Building Front-End Rekaruang Application Using Waterfall Development Method in The Design Order Module

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Abstract

Based on research conducted on sixty-ninth-grade female students at Shiraz high school, interior design was able to improve mental health and decrease anxiety and insomnia. This research result shows that the importance of applying interior design to a person's psychological health. However, nowadays, many people do not care about implementing interior design because they are worried if the results are not as desired. It becomes a problem for interior designers in getting customers. Based on these problems, the researcher tries to provide a web-based practical application for bridging interior designers with clients as building owners. This research only focuses on developing Front-End applications using the JavaScript programming language and the vue.js framework. This study applies the waterfall method as a software development method. This research produces a design application that can be a place for interior designers to get clients through design messaging services. This application testing using a user acceptance test. The test results show that three out of five interior designers have accepted the entire process of the design Order service. While the other two designers have accepted conditions for some process on the design Order service to help get clients.

Keywords— Interior Designer, Rekaruang Application, Front-End, Vue.js, Waterfall

1. INTRODUCTION

Furniture arrangement or interior design is the basis for the nature of the use of the building, the environment and appropriate standards, the use of materials, and the principles of architectural design. Interior design aims to create a functional, comfortable, and beautiful life, meeting people's material and spiritual needs, as well as environmental needs [1]. Interior design needs to play environmental psychology to analyze and explore thoughts to create a comfortable and harmonious living environment for users. Public. The results of a study conducted by [2] from the Department of Psychology showed, as many as sixty-ninth-grade female students at Shiraz High School experienced improved mental health, decreased anxiety, and insomnia thanks to the role of interior design. 

With the development and improvement of people's living standards, people have put forward higher requirements in interior design. Currently, design has evolved into a commodity that many people can enjoy. Based on Figure I.1 Opus Creative Economy Outlook 2019, the GDP growth rate of the 2016 Interior Design Sub-Sector was 5.92%, with the GDP generated by the 2016 Interior Design Sub-Sector of Rp. 1,483.7 B, an increase in the GDP value in 2015, which only reached Rp1,354 billion.
In addition, the evolution of the design industry as a commodity has also increased the growth of the interior design industry as one of the sub-sectors of the Indonesian Creative Economy Agency (Bekraf), which has a contribution of 7.33% [3]. In the national economic growth, the Indonesian Interior Design Association also revealed that the interior design business had recorded a growth of 50% since 2017. The data shows that the potential for interior design will continue to grow in the future.

Research related to interior design has been carried out by conducting interviews with five interior designers to support the growth of the interior design industry. The interview results revealed the problem most often encountered by interior designers, namely the absence of a promising platform for some designers to find clients. In addition, to validate the availability of the interior design market, five respondents as building owners were interviewed. Based on the interview, it was found that respondents were still hesitant to use the services of an interior designer because there was no actual price for interior design services and were worried if the results were not as desired. These problems provide an opportunity for the development of platforms using information systems, which can accommodate designer associations, provide applicable standards for interior designers, and connect clients with desired designers. For this reason, through this research, a platform called Rekaruang will be built.

Rekaruang is a website application-based platform designed to bridge interior designers with clients as building owners who want to get designers with the proper budget and design. This application will target two user roles, namely interior designers, and clients. Clients who become the Rekaruang market are people aged 25-30 years, entrepreneurs, and building owners. The selection of clients aged 25-30 years is based on research conducted by the Demographic Institute FEB UI in 2017 [4], where that age falls into the category of people who want to get married, so they need living space. In this research, Rekaruang will provide design messaging services to help clients place designs for the desired designer and become a forum for designers to present portfolios that can attract clients' interest.

The Rekaruang application will be built on a website-based platform because, according to [5], the website provides flexibility for users to access only using the internet and browsers on any device, so it does not require an install process can burden memory usage on the device. In building applications, appropriate development methods are needed so that the results obtained follow user needs. Therefore, the development of the Rekaruang application uses the waterfall development method, which is considered appropriate with a reasonably short application development deadline. In addition, the process of implementing the Rekaruang application interface will use a JavaScript framework. According to [6], these libraries and frameworks are templates that developers must follow to help the development process become much more efficient. Vue.js was chosen as the framework used to help implement the Engineering application interface.

2. METHODOLOGY

The method used in this study is the waterfall. The waterfall model is one of the oldest models commonly used to develop government and corporate projects [7]. The focus of the waterfall is on planning and setting schedules with predetermined deadlines and budgets. This study uses four phases of the waterfall, namely requirements, design, implementation, and testing.
2.1 Requirement Phase

The requirements phase focuses on gathering requirements from users to be analyzed to define the requirements of the Engineering application. To get the results of user needs effectively, Rekaruang conducts interviews with interior designers and clients, which are carried out online using video conferencing to get an overview of users’ problems, needs, and goals. The interview results became the basis for Rekaruang to start analyzing the problem and start designing solution assumptions.

2.2 Design Phase

In this phase, the research will focus on producing a system design from the Engineering application based on the analysis from the previous phase. In the design phase, the application system design begins to be built based on the research team's analysis results to produce a prototype.

2.3 Implementation Phase

In the implementation phase, researchers began to build the front-end of a web application based on a prototype that had passed the test from the design stage using JavaScript and the help of the vue.js framework.

2.4 Testing Phase

Then in the last phase, namely testing, researchers tested the front-end of the application built in the implementation phase. The testing phase aims to determine the readiness of the application and the optimal level of the Rekaruang application when it is accessed.

3. RESULT AND EXPLANATION

3.1 Requirement Phase

In analyzing user needs, Rekaruang conducts interviews with two categories of users who will become potential users, namely interior designers and people who use the services of interior designers.

3.1.1 User Needs Analysis

The results of interviews with prospective users of interior designer services show that potential users are in the age range of 25 years with different professions. In addition, potential users already know the benefits obtained, such as comfort and beauty. Hence, users are interested in implementing the interior design on their properties, such as homes and places of business. Users have also used several existing e-commerce and social media to be already familiar with conducting online transactions. However, users still have concerns about making transactions if the fees do not match the budget that has been provided.

Then the results of interviews with interior designers show that the average interior designer is domiciled in Bali, Jakarta, and Bandung with two professional categories, namely freelancers and professionals. Then, interior designers are also interested in getting additional income outside of working hours. There is no platform for designers, so they only get clients who come from recommendations from acquaintances and social media.
3.1.2 Business Needs Analysis

a. Business Model Analysis

Then to find out business needs, this study uses a lean canvas business model, which consists of 9 elements including customer segment, problem, solution, unique value proposition, channel, revenue stream, cost structure, key metrics, and unfair advantage in Figure 1.

![Lean Canvas Business Model](image)

**Figure 1. Lean Canvas Business Model**

b. Market Potential Analysis

To maximize the reach to the target market, it is necessary to analyze the measurement of market potential, which aims to consider how the business to be built can be following the available energy, time, and development costs. This study uses the TAM-SAM-SOM model analysis method.

i. Total Available Market (TAM)

Rekaruang total available market is taken from interior design sales in Indonesia. Based on the results of interviews and research, as many as 180000 (one hundred and eighty thousand), interior designs have been sold in Indonesia within one year. This amount is the total available market (TAM) of Rekaruang.

i. Serviceable Available Market (SAM)

Based on the number of TAMs obtained, the data is processed based on online interior design sales in Indonesia. Competitors can sell more than 1500 designs or about 1.11% of total interior design sales in Indonesia. Based on this number, Rekaruang has 0.3% or 540 services available market (SAM).
ii. Serviceable Obtainable Market (SOM)

Serviceable Obtainable Market is an opportunity for the number of users that Rekaruang can reach and serve. The serviceable obtainable market (SOM) value is obtained from 65% of the SAM value. Thus, within one year, Rekaruang sales target is 351 designs, considering designer resources and application capabilities in the first year.

c. Business Feasibility Analysis

Business Feasibility Analysis is used to determine the feasibility of a business [8]. Five aspects were observed in conducting a business feasibility analysis: market aspects, marketing aspects, technical and technological aspects, organizational and management aspects, and financial aspects [9]. Then there are other aspects related to the feasibility from a juridical side that need to be elaborated on the legal and legal aspects [10].

i. Market Aspect

Rekaruang sales target within one year is 351 designs. A marketing strategy is needed to achieve these sales targets. The cost for marketing using Instagram ads, influencers, YouTube, and google ads in one year is IDR 40,700,000.

ii. Technical Aspects

Four categories must be considered in the technical aspect, namely investment costs, depreciation costs, direct cost planning, and indirect cost planning. Investment costs in Rekaruang are divided into three categories, namely facilities, equipment, and general administration. In the category of total expenses reached Rp27,300,000. Then in the equipment category, Rp. 250,000. Then in the general administration category of Rp.800,000.

Every investment that Rekaruang has purchased will be depreciated. The calculation of depreciation uses a sum of years digit, where the cost of depreciation will decrease every year, and each item has an economic life that determines when the item must be replaced.

The direct costs that Rekaruang needs to pay are on application infrastructure costs because the main product of Rekaruang is an interior design ordering application. Rekaruang must incur costs in aspects that can support Rekaruang primary operations are included in indirect costs. Indirect costs that Rekaruang must incur are internet costs and electricity and water costs.

iii. Management Aspect

The management aspect is divided into two categories, namely direct labor salary and indirect labor salary. Direct labor salary is addressed to interior designers. Interior designers will receive salaries ranging from IDR 8,100,000 to IDR 28,500,000, depending on the scale. Meanwhile, indirect labor salaries at Rekaruang are Software Engineer, Research and Development, Marketing and Sales, Designer and Admin with a salary of Rp.4,400,000 for each position.

iv. Legal and Legal Aspects

The legal and legal aspects are an analysis of the feasibility of Rekaruang from a juridical point of view. To fulfill legal and legal aspects, Rekaruang will form a legal entity in the form of a limited liability company or PT by making domiciles, doing notarial deeds, and making SIUP.
v. Financial Aspect

The selling price of Rekaruang products is in the form of ordering a design with an interior designer, with an admin fee of 5% per service. Every year, the selling price will increase by 3.12%, referring to the inflation rate in 2021, according to Bank Indonesia. Thus, the required funds as initial capital for Rekaruang is Rp.45,450,000 and comes from the owner's equity.

vi. Calculation

Four methods will be used to calculate the design's feasibility, namely NPV, payback period, IRR, and BCR. Rekaruang business model will be feasible if each method's value exceeds the minimum value.

NPV or Net Present Value is a method used to calculate the difference between the present value of an investment and the present value. Then the payback period becomes the period needed to cover investment expenses or initial cash investment. Based on the calculations, the NPV value of Rekaruang is Rp445,177,175, with a payback period value of 2.54.

Internal Rate of Return (IRR) is a method used to find the rate of return on the initial investment. The IRR value of Rekaruang is 64%, which means that Rekaruang can get a profit of 64% if the business goes according to plan.

Finally, the value of BCR or B/C Ratio is the ratio used to compare revenue with costs incurred by Rekaruang. The BCR value of Rekaruang is 1.09. This value can be an indication that Rekaruang can make a profit.

3.2 Design Phase

The design phase focuses on producing a system design from the Engineering application. The system design formed in this phase consists of business processes, UML diagrams, and application designs.

3.2.1 Business Process

The business process is formed by mapping the analysis results against the opportunities that can be seen in the business model. Rekaruang sees an opportunity to use a design purchase service from the problems and solutions they want to address. Business processes are described in the form of a Business Process Modeling Notation (BPMN) diagram. There are two actors in the design buying business process, including the client and the interior designer. The business process describes the activities carried out by each actor and the process flow that is interrelated between actors.

3.2.2 Use Case Diagram

Design Orders are one of the functionalities of the Rekaruang application. The actors in the use case ordering the design are the building owner and the interior designer. It can be seen from the relation in Figure 2, before entering the use case Order design actor must perform use case authentication as a condition or pre-condition. The form of authentication in Rekaruang is that the user must register and log in first. The design Order use case describes the functionality of the application that provides services for the client to receive the design and provide a rating as a form of feedback to the designer. Meanwhile, the designer actor in this functionality can provide a design according to the request that has been submitted by the user and receives a rating from the client.
3.2.3 Activity Diagram

One of the activity diagrams owned by the Rekaruang application system is a design ordering activity diagram that describes the process flow and interactions between interior designers, systems, and clients. Each actor is separated by a swim lane or pool, making it easier for researchers to see the activities that occur in each actor.

3.2.4 Application Design

Based on the needs analysis that has been obtained, a high-fidelity design of the Rekaruang application is made which is used as a reference in the development of the Rekaruang application's front-end. The design that is made is intended for two roles, namely designer and client. Each design consists of a login process flow and a design Order flow.

3.3 Implementation Phase

After the design of the high-fidelity Rekaruang application is made, it is continued in the implementation phase in the form of application creation. The application development uses the Vue.js framework which optimizes the features of a single page application or SPA, using the JavaScript programming language and only covers the front-end side of the application. The main page view of the Rekaruang design Order from the client side is shown in Figure 3, and the main dashboard view from the designer side is shown in Figure 4.
From the side of the program code, it is creating a display page using the CSS library provided by Vue, namely Vuetify. The use of the Vuetify library aims to produce a more optimal display because it is provided directly by Vue. In addition, the components provided are complete, so only minor adjustments are needed to create the design. Then, to meet the functional needs of the display, Rekaruang uses the JavaScript programming language and accesses data in the database using an API that has been provided by the back end or what is called the consume API process.

3.4 Testing Phase

The testing phase aims to ensure that the implementation process runs according to the design and meets user needs. In the Rekaruang design Order feature, user acceptance testing (UAT) testing is carried out, which is included in the black box testing technique. This test helps
determine whether the Rekaruang application is following user needs. The results of testing using user acceptance testing are listed in Table 1.

Table 1. User Acceptance Test Results

<table>
<thead>
<tr>
<th>Test ID</th>
<th>Test Name</th>
<th>Description</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.01</td>
<td>LoginTest</td>
<td>Access the login page and login using an interior designer account</td>
<td>Accepted</td>
</tr>
<tr>
<td>B.01</td>
<td>ShowTransactionList</td>
<td>Displays a list of designer deals</td>
<td>Accepted with condition Rejected</td>
</tr>
<tr>
<td>B.02</td>
<td>ShowDetailTransaction</td>
<td>Show details of designer transactions</td>
<td>Accepted with condition Rejected</td>
</tr>
<tr>
<td>B.03</td>
<td>InsertContractForm</td>
<td>Receive offers and fill out employment contract forms by interior designers</td>
<td>Accepted</td>
</tr>
<tr>
<td>B.04</td>
<td>WaitingForConfirmation</td>
<td>Waiting for confirmation and payment from clients</td>
<td>Accepted</td>
</tr>
<tr>
<td>B.05</td>
<td>DesignPage</td>
<td>Conduct 2D design, conduct 2D design adjustment meeting, make 3D design, make 3D design adjustment meeting by interior designer</td>
<td>Accepted</td>
</tr>
<tr>
<td>B.06</td>
<td>UploadDesign</td>
<td>Uploading interior design results by interior designers</td>
<td>Accepted</td>
</tr>
<tr>
<td>B.07</td>
<td>FeedbackPage</td>
<td>Show project appraisal</td>
<td>Accepted</td>
</tr>
<tr>
<td>B.08</td>
<td>WithdrawIncomePage</td>
<td>View the total income earned and make withdrawals of income by interior designers</td>
<td>Accepted</td>
</tr>
<tr>
<td>C.01</td>
<td>BiddingPage</td>
<td>Accessing the bidding menu</td>
<td>Accepted</td>
</tr>
<tr>
<td>C.02</td>
<td>ShowProjectDetail</td>
<td>Select a specific project and view the details of the project</td>
<td>Accepted</td>
</tr>
<tr>
<td>C.03</td>
<td>InsertContractForm</td>
<td>Making offers and filling out employment contract forms</td>
<td>Accepted</td>
</tr>
<tr>
<td>C.04</td>
<td>ConfirmationPage</td>
<td>Waiting for confirmation from the client</td>
<td>Accepted</td>
</tr>
<tr>
<td>C.05</td>
<td>DesignPage</td>
<td>Conduct 2D design, conduct 2D design adjustment meeting, make 3D design, make 3D design adjustment meeting by interior designer</td>
<td>Accepted</td>
</tr>
</tbody>
</table>
Based on the results of user acceptance tests carried out on five interior designers, three out of five designers accept the entire process from the design Order service. At the same time, the other two designers accept conditionally in the ShowTransactionList and ShowDetailTransaction test cases. So that out of 17 test cases, there are 15 test cases with the percentage accepted as much as 100%, and two other test cases, namely ShowTransactionList and ShowDetailTransaction, each receiving 80% acceptance percentage.

4. CONCLUSION

Based on the research results conducted regarding the development of a website-based front-end application using the waterfall method, it can be concluded that The Rekaruang application can become a place for interior designers to get clients through design messaging services. Design messaging services that are built to suit the needs of designers. In this application, designers can receive design orders from specific clients or provide design offers. The test results using the user acceptance test show that three out of five interior designers have accepted the entire process for the design Order service. The other two accepted conditions for several processes on the design Order service to help get clients.

The front end of the Rekaruang application was successfully built using the waterfall development method. In the application of the waterfall method, each phase only runs once. The development phase starts from the requirements phase when defining requirements, and then the results are processed into business processes, system design, and application design in the design phase. Then the design results are implemented in the implementation phase, and front-end testing is carried out in the testing phase. The results of the test will be used as suggestions and input for further development.

Implementation of the interface that has been successfully built on the Rekaruang application, using the Vue.js framework that emphasizes using the latest and most popular technologies. Vuetify is used as a CSS library provided directly by Vue.js. The implementation process uses components that have been provided by Vuetify and components that Rekaruang specially customizes. After that, the functionality of each component and implementation using JavaScript.
REFERENCES


