPSPLK) as a coordination unit at the central level. So far, the procurement of ATK in every work unit in the IPB environment uses a direct purchase method. Direct purchasing methods cause problems and weaknesses, including: (1) price differences between providers for the same goods, (2) the quality of providers varies because each work unit directly selects providers, (3) vulnerability to price manipulation, (4) needed storage space for goods in each unit, (5) management and organization of ATK data are carried out partially in each work unit. Atk data management and organization have not been systemized, making it difficult for DPSPLK to reconcile data. An umbrella contract procurement method (framework contract) is applied to deal with problems in the direct purchase method. Management and organization of unsystematic ATK data, an integrated information system is built to facilitate DPSPLK reconciling data for reporting needs. The information system development method uses the waterfall method and tests the User Acceptance Test (UAT) black-box type. This research resulted in the procurement and management application of ATK used by DPSPLK.

Keywords: Office stationery, umbrella contract, information system, waterfall model

Abstrak— *Alat Tulis Kantor (ATK) adalah barang yang digunakan untuk mengerjakan pekerjaan tertulis seperti kertas, buku-buku, tinta, pensil, pulpen, jepitan kertas, dan lain-lain. ATK merupakan sarana penunjang yang mempunyai peran penting dalam pelaksanaan fungsi administrasi suatu perusahaan atau instansi. Pengelolaan pengadaan ATK di lingkungan Institut Pertanian Bogor (IPB) berada dibawah koordinasi Direktorat Prasarana, Sarana, dan Pengamanan Lingkungan Kampus (DPSPLK) sebagai unit koordinasi ditingkat pusat. Selama ini pengadaan ATK disetiap unit kerja dilingkungan IPB menggunakan metode pembelian langsung. Metode pembelian langsung memunculkan permasalahan dan kelemahan diantaranya adalah: (1) terjadinya perbedaan harga antar penyedia untuk barang yang sama, (2) kualitas penyedia beragam karena penyedia dipilih langsung oleh masing-masing unit kerja, (3) rentan terjadi manipulasi harga, (4) diperlukan ruang penyimpanan barang pada masing-masing unit, (5) pengelolaan dan pengorganisasian data ATK dilakukan secara parsial di masing-masing unit kerja. Pengelolaan dan pengorganisasian data ATK belum tersistem, ini menyulitkan DPSPLK melakukan rekonsiliasi data. Untuk menangani permasalahan pada metode pembelian langsung maka diterapkan metode pengadaan kontrak payung (framework contract). Untuk menangani pengelolaan dan pengorganisasian data ATK yang belum tersistem maka dibangun sistem informasi secara terintegrasi sehingga memudahkan DPSPLK dalam melakukan rekonsiliasi data untuk kebutuhan pelaporan. Metode pengembangan sistem informasi digunakan metode waterfall dan pengujian menggunakan User Acceptance Test (UAT) tipe black box. Penelitian ini menghasilkan aplikasi pengadaan dan pengelolaan ATK yang digunakan oleh DPSPLK.*

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Kata Kunci: *Alat tulis kantor, kontrak payung, sistem informasi, model waterfall.*

INTRODUCTION

Office Stationery (ATK) is the form of goods used to write works (Wursanto, 2006). ATK can be paper, books, typewriter tape, ink, pencil, rubber eraser, paper clamps, cards, and so on (Purnama et al., 2021). ATK can be divided into stationary, paper, books, file organizers, and general equipment (Getvendor, 2018). ATK is an essential means of administrative support in implementing administrative functions in the operations of companies or agencies. Bogor Agricultural Institute (IPB) is a State Higher Education Institution that does not escape ATK use. Atk procurement management in the IPB environment is coordinated by the Directorate of Infrastructure, Facilities, and Campus Environmental Security (DPSPLK). ATK procurement in the current IPB environment refers to the rules and mechanisms for the procurement of goods and services that apply in the internal IPB, where each work unit can meet the needs of ATK through direct purchase methods or particular procurement (Peraturan Rektor Institut Pertanian Bogor, 2018). Procurement of ATK in each work unit using a direct purchase method means buying goods directly to the provider according to their needs. This direct purchase method raises several problems, including (1) the price difference between providers for the same goods and (2) the quality of providers is diverse because each work unit directly selects the provider. (3) vulnerable to price manipulation resulting from the price of non-uniform goods, (4) the need for space for the storage of goods in each work unit, and (5) the management and organization of ATK data is carried out by each work unit. It makes it difficult for DPSPLK as a coordination unit at the central level in conducting data inventory quickly. To meet ATK data inventory reporting needs, DPSPLK must reconcile data offline with each work unit at the end of each semester and or end of the year. This happens because there is no integrated information system to be used in managing ATK data in every work unit or in DPSPLK.

Fixed an issue caused by the direct purchase method, an umbrella contact method (framework contract) is applied in ATK procurement, while in the management and distribution of ATK data in each work unit, an INFORMATION system for procurement and management of ATK is built. It will facilitate the work unit in ATK procurement because the provider has guaranteed the availability of ATK, ATK quality desks, and there is no price difference between providers, and the work unit does not need to prepare a place to store ATK goods. The work unit can make an ATK request and perform ATK returns if the work unit receives a damaged ATK through the information system. DPSPLK will more easily control and reconcile data quickly for reporting needs because it has used an integrated information system.

Umbrella Contracts can be unit price contracts within a certain period for goods/services that have not been able to determine the volume or delivery time when the contract is signed (Peraturan Presiden Republik Indonesia, 2010) (Sinaga, 2019). Umbrella contracts are one type of contract on repetitive work over a long period and large volumes (Hamkah, Purwanto, & Matitaputty, 2019). The umbrella contract means that the contractor has cooperated for all work wherever the company will supply it so that it is more efficient and reduces the price of products (Sholeh et al., 2020). An Umbrella Contract (Framework Contract) is an agreement with one or several providers to procure goods/services by setting a unit price. The advantage of this contract is that the Procurement Services Division does not need to tender continuously, just once within 1 or 3 years in 1 contract (Lazuardi, 2020).

So it can be concluded that an umbrella contract is an agreement with more than one provider in procuring goods/services by applying the exact unit price and guaranteeing the availability of goods within a certain period.

An information system is a combination of organized modules derived from components related to hardware, software, people, databases, and networks based on a set of computers that are interconnected or interact to process data into information to achieve the goal. The information produced has a significant meaning in supporting the decision-making process by the management (J. Simarmata, M.E. Taufik, J. Sidik, R.W. Saputra, S. Hapsah, 2020), so that with this information system has become one the success factor of the agency strategically (Indrajit, 2020). This research aims to design and build a web-based ATK procurement management information system integrated with the umbrella contract method (framework contract) in ATK procurement, where ATK procurement can be done with one or more providers, pricing of the same unit of goods, and guaranteed availability of goods (Peraturan Presiden Republik Indonesia, 2010). The system development method used in this research is the waterfall model and used User Acceptance Test (UAT) type black box testing used for system trials (Novita Br Ginting, Yuggo Afrianto, & Suratun, 2019)(Cholifah, Yulianingsih, & Sagita, 2018).

MATERIALS AND METHODS

The materials used in the research are: 1) data on the proposed needs of ATK from each unit, 2) data on the procurement of ATK using umbrella contract methods, 3) a list of work units in the IPB environment, 4) organizational documents and work procedures of IPB, and 5) IPB rector regulation No.18 / IT3 / LK / 2020 concerning the second regulation of the Rector of IPB number 13.IT3 / LK / 2018 concerning procurement of IPB goods / services. The research method refers to the Waterfall method, which is a stage of software system development that consists of several stages, namely: analysis (analysis), design (design), implementation (implementation), and trial (testing). Each stage is interrelated and interacts with the other[Yuggo Afrianto1, Jejen Jaenudin2, Novita Br Ginting3] (Afrianto, Heryandi, Finandhita, & Atin, 2021). The research stages of procurement and management of ATK are shown in figure 1.

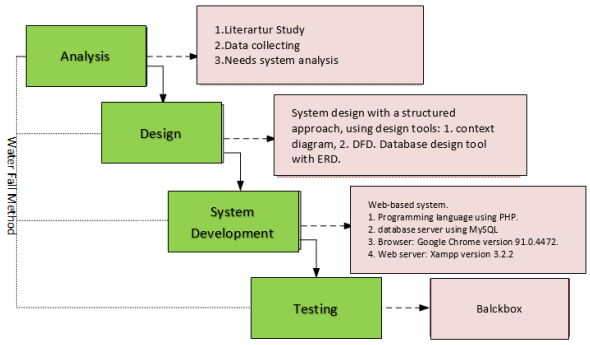

Figure 1. Research Stages

a. Analysis Stage

To find out the problems of the procurement process and the management of ATK in DPSPLK through interviews and observations. The discussions and comments result in business processes from the procurement and management of ongoing ATK. The business process will be described in the form of a flowchart document. At this stage also conducted a study of the relevant literature. Literature study sources in 1) journals, 2) IPB rector regulation No.18/IT3/LK/2020 concerning the second Regulation on IPB Rector regulation number 13.IT3/LK/2018 concerning procurement of IPB goods/services, 3) procurement procedures, 4) data on proposed ATK needs from each unit, 5) information on ATK procurement results using umbrella contract methods, 6) list of work units in IPB environment, and 7) IPB organizational documents and work procedures. After understanding the problems faced by DPSPLK, it will be proposed that flowchart information system documents be developed. The information system context diagram is depicted through the flowchart of information system documents created, and the identification of actors and use cases is carried out, which will then be used in the ATK procurement and management information system design stage.

b. System Design

It will design an ATK procurement and management information system model, which is needed to provide an overview of the information system built for DPSPLK. The design method used is the closeness of object-oriented design, and the design tool used is the UML diagram (Unified Modelling Language). Use case diagrams, activity diagrams, deployment diagrams, and database diagrams will be designed at this stage.

c. System Development Stage

In this stage, the design of the information system will be translated into programming languages (coding) to produce applications/information systems procurement and management of ATK. Information systems are built on a web-based programming language using PHP. Database Server uses MySQL. The browser uses Google Chrome Version 91.0.4472.124, the Web Server uses Apache, and the text editor uses sublime text.

d. Testing

The information system for procurement and management of ATK is carried out by testing the system with the black box testing method. This method pushes the software in terms of functional specifications without trying the design and program code to determine whether the software's input and output function are by the specifications required (Cholifah et al., 2018). This test will involve the end-user using the ATK procurement and management information system. Where testing focuses on software functionality, there are 5 (five) types of UAT: 1) Alpha and Beta Testing, software trials conducted to look for bugs and other problems before the product is released to the public. 2) Contract Acceptance Testing, a software trial based on several specific criteria, such as what has been approved in the contract. 3) Regulation Acceptance Testing this trial aims to ensure that the software that has been developed is too specific to regulations. 4) Operational Acceptance Testing, Operational Readiness Testing, or Production Acceptance Testing, This trial focuses on workflows that allow systems or software to be used. Operational Acceptance Testing includes backup plan workflows, user training, a wide variety of maintenance processes, and security checks. 5) Black Box Testing UAT type is usually a functionality trial. End-users will test the software's functionality

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without looking at its internal code structure. (Afrianto et al., 2021)

RESULTS AND DISCUSSION

a. Analysis Step

At the analysis stage, obtained: 1) Overview of ongoing business processes depicted with a document flowchart. The results of the business processes of the running system are shown in figure 2. 2) An overview of the system's business processes to be developed and illustrated with a document flowchart, shown in figure 3, and 3) an overview of the procurement and management information system ATK as a whole depicted with a contextual diagram, shown in figure 4.

1) Ongoing ATK procurement and management business processes

The current ATK procurement and management business process starts with the work unit preparing a plan for the needs and implementation of ATK, and if the procurement of the ATK procurement requires a budget of more than 100 million, then the work unit will propose the procurement of ATK to the procurement unit. The procurement unit will facilitate the procurement of ATK by issuing an ATK procurement approval letter along with an attachment to the needs of the ATK work unit. The procurement unit will provide the document to the specified ATK provider, and the ATK provider will send the ATK to the work unit section. If the procurement of the ATK does not exceed the budget of 100 million, the work unit can carry out direct procurement and appoint an ATK provider. DPSPLK will reconcile ATK in each work unit at the end of the semester or the fiscal year as an accountability report to the ministry. The ATK data reconciliation process takes a long time. Based on the results of interviews with DPSPLK takes about 3 (three) months to reconcile data. There is no integrated information system that DPSPLK and work units can use in the ATK data reconciliation process.

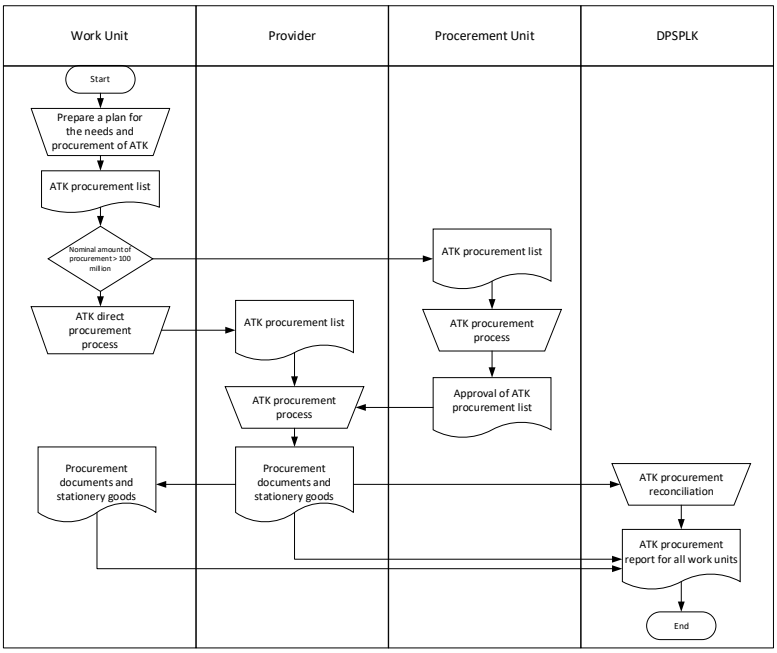


Figure 2. Analysis of running system business processes

2) ATK procurement and management business process to be developed

Analysis of system business processes to be developed for ATK management and procurement information systems starts from ATK procurement contracts that use umbrella contract methods carried out by the IPB Procurement Unit with several ATK providers through various stages of procurement selection, by the procurement regulations applicable in IPB. The results of the procurement contract are in the form of ATK procurement documents containing procurement contracts for one year. The contract consists of a list of ATK at predetermined prices and applies to all providers. Referring to the procurement contract document, DPSPLK as a work unit that coordinates the management of ATK procurement in IPB inputs reference data such as 1) ATK data, 2) data list of providers who are its procurement partners, 3) work unit data in IPB, and 4) user data to be registered as users of ATK procurement and management information systems. After all the reference data is inputted, all work units in the IPB environment can procure ATK using this ATK

management information system by first entering the system using their respective usernames and passwords based on the category of users who have been registered in the information system. The work unit places ATK orders in the information system, and the ATK order data will be forwarded to the provider. The provider will follow up on the ATK order by inputting ATK delivery data, with the final output in a delivery invoice to the work unit. The ATK held will be sent by the provider based on the delivery invoice. All ATK delivered will be verified by the work unit related to the number of goods per item, the specifications, and the goods' physical condition. In goods that do not comply with specifications or have damage, a return of goods can be done by making a return transaction into the information system. The provider sends returns based on the return data. The provider sends returns and issues invoices for returns and replacement goods to the work unit. Figure 3 is a business process analysis developed in the ATK procurement management information system.

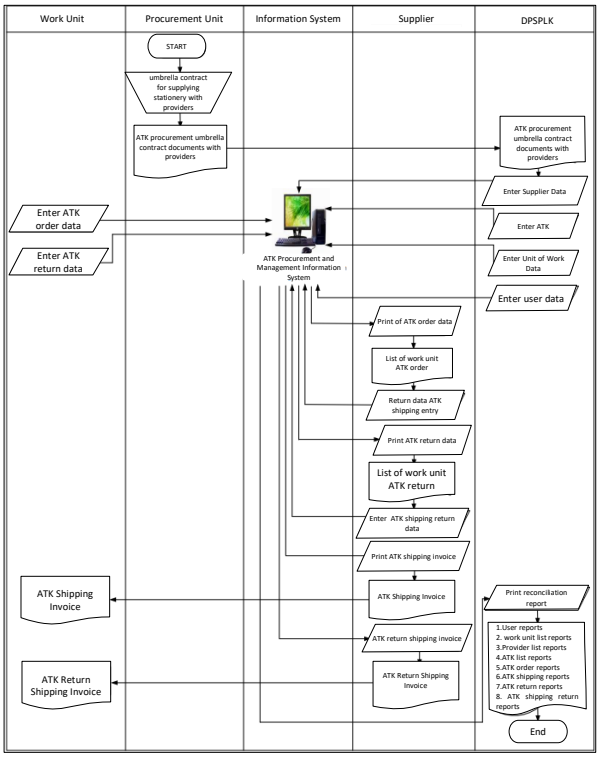


Figure 3. Developed Business Processes

3) The confection diagram of the ATK procurement and management information system is shown in figure 4. The Contect diagram developed shows that the ATK management and procurement information system actors are: 1) DPSPLK, 2) Work units, and 3) providers, whom each have different data process flows.

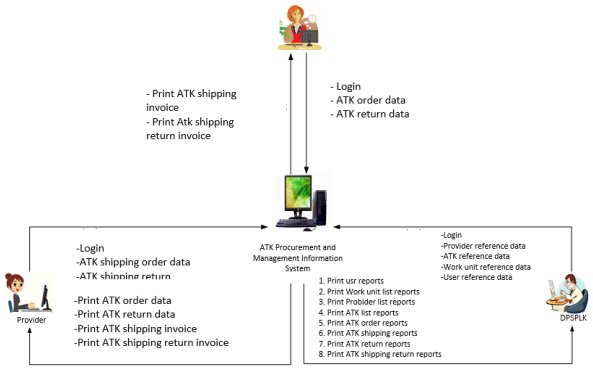


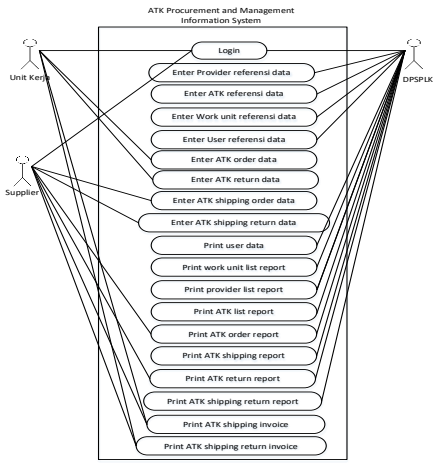
Figure 4. Information system context diagram

b. System Design

The design phase of the ATK procurement and management information system uses an object-oriented design approach. The design tool used is UML (Unified Modelling Language). UML is the standard language for visualizing and documenting systems or blueprint writing software standards (Renny & Beni, 2016). Through UML diagrams will facilitate the development of software (information system) because the diagrams will serve as translators between system developers and users so that users can understand how the system will be developed. This study produced use case diagrams, activity diagrams, sequence diagrams, database diagrams, and deployment diagrams.

1) Diagram use case pengadaan dan pengelolaan ATK

The use case diagram describes the interaction relationships between the system and actors (Ginting, Afrianto, & Suratun, 2021). From the ATK management and procurement use case diagram, there are 3 (three) actors: work units, providers, and DPSPLK. All actors will interact with the system according to the authorization of each actor. The ATK procurement and management use case diagram is shown in figure 5.



igure 5. Diagram of ATK procurement and management use case

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1) Diagram of ATK procurement and management activities

a. Login activity diagram

Activity diagrams are used to model various processes that occur in the system (Novita Br Ginting et al., 2019). Activity diagrams, such as the running process, are described vertically (Novita Br Ginting et al., 2019). The graph of ATK procurement and management activity is shown in the login process in figure 5, and the ATK ordering process is shown in figure 6. All system user actors who have been registered in the database can use the system through the login form by entering the user id and password first. The system will verify the value of the user id and password attributes, if the user id and password attribute values are correct or by the data in the database, then the system will display the main menu of the application, but if the user id and password values are incorrect, then the system will notify the actor through an error message.

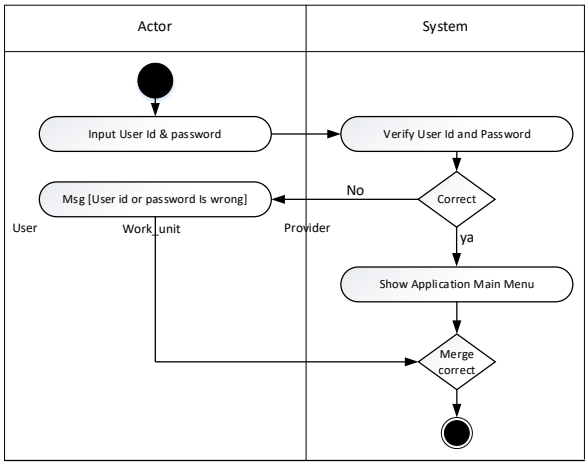

Figure 6. Login activity diagram

b. ATK booking activity diagram

Work unit actors carry out ATK order transactions. The work unit places ATK orders based on the list of ATK that has been available and the price that has been determined on the information system. The booking is addressed to one of the providers that have been registered in the information system. The booking data is then received by the provider selected by the work unit for further processing. The output generated in this process is from order data from work unit actors, and providers can print order invoices. The activity of the ATK order transaction diagram is shown in figure 7.

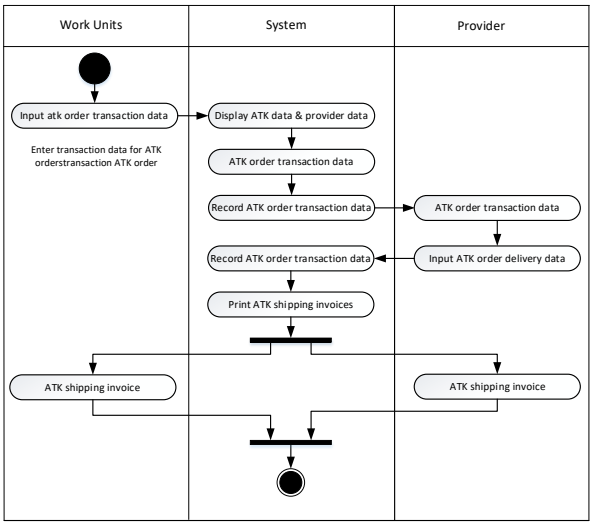

Figure 7. ATK Booking Activity Diagram

3) ATK management and procurement database

A database is a collection of data related to each other to achieve a goal. The database is the most important part of an information system. The database stores data to accumulate the data to produce the information needed by the user (Malagandi & Siahaan, 2017). The ATK procurement and management database are shown in figure 8.

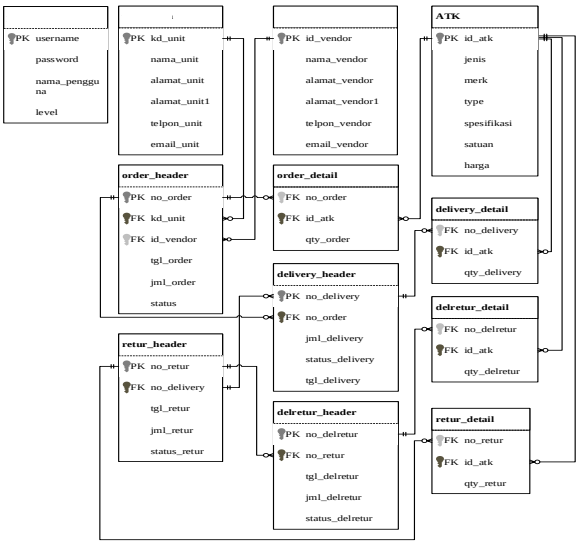

Figure 8. ATK procurement and management database design

System Development Stage

The information system development stage translates blueprints or information system designs into programming languages to produce information applications/systems. ATK procurement and management information systems are built web-based, using the PHP (Hypertext Preprocessor) programming language. Database Server uses MySQL. The browser uses Google Chrome Version 91.0.4472.124, the Web Server uses

Apache, and the text editor uses sublime text. The ATK procurement and management information system results are shown in several processes, namely login, order transactions, shipments, returns, and return shipments, as well as the effects of data reconciliation.

1) Login page view and main menu of ATK management and procurement information system

To enter the ATK procurement management information system, system users must enter a user id and password. Users in this system consist of three parts: DPSPLK, work units, and providers. The interface view of the Login page is presented in Figure 9. After the information system verifies the user, the system will display the main page, as shown in figure 10.

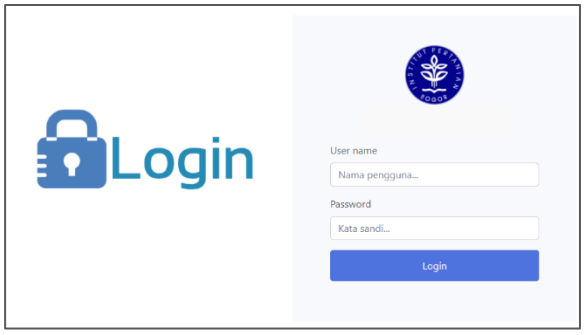

Figure 9. User Login Page

Figure 10. System Main Page

On the main page of the information system, there are several menus in the left column consisting of Home, Dashboard, Transactions, Reports, References, User Management, and Logout.

1) Home is the main page of the ATK procurement management information system.
2) A dashboard is a report in the form of graph information that presents the information needed by the lender based on specific criteria.
3) The transaction is a menu used to carry out the ordering, shipping, and returning transactions, ATK.
4) A report is a menu that displays report data with various criteria such as order reports, shipments, returns, and submissions.
5) Reference is a menu for reference data consisting of ATK data, work units, and providers.
6) User management is a menu system administrators use to perform system user settings.
7) Logout is a menu that is used to exit the system.

2) Transaction Menu Page View

The sub-menu in the transaction menu consists of ordering transactions, shipping, returns, and delivery. This sub-menu is only accessible to users for the work unit and provider categories. The sub-menus that are accessed are bookings and returns regarding work unit users. While from the provider side, the sub-menu that can be accessed is delivery and delivery of returns. One of the page interface views on this transaction menu is presented in figure 11, and Figure 12 shows the appearance of the order details page.

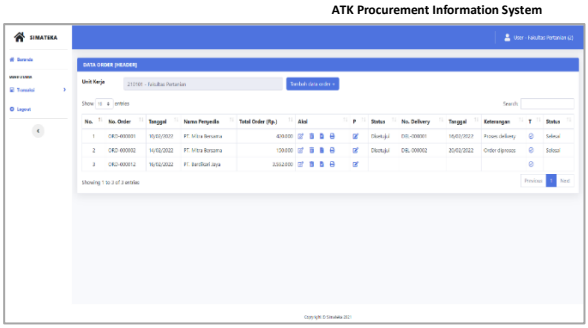

Figure 11. Transaction Menu Page View

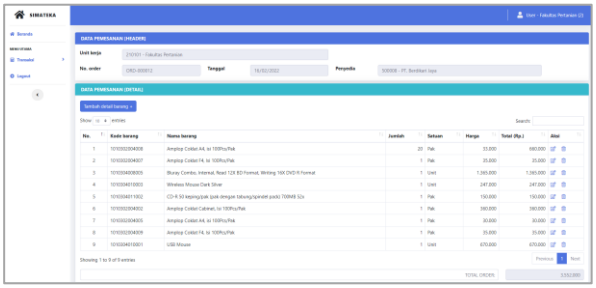

Figure 12. Booking details page view

Testing Stage ATK procurement and management information System

The system testing phase is carried out to determine whether the built information system can solve problems in DPSPLK and work units. The User Acceptance Test (UAT) is carried out to ensure this. In this study, black-box testing is used to test the functionality of information systems. The users who try are DPSPLK, work units, and providers. An example of the Black box testing test conducted by the user is shown in the login page testing process,

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shown in figure 13, and the order transaction process, shown in figure 14.

Login Page Testing

Login page testing is done to determine if the user's login module has worked correctly and by the system design flow. This test is based on user categories DPSPLK, work units, and providers.

Table 1. Login page testing

Input data	Output expectations	Observation results	Conclusion
Username: admin and password: **** (Figure 13)	The system can validate data for users who are not registered in the design and then cannot enter the system	Stay on the login page and can't log in to the system	Succeed
	The system can validate user data registered to get access rights to the primary page system.	Go to the primary page System (Figure 14)	Succeed

Figure 13. Login User Page

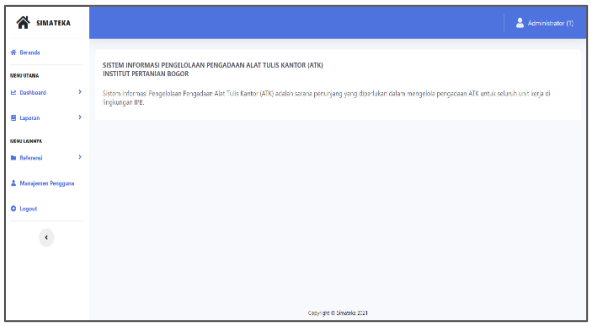

Figure 14. The main page of the system

Booking Transaction Page Testing

Testing the ATK order transaction data page is contained in the transaction menu. Users with the working unit category can access this booking transaction. The following describes the test and display of the work unit's ATK order transaction input page to the provider of the goods. The test description and the appearance of the order transaction input page are presented in Table 2 and Figure 15.

Tabel 2. Pengujian halaman input data pemesanan

Input data	Output expectations	Observation results	Conclusion
Addition of order data (header data):			
Click the Add Order Data + button	A system capable of displaying ATK order data filling form	View ATK order data filling form	Succeed
	The user fills each data item	Each order data filling item has been filled in data	Succeed
Click the Submit button	Data yang telah diinputkan dapat tersimpan	View returns to the item order page, and data is successfully saved	Succeed
Click the Cancel button	Data yang telah diinputkan tidak tersimpan	View returns to the item ordering page, and data is not stored	Succeed
Addition of order data (detailed data):			
Click the Add Item Details button +	The system can display	Displays the ATK order details data filling the form	Succeed

Input data	Output expectations	Observation results	Conclusion
	the form of filling in the order details data ATK		
	Users can charge each data item	Each item filling in the order details data has been filled in the data	Succeed
Click the Submit button	Data that has been inputted can be saved	View Return to the item order details page, and the data is successfully saved	Succeed
Click the Cancel button	Data that has been inputted is not saved	View Return to the item order details page and unsaved data	Succeed

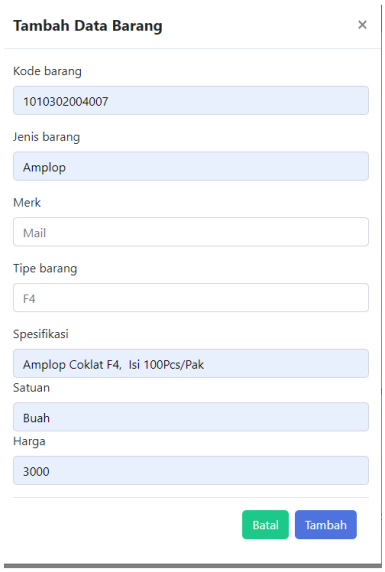

Figure 15. ATK order transaction input page

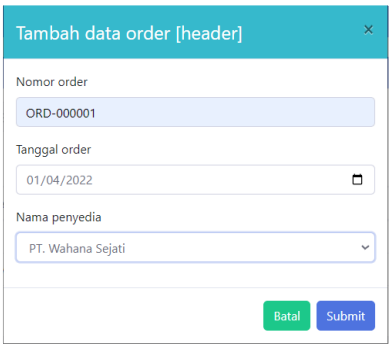

Figure 16. Addition of Order Data (Header)

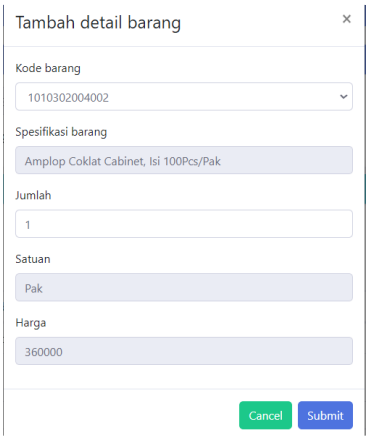

Figure 17. Addition of Order Data (Detail)

Users are also asked to fill out questionnaires to find out their responses about whether the ATK procurement and management information system is by their functional needs and the needs of their users. The questionnaire is filled with ten questions covering variable interface design, ease of use of the system, and time efficiency. With the number of respondents, as many as 23 people are separated from representatives of work units, providers, and DPSPLK. The questionnaire uses a Linkert scale with an answer option of A = Very Good with a weight of 5, the choice of answer B = Good with a weight of 4, the choice of answer C = Good Enough with a weight of 3, the choice of answer D = Less Good with a weight of 2, and the choice of answer E = Very Poor with a weight of 1, where the answer of the question consists of a level that can be selected the importance of the answer value. The results of the user's response are indicated in the table.

Table 3. UAT Test Table

No.	Variable	Question	Number of Values/ Questions	Percentage
1	Interface Design	P1	98	85,22%
2		P2	93	80,87%
3		P3	101	87,83%
4	System User Ease	P4	100	86,96%
5		P5	103	89,57%
6		P6	104	90,43%
7		P7	101	87,83%
8	Efficiency	P8	105	91,30%
9		P9	98	85,22%
10		P10	106	92,17%
Total value			1009	877%
Average score			100,9	87,74%

Based on the results of UAT testing through filling out a questionnaire, the results were obtained that the ATK management and procurement information system can be accepted and function functionally and can solve the problems of procurement and management of ATK DPSPLK IPB Bogor with a UAT value of 87.74%.

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CONCLUSION

The results and discussions concluded that this study successfully designed a web-based ATK procurement management information system with a waterfall model and adopted an umbrella contract procurement method (framework contract) in its procurement. The design results are use cases, activity diagrams, sequence diagrams, database diagrams, and deployment diagrams. Black box testing has been performed on every application module function, and the test results successfully meet the needs expected of users based on UAT results of 87.74%. This information system makes it easier to manage ATK procurement in the IPB environment and provides convenience for central-level leaders in obtaining the data and information needed for decision-making.

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