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Oristingray: A Web Application to Validate Authenticity of Stingray Leathercraft

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Abstract. Products using stingray leathercraft have become popular in recent years in some countries and because many countries have been exporting them. But stingrays are a protected species, and the government and international laws regulate its trade. To prevent stingrays from being illegally poached or imitations being sold, there is an idea for a web-based application to monitor and determine the authenticity of stingray leathercraft products, and that idea is called *OriStingray*. The object for this research is in the form and development of a front-end UI interface of such a web application, which makes use of the ReactJS framework. Testing data is gathered using a User Experience Questionnaire (UEQ). After the front-end is completed and then tested, the testing data is then processed and the results of this research shows that, according to the test users, the front-end presents a stimulating experience to the user and the application's user interface (UI) is exciting, interesting and innovative to most users.

Keywords: *Stingray, Front-end, Application, Blockchain, User Experience.*

1 Introduction

Stingray fish are a very valuable resource. Its meat can be made into delicious food products, and its leather is used in many fashion products across the world. Some examples of the stingray leathercraft products include the following: Samegawa/Samehada (which is the wrapping component for the handle/tsuka of the Katana/Samurai sword), belts, boots, handbags, and phone cases.

In 2021, Indonesia ranked ninth in the Top Ten Countries that exported frozen stingrays, with an export value of USD 1,3 million. Around USD 830 thousand of that value was from exports to South Korea. South Korea is one of the major importers of stingray leather, with an import value of around USD 13 million. Other countries that also export to South Korea are the United States of America, China, Japan, Spain, Brazil, Chile, and Argentina [1].

However, according to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), stingrays are an endangered species and

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therefore are protected by law. Stingray species like *Mobula alfredi* and *Mobula birostris*, for example, are prohibited from national and international trade. While other species like *Rhynchobatus spp* and *Rhina anclyostoma* are allowed to be traded commercially and internationally but are still controlled by the agreed regulations.

In regards to exotic fashion products made from stingray leathers, some buyers need valid information and guarantees that the products that they bought do not violate international regulations regarding the protection of endangered animals. Therefore, the idea for this research is proposed, which is to create a web application for supply chain traceability, in this case, of stingray leather, with an integrated blockchain technology to help determine whether the material for such products were legally sourced and authentic.

2 Literature Review

2.1 Design and Development of Cloud-based System for Meat Traceability

The approach for the design of the front end for this system [5] was cross-platform, and it was also based on web technologies. A cloud server developed for the system's needs is connected to it. Access to the application is available through PCs and mobile devices that are already connected to a cloud server. Angular Reactive Forms were used to collect data for the traceability system. The reason forms of this type were used is that it allows for the implementation of a more complex logic than just forms with simple templates. Data transfer to the database is made through the REST API. The forms are specifically designed for ease of employee use. An authorization form is provided by the provision and handling of captured data, which then allows users—in this case, farmers, administrators, and employees—to be able to interact with the system through a real-time environment. In regards to system access, the administrator has created many credentials that are unique for each employee. If the credentials the user entered are valid and verified, the system then analyzes the user's role; then, based on their role, they can have access to particular tasks (such as access to specific forms). Users who are farmers, with farm-level access, can only access forms from the farm level; users who are employees can only access forms from the factory level, and a user who is administrator (super user) can access both levels' forms. [5]

2.2 Blockchain-based Smart Tracking and Tracing Platform for Drug Supply Chain

Five layers shape the platform [6]: perception, off-chain, blockchain, application, and user. And there are four services in the application layer: user identity management, quality regulation, product traceability & visibility, and risk analytics & smart alert. As for the user layer, there are four user groups; these include drug producers, drug logistics providers, pharmacists and consumers. Bootstrap is used to design the client-side of the application, which is a free and open-source CSS framework used for responsive, mobile-first front-end web development. It contains some design templates that are CSS and Javascript-based, which are then used to create components for typography, forms, buttons, navigation, and other interfaces. [6]

2.3 Blockchain-based Application for the Traceability of Complex Assembly Structures

This report [2] covers the development of TokenTrail, a traceability application that retrieves and processes data from the blockchain database and also from off-chain data sources. It then translates the data into readable and intuitive formats through a user-friendly front end. The off-chain data storage uses Neo4j, which is a graph database. It contains further traceability data, such as product, process, and resource descriptions, and also the order specifications and execution information. The front end of the application then displays the status log of the manufacturing, which is retrieved by the algorithm by translating the blockchain status into manufacturing events [2].

2.4 Proposed Blockchain-based Smart Traceability System for Teak Supply Chain

The system that is proposed in [3] has a two-level architecture. The front-end UI is made with Node JS. It is responsible for interacting with users. It has a Web3 library, which is responsible for API calls from front-end clients to the back-end Ethereum blockchain. The blockchain uses Ganache. The front-end UI receives the user’s input, including stakeholder's data and teak profiles, and then passes them to the relevant Web3 library. The Web3 library then calls a plugin, which in this paper is Metamask, which will then interact with the relevant blockchain system to store the transaction receipts and return [3].

2.5 Design and Development of an Efficient Traceability System for Greek Kiwifruit

The application layer for this system [4] is a user-friendly interface. It automates data collection by reading the barcodes, and then it enters them into the traceability platform. At the same time, users can input data into the application via forms, if the automated process did not work. The application in this paper is developed using agile methods and other web technologies, such as HTML, CSS, and JavaScript [4].

3 Research

3.1 Research Framework

Fig. 1 shows the framework for the research, which includes data gathering, front-end and back-end design, front-end and back-end development, application testing and thesis writing.

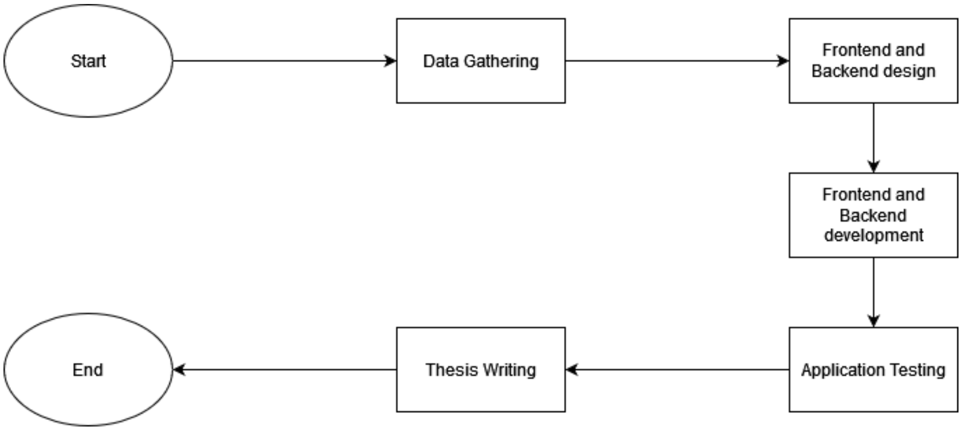

Fig. 1. The Project Framework

3.2 System Overview

This chapter contains some Unified Modeling Language (UML) diagrams that showcase the functions that could be performed on the front-end side of the application and the users that would interact with it. Fig. 2 shows the Use Case Diagram of the web application.

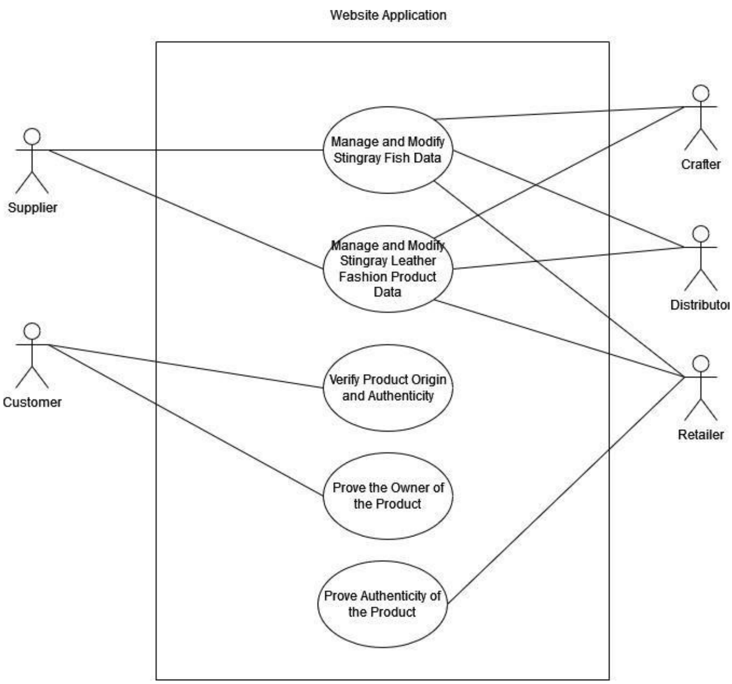

Fig. 2. Use Case Diagram

The Use Case Diagram shows the actors of the system, which consists of the following: Supplier, Crafter, Distributor, Retailer, and Customer. It also shows what functions each role can perform within the application. Fig. 3 shows the activity diagram among the various actors of the system.

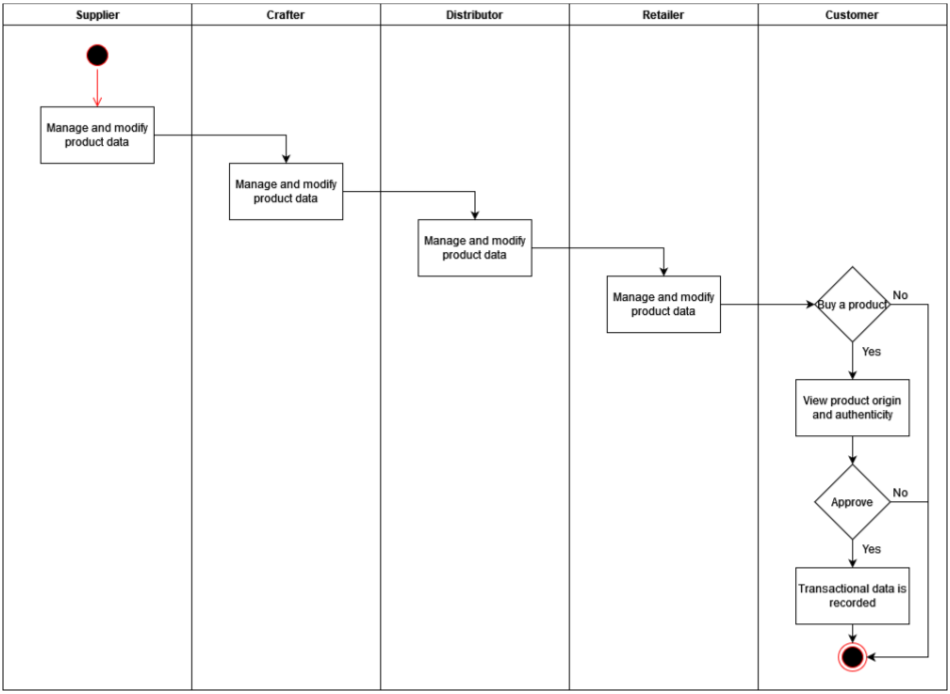

Fig. 3. Activity Diagram

This diagram shows how the data will be managed and modified before being stored on the back end of the application. It includes the details that depend on the various actors involved in the process. Fig 4 showcases the architecture diagram of the system.

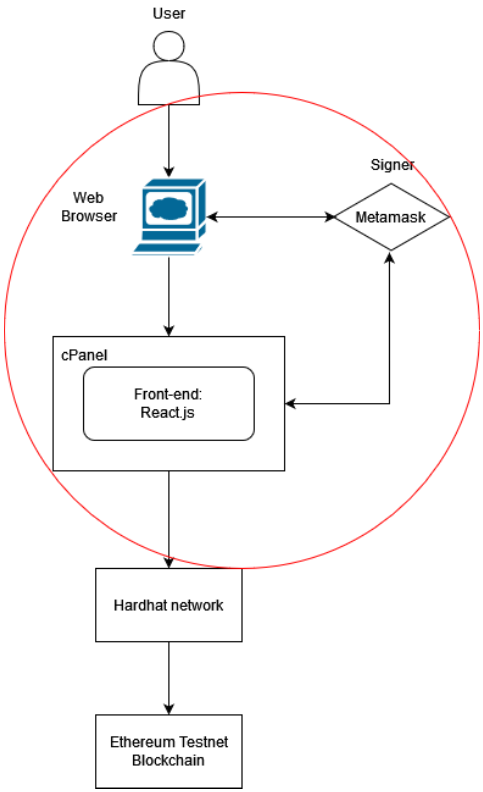

Fig. 4. Architecture Diagram (The front end is circled in red.)

This diagram describes the structure of the application. The area inside the red circle is the front end part of the application, which is the main focus of this research. The area outside of the red circle is the back end of the application.

4 Result and Discussion

This section is divided into two subchapters. The first subchapter covers the development results of the User Interface (UI) of the application. The second subchapter explains the results gathered from the User Experience Questionnaire (UEQ), which gives a picture of the User Experience (UX) of the application.

4.1 Homepage and Tracking Page

This section contains some images from the website application, namely the Homepage, the Tracking page, and the Add New User form.

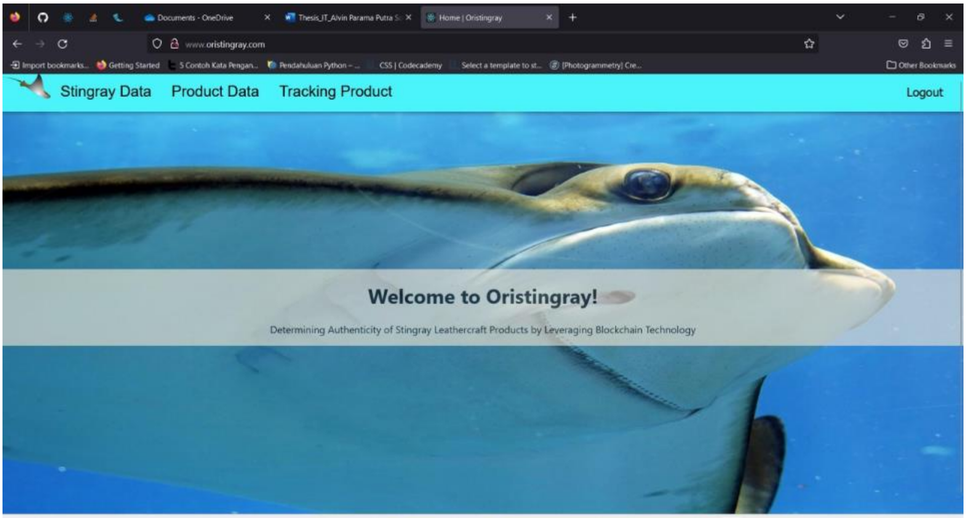

Fig. 5. Homepage/Menu Page

When a user first enters the website, the Homepage will look just like the image in Fig. 5, but instead of four options in the navigation bar, there are only two options: Login or SignUp. After a user either logs in or signs up to the website, the navigation bar will change and provide four options: Stingray Data, Product Data, Tracking Product, and Logout. Clicking Stingray Data or Product Data will redirect the user to the Stingray Fata form page or Product Data form page, respectively. Clicking Tracking Product will redirect the user to the Tracking page. And clicking Logout will change the navigation bar to only Login and SignUp options.

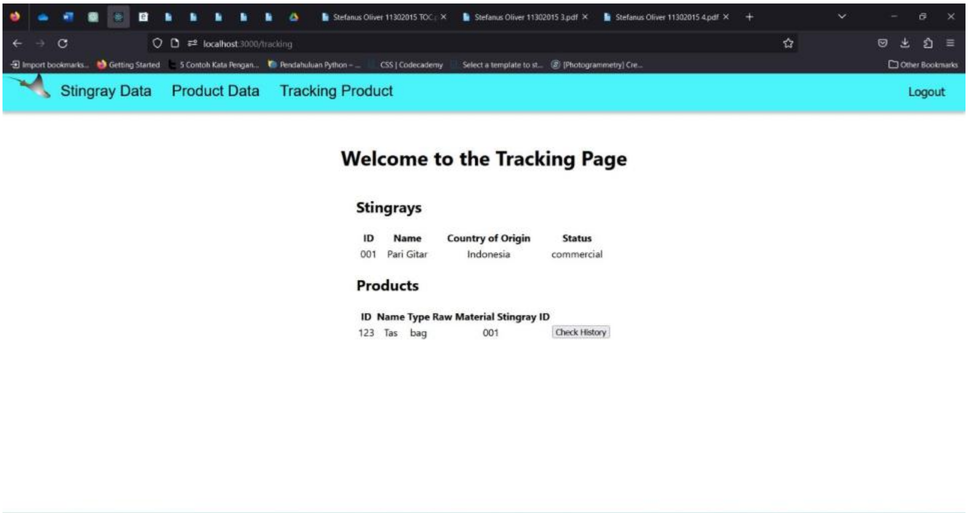

Fig. 6. Tracking Page

Fig. 6 shows the contents of the Tracking page, which consists of two tables. The first table contains data of recorded stingrays from the Stingray Data form. The second table contains data of recorded products from the Product Data form. The Products table also has a feature that allows users to see the history of a product's ownership by clicking the Check History button.

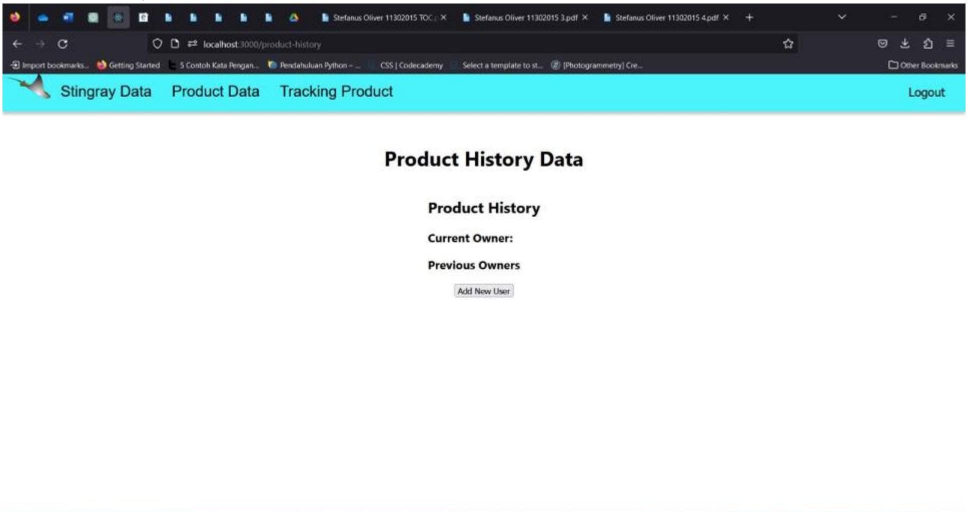

Fig. 7. Product History Page

If a user clicks the Check History button from one of the products in the product table, said user will be redirected to the Product History page as shown in Fig. 7.

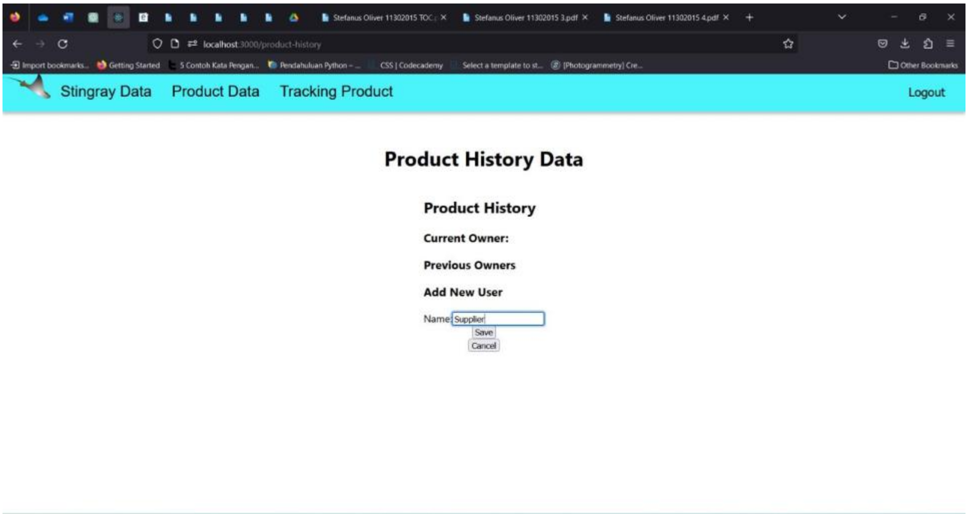

Fig. 8. Add New User Form

If a user wants to add a new owner to a product, they can click the Add New User button as shown in Fig. 7 and a form will appear, as shown in Fig. 8. After typing the name for the new owner and clicking the Save button, the new name will be added to the Current Owner section and the previous name will be moved to the Previous Owners section.

4.2 User Experience Questionnaire (UEQ) Results

The data from the UEQ was gathered before the functions and features in the Tracking page were implemented. The questionnaire and the website application were distributed through online messenger to the owners and employees of three small companies that make handicraft products. Some of the respondents may have had problems when trying to answer the questionnaire and also may have misunderstood the questions in it.

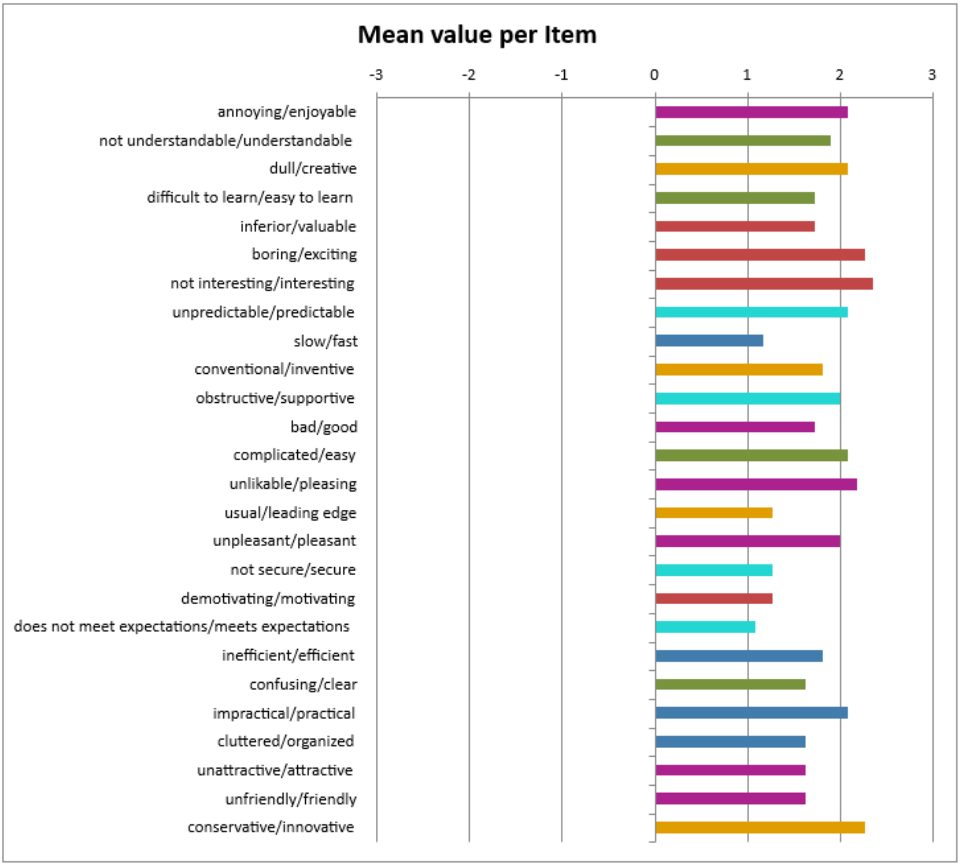

Fig. 9. Mean Value per Item of the Oristingray Front End

Fig. 9 showcases the mean value per item of the application. The value of the data is transformed so that it can be used to determine the mean value. The questionnaire's original value ranges from 1 to 7, and it is then changed from -3 to 3. The graphs also have it changed from -3 to 3. The average value of every item and scale is determined.

Each of the bar colors in Fig. 9 represents the scales used to measure the UI of the application. Purple is for the Attractiveness scale, green is for the Perspicuity scale, blue is for the Efficiency scale, black is for the Dependability scale, red is for the Stimulation scale, and orange is for the Novelty scale. The mean values between –0.8 and 0.8 represent a neutral evaluation of the corresponding scale; values over 0.8 represent a positive evaluation, and values less than -0.8 represent a negative evaluation. Based on the values, all of the items' mean values have positive evaluations, and there are no negative evaluations. And, on a closer look, there are 9 items with the highest mean value evaluation, with a value that is more than 2. These items include the following: annoying/enjoyable, dull/creative, boring/exciting, not interesting/interesting, unpredictable/predictable, complicated/easy, unlikable/pleasing, impractical/practical and conservative/innovative, with the three highest mean values corresponding to the categories boring/exciting, not interesting/interesting, and conservative/innovative. There are also 5 items with the lowest mean evaluation, with a value of just more than one but not really in between 1 and 2. These items follow: slow/fast, usual/leading edge, not secure/secure, demotivating/motivating, and does not meet expectations/meet expectations. Based on these values, it can be inferred that the user interface is generally exciting, interesting, and innovative for most users.

Table 1. Mean Value and Variance per Scale of the Oristingray Front End

UEQ Scales (Mean and Variance)		
Attractiveness	1,879	3,89
Perspicuity	1,841	3,59
Efficiency	1,682	3,50
Dependability	1,614	4,13
Stimulation	1,909	2,77
Novelty	1,864	1,30

Table 1 showcases the mean values and variance of each of the scales. To calculate the scale's mean value, all of the items in each scale are summed and averaged, and the value is found.

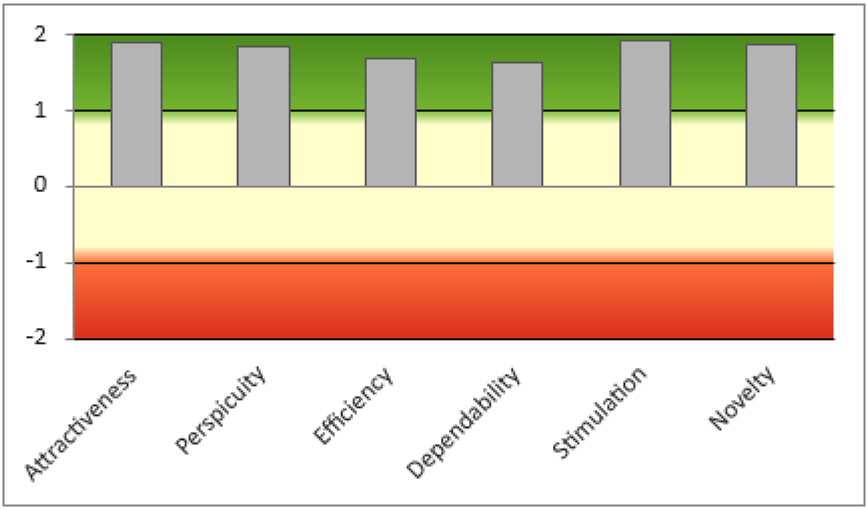

Fig. 10. Graph Showcasing the Mean Value per Scale of Oristingray

Fig. 10 showcases a bar graph of the mean value per scale for the application. The green-colored area of the graph represents positive values, the yellow-colored area represents neutral values, and the red-colored area represents negative values. Based on what can be seen from the graph, the scales are all in the positive values, with the highest mean value per scale on the graph being Stimulation.

5 Conclusion

The results of this research can be used to identify what are the most important characteristics to consider when designing a UI/UX in an application. In this case, a blockchain-based web application was used. Based on the data gathered by the UEQ, from the mean value per item graph, all of the graphs are in the positive values, with the three highest values being exciting, interesting, and innovative. And from the mean value per scale graph, it is shown that all of the scales are in the positive values, with the Stimulation scale having the highest mean value in the graph. This shows that the UI elicits a stimulating experience to the user and the application's UI is exciting, interesting, and innovative to most users.

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