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WEB-BASED COOPERATION INFORMATION SYSTEM AT THE SCIENCE TECHNO PARK TECHNOLOGY BUSINESS DEVELOPMENT CENTER

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ABSTRACT
Science Techno Park (STP) Unand's partnership with various government, business, and legal institutions will continue for the foreseeable future in order to disseminate innovators' knowledge to the larger community. The issue that frequently arises is that the file search procedure is tough to locate. Furthermore, the enormous number of inventors at Andalas University are recorded in Microsoft Excel files, making it difficult for users to locate inventory data. The data that is then entered is frequently duplicated, leaving the user perplexed about the information presented. As a result, at STP Unand's Technology Business Development Center, a web-based cooperative information system was created. The goal is for STP Unand's engagement with partners to be automated, and for data collecting on the number of inventors in Unand to be structured. The SDLC (Software Development Life Cycle) method is used in this study. SDLC is a software development cycle that encompasses software development techniques, phases, and tools. The waterfall paradigm was used in the design of this application. the waterfall method was successfully used to build or design a collaborative information system application. Based on the outcomes of each stage of the waterfall method, namely analysis, design, coding, and system testing, it is possible to conclude that the design of this collaborative information system application has been successfully built in accordance with needs.
Keywords: *Information System, SDLC, Waterfall Method, Cooperation Agreement*

1. Introduction

Because technology is advancing at such a rapid pace these days, the presence of technology is critical in data processing. From ancient times to the present, the development of technology and media to communicate has continued. Prior to the discovery of media to document information, information was conveyed from one location to another (Muttaqin & Rahmadoni, 2020). Today, the function of information technology has made human existence easier, not just for corporations, but also for individuals (Christian, & Ariani, 2018). Computer-based information technology has the potential to improve performance efficiency and effectiveness (Dharmawan et al, 2018). Data can still be processed to create information in the absence of technology, but it takes a long time and sometimes contains errors. With technology, it is possible to provide information from processed data in less time and with fewer errors. One of the functions of modern technology is to simplify all tasks, including the administration of inter-agency collaboration, by offering a computerized system that can help capture and manage existing data and information (Welda & Minartiningtyas, 2017). Cooperation is an action carried out by numerous organisations or individuals in order to attain goals that have been set together (Sugianto & Aulia, 2017). Of course, the ideal cooperative pattern must be founded on the principles of mutual need, mutual strengthening, and mutual advantage (Utomo & Mariana, 2011).

Andalas University has 1,541 lecturers for the odd 2019/2020 academic year. There are many instructors with diverse fields of knowledge divided among 127 study programs. Not all instructors at Andalas University are inventors or have invented something. Inventor data may be obtained at Science Techno Park (STP) Unand in the field of the Technology Business Development Center, which includes the names of the lecturers as well as the inventions created by these lecturers.

STP Unand's partnership with various government, business, and legal institutions will continue for the foreseeable future in order to disseminate innovators' knowledge to the larger community. Collaboration data is still collected by dumping it into Microsoft Word and Microsoft Excel. The issue that frequently arises is that the file search procedure is tough to locate. Furthermore, the enormous number of inventors at Andalas University are recorded in Microsoft Excel files, making it difficult for users to locate inventory data. The data that is then entered is frequently duplicated, leaving the user perplexed about the information presented.

As a result of these issues, a study entitled "Designing a Cooperation Information System Web Application at the Technology Business Development Center of Unand STP" was established. This research will help to make it easier for users to collaborate, and the enormous inventory of data at Andalas University can be cleanly organized, making it easier for users to obtain that information. This research is also in line with Andalas University's research master plan and strategy, namely on the theme of innovation in science, technology, and industry.

Sugianto and Aulia (2017) conducted research on the development of a Web-based cooperation information system with a waterfall model system, with the research objective being to analyze and design a website-based cooperation information system to aid in the preparation of cooperation documents, speed up archive searches, and monitor activity plans (works). According to the study's findings, the cooperative information system can aid in document compilation, speeding up archive searches, and online monitoring of work plans for greater control. Welda & Minartiningtyas (2017) conducted another study with the research title "Information System for Management of Public Relations Cooperation at STIMIK STIKOM Indonesia," with the goal of developing a computerized information system that can assist in recording, archiving, and providing information related to cooperation for PR STMIK STIKOM Indonesia. This study aids in the recording and storage of data about STMIK STIKOM Indonesia's partners and cooperation. It also creates an application that can report partner and collaboration data online. Furthermore, Joanda (2018) conducted research at the DEF Institute on the Design of Technology Services and Cooperation Management Information Systems, with the method of constructing a prototyping system. This study results in a desktop application that is also integrated with an SMS gateway. The researchers' research is novel in that the existence of a cooperation information system will make it easier for partners who want to collaborate to find the appropriate inventor in conducting cooperative relationships with various agencies or companies, because there is a complete database of inventors so that partners who will collaborate can easily find information.

2. Literature Review

An information system is a system within an organization that combines everyday transaction processing demands, assists and supports operational activities, is managerial in character, and aids in the supply of required reports (Alter: 2006). Computerized information systems can be utilized to quickly resolve problems that develop in operational systems (Rahmadoni et al., 2021). The word information system is frequently used to refer to the interactions between people, algorithmic processes, data, and technology in a wide sense. In this context, the phrase refers not just to an organization's use of information and communication technology (ICT), but also to how people engage with technology to support business activities. Information systems are used to maximize data processing and convert it into valuable information in order to achieve its goals (Turnip et al, 2020). The beneficial influence of information technology is that it provides convenience and speed in acquiring information, transmitting information, and making activities or jobs easier to do (Mudiar & Hidayat, 2019).

Information Systems, according to Jogiyanto (2017), are made up of numerous major components. Information systems are made up of the following components:

1) Hardware: tangible devices such as computers and printers are examples of hardware.
2) Software, often known as a program, is a set of instructions that allows hardware to process data.
3) Procedure: a collection of rules used to process data and generate the desired outcome.
4) People: all parties responsible for the development, processing, and application of information system output.

5) Database: a collection of tables, relationships, and other data storage components.
6) Computer network and data communication: a system for connecting resources so that they can be shared or accessed by multiple people.

As a result, an information system is a type of communication system in which data is recorded and processed in the form of social memory. Information systems can also be thought of as a semi-formal language that aids humans in making decisions and taking action.

Cooperation is something that cannot be separated in an organization in order to improve the organization's ability. Cooperation is a business strategy carried out by two or more parties over a specific time period. Cooperation can occur when the parties involved have similar objectives and are aware of the need to attain mutual goals and interests (Prihadi et al, 2020). A partnership is usually limited by a validity period or a specific amount of time, both in the short and long term, depending on both sides' agreement (Maula et al, 2020). A cooperation agreement document is used to state the terms of the agreement (Ndjurumana & Mailoa, 2020). Profitable and non-profit companies frequently partner to gain an advantage (Sidik: 2014). The cooperation must be archived in an organized manner so that the cooperation document can be easily found when needed.

3. Research Methods

The SDLC (Software Development Life Cycle) method is used in this study. Software developers from both the institution and consultants must implement the SDLC by using a certain process model (Rahmani & Hikmawati, 2020). SDLC is a process for developing and modifying systems, as well as the models and procedures used to do it (Rhodes, 2012; Asmanto et al, 2020). SDLC is commonly separated into five stages: requirements analysis, design, implementation, testing, and software maintenance (Sommerville, 2015). The goal of adopting this SDLC is to generate quality software within the time and budget constraints while meeting the client's needs and providing clear thinking about the level of progress for both the client and the programmer (Malleswari et al, 2018).

SDLC is carried out using a software development process paradigm. The waterfall model is one of several types of software development process models. Winston W. Royce proposed the Waterfall model in 1970, and it is considered one of the most iconic models in software engineering (Gupta et al, 2021). This model is more stable since it is defined by a sequence of steps that must be completed in a linear or sequential order (Agarwal et al, 2017; Thummadi & Lyytinen, 2020). The waterfall approach is incredibly straightforward to understand and learn, and it is widely documented (Nere & Buani, 2018). Each step in the waterfall model is completed in stages, one after the other (Sommerville, 2015). The Waterfall technique is one of the methods in the System Development Life Cycle (SDLC) that works in each step of the waterfall that must be finished before moving on to the next (Heriyani & Ishak, 2020). This model suggests a method for systematic and sequential software development, beginning with the level of system progress and continuing through analysis, design, coding, testing, and maintenance (Hasanah & Indriawan, 2021). Figure 1 depicts the waterfall development process model:

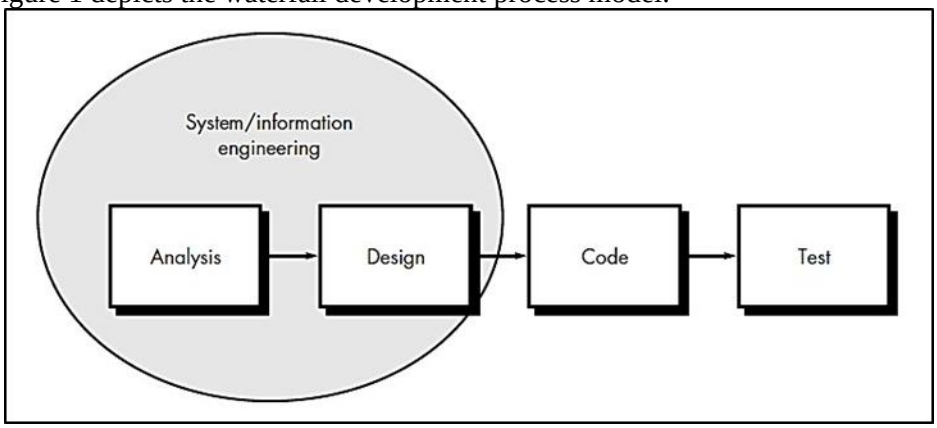

Fig. 1. *Waterfall* Method

As a result, the waterfall process model will be used in the investigation. Based on the aforementioned research flow diagram, it is possible to explain:

1. Analysis system

System development precedes system analysis and design and comprises data identification, information identification, data source identification, destination identification, input design, process design, and output design.

The following investigations were conducted at this stage of the literature review: theoretical studies and earlier researchers connected to cooperative information systems

a) Review of Literature

A literature study is a technique for gathering data that is required to support the theories employed in the creation of this research in the form of journals, books, e-books, or processed data sources, specifically the findings of previous research linked to this research.

b) Notification

Observations are made in order to collect data for the purposes of the research being conducted. At the STP Unand Technology Business Development Center, observations were made.

c) Job interview

If the research aims to do a preliminary study to identify problems that need to be investigated, interviews are employed as a data gathering approach (Sugiono, 2011). Field interviews were performed with officers in the cooperation area of the Center for Business and Technology Development, as well as administrators for data inventors at STP Unand, for this study.

2. The Design Stage

All of the needs identified in the previous step are planned during the design stage. The design process includes creating an ERD (Entity Relationship Diagram), software architecture, and interface design with UML tools.

3. The Coding Stage

At the coding stage, coding is carried out from the previous step's design to create a single program unit. The PHP programming language and the MySQL database are used in the implementation. This step of coding is used to construct a web-based Cooperation information system application.

4. System Testing

Stage System testing is an important part of quality assurance since it represents specification, design, and code. A team of specialists verifies and validates the system in order to test the practicality and rationality of the system by practitioners involved in research. The system test format is used for this stage. Following verification and validation by an experienced team, changes and reviews will be carried out to ensure that the system has sufficient feasibility and functionality to become a viable system. At this point, the viability of the resultant collaboration information system, flaws, benefits, limits, and recommendations are also visible. The study was thereafter restricted to STP Unand.

4. Results and Discussions

A. System Analysis

1) Operating system: The goal of this study is to establish a business development centre for STP Unand technology. The current system is a collaboration system between STP Unand and partners, with Unand inventors included in the cooperation agreement. The STP Unand technology business development centre's collaboration process, as well as a recap of the cooperation agreement and inventor search, can be described using BPMN tools, as explained below:

a. Business Model for Cooperation Agreements

STP Unand's current collaboration process with partners is done traditionally through the use of existing information and communication technology such as WhatsApp and other supporting media. When partners want to collaborate with STP Unand, they contact STP Unand via whatsapp or email, then hold a FGD to discuss further. After both parties (STP Unand and Partners) agreed to collaborate, STP Unand drafted a collaboration agreement, which was later

signed by both parties and archived in hardcopy and recaptured in Microsoft Excel. Figure 2 depicts the business model of the currently active cooperation agreement.

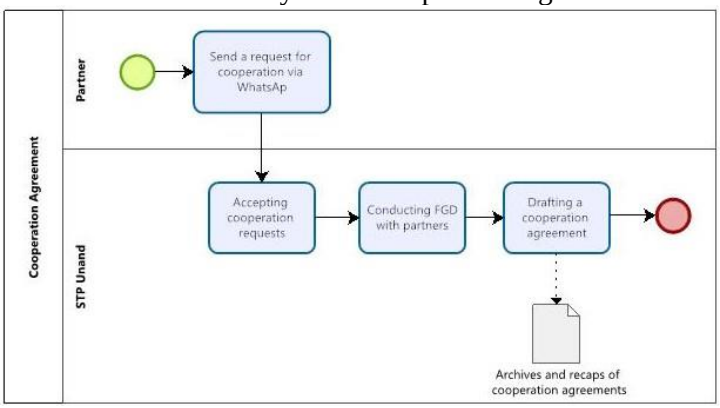

Fig. 2: The Business Model for Ongoing Cooperation Agreements

b. Inventor Look for a Business Model

In the 2019/2020 academic year, Andalas University had 1,541 lecturers, all of whom were automatically inventors. If partners want to collaborate with STP Unand and require inventors, STP Unand's technology business development centre is looking for inventors who have not yet been recorded at the STP Unand technology business development centre. As a result, the STP Unand technology business development centre solicits inventors from all faculties in Unand. After obtaining the required inventor, communication is established with the inventor in order to proceed to the next stage. The inventory search business model is currently operational, as illustrated in Figure 3.

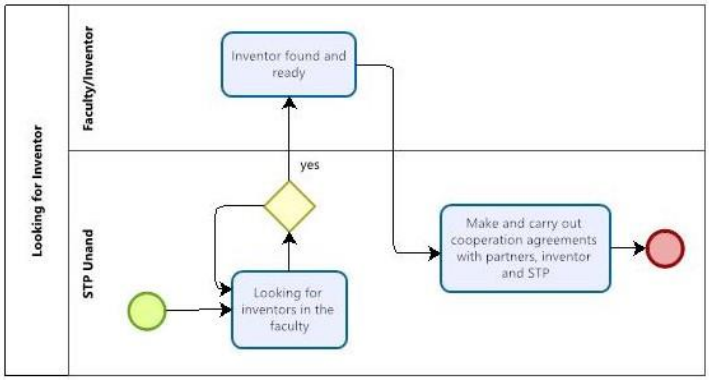

Fig. 3: Business Model for Ongoing Inventor Search

2) The proposed system is based on observations and interviews conducted at STP Un, particularly at the Technology Business Development Centre, regarding the collaborative process and the archiving of collaborative documents, as well as the fact that the search for inventors is still done manually and is not fully computerized. Initially, partners who want to collaborate use whatsapp or email, and then a cooperation agreement is made and physically or hardcopy archived, which is then recapitulated in Microsoft Excel. Then, if the collaboration with the partner requires Unand inventors, the Unand STP Technology Business Development Centre searches the faculties at Unand for inventors who are compatible with the collaboration.

SPT Unand and Partners' collaborative process, as well as the search for inventors, will now be made into a collaborative information system application. This application will streamline STP Unand and Partners' collaborative process, as well as document archiving in the cloud. Furthermore, a special database for all Unand inventors was created to make it easier for the STP Unand Technology Business Development Centre to find inventors for STP Unand's collaboration with partners. The flow of the mass work agreement will be described below using the Business Process Modelling Notation (BPMN), as shown in Figure 4.

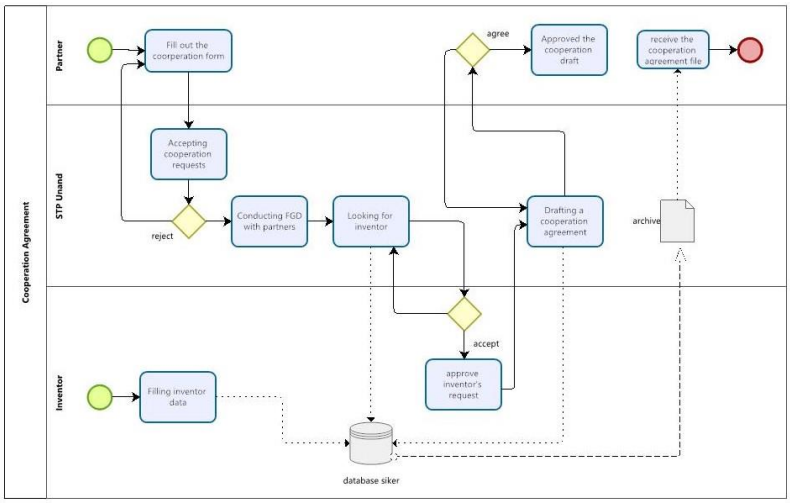

Fig. 4. Business Model of the Proposed Cooperation Agreement Process

According to Figure 4, the stages of the proposed cooperation agreement process's business model are as follows: 1) The inventor enters inventory data into the application, which is then saved in the Siker database; 2) Partners complete the STP Unand cooperation application form; 3) STP Unand accepts applications for collaboration from partners, who can then confirm acceptance or rejection. If the request for cooperation is rejected, STP Unand must provide information or reasons for the rejection; 4) If the cooperation application is approved, STP Unand will seek an inventor on the application; 5) The inventor confirms the inventor's request and can accept the request for cooperation. If the request is denied, the inventor must provide information or explain why the request was denied; 6) STP Unand drafted a collaboration agreement with partners; 7) A draft cooperation agreement is distributed to partners for review. Partners can either improve the draft or approve the contents of the cooperation draft directly, and 8) The completed draft is then archived as a guide for STP Unand and partners.

3) Use case diagram: Use case diagrams are used to describe the relationship between functional components and system actors. Use case diagrams describe the roles of actors or users in a program. Figure 5 depicts the use case diagram for this cooperative information system:

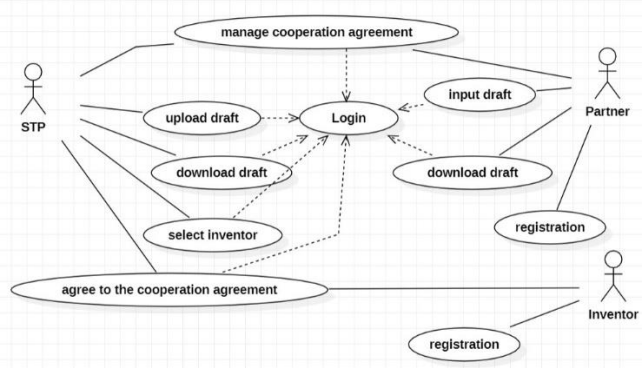

Fig. 5. Use Case Diagram of Cooperation Information System

According to the use case diagram above, there are three actors: STP, Partners, and Inventors. To access the application, each actor must first log in. This application contains seven functionalities that are related to the function of each actor. STP actors can perform four functions: managing cooperation agreement, selecting inventors, agree to the cooperation agreement, and uploading drafts. Partner Actors have four functions: partner registration, managing cooperation agreement, cooperation agreement input, and draft uploading. Meanwhile, the Inventor actor performs two tasks: inventory registration and agree to the cooperation agreement.

B. System Design

The results are obtained based on the stages of analysis of ongoing business processes, system flow, and functional requirements of the system being built, and serve as the basis and benchmark for conducting system design or system design. This system's design includes the creation of a database and a user interface.

1) Database design: Database design begins with the creation of a database structure based on the entities used and their relationships with one another. ERD describes entities and relationships between entities (Entity Relationship Diagram). Cooperation in the application of information systems at the STP Unand Centre for Business and Technology Development. The database is then designed to meet the needs of the cooperation's information system. This database is subject to modification as the application is developed. Figure 6 depicts the ERD design of this collaborative information system application.

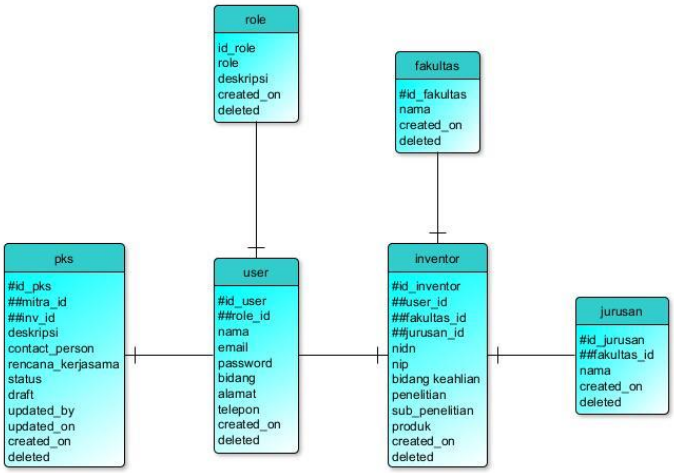

Fig. 6. Entity Relationship Diagram

2) Interface design: the interface acts as a communication channel between the user and the system. The system interface can receive and provide information to the user in order to assist the user in navigating the troubleshooting path until a solution is found. Here are a few screenshots of the app's user interface:

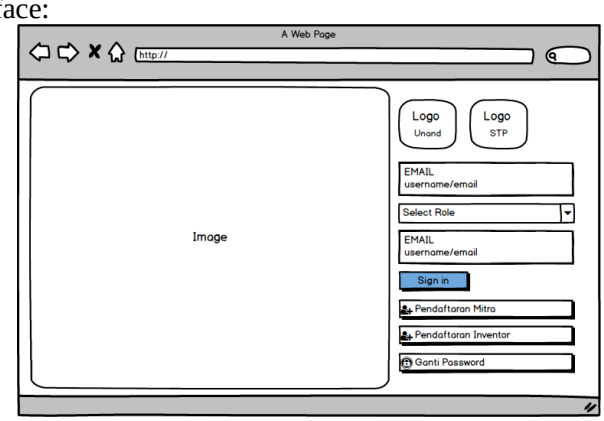

Fig. 7. Login Page for User Interface Design

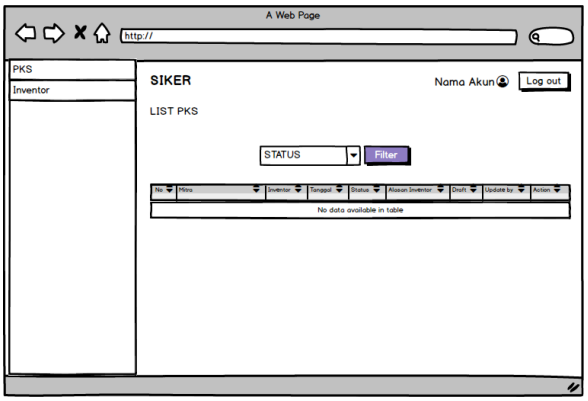

Fig. 8. Design of the Dashboard Page User Interface

C. System Coding

The cooperation information system application is designed to function as a system that manages cooperation, inventories, and the filing of cooperation agreements. This system has two actors and seven functionalities that can be executed. This function represents each user's task and is intended to improve the efficiency and effectiveness of system processes. The PHP programming language (Pearl Hypertext Pre-processor), the Laravel framework, and the Apache XAMPP web server version 3.2.2 were used to create this application. MySQL is the database used for data storage.

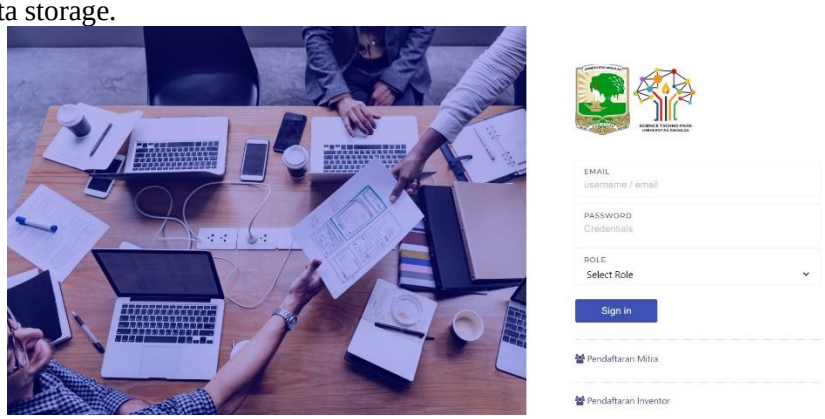

Fig. 9. Display of the Login Page

To enter the system, the user must first login by entering the username and password stored in the database and then clicking the "sign in" button, as shown in Figure 9. The system will display the main application page if the user has successfully logged in.

After logging in, the user can access the STP user page. Users can manage their own user data and inventor data, as well as accept or reject cooperation agreements and upload and download draft cooperation agreements. Figure 10 depicts a user page view of STP.

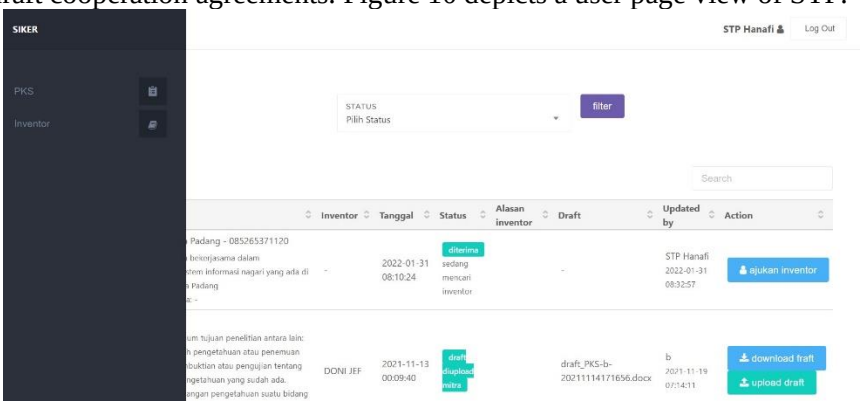

Fig. 10. Display of the STP User Main Page

The STP user page, as shown in Figure 10, has two main menus, which are described below: 1) On the cooperation agreement page, the user can perform activities related to the proposed collaboration, accept or reject the proposed collaboration, and upload and download the proposed collaboration. have been discussed with partners; 2) on the inventor page, the user can manage Unand inventory data. This is intended to make it easier for STP to find inventors who will participate in the collaboration agreement.

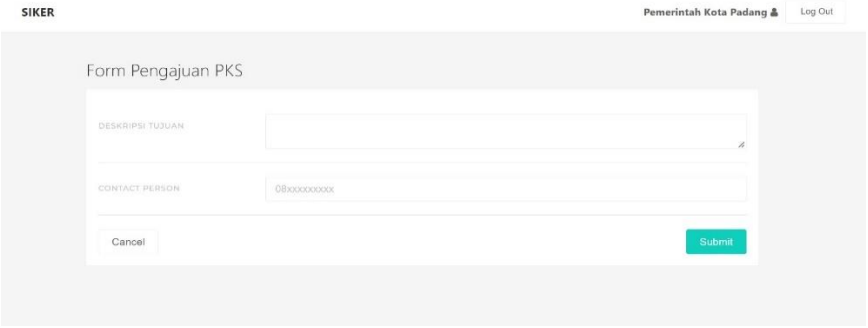

Fig. 11. Display of the Partner User Main Page

After signing in, the user can access the partner user page, as shown in Figure 11. Partner users can apply for a cooperation agreement through this information system by filling out the system's form and waiting for the STP to determine whether the collaboration is accepted or rejected.

After signing in, the user can access the user inventor page. As shown in Figure 12, user inventors have the authority to manage user data and cooperation requests submitted by partners via STP users.

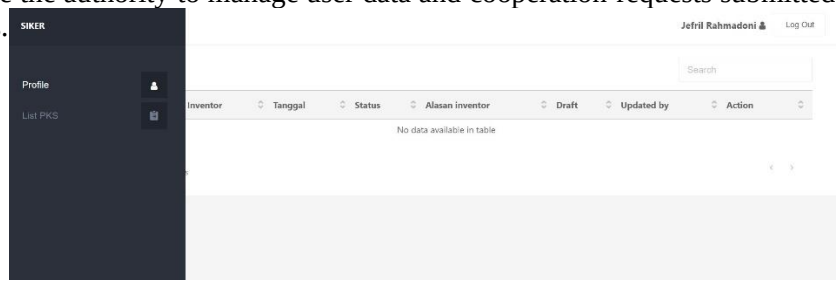

Fig. 12. Display of the User Inventor Main Page

The inventor user page, as shown in Figure 12, has two main menus: Profile and a list of cooperation agreements. Users can update the information that was previously entered in the "profile" menu. This is required because the inventor has the most recent data to update. Furthermore, the inventor user can see the cooperation request on the cooperation list menu and accept or reject the cooperation requested by STP from this menu.

D. System Testing

The emphasis is on testing the system built with test data based on the application's data.

Table 1 – Test Focus

No	Tested Items	Tested Process
1	Manage cooperation agreement	Create, read, update, delete
2	Agree to the cooperation agreement	Read, update, delete
3	Select inventor	Read, update
4	Download draft	Read
5	Upload draft	Read, delete
6	Registration	Create, update

The testing is done on a predetermined test focus. Testing is done using black box testing, which is based on system features and pays special attention to system inputs and outputs. The table below lists the system tests that have been implemented.

Table 2 – System Testing

No	Tested Items	Data Entered	Sighting	Result
1	Manage cooperation agreement	All the data needed on the manage cooperation agreement form	Saved data, system displays cooperation list page, and notification of saved data	Suitable
2	Agree to the cooperation agreement	User clicks click accept/reject button	Saved data, the system displays the cooperation list page, and there is a notification	Suitable
3	Select inventor	User clicks the "search" button on the select inventor menu	Saved data, the system displays the inventory list page, and there is a notification	Suitable

4	Download draft	Users click the download button	Data downloaded successfully	Suitable
5	Upload draft	All data needed on the upload draft form	Saved data, the system displays the upload draft page, and there is a notification	Suitable
6	Registration	All data required on the registration form	Saved data, system displays login page, and notification of saved data	Suitable

The testing phase is carried out on applications that are built with the goal of focusing on the system's availability and functional suitability. The results obtained after testing are consistent with the design and system output. Furthermore, during the test, there were no failures in any of the processes or functions. As a result, the design of the collaborative information system application at the STP Unand business and technology development centre appears to be performing as intended.

5. Conclusion

At the STP Unand business and technology development center, the waterfall method was successfully used to build or design a collaborative information system application. Based on the outcomes of each stage of the waterfall method, namely analysis, design, coding, and system testing, it is possible to conclude that the design of this collaborative information system application has been successfully built in accordance with needs. Furthermore, the development of this cooperation information system can assist STP Unand's business and technology development center in collaborating with partners, easily finding inventors, and STP can archive existing collaborations to facilitate the search for collaboration through built-in applications.

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