

# User-Centered Design for E-commerce Prototyping (A Re.wood Case Study)

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## Abstract

Re.wood is a wooden furniture business located in Tinggarjaya Village, Jatilawang District, Banyumas Regency that offers a variety of furniture products, ranging from chairs to wall hangings, to beautify interior and exterior spaces, but still has a limited market share. Re.wood currently uses a conventional sales process that is less effective and lacks information for customers, which causes a lack of sales levels for Re.wood. Designing a system before entering the system development stage is a must because it ensures that the resulting solution is relevant and effective in overcoming the problems users face. The problem can be solved by designing User Interface and User Experience of web-based e-commerce applications. The design method used by researchers is the user-centered design method. User-centered design is a method of focusing on the needs of potential users in the system design stage or process. The results of designing the user interface and user experience only include the user interface developed using Figma. The resulting website produces menus such as Home Page, login, Shop, Cart, Search, and Profile. This evaluation utilized the User Experience Questionnaire (UEQ) methodology to assess various aspects of the system. The resulting values (1.55 for Efficiency, 1.54 for Attractiveness, 1.49 for Clarity, 1.33 for Accuracy, 1.5 for Stimulation, and 1.15 for Novelty) represent the average UEQ calculation figures for each dimension. In other words, these numbers correspond to the results obtained through the UEQ, which helps evaluate user experience in terms of efficiency, attractiveness, clarity, accuracy, stimulation, and novelty. UEQ uses a Likert scale to measure user experience, and the resulting values show that the system performs well in most aspects. These findings indicate that the prototype meets the needs and provides a satisfying user experience.

**Keywords:** E-commerce, Prototype, User-Centered Design, User Experience Questionnaire, User interface

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## I. INTRODUCTION

THIS development of the internet is a much-needed phenomenon today. The Internet is an intermediary that connects millions of personal computers around the world, allowing for unlimited communication and information exchange. Around the world, allowing for unlimited communication and information exchange. The Internet facilitates communication between computers without distance barriers, with Transmission Control Protocol (TCP) and communication infrastructure such as satellites, telephones, and radio packets [1]. With this internet, anyone can exchange information with each other, so that it can support all needs, one of which is the business world.

The competitive business sector is projected to benefit greatly from the adoption and use of Internet technology. Companies that can adopt information technology into their business can participate in the competition. The utilization of electronic commerce (e-commerce) to promote various goods or services,

both physical and digital, is one form of technology application to increase product competitiveness and sales[2].

Re.Wood is a wood furniture business founded by Mr. Sudir Susanto. Re.Wood operates in Tinggarjaya Village, Jatilawang District, Banyumas Regency. Re.Wood sells a variety of furniture, ranging from chairs to wall hangings, to beautify the interior or exterior, which still has a limited market share.

Based on the results of interviews with the owner of Re.Wood, the marketing system used by Re.Wood currently still uses conventional methods by marketing finished products to customers who visit the production site and by word of mouth or via WhatsApp. The marketing system, in this way, is less effective because the resulting market tends to be smaller, besides that, many of the customers are less informed about various types of wood and new products.

The interface acts as a channel between the user and the application that allows them to interact with each other[3]. Each application has a unique user interface based on its needs and functions. The interface is also known as one of the important factors to improve user satisfaction and user experience, but the interface must be attractive and easy to use[4]. Designing a system before entering the system development stage is a must because it ensures that the resulting solution is truly relevant and effective in overcoming the problems faced by users[5].

The expression of user experience is the result of the user's reaction when using a product, which includes things like what the user feels when using the product[6]. User experience is influenced by aspects of the ease of the product to be understood and learned by users, such as the level of difficulty and complexity of the product[7]. In addition to product quality, the user interface in an application or web can improve user experience [8].

Poor systems and service quality affect user attractiveness, which results in hindering user experience in several ways, both in terms of practical quality aspects, such as users failing to achieve their goals quickly and efficiently and in terms of failing to meet user expectations [9]. As a result of this, users can become bored and lose enthusiasm for using the product. Therefore, to prevent this from happening, it is necessary to research the User Interface design and User Experience of the Re.wood web-based E-Commerce Application using the User Centered Design method, and it is necessary to evaluate the level of user experience to ensure the system can fully meet the needs and expectations of users using the UEQ (User Experience Questionnaire) method. The goal of this research is to produce a design for the user interface and user experience of website-based Re.Wood e-commerce by applying the user-centered design (UCD) method. This research aims to evaluate the level of user experience to ensure the system can fully meet the needs and expectations of users using the UEQ (User Experience Questionnaire) method.

## II. RESEARCH METHOD

The methodology in this research is a mechanism for investigating research problems and explaining the steps used in this research by referring to the User Centered Design method. The picture of the research method can be seen in Fig. 1:

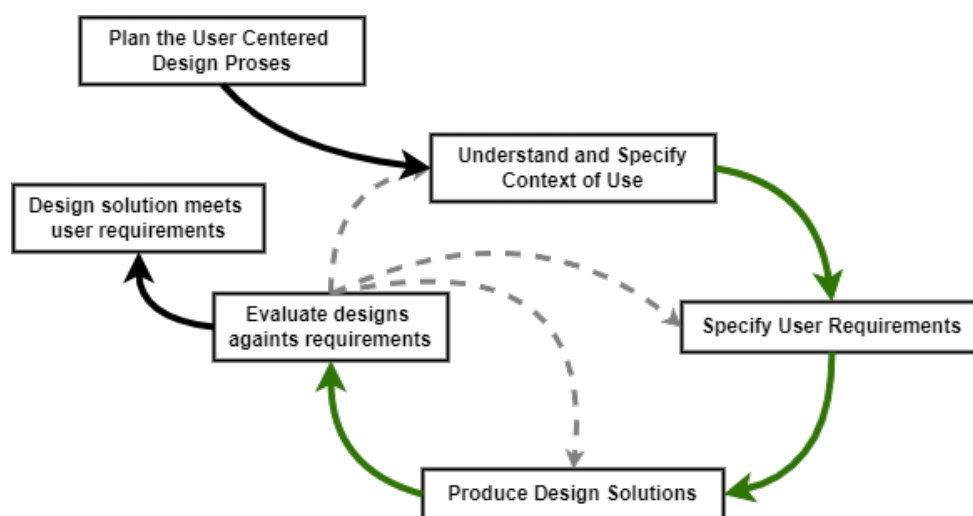


Fig. 1. Research Flowchart

### A. Plan the User-Centered Design Process

Several research preparations were made at this stage, including a more thorough literature review in accordance with the methodology used and getting assurance that the stages to be completed were user-centered[10].

### B. Understand and Specify Context of Use

User needs and demands are the main emphasis at this stage. At this stage, identification of the user is carried out. The results of this stage will be able to describe the goals and conditions that users experience when using the product. This stage is also useful for collecting and evaluating information about the user context, which can then be used for the next system. This stage involves several processes, including identifying potential users, conducting interviews, creating user personas, and defining user needs and pain points[10].

The author conducted observations to determine potential users, which resulted in many criteria. The Fig. 2 displays the criteria for potential users.

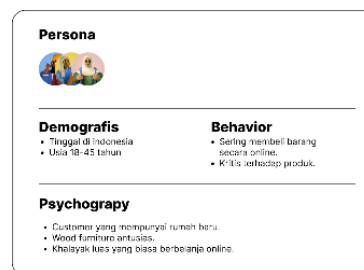


Fig. 2. Criteria for Potential Users

To understand user needs and pain points related to online furniture shopping, structured interviews were conducted with potential users. A pre-defined list of questions guided the interviews, focusing on:

1. Information gathering:  
How have you found information on the wooden furniture you wish to purchase?
2. Online research habits:  
When purchasing wooden furniture, do you frequently conduct internet research? If so, which websites do you frequently use?
3. Website/app preferences:  
When purchasing wooden furniture, how do you like the look and functionality of the website or e-commerce application?
4. Challenges faced:  
Have there ever been issues or challenges with purchasing wooden furniture online? If so, what was challenging or inconvenient about it?
5. Importance of reviews:  
How significant is it to you to read customer endorsements or reviews before making a purchase of wooden furniture from an online retailer?
6. Preferred payment methods:  
When purchasing wooden furniture online, which payment options are your favorites? Which payment methods—credit card, bank transfer, or other—do you like to use?
7. Warranty importance:  
How crucial is it to you to have a quality guarantee or warranty for the wooden furniture you purchase online?
8. Delivery preferences:  
How would you wish the wooden furniture you purchased to be delivered? Which would you prefer: in-store pickup or direct delivery to your home?
9. Return/exchange process:  
Should there be an issue with the wooden furniture you purchased, are there any particular preferences you would want to see followed in terms of the return or exchange procedure?
10. Brand trust factors:

How much do you trust the brand or online retailer from whom you purchased your wooden furniture? What aspects of an e-commerce platform inspire confidence or mistrust in you?

11. Past online shopping experiences:

Did you have any bad experiences when you were shopping online for furniture? If so, what? What if not?

The interview findings are also gathered by the author and utilized to compile a list of the main issues that create user personas, user needs, and pain points.

C. *Specify User and Organizational Requirements*

Specifying user requirements is the next step after understanding, determining, and collecting information from users. There are three steps to be taken, namely creating a site map, user flow, and wireframe. The first step is to create a site map, which is a visual representation of the website structure that can help users in the operation of the website. The next step is to create a user flow, which is the user's workflow in the system or application to complete the task. The last step is to create a wireframe. This wireframe serves as the initial framework for the system interface design and will be used as a reference for the prototype. Examples of components to compose a wireframe include buttons, images, text, input text, radio buttons, and dropdowns [10].

D. *Product Design Solution*

The next step is to leverage the user requirements to produce a design solution in the form of a prototype. The author uses the wireframe as a reference while developing the interface design. The author is using Figma, a tool, to develop the user interface for the website[10].

E. *Evaluate Design Against Requirement*

During this testing phase, the User Experience Questionnaire (UEQ) will be utilized to gauge the level of user experience. The results of the user experience measurement will be looked at in this step. The purpose of this questionnaire is to evaluate the perceived user experience rapidly. The UEQ assessment method employs six grade systems: attractiveness, clarity, efficiency, correctness, stimulation, and novelty. The UEQ consists of 26 question components and seven response options[11].

III. RESULTS AND DISCUSSION

This section will adhere to the research flow as illustrated in the methodology flowchart. The primary objective of this project is to develop and implement a web application prototype Re.wood.

A. *Understand and Specify Context of Use*

After conducting interviews with four potential users, different responses were obtained. Based on the data that has been obtained, pain points (core problems) are found, which are addressed in Table I.

TABLE I. PAIN POINT

No	<i>Pain Point</i>
1	Difficulty finding the right and in-depth information about the desired product
2	It is difficult to find a trustworthy platform with relevant information.
3	Difficulties with payment procedures, poor delivery, or not receiving the expected warranty.
4	It is difficult to find relevant information on reviews or testimonials.
5	Unable to use preferred payment methods, getting or being charged extra fees, and experiencing issues with online payment security.
6	Not receiving the promised warranty or quality assurance and difficulty in finding products with a suitable warranty.
7	Find problems with the exchange or return procedure, or feel uncomfortable with the return policy.

The list of pain points was then used to create user personas of potential users to get a point of view that suits the user's needs. One user persona has been created, which contains demographics, goals, online shopping habits, and pain points.



Fig. 3. User Persona

Fig. 3 shows the user persona of a man who is a 29-year-old married employee who lives in Banyumas. The persona is interested in finding high-quality wooden furniture with detailed product information. The persona's online shopping habits include:

1. Surfing Google with specific keywords related to wooden furniture.
2. Reading user reviews before buying.
3. Favoring sites with clear navigation and detailed product descriptions.
4. Using the filter feature to reduce product selection.
5. Preferring well-known sites such as Ikea, Shopee, Tokopedia, and Lazada.
6. Preferring direct home delivery.
7. Appreciating secure payment methods.
8. Expecting a quick and easy returns process.

The persona's pain point is that they have difficulty getting detailed product information and often receive damaged products due to poor shipping conditions.

Next is determining user needs and pain points. User needs and pain points are generated from the list of core problems that have been obtained in the previous step and the user personas of prospective users. The set of desires is combined to form user needs. The set can be implemented as features for the website to be developed. Problems that customers experience when using similar programs or sites are referred to as pain points. User needs and pain points are addressed in Table II.

TABLE II. USER NEED AND PAIN POINT

<i>User Need</i>	<i>Pain Points</i>
Ease of viewing product details through videos.	Users prefer to view product videos, but not all sites provide this feature.
Clear navigation and complete product descriptions.	Users have difficulty with navigation and unclear product information.
Easy, fast and user friendly payment process.	Users experienced difficulties with the complicated payment process on some sites.
Possibility to customize products according to user preferences.	Users prefer a wider range of customization options that not all sites offer.
Easy access to reviews and testimonials from previous customers.	Users look for reviews and testimonials to gain clarity before buying.

Table 2 showcases a comparison between user needs and pain points, highlighting potential issues faced by users on certain websites. User Needs outlines desired features and functionalities that users seek on online platforms. For instance, they want easy access to product details, clear navigation, a user-friendly payment process, customization options, and reliable customer reviews.

Pain Points are the negative experiences encountered by users. These include a lack of product videos on websites despite user preference. Difficulties in website navigation and unclear product information. Complicated payment processes on some sites. Limited customization options are offered by websites. Absence of readily accessible customer reviews and testimonials. Essentially, the table illustrates a gap between user expectations and the actual experiences provided by some websites. It emphasizes the importance of addressing these pain points to enhance user experience.

**B. Specify User and Organizational Requirements**

There are three steps at this stage, namely creating a sitemap, user flow, and wireframe.

At this stage, a sitemap is created to facilitate the creation of the user interface design. The purpose of making a sitemap is to facilitate the layout of each page on the menu and sub-menu of the Re.wood website. The sitemap image can be seen in Fig. 4.

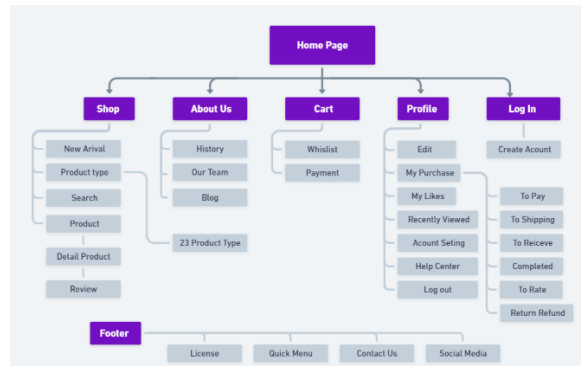


Fig. 4. Site Map

User flow is the steps that users must take to use the product to solve problems. User flow on the Re.wood website can be seen in Fig. 5.

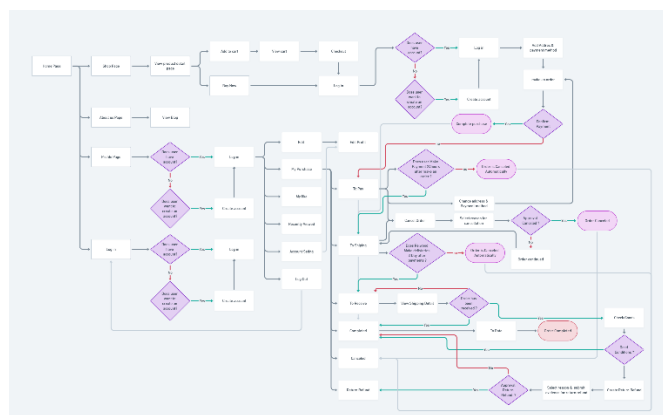


Fig. 5. User Flow

On the store page or home page, the consumer can peruse product details or the blog. If customers choose to make a purchase, they may see their basket or continue shopping after adding the item to it. From the cart, they go to the checkout. If they already have an account, they log in; if not, they may create one or continue as a guest. After they create their account, they submit their payment method and address. After that, they pay for their order. After making a payment, the user may view their history of purchases and favorite products. The user can choose to continue with the order or to restart it. The directive is still in effect. Following that, the customer may monitor their order and view shipment details. The user can inspect and assess the products after they have been delivered. The buyer may return the item for a refund if there is a problem, together with supporting documentation and a message outlining the reason for the return. After assessing the request, the system will determine whether to allow or reject the return and refund.

Wireframes are rough designs or sketches intended to organize objects on the display before the actual design process.

The wireframe of this research is as follows in Fig. 6, Fig. 7, Fig. 8



Fig. 6. Wireframe Home Page

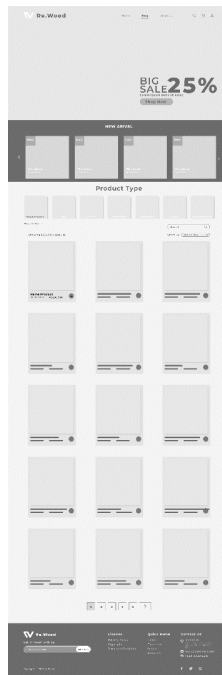


Fig. 7. Wireframe Shop Page

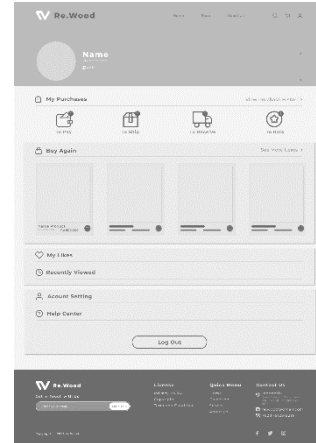


Fig. 8. Wireframe My Profile

C. Product Design Solution

The author now just goes over the interface design for the Re.wood website, which is divided into four main parts according to user needs. The Home Page, Shop, About Us, and My Profile are the three main sections of the Re.wood website. The user interface of the Re.wood website looks like this:

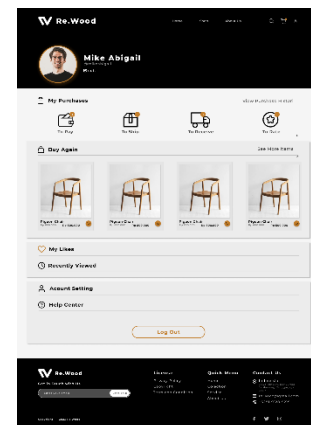
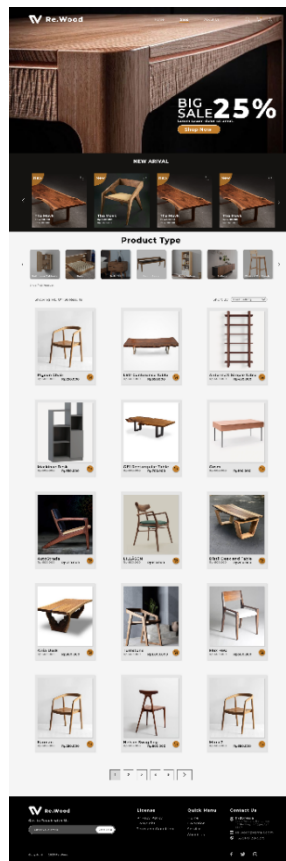
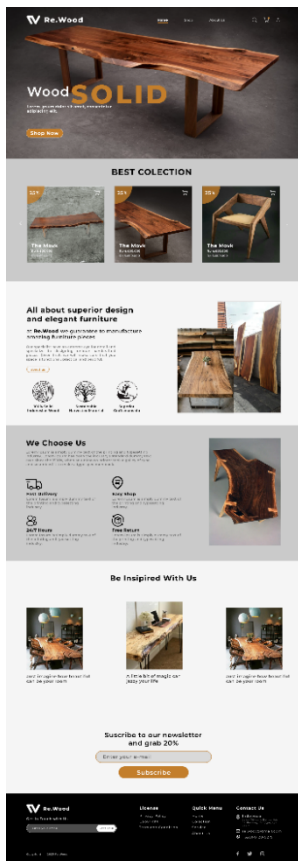


Fig. 11. Prototype My Profile



Fig. 9. Prototype Home Page

Fig. 10. Prototype Shop Page

*D. Evaluate Design Against User Requirement*

At this stage, a questionnaire was distributed to 20 respondents who were potential users of the Re. Wood website. The questionnaire was conducted using the User Experience Questionnaire (UEQ) method. Furthermore, the answers from each respondent were entered into the UEQ tools excel. After being entered into the UEQ tools, the respondent's answer data will be converted into a row automatically, as in Table III.

TABLE III. CONVERSION DATA

Conversion Data
1 => -3
2 => -2
3 => -1
4 => 0
5 => 1
6 => 2
7 => 3

After being entered into the existing Excel tools, it is automatically converted according to Table 3 according to the weight of the items on each item and then processed to get an average based on the UEQ scale. The diagram of the average results of the UEQ scale of the Re.Wood's website can be seen in Table IV and Table V.

TABLE IV. UEQ SCALES

Scale	Mean	Variance
Attractiveness	1.542	1.52
Perspicuity	1.488	1.31
Efficiency	1.550	1.37
Dependability	1.325	1.17
Stimulation	1.500	1.55
Novelty	1.150	1.82

TABLE V. AVERAGE UEQ

Scale	Mean	Comparisson to benchmark
Attractiveness	1.54	Above average
Perspicuity	1.49	Above Average
Efficiency	1.55	Good
Dependability	1.33	Above Average
Stimulation	1.50	Good
Novelty	1.15	Good

Attractiveness gets an average of 1.54, which means above average, and clarity gets an average of 1.49, which means above average, efficiency gets an average score of 1.55, which means good, accuracy gets a score of 1.33, which means above average, stimulation gets a score of 1.5 which means good and novelty gets an average score of 1.15 which means good.



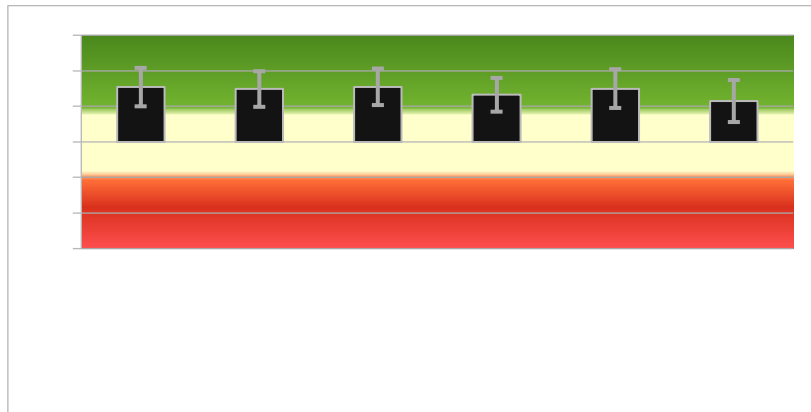


Fig. 12. Average UEQ graph

Fig. 12 is a graph of the average value of the six UEQ scales. The division of measurements in the UEQ method are divided into 3 (three) areas: a positive scale that ranges from 0.8 to 3, a neutral scale ranging from -0.8 to 0.8, and a negative area scale that ranges from -0.8 to -3. In the figure above, it can be seen that all scales are above the green border. This shows that the measurement scale is generally at a good level. Attractiveness, clarity, efficiency, accuracy, stimulation, and novelty are the constituent parts of the scale. The elements of attractiveness, efficiency, and stimulation received the highest evaluation, while the novelty points received the lowest.

Fig. 13 displays the benchmark graph created from the questionnaire data using the user experience questionnaire (UEQ) calculation tool. The benchmark classifies a product into five categories (per scale):

- Excellent: In the range of the 10% best results.
- Good: 10% of the results in the benchmark data set are better, and 75% of the results are worse.
- Above average: 25% of the results in the benchmark are better than the results for the evaluated product, and 50% of the results are worse.
- Below average: 50% of the results in the benchmark are better than the results for the evaluated product, and 25% of the results are worse.
- Bad: In the range of the 25% worst results.

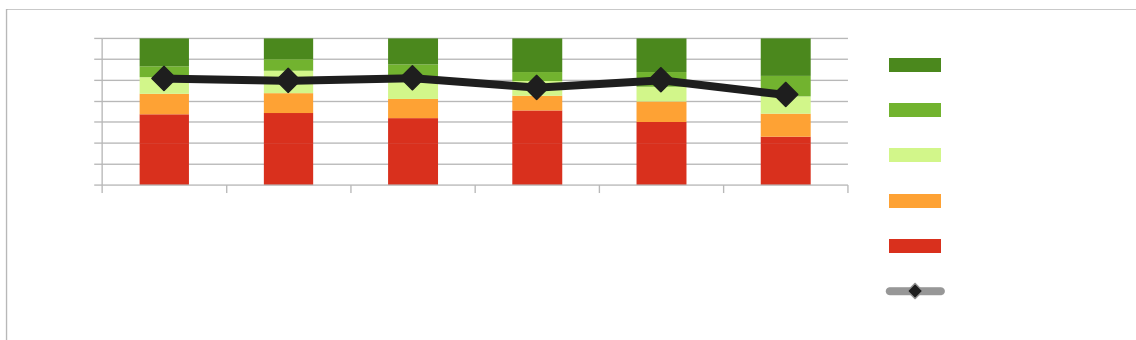


Fig. 13. Benchmark Graph

According to Fig. 13 of the benchmark graph above, this product has a generally high average across several categories. The highest average efficiency of all categories is 1.55. This shows that the product works with high efficiency and minimal errors. This shows Re.Wood website's excellent efficiency and low error rate.

The category averages of clarity and attractiveness were 1.49 and 1.54, respectively, which are strong categories alongside efficiency. This shows that the product is easy to use and entertaining to use. The averages of 1.33 and 1.50 for the accuracy and stimulation categories are rather high. This suggests that the product offers a satisfying and reliable user experience.

However, the benchmark graph above shows that this Re.Wood's website lacks innovation and uniqueness. With an average of 1.15, the novelty category has the lowest average of all categories. This

implies that compared to other e-commerce websites, the Re.Wood websites may not be that new or different.

#### IV. CONCLUSION

Re.wood currently uses a conventional sales process that is less effective and lacks information for customers, so that from this it causes a lack of sales levels from Re.wood. Designing a system before entering the system development stage is a must because it ensures that the resulting solution is truly relevant and effective in overcoming the problems faced by users. The problem can be solved by designing the User Interface and User Experience of web-based e-commerce applications, which can help the system development team later in developing the Re.Wood e-commerce.

This research adopted a user-centered design (UCD) methodology to develop the User Interface (UI) and User Experience (UX) designs for the application. This approach prioritizes user involvement throughout the design process, ensuring that the final product aligns with their needs and expectations. By incorporating user feedback at each stage, from initial planning to final testing, the UCD method helped to ensure the application's usability, effectiveness, and overall user satisfaction. The steps in user-centered design are the first to plan the user-centered design process. Planning the user-centered design process is a preparatory stage carried out before research, including literature studies to understand research methods and clarify problems. Second, understand the context of use, which aims to collect and evaluate information about the user context. Third, two steps must be taken at the specific user and organizational stage, such as creating a site map and user flow. Fourth is the product Design Solution, which is the solution design stage through wireframes and prototypes. Fifth, which is the last stage, namely evaluating design against requirements, after the UI is made at the previous stage, it will be evaluated using the User Experience Questionnaire (UEQ) method.

At the evaluation design against user requirements stage, the results of the Re.Wood website's prototype was evaluated using a user experience questionnaire (UEQ). The results of the evaluation show that the average value on the highest efficiency aspect is 1.55 and gets a good category. Attractiveness gets an average of 1.54 and gets an above-average category, and clarity gets an average of 1.49 gets an above-average category, accuracy gets a value of 1.33, gets an above-average category, stimulation gets a value of 1.5, gets a good category and novelty gets an average value of 1.15 which means good. From these results, it is known that the prototype has met the needs of Re.wood.

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