

Application of the Prototype Model in Cooperative Profile Web Application Design

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ABSTRACT

The development of information technology has triggered everyone in the business world, including cooperatives, to change the service system that was initially conventional to switch to digital. This is because the traditional business approach has several shortcomings in disseminating information on cooperative business profiles to external parties, such as limited access to information, slow dissemination of information, and being time-consuming and costly. For this reason, developing a business profile web application is needed to provide efficient access to information without limitations of space and time. However, there is a problem with how to design an application that fits the needs and meets user expectations. The prototype model can be used as a benchmark for an application, whether it is feasible to implement or not, following the results of the evaluation of user satisfaction. So, in this study, it is proposed to apply a prototype model to design applications that suit the needs and expectations of users. The application's design has been assessed using a questionnaire distributed to 30 respondents. The average result of the feasibility of the prototype design made is 93.05%, with a very feasible category.

Keywords: Prototype Model, Application Design, Web Profile, Cooperative

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1. INTRODUCTION

In the era of the industrial revolution 4.0, it encourages every organization, including cooperatives, to quickly adapt to environmental changes. However, if they cannot read the change situation, they will be easily crushed by the pace of change. Cooperatives must be able to transform various innovations in a very dynamic environment by always paying attention to the principles of cooperatives [1]. Therefore, to survive, cooperatives must immediately carry out technological transformation in the business process, management, and service departments towards digitalization. On the other hand, according to data from the Ministry of Cooperatives and SMEs, it is stated that of the 123,048 cooperatives active in Indonesia, only about 0.73% of them implement digital systems. This percentage is still deficient, so the existing cooperatives still need to change by adopting information technology in several aspects of cooperative business activities.

Information technology has a vital role in the transformation process of providing excellent service. Web applications, for example, can be used as portfolios and help cooperatives introduce their business activities through internet technology. In addition, web applications are digital media that can effectively publish business profiles to the public with a broader target reach [2]. The old conventional way of providing business information in the form of a business profile book or distributed poster so that the public knows the existence of a business currently running in a cooperative will change. This method is considered ineffective and costly, so the web application can be used as a solution that can provide information and business profiles more efficiently. The importance of using profile web applications, especially in cooperatives, aims to make it easier for cooperatives to expand networks and connections. In addition, the profile web application can introduce business units or business activities owned by cooperatives. However, in making the application, there is a problem with creating a profile web application that suits the needs and expectations of users.

Prototype models can be a benchmark for an application, whether it is feasible to implement or not. So that in this study, applying a prototype model in making application designs that suit the needs and expectations of users quickly. The application assists the cooperative in displaying general information related to the profile of the Cooperative, such as about the Cooperative, videos of the activities of the Cooperative business unit,



history, vision and mission, legality, organizational structure, leaders, and administrators, business units and services owned by the cooperative, galleries and contacts. The purpose of the study was to determine the feasibility level of the Cooperative profile application design and whether it met the needs and expectations of users. This application design's feasibility level can be a reference in making profile web applications, especially in cooperative businesses.

2. LITERATURE REVIEW

Some previous research that discusses prototype software development models can be seen in the following description. Research conducted by Robbi and Yulianti [3] built an e-learning system that can help teachers and students in the learning process in junior high school. The method used to develop the system is a prototype method described by Rossa and Shalahuddin [4]. This method can explore and describe the specifications of customer needs in more detail to follow needs. The distribution of questionnaires to 21 respondents consisted of five teachers and sixteen students. To determine the ease, effectiveness, efficiency, and satisfaction of using the application to obtain research results. Where the results obtained on average, 90.95% of respondents agree that the system created has met user satisfaction.

Furthermore, research conducted by Maulana et al. [5] made an Android-based connecting book for parents of students and teachers. Parents use the connecting book as a medium for monitoring their children's activities at school, especially to discover the obstacles for children on learning activities. The application was developed using the prototype method. Usability questionnaires are tools used to evaluate and obtain the level of feasibility of an application when used. The results of the application evaluation on the teacher's side have an average eligibility score of 88.75% with a very decent category. The prototype evaluation on the parent side has an average feasibility score of 80.17% with a decent category. These results show that the prototype is worthy of being used as a reference in making a connecting book application.

Punkastyo's research [6] uses a prototype model in designing a tutorial application for basic martial arts techniques. This application is for extracurricular activities for students cimande MANLeuwiliang. The problem faced is that many students have difficulty memorizing basic martial arts moves and limited meeting time in routine training, which is an obstacle for students to learn martial arts. So an Android-based tutorial application was created as a practical learning medium. The prototype model was selected as an application development model and evaluated using the questionnaire distribution technique to 30 respondents. The results obtained by 85.5% of students agree that the application built can help novice students learn martial arts.

Prototype model on the waste bank information system [7]. This information system can overcome the problem of ineffective waste management. The design of the information system is web-based, using a prototype model in its development stage—a user satisfaction questionnaire as a system evaluation tool. As a prototype evaluation tool, there are five parameters [8], namely learnability, efficiency, memorability, error, and satisfaction. There were 35 respondents as appraisers, where respondents agreed and believed that the system design had met customer satisfaction.

Prototype Method in developing real work lecture applications at IAIN Salatiga [9]. The application aims to change the conventional KKN management system to become computerized. So far, there have been problems in recording, processing, and reporting KKN data that are ineffective. However, based on the results of the prototype evaluation, values of learnability, efficiency, and satisfaction were obtained by 3.84, 3.80, and 3.97, in order where the application eligibility is in the very decent category, with an average value of 81.20%.

The prototype method was also used in the research of Yoko et al. [10], designing a website-based SIPINJAM application at the credit union Canaga Antutn. Problems in recording data and savings and loan transactions that are still conventional are behind the creation of the SIPINJAM application. Where the model applied to develop the system is the prototyping model by Khosrow-Pour, which simplifies the prototyping model into three stages, namely hearing and capturing the needs of the user, building or revising the mockup, and the user tests the mockup created to get feedback [11]. As a result, the test results of the application can run well according to user expectations.

The following research by Teddyana designed an Android-based fire response application using the design sprint method [12]. Application to overcome the problem of forest and land fire disasters in the area around the island of Bengkalis. The design sprint method analyzes the needs of application users using tools in the form of a system prototype that the user validates. From the results of the usability trials that have been carried out, it shows that the average score is 68.21 which is in the good category based on the adjective rating [13]. Sianturi has design basic Japanese e-learning application with prototype methodology. The analysis and design stages use the Object Oriented Methodology from Coad and Yourdon with modeling using UML, while the implementation uses the PHP programming language with the MYSQL Database Management System (DBMS) [14].

A survey paper by Pricillia and Zulfachmi [15] compares the waterfall, prototype, and RAD software development methods. The research discusses the advantages, disadvantages, and characteristics of the three

software development methods and concludes with the comparison results. Waterfall development models are suitable for generic systems or software. While the prototype and RAD methods are more suitable for customized systems (based on requests and needs from users). The prototyping methodology is also suitable for innovative or unique projects where no previous examples exist [16].

Mockup-driven fast-prototyping methodology has been developed by Zhang et al, this research help elicit and finalize system requirements, as well as facilitate adjustment to quickly changing user requirements typical to web applications. Supporting the inclusion of customer feedback early in the development process, this strategy minimizes the risk of wasting valuable development efforts because of ambiguous or incomplete specifications [17]. Tanfir et al has proposed an approach of Merging Prototyping with Agile Software Development Methodology. The research introduces a concept to reuse components from agile development by developing prototyping that could be reused [18]. The prototyping model is also used to assist problems in defining the lack of requirements in terms of documentation and communication quality on large-scale projects using the Scrum method [19].

By referring to some previous research, the prototype model can be used to develop web-based and mobile-based applications with a reasonably good level of feasibility and meet its users' needs and satisfaction. In addition, the characteristics of the cooperative profile web application to be built are also customized, where the application must follow the cooperative partners' demands and needs. Therefore, in this study, the author proposes the application of a prototype model in the design of cooperative profile web applications to meet users' needs and satisfaction with a good level of application design feasibility.

3. RESEARCH METHODOLOGY

The research stage used is a prototype model [20]. Where the stages are as follows:

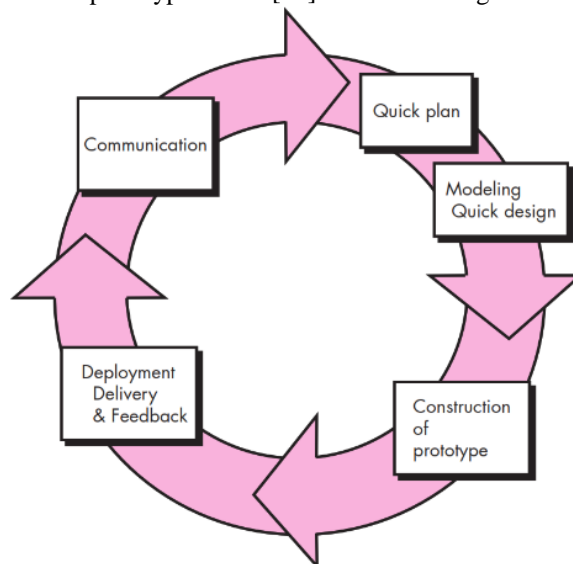


FIGURE 1. Prototype Model Stages

The initial stage in building an application using a prototype model is communication. Communication is carried out with stakeholders to determine the purpose of creating the application, identify the needs of users and systems, and define and explore other areas. The second stage is to carry out strategic planning quickly. This planning aims to provide initial solutions to the problems described, then continue by modeling the design quickly. The existence of communication with stakeholders can make it easier for developers to model designs quickly [21][22]. After that, it continued with the prototype construction stage, usually in the form of a mockup system interface that works almost the same as the original system to be built. Then the prototype is shared and evaluated by the customer, so that the customer will provide feedback that can be used to refine further needs and designs. Iteration of prototype design improvements may occur when the prototype still does not meet the needs and expectations of stakeholders. For this reason, the development team must repeat repairs and confirmation of prototype results in the next iteration stage [23].

4. RESEARCH RESULT

Communication Stage

Communication with Produksi Generasi Mandiri cooperative partners. Where the results obtained at this stage are mutual agreements documented in the software requirement specification (SRS). Therefore, the statement of software requirement of the cooperative profile application is as follows:

TABLE 1. Functional Requirement

Id	Requirement Statement	Use Case	Priority
FR-01	Web visitors can display the home page	UC-F01	High
FR-02	Web visitors can view the Cooperative's About page	UC-F02	High
FR-03	Web visitors can view the Cooperative's History page	UC-F05	High
FR-04	Web visitors can view the Cooperative's Vision and Mission page	UC-F06	High
FR-05	Web visitors can view the Cooperative's Legality page.	UC-F07	High
FR-06	Web visitors can view the Cooperative's Organizational Structure page.	UC-F08	High
FR-07	Web visitors can view the Cooperative's Leaders and Administrators page.	UC-F09	High
FR-08	Web visitors can see the Cooperative's Business and Services page.	UC-F10	High
FR-09	Web visitors can display the Cooperative's Business and Services detail page.	UC-F11	High
FR-10	Web visitors can view the Cooperative's Gallery page.	UC-F12	High
FR-11	Web claimants can view the Cooperative's Contact page.	UC-F13	High
FR-12	Web visitors can send messages to admins on the Cooperative's Contact page.	UC-F13	Medium

Table 1 shows the twelve requirement statements obtained from the interviews. Where web visitors can see the home page, about, history, vision and mission, legality, leadership and management, businesses and services, business and service details, galleries, cooperative contacts, and can send emails to cooperative admins.

Quick Plan Stage

After getting the user's requirements, the next step is quick planning. Quick planning generates an overview of the system as an application architecture. Here are the results of the designed profile application architecture:

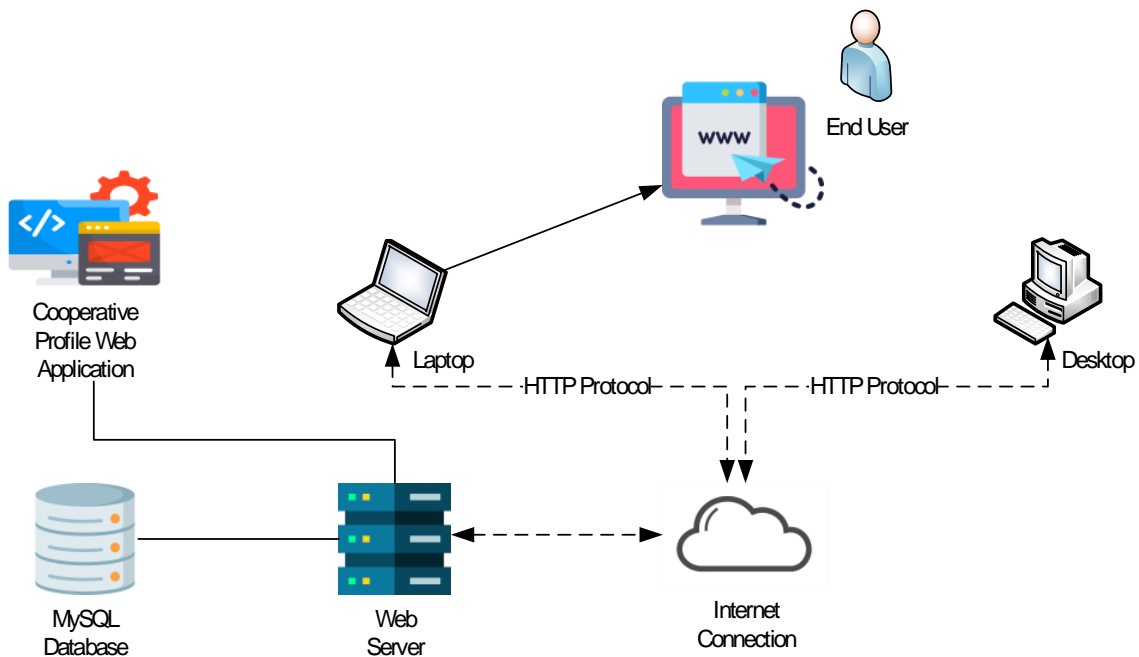


FIGURE 2. Cooperative Profile Web Application Architecture

The picture above shows the architecture of the cooperative profile application system consisting of several units of inter-integrated systems, namely, the Database unit of the MySQL Database system, the Apache Web Server, and the Cooperative-Profile Application itself. The cooperative profile application specification uses the PHP programming language based on the Laravel framework.

Modelling Quick Design Stage

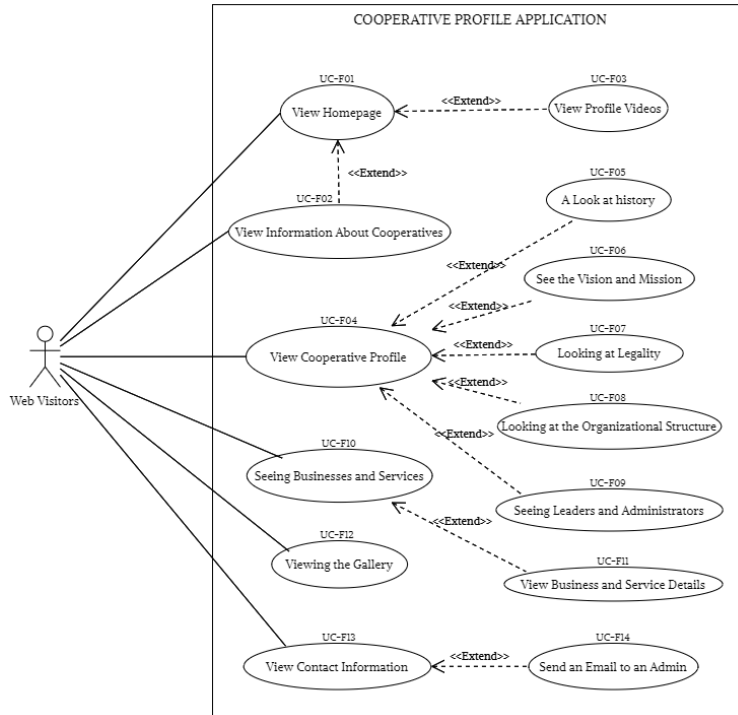


FIGURE 3. Use Case Cooperative Profile Application Diagram

Figure 3 is a use case diagram of a cooperative profile application that illustrates the activity of application visitors to the system. Web visitors can see the homepage's appearance when initially accessing the web URL address. On this home page, there is also a shortcut to the link to view the cooperative profile video and see information about the cooperative. In addition, visitors can also see the cooperative profile, which includes the history, vision and mission, legality, organizational structure, leadership, and management of the cooperative. Then visitors can also see the business units and services owned by the cooperative along with detailed information, see pictures of the activities of the cooperative business unit in the gallery, and access cooperative contact information.

Construction of Prototype Stage

The prototype construction activity is to design the application interface using mockup software. Here are some of the preliminary design results of the system mockup that has been designed, along with the results of its improvements:

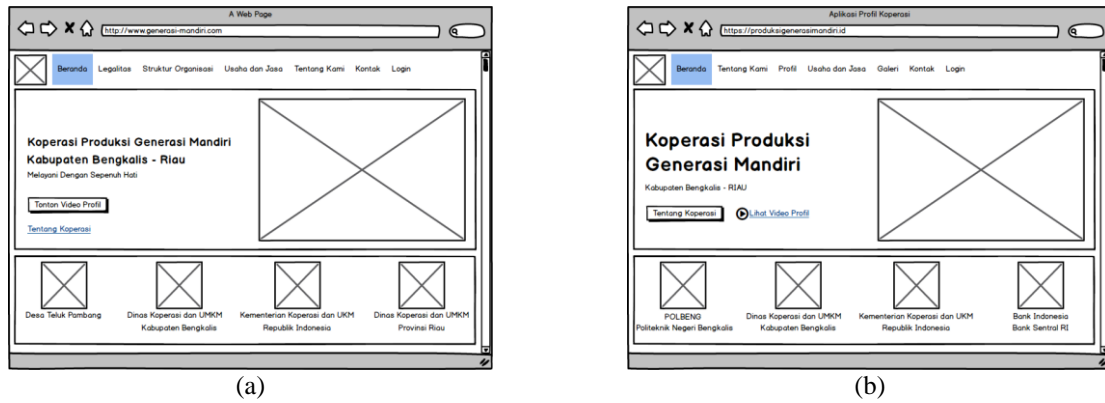


FIGURE 4. Initial Homepage (a), Homepage Improvements (b)

Based on the results of presentations and discussions with partners. Several notes on changes to the application prototype: the menu structure initially designed is Home, Legal, Organizational Structure, Business, and Services, About Us, Contact, and Login. Then changed to the Home menu, About Us, Profile, Business and Services, Gallery, Contacts, and Login. For the initial design of the home page, see Figure 4a. Agreed to change the banner text to become the Produksi Generasi Mandiri Cooperative, Bengkalis Regency – RIAU, the position of the view video profile button and the link about the cooperative has been changed, and changes to cooperative partners, the results of the changes are shown in Figure 4b.

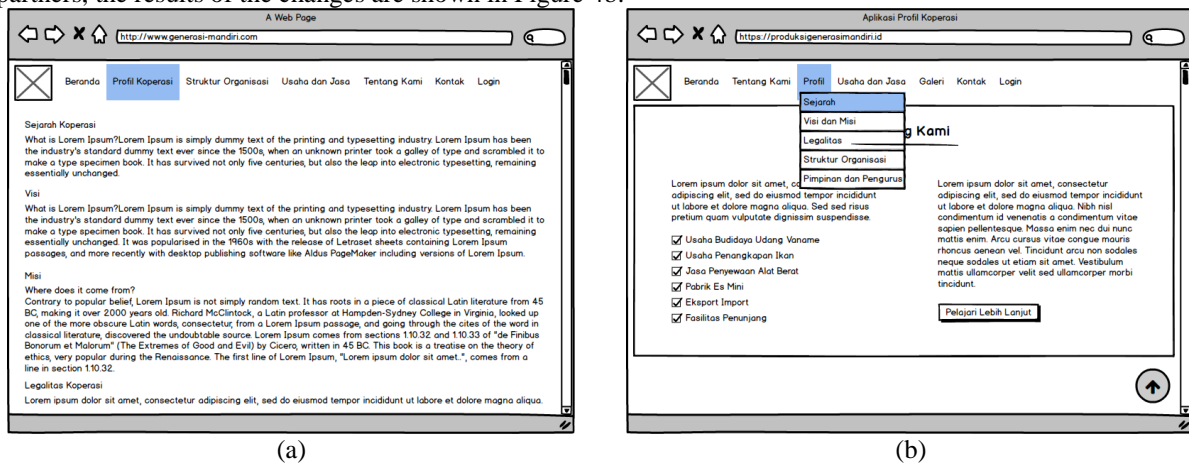


FIGURE 5. Cooperative Profile Page Plan (a), Cooperative Profile Menu Improvements (b)

Initially, the history, vision and mission, and legality pages of the cooperative became one page on the Cooperative Profile page, which has been split into different pages and can be accessed through the Profile menu, see Figures 5a and 5b.

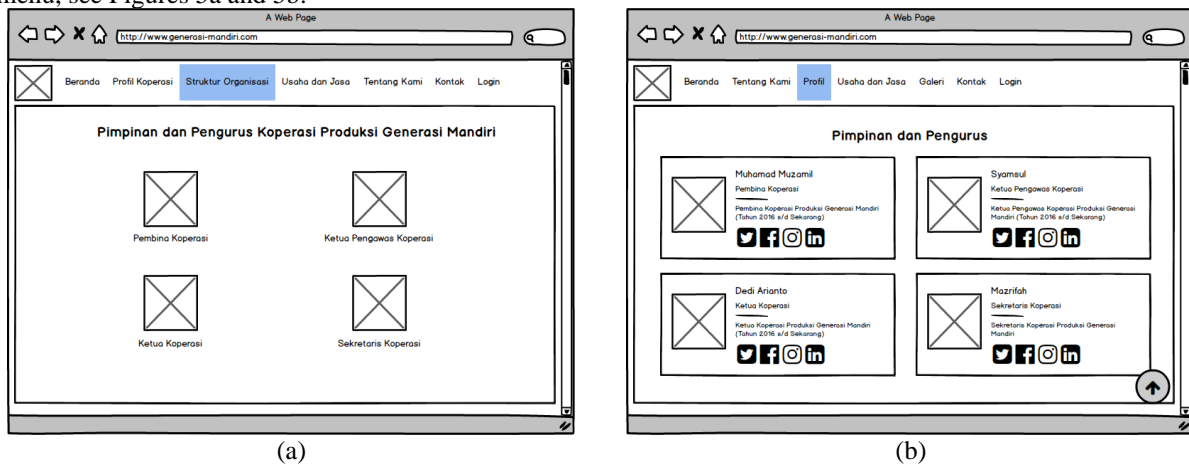


FIGURE 6. Cooperative Leaders and Management Page (a), Improvement of the Cooperative Leadership and Management Page (b)

Likewise, the leadership and management page, which initially contained photos of leaders and administrators and position information, has been added with relevant information such as names, positions, and descriptions of periods of office, see Figures 6b.

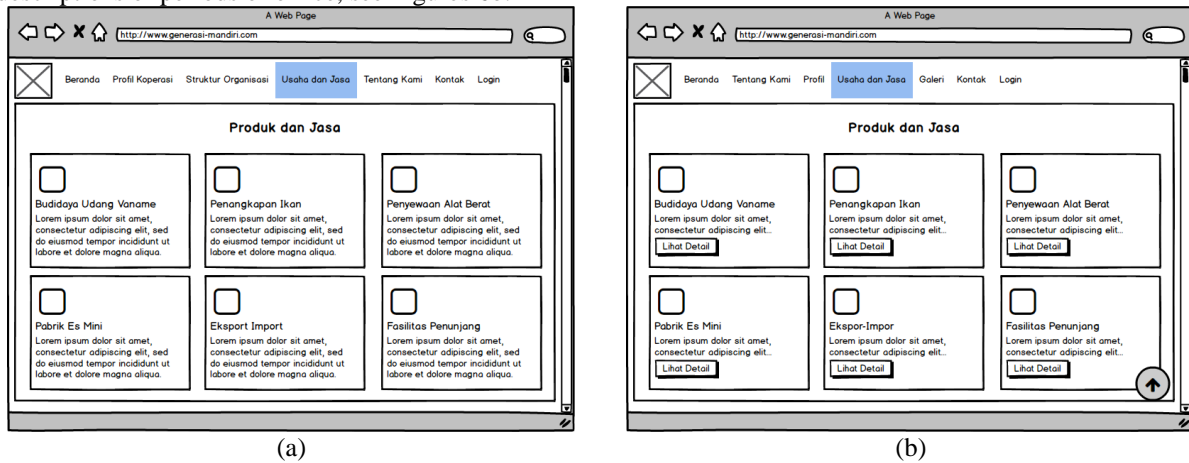


FIGURE 7. Cooperative Business and Services Page Plan (a), Improvement of Business Page and Cooperative Services (b)

Finally, the business and service page initially designed only contains a card whose content consists of business and service icons, business and service names and descriptions, plus a button that will refer to the business and service detail page, as shown in Figures 7a and 7b.

Deployment, Delivery, and Feedback Stage

At this stage, spread and send the prototype design to the cooperative partners for further feedback. Furthermore, to determine whether the prototype design is feasible to proceed to the implementation stage, a user satisfaction questionnaire is used to determine user opinions from the cooperative profile application design. Respondents amounted to 30 people consisting of 10 people from cooperatives and 20 from cooperative partners. Each question item on the questionnaire has a score range of 1 to 5, where a score of 5 for strongly agreed to answers, a score of 4 for agreed answers, a score of 3 for disagreeing answers, a score of 2 for disagreeing answers, and a score of 1 for strongly disagreeing answers [24]. From the results of the answers from 30 respondents, an average score calculation will be carried out for each question using percentage analysis techniques [25].

$$p = \frac{f}{n} \times 100 \tag{1}$$

where:

- p* is the percentage value
- f* is answer frequency
- n* is the total frequency

The following are the results of the questionnaire distributed to respondents.

TABLE 2. Customer Satisfaction Questionnaire

No	Question Item	Percentage
1	What does your banner look like?	93,33%
2	Are the menus provided good?	70%
3	Are you easy to access the menus provided?	90%
4	Are the letters on the home page easy to read?	90 %
5	Is the position component of the link and button components on the home page appropriate?	66,67%
6	What does the look of your cooperative partners like?	90%
7	Is there a feature to run a profile video you like?	90%
8	Do you like the design of our about page?	96,67%
9	Is the description of the information provided on our about page complete?	100%
10	Are the letters on our about page easy to read?	100%
11	Does the existence of a button link to the co-op history page help you to switch pages?	96,67%
12	Are the sub-menus on the profile menu easily accessible?	96,67%
13	Is the description of the information provided on the history page appropriate?	100%
14	Are the letters on the history page easy to read?	100%

15	Is the description of the information provided on the vision and mission page appropriate?	100%
16	Are the letters on the vision and mission pages easy to read?	100%
17	Is the description of the information provided on the legality page complete?	96,67%
18	Are the letters on the legality page easy to read?	96,67%
19	Do you like the certificate view feature/button?	96,67%
20	Is the Cooperative NIK check link appropriate?	93,33%
21	Do you like to see certificates in the form of a dialog view?	86,67%
22	Is the appearance of the organizational structure appropriate?	96,67%
23	What do your lead and admin pages like?	90%
24	Is the description of the information provided on the leadership and administrator pages complete?	76,67%
25	Do your business and service pages like in the form of cards?	90%
26	Do you like the details page of your business and services?	96,67%
27	Is the description of the information provided on the business and service detail page complete?	96,67%
28	What do your gallery pages like?	96,67%
29	Is the category feature page on the gallery page easy to understand?	96,67%
30	Does the image preview feature in your gallery like?	93,33%
31	Does your contact page like?	90%
32	Is the send messages to admin feature easy to use?	93,33%
33	Overall is the use of the app easy to understand?	96,67%
34	Does the application already contain the information you need?	93,33%
35	Can you understand the overall flow of using the application?	93,33%

From the questionnaire results in Table 2, several improvements must be made, namely on the home page and the leadership and management pages, along with adjusting the menu structure. Furthermore, the average of all the components of the question will be determined using the following calculations:

$$average_eligibility = \frac{the_amount_of_elegibility_value}{number_of_questions} \quad 2)$$

So that the average feasibility based on the results of the Questionnaire Table III is as follows:

$$average\ eligibility = \frac{3256,67\%}{35}$$

$$average\ eligibility = 93,05\%$$

The average feasibility will then be categorized into a table of prototype evaluation results as follows:

TABLE 3. Prototype Eligibility Categories

Category	Feasibility (%)
Very Feasible	81 - 100
Feasible	61 - 80
Feasible Enough	41 - 60
Not Feasible	21 - 40
Very Unworthy	< 21

The average result of prototype feasibility is 93.05% and is included in the category of very feasible to be implemented to the next stage and, of course, by paying attention to some suggestions and improvements requested by partners.

5. CONCLUSION

The prototype design uses a user satisfaction questionnaire as an evaluation test tool. The number of questionnaires distributed to partners was 30 respondents. The average result of prototype feasibility is 93.05% which is included in the very feasible category and can proceed to the next stage. Meanwhile, the feedback obtained from the final stage of the prototype is improvements on the side of the home page, the leadership and administrator pages, and the menu structure that must be adjusted.

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