Usability Evaluation on Website Using the Cognitive Walkthrough Method

1st Yuni Sugiarti
Faculty of Science and Technology
UIN Syarif Hidayatullah Jakarta
Jakarta, Indonesia
yuni.sugiarti@uinjkt.ac.id

2nd Salma Riyanti Hanifah
Faculty of Science and Technology
UIN Syarif Hidayatullah Jakarta
Jakarta, Indonesia
salma.hanifah20@mhs.uinjkt.ac.id

3rd E. Oos M. Anwas
National Research and Innovation
Agency
Jakarta, Indonesia
ence002@brin.go.id

4th Sumanto
Faculty of Technology and Information
Bina Sarana Informatika University
Jakarta, Indonesia
Sumanto@bsi.ac.id

5th Saipul Anwar
Faculty of Engineering and Technology
UIN Syarif Hidayatullah Jakarta
Jakarta, Indonesia
saipul@tau.ac.id

6th Anggraeni Dian Permatasari
National Research and Innovation
Agency
Jakarta, Indonesia
anggraeni.dian.permatasari@brin.go.id

7th Evy Nurmiati
Faculty of Science and Technology
UIN Syarif Hidayatullah Jakarta
Jakarta, Indonesia
Evi.nurmiati@uinjkt.ac.id

Abstract— **Usability testing conducted on the PT Beli Jelantah Trafiguras website was carried out with the aim of identifying and analyzing the level of usability of the website, finding various new problems related to usability that are felt directly by website users, as well as providing recommendations for improvements in the form of analysis that can improve design and functionality on linked websites. The method used in this research is the Cognitive Walkthrough method with 10 (ten) respondents. The results of this study indicate that the related website still has several interface problems, such as unclear colors and font sizes, too many and ambiguous logos, incomplete registration instructions, and so on. The linked website also has a medium usability level with an effectiveness level of 67.5% and an efficiency level of 57.9%.**

Keywords—effectiveness, efficiency, usability testing, website

I. INTRODUCTION

Processing used cooking oil into biodiesel is one of the efforts that can be made to reduce the negative impact of waste cooking oil on the environment [1]. Used cooking oil itself is used cooking oil resulting from the use of cooking oil in cooking [2]. Waste used cooking oil that is not disposed of properly can cause environmental damage such as contamination of water and soil [3]. PT Beli Jelantah Trafiguras is a company engaged in the field of Sustainability and Climate Tech that can utilize and convert used cooking oil (UCO) into new goods of use value such as soap, candles, and biodiesel. PT Beli Jelantah Trafiguras already has thousands of customers spread across Jakarta, Bogor, Depok, Tangerang and Bekasi who will exchange their used cooking oil regularly and periodically. With so many customers, PT Beli Jelantah Trafiguras needs a technology that can help expand their reach and promote their value. One of the technologies that can be used for this is a website. The website itself is a page or a collection of pages can be accessed via the internet and contains information or content displayed in the form of text, images, videos, and the like [4]. This form of multimedia content is attractive to the current generation [5].

The website of PT Beli Jelantah Trafiguras (https://belijelantah.com) is still being used and running, so it requires some evaluation to make it easier for users to find the information they need. This is because the main purpose of the linked website is to introduce PT Beli Jelantah Trafiguras and provide information about the benefits of collecting used cooking oil, such as providing illustrations related to customer contributions in saving the aquatic environment and reducing carbon emissions based on used cooking oil collected. Much research has been conducted on the web [6] Like a set of blueprints used to build a house [7]. [8] but one that focuses on the characteristics of the web has not yet been carried out.

User Experience (UX) is growing in significance and influencing the needs and expectations of users [32]. Usability testing is a method that can be used to evaluate a product by testing it directly based on user experience [9]. One of the usability testing methods that can be used is cognitive walkthrough, which is a method that can be used on websites or mobile applications and used in a similar way to novice users [10]. In addition, cognitive walkthrough can also be used as a usability testing method that allows researchers to evaluate each step taken by respondents to complete the task scenario [11].

According to one study using the cognitive walkthrough method to find out difficulties in using the Zoom application [12], this method only involves 5 respondents and has been able to show that the use of the 4 main features on Zoom has been carried out well, but there are still difficulties in the second scenario, namely creating a breakout room in a video meeting group conference. In another study, the cognitive walkthrough method can also be used to evaluate the E-Learning design of the UKMC Information Systems Study Program and involve 28 respondents [13]. This study shows that as a whole the UKMC Information System E-Learning users are satisfied with the system used, but there are still some problems in the design that hinder the efficiency and effectiveness of users.

In another study, the cognitive walkthrough method This is used to identify and analyze the problems faced by users on the LatihID website. This research involved 10 respondents and the research results showed that the success

rate of users in completing tasks reached an average of 86.67%, with an average time needed by users to complete all tasks is 211.5 seconds. In addition, this study provides recommendations for improvements to the edit profile page, list of modules, and module materials so that the LatihID website becomes more user-friendly [14].

In another study conducted to evaluate self-management mobile health (mHealth) applications in chronic disease management and evaluate effectiveness and efficiency using the cognitive walkthrough method, this involved 12 respondents. This study identified 26 usability problems based on the severity of the problem, the number of problems [15]. While research with 20 respondents which aimed to evaluate the usability of a USB Cable equipped with SMART Universal Serial Bus (USB) technology resulted in that the average user success in completing tasks using the SMART USB Cable was 95.5% with an average time of average 50 seconds. In addition, this study also found several usability problems with USB Cable SMART, such as buttons that are too small and hard to press, connection indicator displays that are not clear, and difficulties in distinguishing USB Cable SMART from ordinary USB Cables [16].

Based on the explanation above, it can be concluded that the cognitive walkthrough method can assist PT Beli Jelantah Trafiguras in evaluating the extent to which the related website can assist users in finding the information they need and completing the tasks given. Apart from that, this cognitive walkthrough method can also evaluate user experience when using a website so that related companies can determine which areas of the website need improvement or changes. The results of this research will provide several recommendations that can help companies to improve website design and functionality, so as to improve user experience and help companies achieve their business goals.

Based on the description above, the author, who is a student of the Information Systems study program, Faculty of Science and Technology, Syarif Hidayatullah State Islamic University Jakarta, tried to conduct research with the title "Usability Evaluation on PT Beli Jelantah Trafiguras Website Using the Cognitive Walkthrough Method ".

II. RELATED WORK

A. Usability

The term usability comes from the word usable which means it can be used properly. This use can be categorized as good if a failure is not found or can be minimized and eliminated with the aim of providing benefits and satisfaction for users [17]. Usability is also related to the extent to which a product can be used by users to achieve specified goals in an efficient, effective and satisfying manner. The context of use involves various elements, such as the task to be performed, the characteristics of the user, the equipment used, and the environment in which the product is used [14] All of these factors can affect the use of the product in an actual working context.

B. Usability Testing

Usability testing is a test method used to evaluate digital products by involving users as testers. In this test, a test scenario is created to test a product system with the

assumption that the user is someone who has never used it before. The purpose of usability testing this is to identify problems that arise during the use of product systems, as well as collect qualitative and quantitative data to evaluate user satisfaction with related product systems [18].

Meanwhile, according to [19], Usability testing is used to evaluate the usability of a system by testing a product system through predetermined tasks. In this test, respondents will perform these tasks thereby providing first-hand information about the problems they encounter during the usability testing process. This information is then recorded and evaluated for future application development.

C. Cognitive Walkthrough

Cognitive walkthrough is a usability testing method that involves examiners in evaluating the steps taken by respondents when carrying out predetermined tasks. The goal is to identify some of the problems associated with usability of a product system [20]. Cognitive walkthrough method This can be done using various forms of textual description , such as action sequences, sketches, paper prototypes, and existing products [21]-[24] .

According to [17], method This cognitive walkthrough is centered on the point of view of new users or users who have limited experience in using a related product system, with a focus on understanding the design of the system. Meanwhile, according to [12], cognitive walkthrough is a structured, task- based analytical method used to evaluate the usability of a product by following a linear task flow that focuses on system learning ability (learnability), and is designed to find out whether new users can easily use the product system .

D. Respondent Selection

According to [25], in carrying out usability testing, the number of respondents involved can affect problem identification usability. Usability testing involving 5 (five) respondents is sufficient to find usability problems with a relatively similar number of tests involving a larger number of respondents. This can be seen more clearly in Figure 1 listed below.
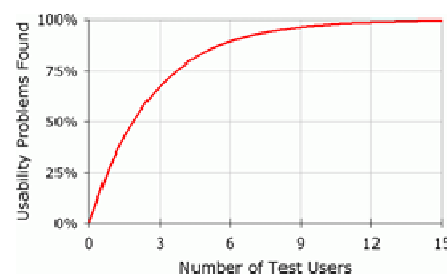

Fig. 1. Graph of Respondents Comparison of Usability Problems

The graph above illustrates that involving 5 (five) respondents in usability testing can identify about 85% of usability problems. The graph also shows that at least 15 (fifteen) respondents are needed to identify 100% of usability problems. Testing with 5 (five) respondents provides the most optimal ratio between the benefits and costs incurred in usability testing. In usability testing with the cognitive walkthrough method, the testers and respondents involved are often part of the development team who act as reviewers, designers, personnel usability, as well content expert. According to [26], the more respondents involved in

usability testing, the fewer problems identified because the test team will face the same problem over and over again. Therefore, usability testing involving 5 (five) respondents is sufficient.

Based on the explanation above, it can be concluded that usability testing using the cognitive walkthrough method can involve a minimum of 5 (five) respondents and a maximum of 15 (fifteen) respondents with results that are not much different and significant. Therefore, in this study the researchers decided to use as many as 10 (ten) respondents in conducting usability testing on the PT Beli Jelantah Trafiguras website using the cognitive walkthrough method.

E. Sampling Technique

According to the sampling technique This can be divided into 2 (two) groups, namely probability sampling and non - probability sampling also known as judgment sampling. Probability sampling is a sampling method where each data has the same opportunity to be selected as a sample. Thus, the probability of each element being selected as a sample will not be hampered in research. Wait a minute non - probability sampling is a sampling method in which each data has a different chance of being selected as a sample. Meanwhile, according to [27], there are several types of methods that can be used in non - probability sampling, such as purposive sampling, quota sampling, systematic sampling, saturated sampling, incidental sampling, and snowball sampling.

The explanation above, it can be concluded that the sampling technique is a method used to select samples in a study. In this study, researchers used a non-probability sampling technique with purposive sampling. Where purposive sampling is a sampling method that specifically selects samples that meet certain objectives and criteria [25]. The purpose of choosing this sample deliberately is so that the sample can function as an informant that represents the population effectively, making it easier for researchers to gather information related to the object of research.

F. Website

The website itself is a collection of pages that contain various digital information, either in the form of text, images or animations which can be accessed via the internet from various locations around the world. The website uses hyperlinks as a concept to connect these pages, so that users can easily explore the information available on the internet[29].

Meanwhile, according to [30], website is a term that refers to a group of web pages that are connected and related to one another. Usually, these web pages are joined in a domain name or sub domain on the World Wide Web (WWW) on the internet. Each website consists of several pages that are connected and share relationships. On a website there is usually a main page called the homepage and is in the top position, while other related pages are below it. The pages below the homepage are often referred to as child pages , which contain hyperlinks that point to other pages on the website [31].

III. RESEARCH METHODOLOGY

A. Method of Collecting Data

a) Observation

The observation this time was carried out on the research object to be tested, namely the PT Beli Jelantah Trafiguras website which can be accessed via the URL http://belijelantah.com. This website aims to introduce related companies and provide information about the benefits of collecting used cooking oil. There is a related website display which will later be used as test material for respondents, as shown in Figure 2.

Fig. 2. Initial View of the PT Beli Jelanttah Trafiguras Website

b) Interview

The interviews that will be conducted in this study will involve 10 (ten) respondents as participants. Respondents who were involved were selected by considering the criteria according to the research objectives. The respondent selection process will pay attention to factors relevant to the research topic and ensure variation in the backgrounds, experiences, and perspectives of the respondents.

In an effort to collect data, interview techniques will be conducted online using the Zoom Meeting platform. The use of this technology allows researchers and respondents to interact directly and in real-time, even though they are in different locations. By using online techniques or Zoom Meetings, this research can involve respondents from various places.

c) Study of literature

Through literature studies, researchers can explore existing knowledge, analyze different views, and develop a strong theoretical foundation for related research . There are several similar literatures that have been selected and selected by researchers for deeper analysis regarding the objectives, methods, and research results which also contain the advantages and disadvantages of each.

In order to differentiate this research from previous research, the researcher tries to apply the cognitive walkthrough method to a new environment, namely a website that has not been explored much. In addition, this research also involves the participation of various users in the cognitive walkthrough process, thus providing a rich and representative perspective on usability problems that may occur. Thus, this research can contribute to the development of

usability evaluation methods and open up new opportunities to improve design recommendations and user experience in various technological contexts.

B. Analysis Method Used

a) Cognitive Walkthrough Testing

1. Preparatory Stages

- Related reference search

- Determine the respondents to be tested

- Develop a task scenario along with the steps that must be carried out by the respondent

2. Execution Stages

b) Analysis of The Results

According to the error rate can be used to identify and measure the level of difficulty of a task scenario compared to other task scenarios. This helps in prioritizing the problems found and provides an understanding of the constraints that users face when interacting with the PT Beli Jelanttah Trafiguras website.

1. Success rate of task scenario completion
2. The amount of time it takes to complete task scenarios
3. The number of task scenario completion errors

c) Identification of Problems and Recommendation for Improvement

C. Researh Framework

The steps for conducting usability testing on the PT Beli Jelantah Trafiguras website are by using the Cognitive Walkthrough method. This method consists of several stages as shown in Figure 3, namely testing of the Cognitive Walkthrough method, analysis of test results, and recommendations for improving the PT Beli Jelantah Trafiguras website.
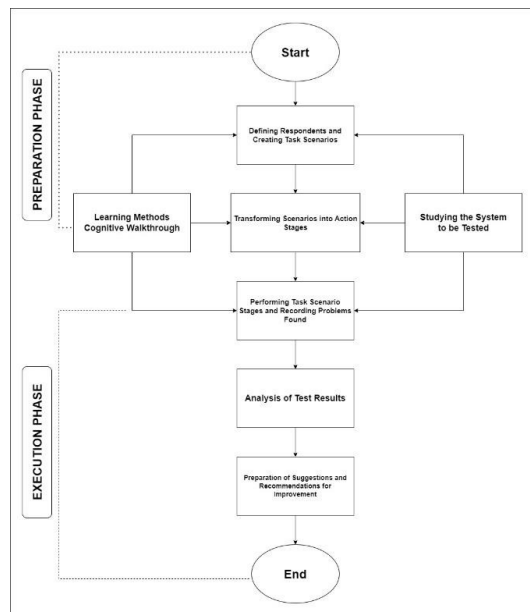
Fig. 3. Research Flowchart

IV. RESULT

A. Scenario Completion Rate

There are 4 (four) task scenarios tested in this study. The test results on the PT Beli Jelantah Trafiguras website are shown in Figure 4. which shows that not all respondents managed to complete the task scenario perfectly. To calculate the success rate of respondents in each scenario, researchers use the following formula:

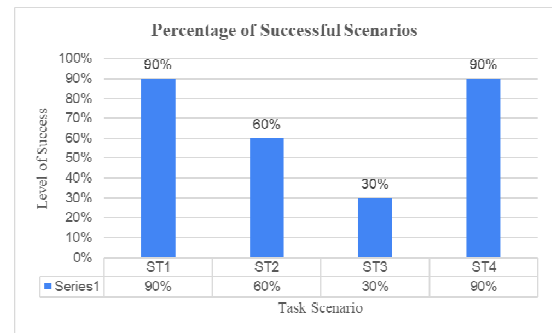$$\frac{\text{The Number of Respondents Who Succeed}}{\text{Number of Respondents}} \times 100\% \tag{1}$$

Fig. 4. Percentage of Successfully Completed Task Scenarios

Based on Figure 4, it can be seen that the average percentage of success in completing the task scenarios given to respondents is 67.5% . Next, the percentage of completion rate for each respondent is calculated for each given task scenario using the following formula:

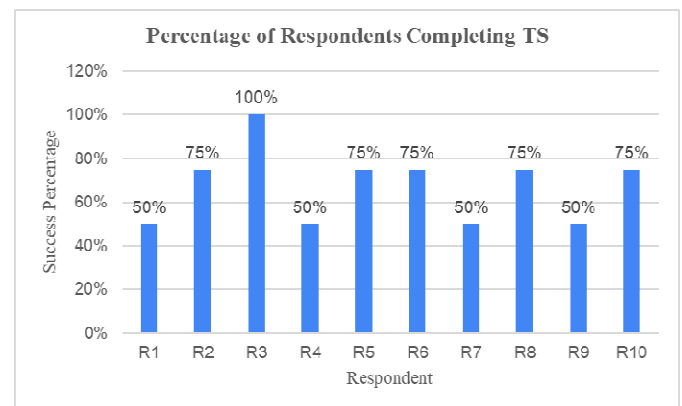$$\frac{\text{Number of Completed TS}}{\text{Number of TS}} \times 100\% \tag{2}$$

Fig. 5. Percentage of Respondents Completing Task Scenarios (TS)

Based on Figure 5, it can be seen that there was 1 (one) respondent who completed the task scenario well, while the other 9 (nine) respondents tended to make mistakes in several task scenarios. From the results of this usability test, the average task scenario that was successfully completed by respondents was 67.5%.

Figure 5 above also represents that there are still some deficiencies in the PT Beli Jelantah Trafiguras website so that users still feel confused and have difficulty understanding the various features and user views when accessing the related website. This caused some respondents to not be able to complete the task scenario properly.

B. Total Scenario Completion Time

Time refers to the total time required by respondents to complete each task scenario. This completion time includes the time recorded or recorded by the researcher for each task scenario, both successfully completed and unsuccessful. Duration is calculated based on the number of seconds needed by the respondent to complete each given task scenario. Information regarding the total time used by respondents to complete all task scenarios can be found in Table 1 below.

TABLE I.   RESPONDENT COMPLETION TIME (IN SECONDS)

R	TS1		TS2		TS3		TS4		Total
	W	Det	W	Det	W	Det	W	Det	
R1	47	S	59	F	51	F	55	S	212
R2	28	S	34	S	42	F	21	S	125
R3	34	S	61	S	26	S	18	S	139
R4	30	F	31	S	55	F	19	S	135
R5	28	S	28	S	33	F	19	S	108
R6	18	S	46	S	36	F	16	S	116
R7	86	S	52	F	77	F	60	S	275
R8	13	S	38	F	31	S	21	S	103
R9	67	S	31	S	89	F	53	F	240
R10	28	S	69	F	53	S	22	S	172

Based on Table 1 above, conclusions can be drawn regarding the longest time, fastest time, and average time used by respondents in completing each related task scenario given by the examiner. The Sign Up scenario has the fastest time of 13 seconds, the longest time of 86 seconds, and the average time of 37.9 seconds. The User Name Change scenario has the fastest time of 28 seconds, the longest time of 69 seconds, and an average time of 44.9 seconds. The article search scenario has the fastest time of 16 seconds, the longest time is 60 seconds, and the average time is 30.4 seconds. Scenario Adding Products to Cart Users had the fastest time of 13 seconds, the longest time of 86 seconds, and an average time of 37.9 seconds.

There are also results of a comparison of the amount of time the respondents spent completing each task scenario as shown in Figure 6 and Figure 7 below.
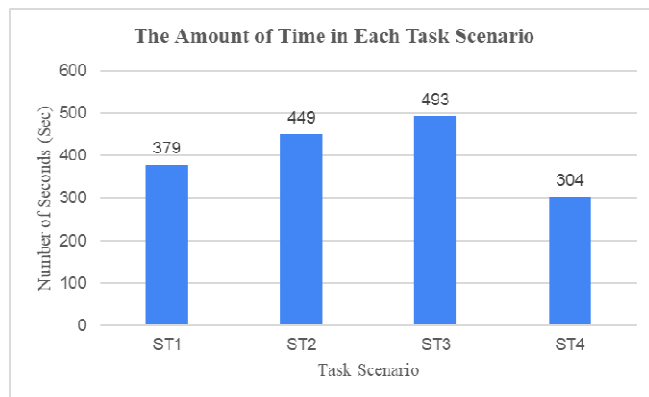

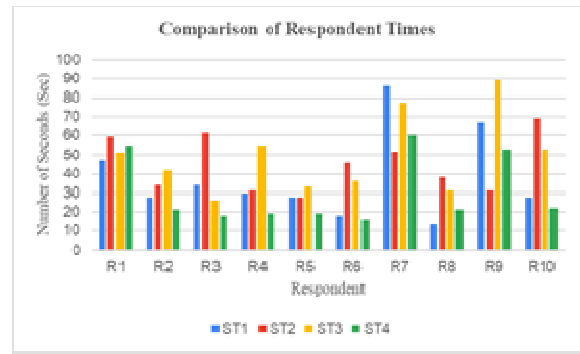Fig. 6.   Total Time in Each Task Scenario (TS)

Fig. 7.   Comparison of Respondents Total Time

After obtaining the total time from the tests carried out by the respondents as shown in Table 2, the next step is to calculate the Overall Relative Efficiency (ORE) by comparing the ratio of the time obtained from the respondents who successfully completed the task with the total time of the task scenario.

TABLE II.   TIME AND DESCRIPTION OF RESPONDENTS

Resp	TS1	TS2	TS3	TS4	Total	Average
R1	47	59	51	55	212	53
R2	28	34	42	21	125	31.25
R3	34	61	26	18	139	34.75
R4	30	31	55	19	135	33.75
R5	28	28	33	19	108	27
R6	18	46	36	16	116	29
R7	86	52	77	60	275	68.75
R8	13	38	31	21	103	25.75
R9	67	31	89	53	240	60
R10	28	69	53	22	172	43
Total	379	449	493	304		
Average	37.9	44.9	49.3	30.4	Information: Longest Fastest	
Max	86	69	89	60		
Min	13	28	26	16		

The overall relative efficiency (ORE) formula used to calculate the efficiency value is as follows:

$$\frac{\begin{array}{l}((1x47) + (0x59) + (0x51) + (1x55) + (1x28) + (1x34) + \\ (0x42) + (1x21) + (1x34) + (1x61) + (1x26) + (1x18) + \\ (0x30) + (1x31) + (0x55) + (1x19) + (1x28) + (1x28) + \\ (0x33) + (1x19) + (1x18) + (1x46) + (0x36) + (1x16) + \\ (1x86) + (0x52) + (0x77) + (1x60) + (1x13) + (0x38) + \\ (1x31) + (1x21) + (1x67) + (1x31) + (0x89) + (0x53) + \\ (1x28) + (0x69) + (1x53) + (1x22))\end{array}}{212 + 125 + 139 + 135 + 108 + 116 + 275 + 103 + 240 + 172} \text{X } 100\%$$

$$ORE = \frac{941}{1625} \ x \ 100\%$$

$$ORE = 0.579 \ x \ 100\% = \mathbf{57.9\%}$$

The results of the efficiency values obtained using the Overall Relative Efficiency (ORE) formula in the four scenarios in this study are **57.9%.**

C. Number of Task Scenario Completion Errors

At this stage, the researcher will describe the number of errors and constraints made by each respondent during the usability testing process. In Table 3, the following will display a list of errors or discrepancies in the steps taken by

the respondent in completing the task scenario. This error occurs when the respondent performs an action that is not in accordance with the predetermined sequence of steps during the test. The following is a table that contains the results of errors recorded by respondents when completing task scenarios.

TABLE III.   NUMBER OF RESPONDENTS' ERROR

R	TS1 Number of Errors	TS2 Number of Errors	TS3 Number of Errors	TS4 Number of Errors
R1	0	1	1	0
R2	0	0	1	0
R3	0	0	0	0
R4	1	0	1	0
R5	0	0	1	0
R6	0	0	1	0
R7	0	1	1	0
R8	0	1	0	0
R9	0	0	1	1
R10	0	1	0	0

In Table 3 above, it can be seen that there was an error that occurred when the respondent tried to complete the scenario given by the examiner. This can be identified by the number 1 (one) if the step is wrong and the number 0 (zero) if all the steps are correct.
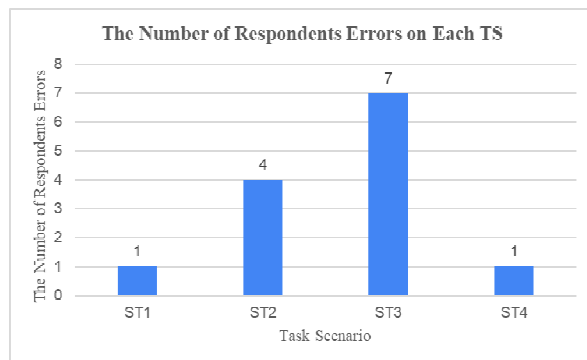

Fig. 8. Number of Respondents' Errors in Task Scenarios (TS)

Figure 8 above shows the number of mistakes made in each task scenario by the respondents. The third task scenario is the scenario that has the most errors, while the first and fourth scenarios are the scenarios that have the fewest errors made by the respondents when testing the PT Beli Jelantah Trafiguras website.
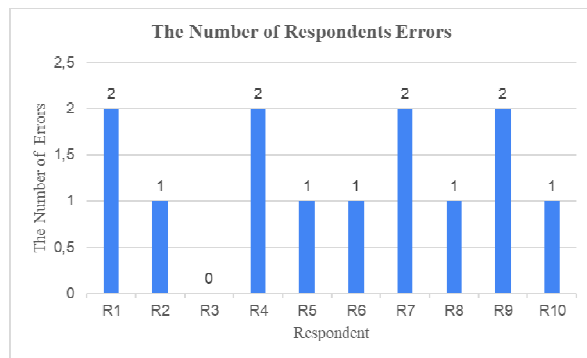

Fig. 9. Number of Respondents' Errors

Figure 9 above shows the number of respondents' errors in completing the overall task scenario. If seen from the

picture above, the highest number of errors is 2 (two) and the least number of errors is 0 (zero). The average error of the respondents in this study was 1.3 errors for each scenario worked on by the respondents of this study.

D. Recommendations for Improvement by Respondents

The following are suggestions or recommendations for improving the web interface for the PT Beli Jelantah Trafiguras website that have been analyzed by respondents.

TABLE IV.   RECOMMENDATION BY RESPONDENTS

RESPONDENTS	IMPROVEMENT RECOMMENDATIONS
R1	ST1: Improve UI appearance and login button to increase visibility on main page and sign up. ST2: Increase the responsiveness of some buttons so they can respond quickly without waiting or reloading the page. ST3: Add background to the dropdown on the button "More" to make it more visible and improve the responsiveness of the button. ST4: Fix direct redirect to "Shop" page after clicking on the option "Shop" without needing to refresh. Develop UI appearance to make it more attractive to users.
R2	ST1: Clarification of registration options with additional icons or visual elements that make the registration process easier. ST2: Remove icon dropdown due to duplication with the profile icon, fix the more prominent color to make it easier to find the "Edit Profile" option. ST3: Simplified the process of liking articles, eliminating the need to click "set to public" after liking the article. ST4: Selection of products to cart is easy to find with a clear icon/button, does not require changes.
R3	ST1: Added verification features such as OTP codes to ensure the security of registered e-mails. ST2: Shorten the "Edit Profile" button spacing with profile picture and name, and clearly differentiate the upper and lower profile update buttons. ST3: Consider placing the "Blog" menu in a place that is more easily accessible than in the "More" menu in order to get more visitors. ST4: Added clear notifications when items are added to cart to prevent users from adding items multiple times.
R4	ST1: Using the OTP code as a login/signup method to increase security for users. ST2: Provides a clear definition for the "Title" section so that users can understand it easily when changing the name. ST3: Improved the color appearance of the website to make it more attractive, moved the like button to a more strategic position, and increased the responsiveness of the website. ST4: Do not place the "Shop" menu in the "More" menu because it will be hard to find. In addition, adding payment options other than PayPal on the payment menu.
R5	ST1: It is recommended to add email verification to increase the professionalism of the website. ST2: It is important to add a loading indicator so that the user can know that there is a running process when clicking the " Edit Profile " button and reduce the inconvenience caused by delays. ST3: Adds a color to the background when clicking the "More" button to enhance the user's visual

R6	experience. ST4: Added a background on the "More" menu and included a search bar so that users can easily search for the desired product. ST1: The login menu UI on the linked website should be updated to be more attractive and colorful, avoiding the usual and monotonous impression. ST2: The "Edit Profile" button should be placed below the profile to avoid user confusion. ST3: Add a loading icon on the website so users can understand that the selected menu is being processed and avoid confusion. ST4: Add a search button (search) to make it easier for users to find products.
R7	ST1: When signing up on the website, it is necessary to add options to fill in other data such as the feature to change passwords, personal information (age, gender, education, etc.) so that users can personalize their profiles. ST2: When updating data, the website needs to display a clear loading indicator so that the user knows that the process is in progress and is not confused. ST3: For the loading process website, it is recommended to display an indicator such as a loading icon or a notification so that the user can know that the process is running. Also, for the like feature on articles, why do you have to switch your account to public mode ? Why not provide an anonymous feature? ST4: The process of adding products to the cart is easy, but it is necessary to improve the loading display so that users are not confused whether the website has processed it or not.
R8	ST1: It is necessary to pay attention to the color difference between the "Enter" button and the background so that the button is more clearly visible. ST2: For navigation on the left side, it is recommended to change the color according to the page currently accessed by the user, for example, on a user's profile or order page, the background can be given a more contrasting color to make it more visible. ST3: For the "More" feature dropdown, you need to add a background color to make the text more clearly visible. ST4: Need to speed up loading times website and addressing a long loading issue, also considering changing the background color in the "More" dropdown
R9	ST1: Website needs to be optimized to be more responsive when signing in with a Google account, reduce network issues, and address the need for page refresh after clicking "Sign In". ST2: To increase web responsiveness, it is necessary to improve performance when changing name in dashboard. Web developers should improve their responsiveness so users don't have to wait too long. ST3: To make it more attractive and responsive, it is necessary to improve the UI appearance and increase the responsiveness of the website. ST4: Web developers should work on making sites more responsive and designing UI appearances to be more attractive and easy for users to understand.
	ST1: While the UI and responsiveness are good, it needs to be continually evaluated to ensure it remains well-run and responsive in the future. ST2: Even if there is a slight delay while editing the

R10	profile, make sure to increase the speed and responsiveness while updating the profile for a smoother user experience. ST3: Fix the delay that occurs when selecting the "Blog" option so that users don't experience interruptions in use, even though opening articles and giving likes run smoothly, ST4: Even though the shopping process and the add to cart feature are smooth, consider speeding up the loading process and ensuring the "View Cart" option continues to work properly to provide an optimal shopping experience for users.

V. Conclusions

Usability testing conducted on the PT Beli Jelantah Trafiguras website using the Cognitive Walkthrough method are as follows.

1. The successful completion of the task scenario and the amount of time it takes to complete the task, the PT Beli Jelantah Trafiguras website has a medium usability level with an effectiveness rate of 67.5% and an efficiency rate of 57.9%. The percentage that is classified as medium is due to the large number of respondents who still experience problems or difficulties when completing the assigned task scenarios.

2. The majority of respondents problems are found in the third scenario, namely when searching for articles. This is because many respondents are distracted by the options that appear when opening articles and there are too many dropdown buttons on related websites.

3. usability level of the PT Beli Jelantah website is still at the middle level. Therefore, the author recommends several improvements, such as making improvements to the sign-up feature, highlighting important buttons, being consistent in writing letters, fonts, and font sizes that can be seen properly by users, reducing less important menus on navigation bar, as well as providing clear instructions when registering so that users know what differences will occur if they choose a different registration option.

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