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Designing A Mobile Application For Fresh Fish SalesUsing A Design Thinking Approach

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Abstract

The decline in aquaculture productivity due to the COVID-19 pandemic and increasing global competition, as well as difficulties for fishermen in selling fish due to high distribution costs and low consumer confidence in fish freshness, demand innovative solutions for the fishing industry. This research aims to answer this problem by developing a mobile-based fresh fish marketing application called "FreshCatch." We use Design Thinking methods to improve user experience and interface design. This methodology includes understanding user needs, determining core problems such as the issue of trust in fish freshness, finding solutions, creating low and high-fidelity design prototypes, and usability testing. The research results show a high level of success and user satisfaction with a significant increase in user trust and market accessibility for fishermen. The study concluded that "FreshCatch" effectively enhances the digital transition in fish sales, expands market reach, and increases fish farmers' income while ensuring the availability of fresh fish for consumers. This research contributes to advancing digital solutions in the aquaculture industry, encouraging sustainable and efficient market practices.

Keywords: Design Thinking; Fresh Fish Sales; Mobile Application; User Experience; User Interface

1. Introduction

As time goes by, the fishing and aquaculture industry has significantly impacted the national economy. However, recent years have posed substantial challenges for this sector. The aquaculture industry experienced a decline of 200,000 tons from 2020 to 2021, primarily due to the restrictive effects of the Covid-19 pandemic [1]. Market demand and increasingly tight global trade competition have made aquaculture products highly competitive [2]. Additionally, fish farmers struggle with high production costs and operational expenses, making it challenging to sustain profitable fish-selling operations [3]. This situation disrupts the fish-selling system, rendering it inefficient due to high operating costs and inadequate marketing efforts [4]. Therefore, innovation is needed to develop more efficient and environmentally friendly cultivation technology while improving product qualityto meet rising market standards.

In the current situation, people in the aquaculture industry face enormous challenges in adapting toand utilizing the digital revolution of the 5.0 era [2]. Rapid technological advancements have drastically altered how we interact with the world. Smartphones, for instance, have become ubiquitous, facilitating online activities such as social media, learning, electronic banking, and e-commerce [5][6]. Consequently, digitizing fish sales applications has emerged as one of the best

strategies and solutions for marketing and selling aquaculture products, especially for consumers with limited mobility.

The primary problem is that the traditional fish-selling system is inefficient due to high operational costs and insufficient marketing, compounded by the industry's slow adaptation to digital technologies. To address this, our research aims to develop an application platform called "FreshCatch," specifically designed to facilitate the sale of fish by fishermen in various regions and users with limited time to purchase fresh fish through the application.

We applied the Design Thinking method as a guide in designing the user application interface, which is an essential step in overcoming the challenges of the aquaculture industry. The Design Thinking process involves several stages, including understanding user needs (Empathize), determining the problem to be solved (Define), generating various ideas (Ideate), creating a prototype, and testing [7]. Good interface design not only pays attention to aesthetic aspects but also considers the overall user experience [8].

Our research objectives are to develop a user-friendly application to streamline the fish-selling process and make fresh fish more accessible to consumers regardless of geographical location. The "FreshCatch" application aims to provide an intuitive user interface and optimal user experience, expanding the reach of fish products directly from fishermen and increasing sales and income for fish sellers and fishermen. This research will demonstrate that a web-based monitoring system can serve as an effective alternative solution to the current inefficiencies in the fish-selling market, supported by reviews of previous research and practical applications in the industry.

2. Method

In designing this mobile application, we used a Design Thinking approach. Design Thinking is an approach that prioritizes collaboration with users to find solutions to problems [9]. In designing this fish sales application, we chose to use a Design Thinking approach because it focuses on understanding the needs of customers and consumers who are the end users of the products and services produced. The resulting solution ideas come from each user's problems and needs, which are then implemented into the application to be built. This approach is effective and profitable because it can quickly adapt and understand various user needs and problems. This is similar to cases that have successfully applied this approach, such as multiple technology companies and startups that have utilized Design Thinking to create user-centric products and services, resulting in higher user satisfaction and engagement [10]. The stages in the Design Thinking method consist of empathy, definition, idea, prototype, and testing [11][12] as seen in Figure 1.

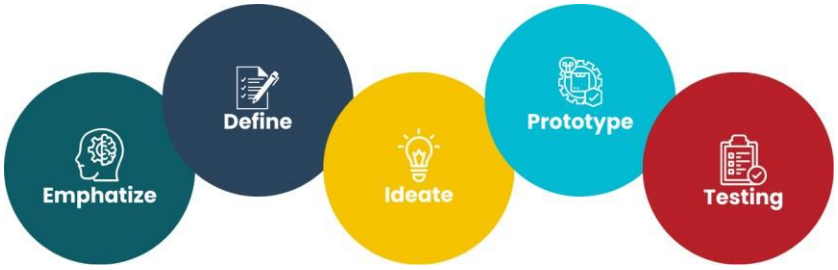

Figure 1. *Design Thinking*

In the Empathize stage, we identify the anxieties, needs, and goals experienced by target users, namely, users who frequently buy fish [13]. We determined respondent segmentation and conducted telephone interviews with 10 respondents in the Bogor area based on the age range of 17 to 50 years to ensure a diversity of perspectives and experiences, which can represent the population of users who often buy fish. This age range includes age groups active in purchasing

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daily necessities, so it can provide diverse and comprehensive insight into the issue of trust in purchasing fresh fish. These respondents were selected to represent the research population relevant to creating fish sales applications using the Design Thinking method.

So, we present the results of the interview in the form of an empathy map. Empathy maps area tool used in design thinking and product development to help us better understand users. This map depicts four quadrants consisting of what users say (Said), do (Do), think (Thought), and feel (Felt), which are taken from how they react to problems or pain points, as seen in Figure 2.

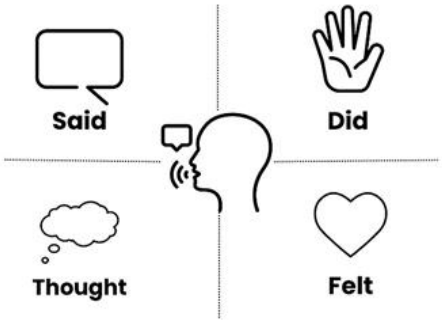

Figure 2. *Quadrant Empathy Map*

In the Empathize stage, we identify the anxieties, needs, and goals experienced by the targetusers. These namely users often buy fish by conducting interviews and casual observations of the users' daily activities [13].

In the Define stage, we collected problems or information obtained from the Empathize stage by analyzing user concerns, needs, and goals based on the information obtained [14]. At this stage, we created a user persona to represent and understand the users' needs, consisting of their background, needs, behavior, goals, and specific problems according to their needs.

At the Ideate stage, we brainstormed to answer all questions about the problem formulation and challenges using an HMW (How Might We) table to produce solutions and encourage explorationin deciding which features to design. After that, we identified the brainstorming results in the user flow to determine the steps and limitations users can take when exploring the application.

At the prototype stage, we design product designs based on solution ideas generated from the ideate stage. By visualizing the user flow of the FreshCatch application design and visualizing it in low fidelity form in the form of a wireframe in the form of a submenu division framework, layout position or layout, and division of functions on a page without a font face, colors, logo, or supportingdesign elements [15].

Also, a form of high fidelity is forming a design based on a style guide to meet the design guidelines that will be created. This is used to be consistent and more specific when creating application interface designs until the application design is ready to be implemented. This prototype can experience reductions or additions depending on the results of the testingthat will be carried out [16].

At this stage, we tested the prototype on users to get input regarding the interface design and user experience using the FreshCatch application. The testing stage is the final stage with life cycle characteristics, allowing repetition if there are errors [12][17].

At this stage, we tested using a website called Maze.co. We chose Maze.co for usability testing in

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this study for the following reasons: ease of use, where Maze.co provides a user-friendly and easy-to-use interface, allowing researchers and test participants to interact with the prototype efficientlywithout significant technical barriers, remote-based testing that allows participation from various locations without the need for physical presence, flexibility in test design that enables the creation of scenarios tailored to the specific objectives of the study and helps in measuring various aspects of the user experience, as well as easy integration with prototypes that can be easily integrated with multiple prototype design tools such as Figma and Sketch. Based on these reasons, Maze.co was chosen as the ideal platform to carry out usability testing in this research, ensuring that the data collected is accurate, relevant, and can be used to improve the design of the FreshCatch application. Through this test, we will convey 1 statement, 5 tasks containing participant scenarios in running the prototype, and 1 opinion scale regarding the features and design of the FreshCatch application that are satisfying and useful. You can find out whether the application design effectively solves existing problems. The hope is that using Maze.co will help identify and correct design weaknesses and ensure that this application effectively solves existing problems.

3. Result

As for the research results, we compiled them based on the stages of design thinking as follows. In the Empathize stage, we conducted long-distance telephone interviews with 10 people ranging from students to housewives who live in Bogor City. From these interviews, data was obtained that 6 out of 10 people were in the 17 - 30 year age range, dominated by students and workers, and housewives dominated the rest in the 30 - 50 year age range. The interview results also showed that 8 out of 10 people we interviewed had used the application to buy fish. GrabMart is one type of application that they often use. However, some of them still need clarity regarding the freshness of the fish. However, they also make direct purchases in conventional markets. So, we put the interview results into an empathy map, as shown in Figure 3.

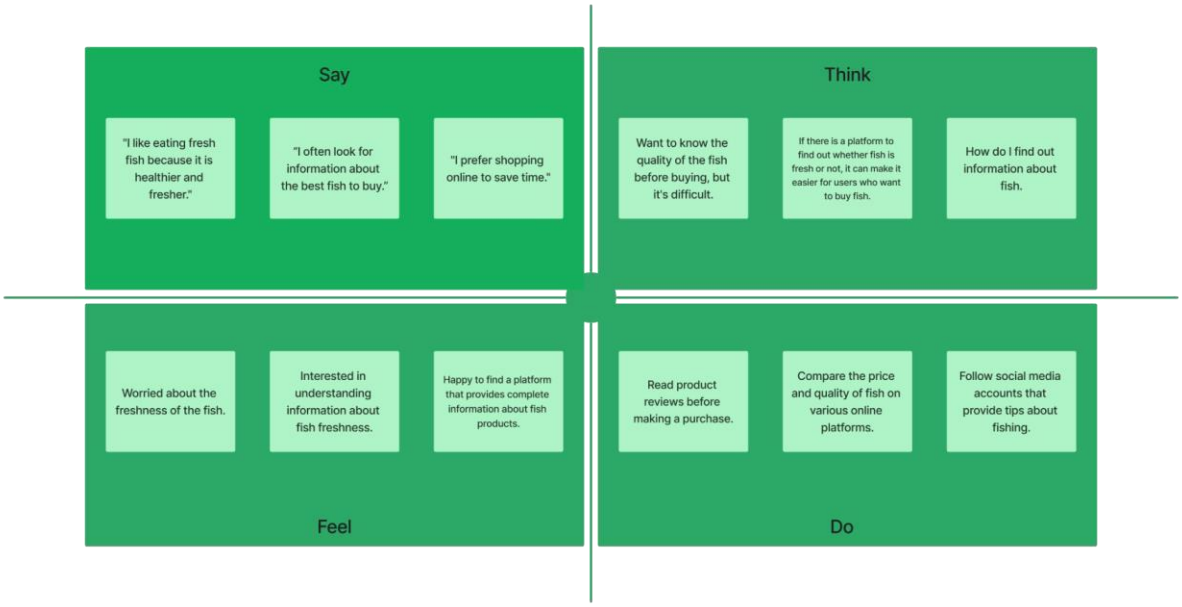

***Figure 3**. Interview Results Into an Empathy Map*

Next, in the Define stage, we formulated the most pressing core problem: limited user confidence in purchasing fresh fish. Based on the results of interviews with 10 people, User

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Personas were created where the answers from 10 people aged 17-50 years were made into 2 personas, basedon age range grouping. This is to make it easier for us to design applications. It can help in seeing the magnitude of the obstacles (pain points) faced and the personality of the target user. The following is the user persona of our target users.

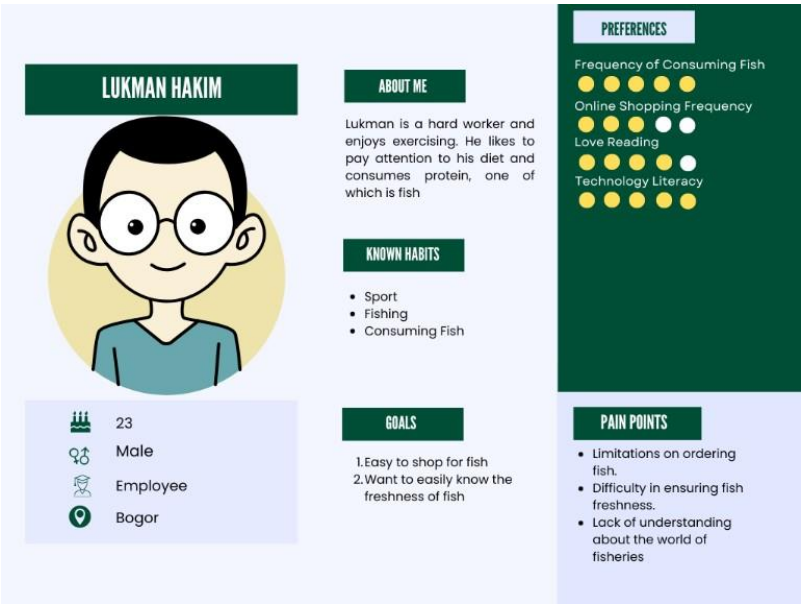

Figure 4. *User Persona Employee*

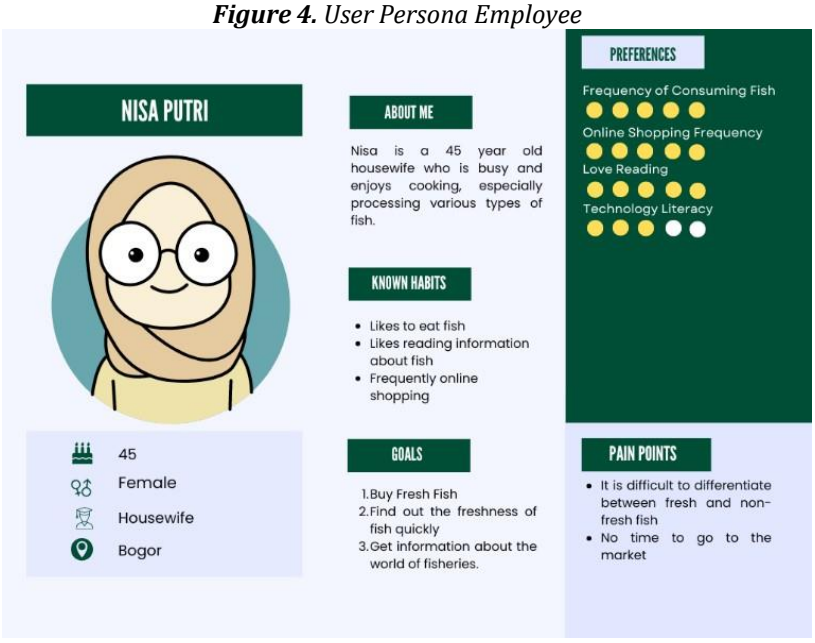

Figure 5. *User Persona Housewife*

From the creation of user personas in Figures 4 and 5, we found the point of view (POV) as the primary guide during the design process, which makes the image of the target user more specific. This process viewpoint is divided into Users, Needs, and Insights. The results of the viewpoint process are as follows. Users, FreshCatch application users are individuals who face problems with limited confidencein purchasing fresh fish. Need, Users need information services about the world of fish and a platform for purchasing fresh fish that is trusted and can be tested for freshness to simplify the fish buying and selling transaction process. Insight, Users need to increase their confidence in purchasing fresh fish. In addition, there is uncertainty or doubt regarding the quality of the fish purchased.

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By clearly defining these elements, the design process can better meet the needs and address the concerns of target users, ensuring that the final application meets their expectations and needs.

The ideate process is the stage of collecting ideas after defining the problem, which becomes a solution to the issues. At this stage, we brainstorm to answer all the HMW (How Might We) we have created previously to produce as many solutions as possible and decide which features will be designed based on these solutions.

After brainstorming as in Table 1, we identified several features that will be present in the FreshCatch: Fish Sales Application:

a. Fish Info
   This feature provides the broader community with the latest information and educationregarding fisheries.
b. Fish Farm
   This feature provides quality information and locations for fish cultivation in an area.
c. Fish Market
   This feature allows e-commerce sales of various types of fish so that fish farmers can sell their fish products online to consumers and distributors.
d. Fish Scan
   This feature helps consumers/buyers find out about the freshness of fish by directly scanning the fish.

Table 1. *How Might We*

User Needs (pain point)	That's why it was made.. (goals)
Facing time constraints in purchasing fresh fish.	The Fish Market feature is designed to help users save time when shopping for fish, ensuring they can quicklyget fresh fish without spending much time.
Fish farmers need help in selling fish because of the high distribution costs.	The Fish Market feature was created to help fish farmers expand market access and reduce distribution costs, making it easier for them to sell fish more efficiently and profitably.
Users need help knowing whether the fish they buy is fresh.	The FishScan feature assists users with fish scans to provide information and answer questions regardingfish quality and freshness.
Users need help finding information about the location of the nearest fish cultivator and the cultivator's direct contact.	The Fish Info feature was developed to give users easy access to fish farmer location information and their contacts, facilitating direct communication and more efficient transactions.

After brainstorming and determining the needed features, our team started planning the userflow to implement the solution. This aims to determine the steps and limitations of the main features that users can use. The following is the user flow of our application design.

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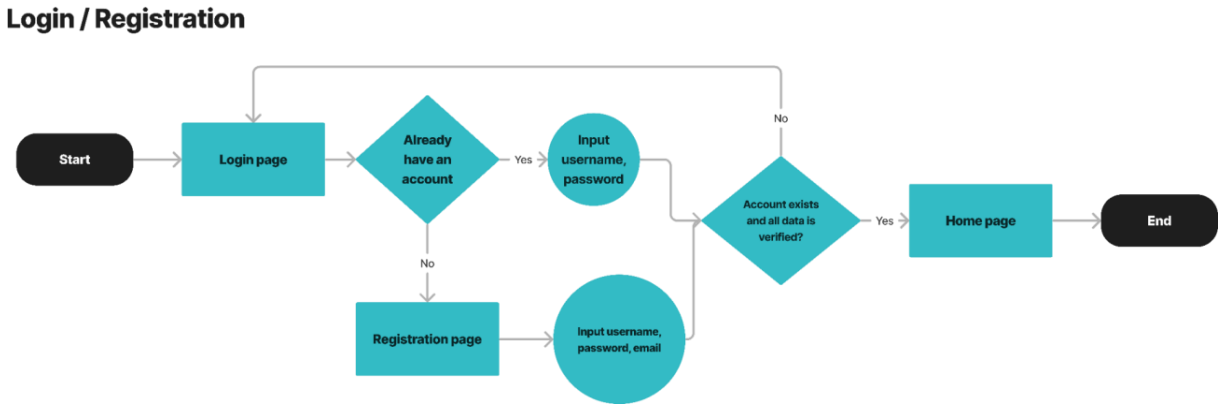

Figure 6. *User Flow Login Registration*

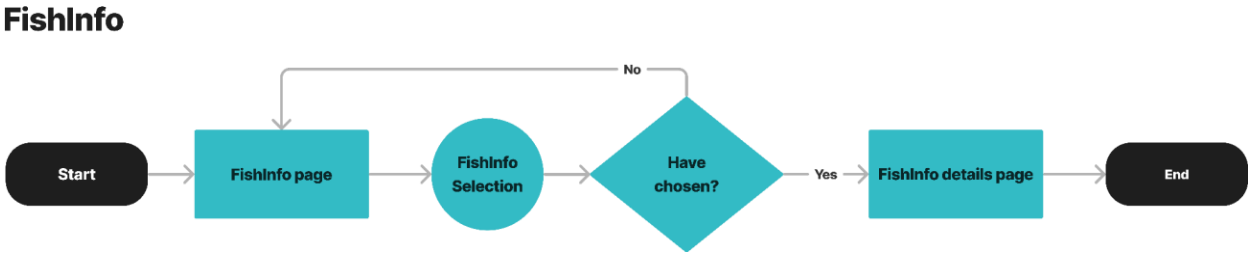

Figure 7. User Flow Fish Info

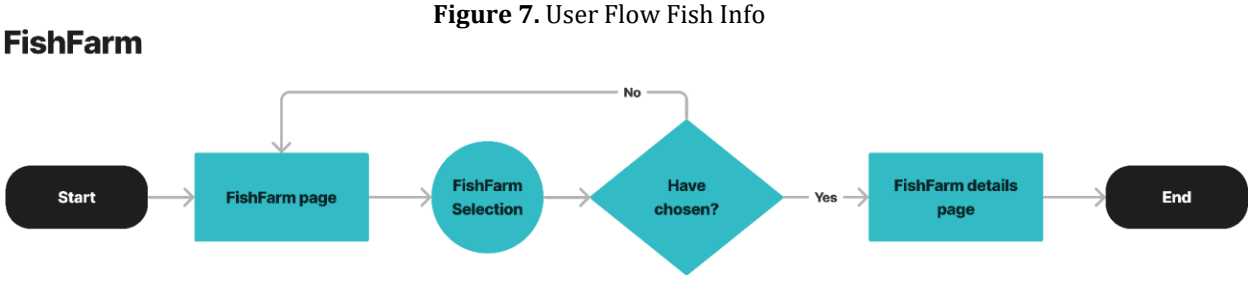

Figure 8. *User Flow Fish Farm*

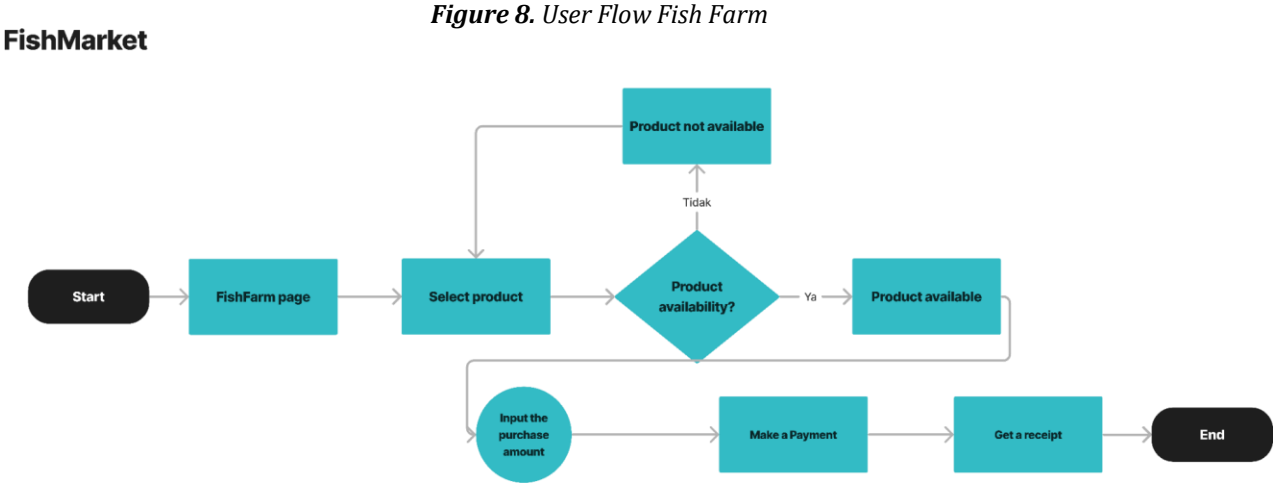

Figure 9. *User Flow Fish Market*

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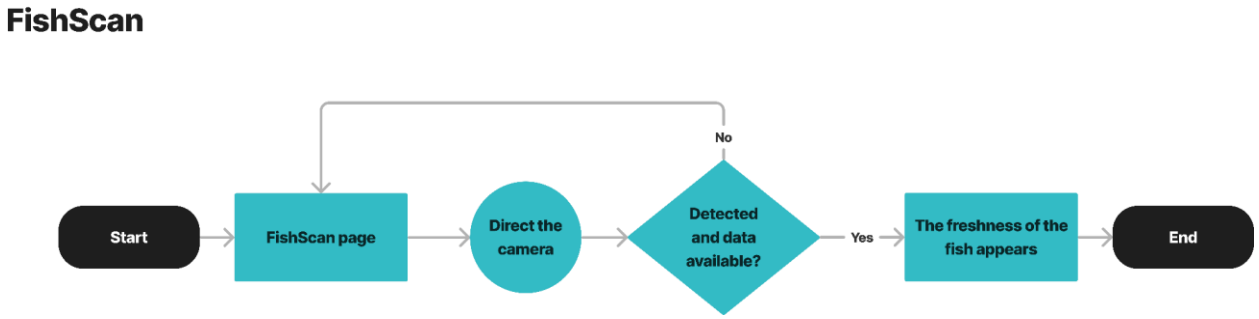

Figure 10. *User Flow Fish Scan*

Figures 6, 7, 8, 9, and 10 explain that creating a user flow can design the FreshCatch application architecture with an intuitive and efficient flow from the registration feature to the checkout page for purchasing fish.

So, by utilizing HMW (How Might We) and creating user flows, we have effectively come up with inventive solutions and steered our product design in the right direction. It is hoped to produce relevant solutions and provide a better user experience from this stage. This process allows us to focus on user needs and provide significant added value to them through our products.

Once the data collection, idea generation, and solution brainstorming processes are finished,the subsequent step involves developing the interface design for the product. For this phase, we utilize the Figma tool. We decided to create two types of prototypes: low-fidelity and high-fidelity prototypes.

The figure above is a low-fidelity prototype, or what is usually called a wireframe, a simple and rough version of the application designed to provide a general overview of the main functions.

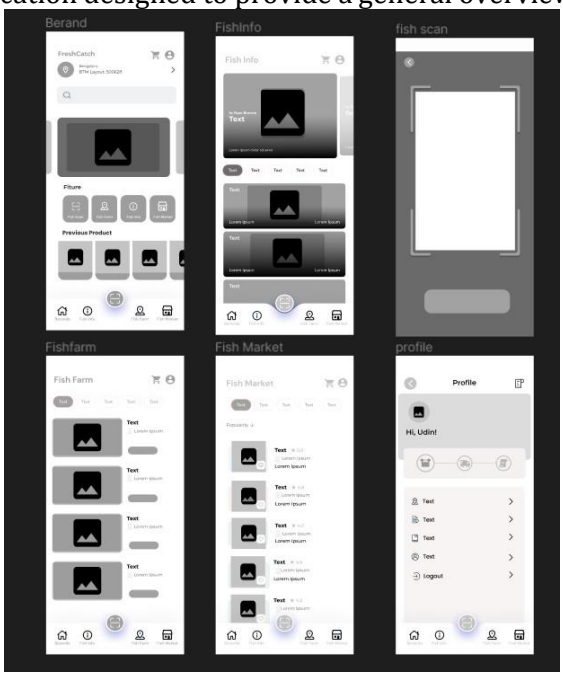

Figure 11. *WireFrame FreshCatch App*

After completing the wireframe, our next move was to craft a high-fidelity prototype. This iteration delves into finer details, presenting more precise visuals to enhance the portrayal of the app's appearance and functionality.

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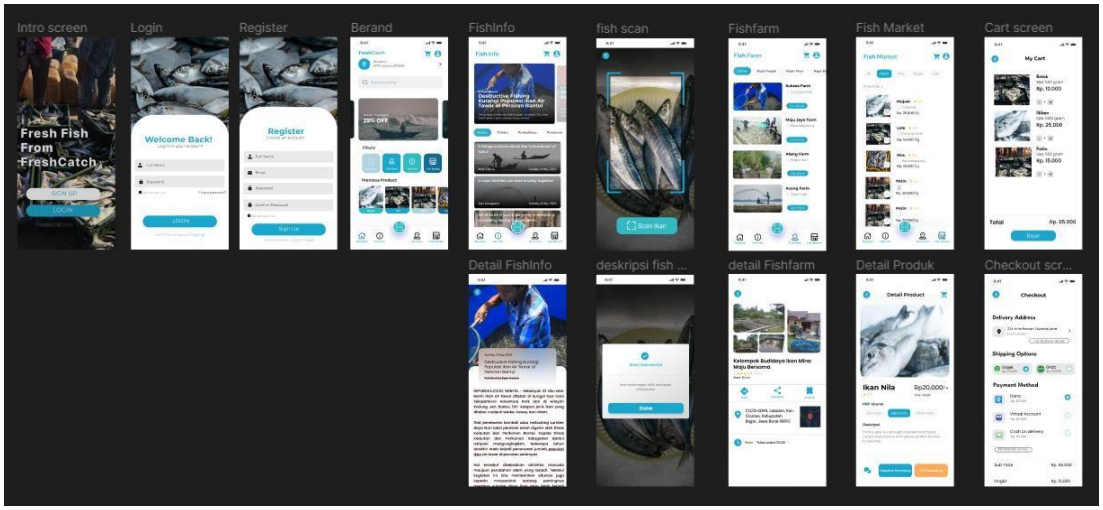

Figure 12. *Mockup FreshCatch App*

By comparing Figures 11 and 12, we gain valuable insight into various aspects of ourapplication design. Low-fidelity prototypes help us test concepts and discover design problems early, while high-fidelity prototypes allow us to evaluate design details in more detail. Combining these two types of prototypes gives us a solid basis for making more targeted decisions in future application development.

4. Discussion

This usability testing used the Maze platform to validate the design solution created after the entire design was prepared. A total of 29 participants who were target users of the application were involved. These participants included students, workers, and housewives aged 17–50 years, selectedto ensure that the testing approach aligned with the research objectives of evaluating user trust andexpanding market reach for fishers.

The testing approach includes specific goals and scenarios that participants need to achieve and an opinion scale to measure the design's usability and obtain effective and valid results. However, even though the number of participants in the initial testing scenario was 29, not all participants were involved in each scenario due to connection instability at the start of testing, so they had to repeat the process, as can be seen in scenario 1 which was only attended by 29 participants, while inscenarios 2, 3, and subsequent scenarios only 26 participants participated.

Figure 13. *Result Testing in Sign-In/Up*

Based on the results of tests carried out on 29 participants in scenario 1, it can be seen in Figure 13 that the results were good, and the average time spent on each page was fast in achieving the objectives of the scenario that had been created. This can be seen in the low percentage of unfinished missions and misclick ratings.

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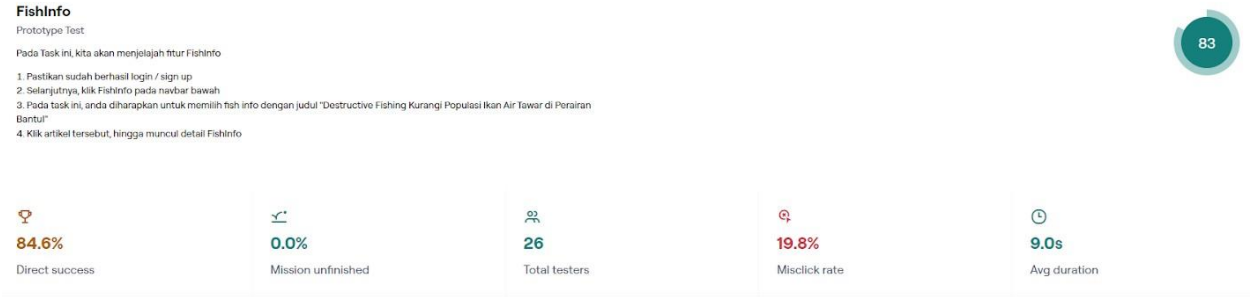

Figure 14. *Result Testing in FishInfo*

Figure 14 shows the values obtained from the test results in scenario 2. In this scenario, therewas a decrease in the number of participants to 26 people. This could be due to an error when running the usability test. However, despite experiencing a reduction in the number of participants, scenario 2 still has a score above 80, which shows that there are no difficulties in running the prototype as evidenced by the miss click rating, which is lower than the previous scenario, and the absence of unfinished missions in carrying out the interface design of the Fish Info feature.

Figure 15. *Result Testing in FishFarm*

Based on Figure 15, in scenario 3 in the FishFarm feature, which 26 participants attended, this application showed excellent performance with an immediate success rate of 92.3%, indicating that most participants could complete the task without errors. Only a few missions are left unfinished, meaning a high engagement level and usability. Then, with a reasonably low click error rate, 17.1%, this shows that user interface elements such as buttons and links are well placed and the right size, thereby reducing accidental clicks. The average time required to complete a task was 24.7seconds, indicating that tasks can be completed quickly, increasing efficiency and overall usersatisfaction.

Figure 16. *Result Testing in FishMarket*

Based on Figure 16, usability testing in scenario 4 for the FishMarket feature involved 26 participants. The results showed an immediate success rate of 76.9%, indicating that most users completed the assigned tasks. Data showed no incomplete missions, highlighting high levels of task completion and engagement among participants. However, there was a click error rate of 23.1%, indicating room for improvement in the placement and design of interface elements. The

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average duration for task completion was 27.3 seconds, indicating that users could complete the task relatively quickly, thereby increasing efficiency and overall user satisfaction with the FishMarket feature.

Figure 17. *Result Usability Testing in FishScan*

Based on Figure 17, usability testing in scenario 5 for the FishScan feature involved 26 participants. The results showed an immediate success rate of 96.2%, indicating that most users could complete the assigned tasks. Although 3.8% of missions are outstanding, this figure is relatively low, indicating high engagement and task success. A click error rate of 15.3% indicates that there is still an opportunity to improve the placement and design of interface elements. The average time required to complete the task was 5.2 seconds, indicating that users could complete the task very quickly, thereby increasing efficiency and overall user satisfaction with the FishScan feature.

Of the 5 scenario tasks we have created, we provide the final question in the form of opinionscale or satisfaction in carrying out usability testing on our application prototype. This can be seen in Figure 18.

Figure 18. *Result Opinion Scale*

Figure 18 shows the results of satisfaction testing from 26 respondents. From these results, it was stated that 38% of the results, consisting of 10 people, felt satisfied, and 62%, consisting of 16 people, felt very satisfied. So, from this, it can be our benchmark that the design we have created is appropriate to the user and can proceed to the next stage to be submitted to application development.

5. Conclusion

The conclusion of this research reveals that the "FreshCatch" application has been successfully developed with the main objectives, namely increasing user trust and expanding market reach for fishermen. The research results show that this application successfully achieved these two

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objectives, so it can be concluded that the research objectives have been achieved. Prospects for further development of this application include expanding features to cover various other fishery products and integrating advanced water quality monitoring technology to support environmental sustainability initiatives. It is recommended to carry out further studies that include an in-depth analysis of the economic impact of using this application on the welfare of fishermen, as well as exploring the application of similar technology in other agricultural sectors to increase efficiency and sustainability in various fields of agribusiness. This conclusion has answered the problem statement by showing that "FreshCatch" effectively increases user confidence and fishermen's market reach. Additionally, suggestions for further research provide direction for expanding the impact and application of this technology in other sectors, thereby providing a comprehensive response to the problem statement.

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