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ROLE OF USER INTERFACE IN SOFTWARE DEVELOPMENT

ABSTRACT

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This thesis aims to analyse the role of the user interface in software development by explaining psychological principles that need to be applied and improved in building products. As a result, it indicates the values of user experience and how to ameliorate the company's business.

The research was conducted of two models included Problem-solving and Product Management Tower. Besides, they also clarify the necessary steps that should be proceeded from the ideation stage to delivering the product to its users.

The process started with explaining relevant definitions which are usability, user journey, accessibility, and user personas. After that, the following examples were used to prove above statements to not only improve the viable perspective but also encourage and make users enjoy using the product. The main part of the thesis is about discussing the progress of building a website named TopDup - the project for raising the awareness of people about plagiarism. In this section, every step is explained and shown how to apply appropriate method for each situation.

ABSTRACT

CONCEPT DEFINITIONS

UI	User Interface
UX	User Experience
CTA	Call to Action
B2B	Business to Business
AI	Artificial Intelligence
CSS	Cascading Style Sheet

ABSTRACT
CONCEPT DEFINITIONS
CONTENTS

1 INTRODUCTION

Due to the raise of research in variety of businesses as well as formed user experience resources, the market was described with several missing pieces in the big puzzle of developing and building a digital product. In the past, developers were not completely aware of all the related factors, however, they had to cover most of the stages in a software development process such as creating the interface or user testing.

According to recent years of the UI/UX evolution, the previous products mostly were claimed to be dependent on technological advantages. However, the one that helps to gain users interest and return for future use is their experience. The human interaction research shows that in different cases, users demand an appropriate method for them rather than a common one for any kind of situation; for instance, a device for people working in extreme conditions requires stronger protection than in household or office. Moreover, in this area's principles, the success of a product or an organisation is not based on their desired plan and from their own decision, but it should be aligned with how users evaluate and approach that. For example, many businesses assume that if they provide as much data as possible or in many places on their website, it is likely to make users understand their service and prioritise it. In contrast with that, for each group of users and even most general ones, do not have time and do not want to spend too much effort to explore a service. They prefer to use it as if it is invisible instead of interrupting their daily routines (Ahad & Fauzl 2014).

UI/UX has brought a renovation and mindset about user-centred design compared to the old version which is information-centred and only focuses on giving unnecessary features. Consequently, targeting on developing around users, their tasks and the environment emphasized the indispensables of a multidisciplinary team with diverse skills and perspectives. This not only involves users throughout design and development but also acts as an interactive and radical innovation.

2 THEORETICAL BACKGROUND

This chapter is divided into 6 parts which define the role and concept of tools used in software development. Besides the meaning of user interface and user experience, this section describes in detail how many steps are required for design and research accurately before conducting the information and moving to the technical process.

2.1 User Interface

The user interface (UI) is what the consumer of a specific product interacts with to get their task done and with minimum effort. This term is familiar in software and computerized devices. Moreover, it is not just a design, but users should find it easy to use and pleasurable rather than focusing on the design itself. To get a good result from that, designers should care about some factors like usability, frustration-free, indicating brand's value and gaining users' trust. In recent years, the upsurging of mobile applications and web applications has led many companies to be aware of the priority of UI to improve the user's overall experience (Churchville 2021).
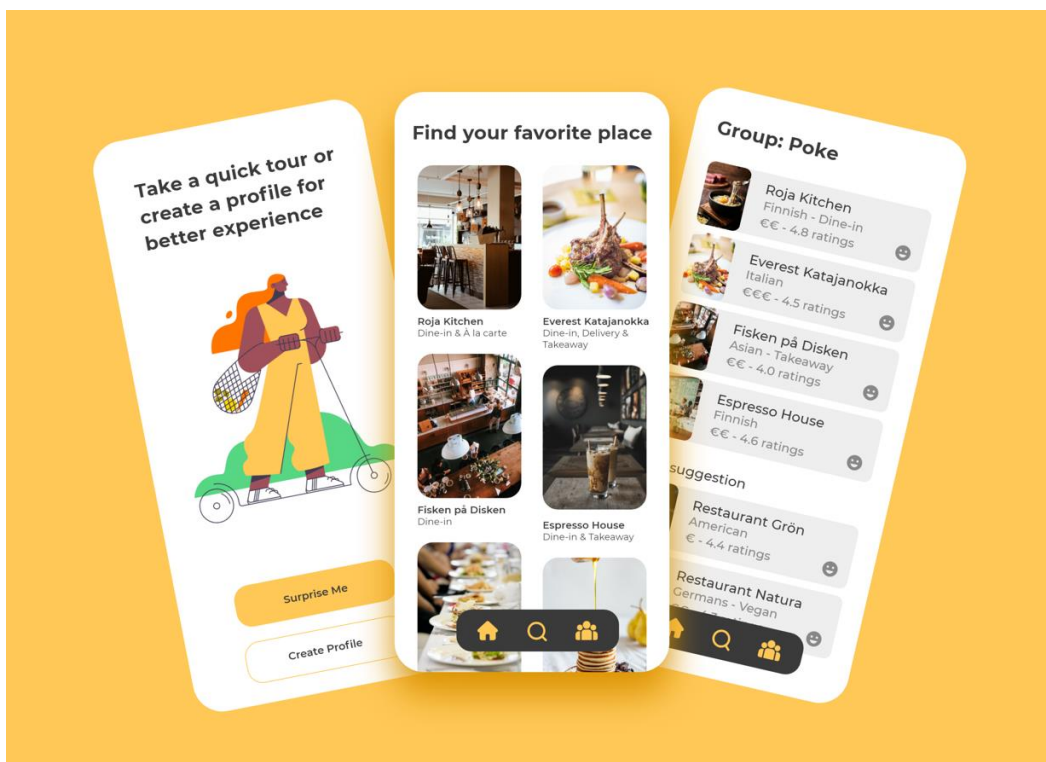

FIGURE 1. A user interface of a restaurant suggestion app.

Figure 1 shows the simple interface of a restaurant suggestion app with heading, navigation buttons and pictures displayed the information of places. The message on the opening screen points to two main purposes which are creating a profile base on the preference of user or generating a list of random locations.

2.2 User Experience

User experience (UX) is the definition that refers to the interaction between end-users and a product or service like using a laptop, a mobile application, or visiting the museum. However, the main thing that designers need to prioritize in generating the experience is to meet the exact needs of the customer without difficulty and provide seamless merging of multiple disciplines such as engineering, marketing, graphical and industrial design. There is no certain formula for all cases to create a good experience. Instead, these tasks can vary from one organization to the next, and customers always demand designers to be their advocates and keep their needs at the center of all design and development efforts (Nomran & Nielsen; Lamprecht 2021).

2.2.1 Usability

Usability is a quality measurement that is applied to assess the UI and improve its ease of use. It evaluates a specific user in a specific context whether they can use a product to achieve their goal efficiently and satisfactorily. To ensure the maximum usability result, designers need to execute the test throughout the development process such as from the wireframe stages to the final deliverable product (Interaction Design Foundation). There is a list of standards to succeed in having the design easy enough for users to navigate without outside knowledge includes five common components. They are Learnability, Efficiency, Memorability, Error Tolerance, and Satisfaction. Learnability is said to show how easy for users to accomplish a task on the first time they encounter the design. With Efficiency, after learning from the design, it measures how quickly users can perform a task. Error Tolerance in this case is for managing how many errors users can make and how easily they can recover them. Finally, Satisfaction is for how satisfied they are to use the design and possibility for them to come back for the next time.

In terms of web services, users will leave if it is difficult to use or the website could not clarify the company's message. Usability, in this case, is a survival condition to keep users staying longer on the

platform because there is not likely to be any reason for them to spend more time figuring out an interface (Nielsen 2012). Besides the existence of various competitors out there, leaving is the first line of defense when users tackle a difficulty.

2.2.2 Accessibility

Accessibility can be viewed as the "ability to access", which also is the concept to check whether a product can be used by everyone and avoid encounters. Normally, it comes with the idea of mainly focusing on people with disabilities. However, the practice of making sites more accessible also benefits other groups with different environments and limitations such as those using mobile devices, people living in rural areas and elders. On the other hand, it means that all users should be able to access the equivalent experience. Moreover, helping people with disabilities often helps other groups too (Henry & McGree). For example, video caption that helps people with hearing difficulties also helps a person who is watching a muted video (on social media feed) (Interaction Design Foundation). The most popular accessibility issues include Visual, Mobility, Auditory, Seizure, and Learning or Cognitive.

FIGURE 2. The basic accessibility approach for general users (Shah & Sizer 2020).

Due to demanding contexts, many users with whatever their abilities always face challenge; and in the Figure 2, are the most popular accessibility groups. Based on a 2011 WHO report concerning disability on earth's population, the percentage of disabled people were about 15% compared to the total. Therefore, without the accessible design, it could cause a big negative impact on most of the technology industries.

2.3 User journey

A user journey is a visualization of the process that the user is about to go through to accomplish a goal. Unlike user flow, which is a different term to describe staging, user journey compiles a series of user actions into a timeline and involves their thoughts as well as emotions to create a narrative. Either it is called user journey or customer journey, they both referenced a visualization of a person using a product or service and understanding of how they work toward a goal over time (Gibbons 2018; Salazar 2020.) The user journey is commonly based on these following 5 key elements. The first element is Actor which is a persona that experiences the journey. Secondly, Scenario and Expectation is the term to describe the situation and it is associated with an actor's need with specific expectations; however, it can be real or anticipated. Thirdly, Journey Phases is a different high-level stage that provides organisation for the rest of the information like actions, thoughts, and emotions. Each organisation will usually have data to help it determine what these phases are for a corresponding scenario. The following is Actions, Mindsets and Emotions. They are the behaviours, feelings, and thoughts that the actor has during the journey and be related to each journey phase. Lastly, Opportunities indicates insights which is gained from mapping and helps the team to clarify how the UX can be optimized and draw the knowledge from the map.

These elements not only include all the information necessary for understanding and analyse the user experience, but they also describe two benefits to having a journey map. The first is creating a map forces conversation and aligning the mental model for the whole team which have the agreement on how to improve the customer experience takes place. The other one is a shared artefact from mapping that could be used to communicate an understanding of users or services to all involved and enhance decision making for the team to move forward (Gibbons 2018 & Salazar 2020). In Figure 3, the main factors are users' emotions which help to guide the team in developing and improving the experience through those and pain points.
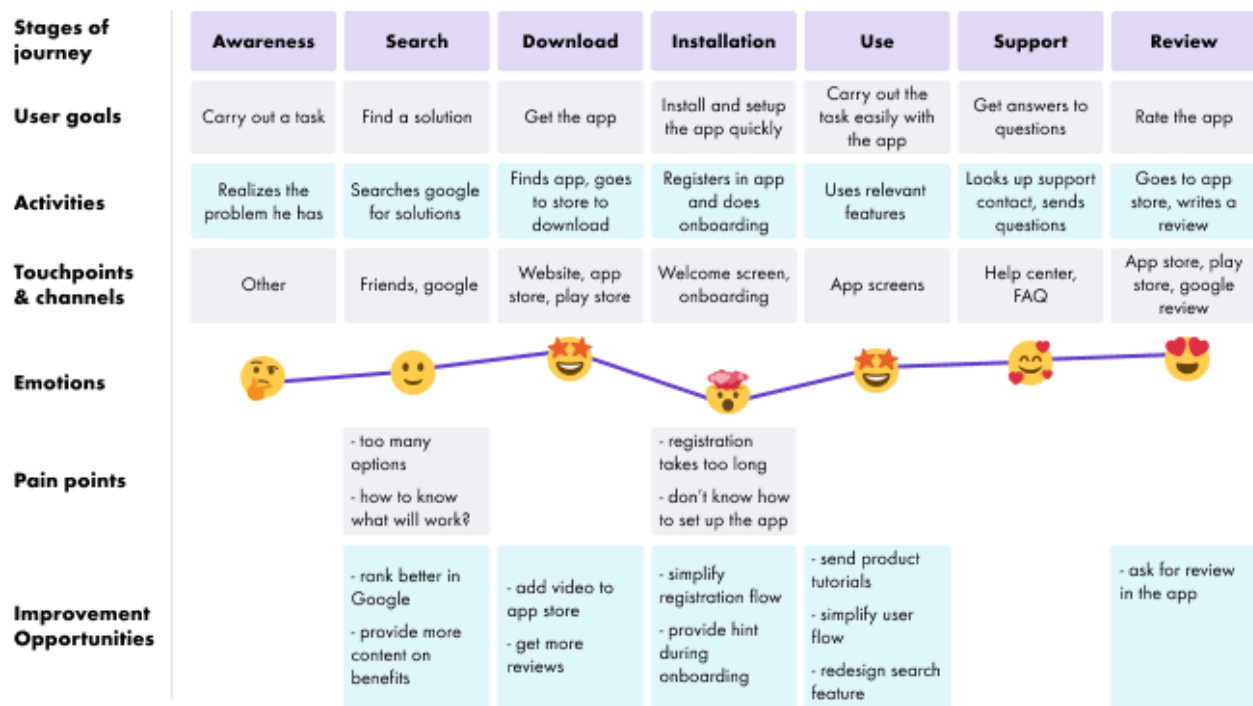
FIGURE 3. An example of user journey map that indicates different stage of users' actions, thoughts, and emotions (Varga 2020).

2.4 User personas

The persona describes a fictional character and includes current or ideal users' experiences, behaviors, and goals. It uncovers different ways people approach a product and other aspects of their needs as well as expectations. With that, the team can define what they are designing for, generate a better solution and improve services for a target user group. There are different perspectives of personas, but the most familiar is goal-directed one (Dam & Siang 2021; Grenier 2021).

Roni Kanerva

Bio

A Midwesterner his whole life, Roni is an outdoor enthusiast and the proud owner of a retired racing greyhound named Kovak. Since temperatures drop to as low as the single digits in Cedar Rapids.

Roni worries about keeping his canine running partner warm. He and his wife do not have children, so they don't mind spending a little extra on personal expenses for entertainment, traveling, and pet care.

Demographics

Age: 28
Location: San Francisco
Occupation: Product Designer
Income: $36k

Related problems

Agency apps are a waste of time.

Strong competition on the market of digital service.

It's hard to find the best way to contact a customer service.

Value

· Time
· Responsibility
· Innovation

Goals

· Requesting and reviewing research
· Preparing memos
· Supervising staff efforts

Challenge

· Client attention
· User satisfaction
· Not enough time for quality testing and recruiting

FIGURE 4. An example of a user persona.

It can be seen in Figure 4 that a persona of user is not only about goal and challenge but also the surrounding artifacts that affect their decision. For example, it would be clearer for a team to provide insight for this case when they know about user's income, their location and what they are struggling in both their personal and professional life.

The purpose of this is to examine the process and workflow that user prefers to utilize to achieve their objectives in interacting with a product. This type includes 3 features such as Persona, Scenario, and Goal. The designer firstly defines who the story is about, and what attitudes and motivation they have toward their goal. The goal seems to be the 3rd part, but it needs to be determined before drafting the scenario. This area motivates the persona to act and defines what the persona would like to fulfil. Lastly, the scenario is the story that contains the series of events that a user is about to do to reach the goal (Faller 2019).

2.5 Wireframe

A wireframe is a two-dimensional skeletal outline with an overview of the page structure, layout, and information architecture. There are 3 levels of wireframes which are lo-fi, mid-fi, and hi-fi. From an

early stage to the final draft, it provides an overview of the page structure, information architecture, and the initial product concept, styling and graphic their minimum level. The wireframe can be a sketch made with pencil and paper or a digital version by using some tools such as Figma, Adobe XD and Balsamiq; and it depends on how much detail is required. The main reason for this is allowing all stakeholders to agree on where the information will be placed before being built by developers. It tends to be made during the exploratory phases of the product lifecycle like gathering ideas and identifying business requirements. The massive advantage of this is that it is cheap, fast, and easy to get fixed. The more effort is put into this, the more precise the product experience is likely to be (Hannah 2021).
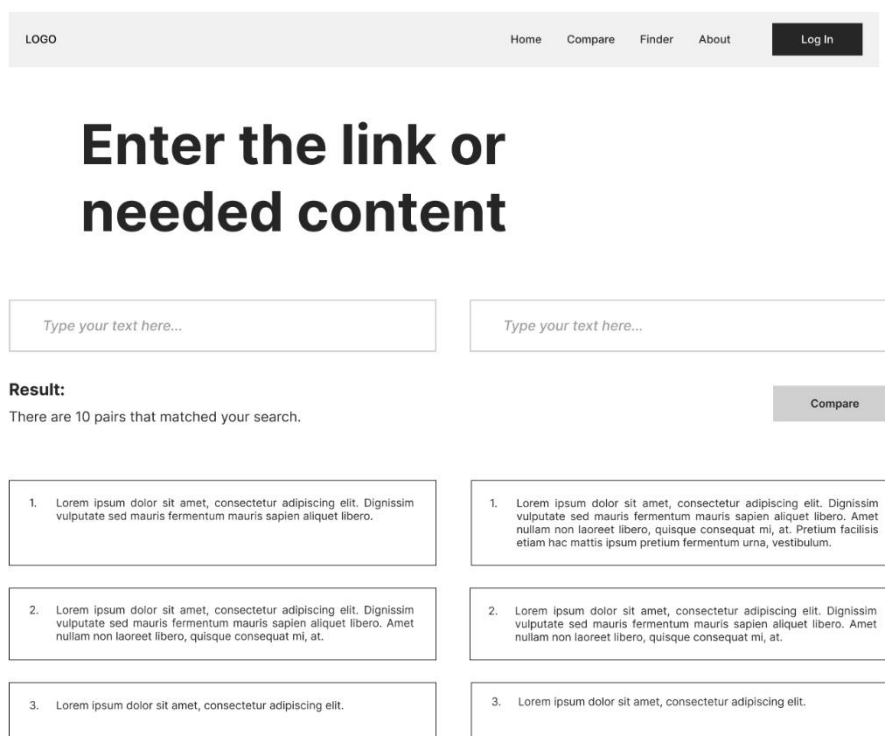

FIGURE 5. Lo-fi wireframe with basic text and layout.

The lo-fi wireframe in Figure 5 is formed with basic elements to quickly create the general look of how the screen would look like. In this stage, it does not require any color theme or detailed information, but black and white and often the dummy texts.
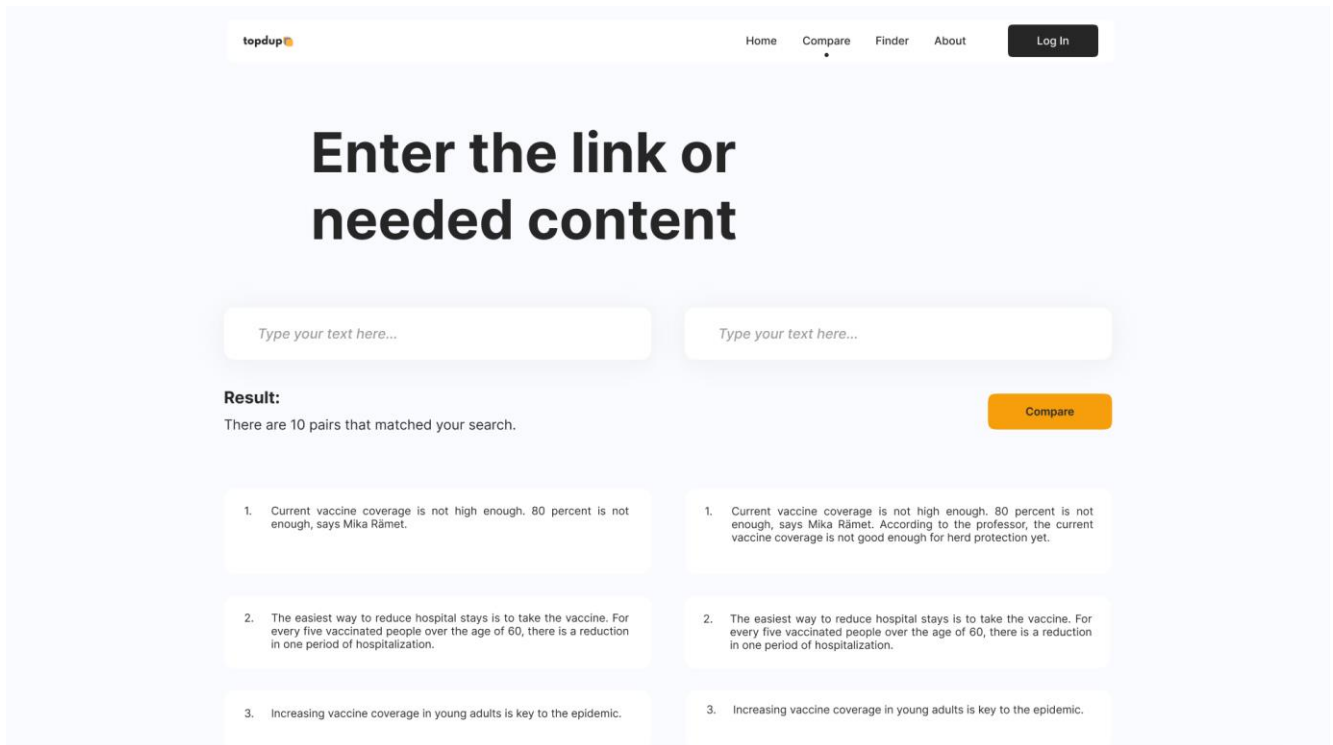
FIGURE 6. Hi-fi wireframe with filled picture and information.

In Figure 6, the colors of backgrounds and buttons were added along with navigation texts such as Home, Compare, Finder and About.

2.6 Prototype

A prototype is a sample version of a product without code and data but behaves as same as the result. It is mainly used for testing before launching and evaluating the design to improve the accuracy of analysis. Moreover, the goal is also to validate ideas before sharing them with stakeholders and passing the final designs to the engineering team for development. The purpose of this is to collect feedback from real users as much as possible via an early version of the solution which was formed by the team (Ramirez 2018). The prototype also plays an essential role in solving user pain points during usability testing and enabling the UX team to visualize and optimize the experience during the design process. Therefore, finding, and fixing errors during this stage is critical and avoid making changes to a final product.

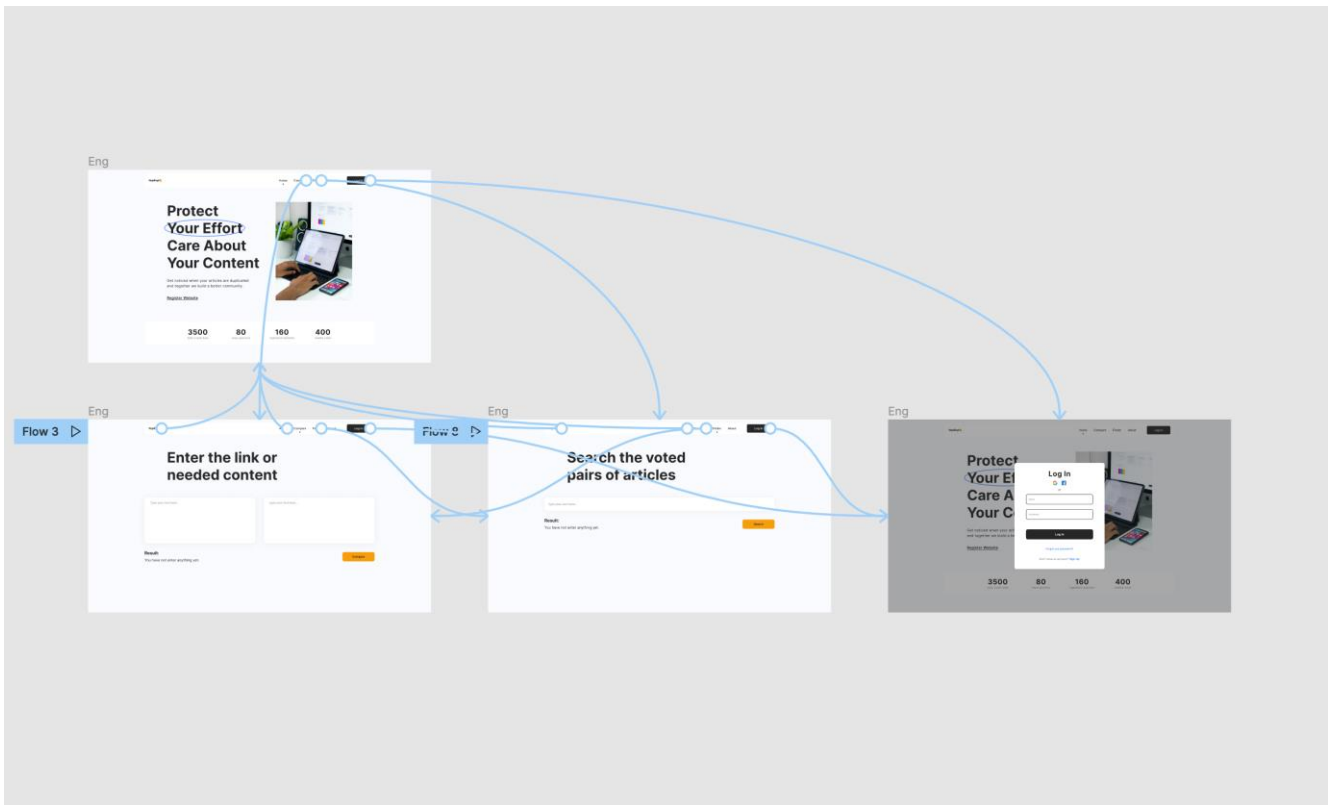FIGURE 7. Basic prototype flow that creates the interaction between different frames so that it could be able to work like a real product (Ramirez 2018).

In figure 7, the pointed lines from different screens to each other describe how they would interact as a normal website. For example, when the site is running, users who just visited the homepage should be able to navigate to further pages like Compare and Finder and backward.

3 DESIGN PROCESS

A good interface is one that helps people solve their problems without bothering them. To succeed in that, there are a variety of steps that need to be done to understand the market needs and the targeted user of the product. The impact of the user interface in software development is not only impressing the user and attracting them to the product but also helping them to complete their tasks effectively. The example topic in this chapter is an ideal website to raise the awareness of people in plagiarism and apply the appropriate UI/UX principles (Mortensen 2020).

3.1 Analysis

In terms of a website, the first area is called Hero Section. Due to new website trends of overusing the negative spaces which makes the site longer and reduces users' attention, the Hero Section is considered as the initial step to emphasize the high-priority content to attract readers (Fessenden 2018). Before diving into a bigger part of that, the logo and menu/ navigation bar is also the essential keynotes. There is an argument about clients who own a business or an entrepreneur or a lead of an organisation usually asking for a bigger logo. However, increasing the size of the logo to make it more visible does not ameliorate the business as well as the company's profit; but it is about whether a user gets or understands what is being offered to them.

The navigation bar contains names of main pages like Service, Work, About or Contact. Based on human eye-tracking research and behavioral psychology, a user is likely to scan with an F-pattern or Z-pattern depending on the load copy of the site. In short, F-pattern is used for a web page that has a big amount of content and this method helps readers to scan naturally and reach the key importance more comfortably. On the other hand, Z-pattern is being applied on a landing page with short and direct messages along with encouraging action as quickly as possible. Therefore, in order to highlight what is serving on the website, the first two titles should be prioritised and valuable for users (Mialki 2021). There are many old-style versions that begin with About/ About Us as a presentation about what the company is instead of what they are working on. For the process of surfing a website, the length of the content does not totally decide the amount of time a user spends on it, but section connection as well as the coherence and cohesion (Ahad & Fauzl 2014).

In the next stage of the main detail in the Hero Section, headings are statements to declare the main action or service that an organisation is providing. Sub-heading could be optional if there is more information to describe about that product. Another function is CTA-Call to action which is a must-have feature for any kind of website that encourages users to make an action and create the interaction as quickly as possible. For example, the CTA button for a B2B service could be Book A Demo, or for an online event could be Buy Your Ticket.
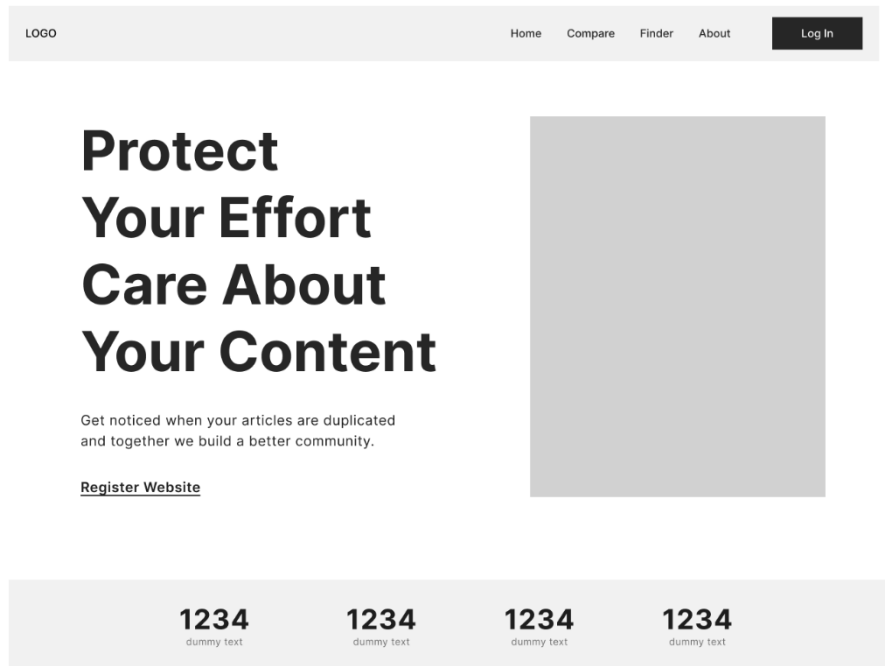

FIGURE 8. Home page of TopDup as lo-fi wireframe.

According to Figure 8, users can compare the unclear articles, find similar topics, and read about who the team behind the website is. In this case, the main functions of TopDup are Compare and Finder that lead users directly to their data pool and experience the service. The About menu is less important than the first one because users would like to know what service is provided to them rather than reading how the organization has been established.

The heading is divided into four lines to be easy for users to scan the message. In TopDup's design, the most important keywords are "Your Effort" and "Your Content" which are dedicated to the value of a user. Therefore, using the Z-pattern here, visitors can get the idea what the service is offering, what functions are existing and what benefits they are targeting. Additionally, the CTA - Register Website appears to persuade users to register their domain for tracking and enriching the database.
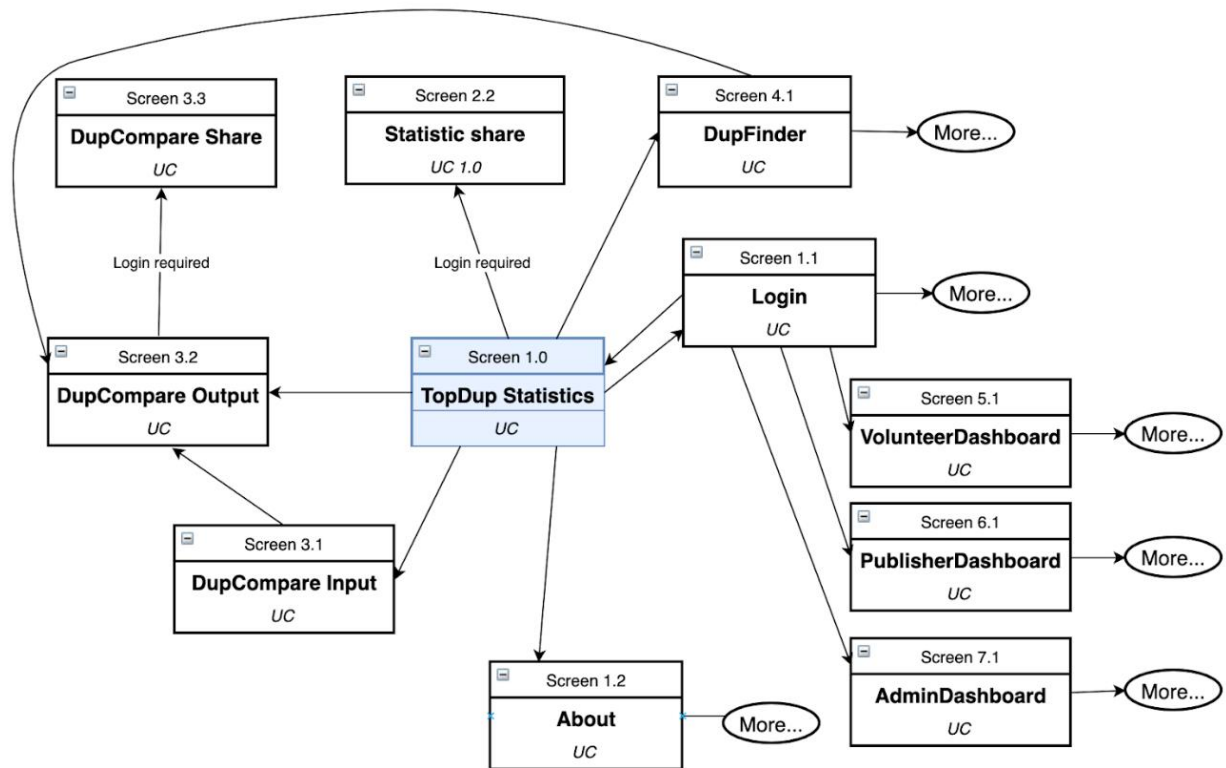
3.2 Use Case

FIGURE 9. The general use case of TopDup for each type of users.

Listing the use cases is to indicate potential and main users' flows in using products and describe a system behaviour as it responds to a request. In the Figure 9, there are four groups of TopDup's users such as regular, publisher, admin, and volunteer.

Firstly, regular visitors seem only to visit the web as a reader and be curious with usual information. In this case, they should be able to skip creating an account and freely explore the site. Because these people do not demand to make an action initially, considering them to register before scrolling could make them feel inconvenient. Secondly, publishers such as web owners, content writers and bloggers, tend to visit the website usually to check their copyright, related data and vote for a pair of articles with higher concern. Therefore, a required login for further action is only needed at this point. For admin and volunteer, even though their tasks could be different from each other but they seem to work backstage rather than on the front side and are less prioritized than the previous two.

3.3 User Research

The meaning of doing the research before proceeding to sketching and developing is to have the most accurate and appropriate product. Research is based on targeted users and there are various methods to expose problems and design opportunities. The two and popular approaches are quantitative and qualitative research (Mortensen 2020).

With quantitative research, its result is conducted through analysing numerical data such as surveys and insight which could be collected by AI technology. For instance, there were 800 people visiting a website and their active hours was around midnight. However, those numbers could not answer exactly why users decided to do that or what the reason behind was. In spite of the unclear information, there is still a wide range of companies that ignore the importance of research to get to know users and what they want. That could be considered as a safe solution for them, but it may not ensure the correct outcome and contain the highest risk.

Qualitative research forms a deeper understanding of why users behave the way they do through interviews or usability testing. Especially, watching and observing while users are using the product in their real environment is the most effective way for the research. For this method, a designer can discover not only the behaviour but also other additional factors. However, even though there are different types of interviews, the team needs to be careful and understand the approaching framework, otherwise the interviewer is about to respond with the expected answer instead of what they truly do (Luca 2021).

3.4 Website wireframing

As described in the above section, wireframing is an indispensable step to assure the output of the team matches the planned requirement. Following the sketch below of TopDup's website, all the text and graphics are set into the draft layout so that the team can have an estimation such as the length of the navigation bar and the header's number of lines. Even at this stage, a designer is still able to implement user testing as a report for stakeholders.
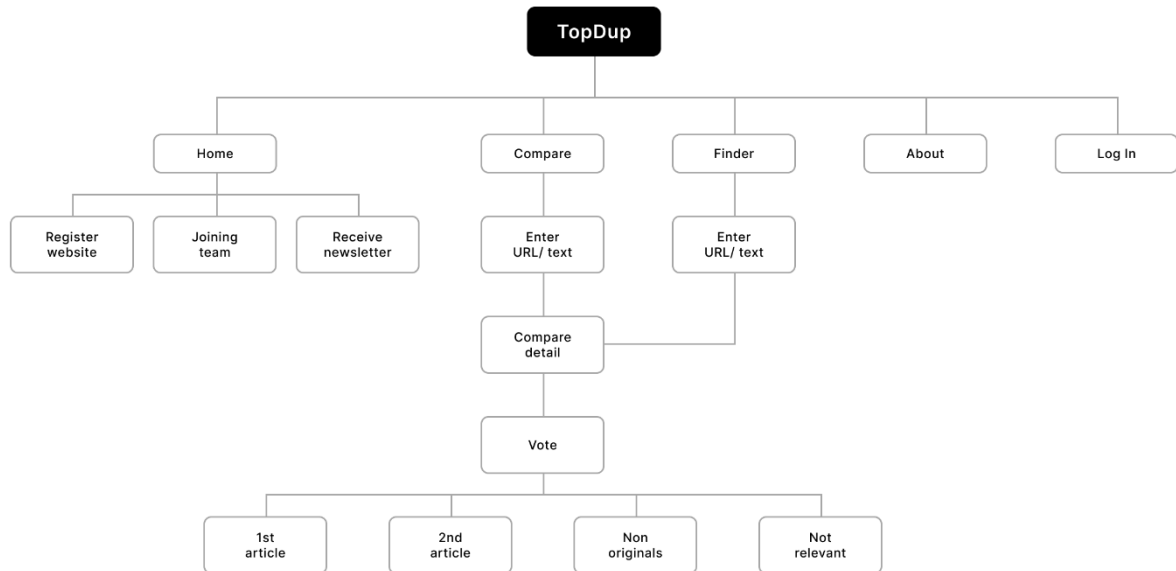
3.4.1 User flows

FIGURE 10. The user flow from Home to other pages.

Figure 10 shows the basic flows of users when they surf the web in general. Based on this, a development team can list all the functions as well as necessary support to help users and link the data to other areas. For instance, when users search for a pair of articles in the database and click on the Compare button on the Finder page, the execution will be forwarded to the Compare page instead of creating a new feature in the current area. There are some cases that people have misunderstood between a user journey map and user flows. This part is more about a technical issue that shows users' present and next steps rather than about what they are thinking and feeling.

3.4.2 Lo-fi prototype

Log In

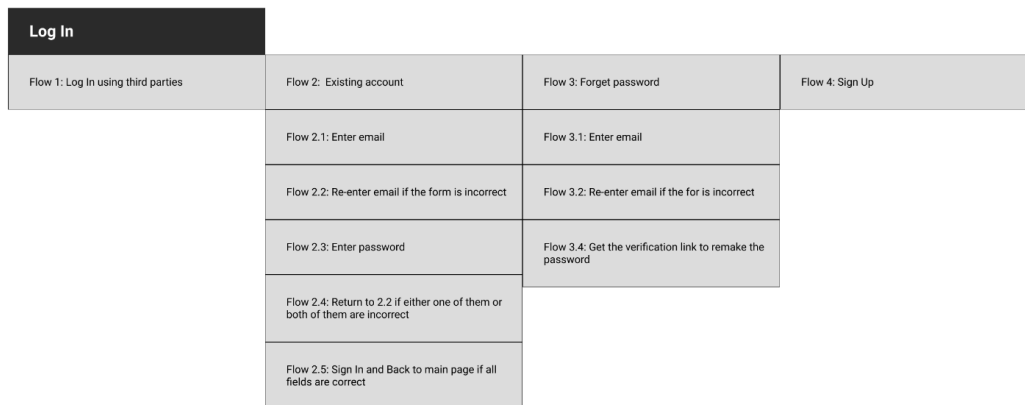| Flow 1: Log In using third parties	Flow 2: Existing account	Flow 3: Forget password	Flow 4: Sign Up
	Flow 2.1: Enter email	Flow 3.1: Enter email	
	Flow 2.2: Re-enter email if the form is incorrect	Flow 3.2: Re-enter email if the for is incorrect	
	Flow 2.3: Enter password	Flow 3.4: Get the verification link to remake the password	
	Flow 2.4: Return to 2.2 if either one of them or both of them are incorrect		
	Flow 2.5: Sign In and Back to main page if all fields are correct		

FIGURE 11. Log In use case.

In the Figure 11, from use cases of Log In, there seems to be a design corresponding to each case to express the status and instruct users what they need to do for the next step. For example, when a user clicks on Log In button in the navigation bar, they can choose to login via third parties like social media or enter the account info; and other options like Forget Password and Sign Up.

Sign Up

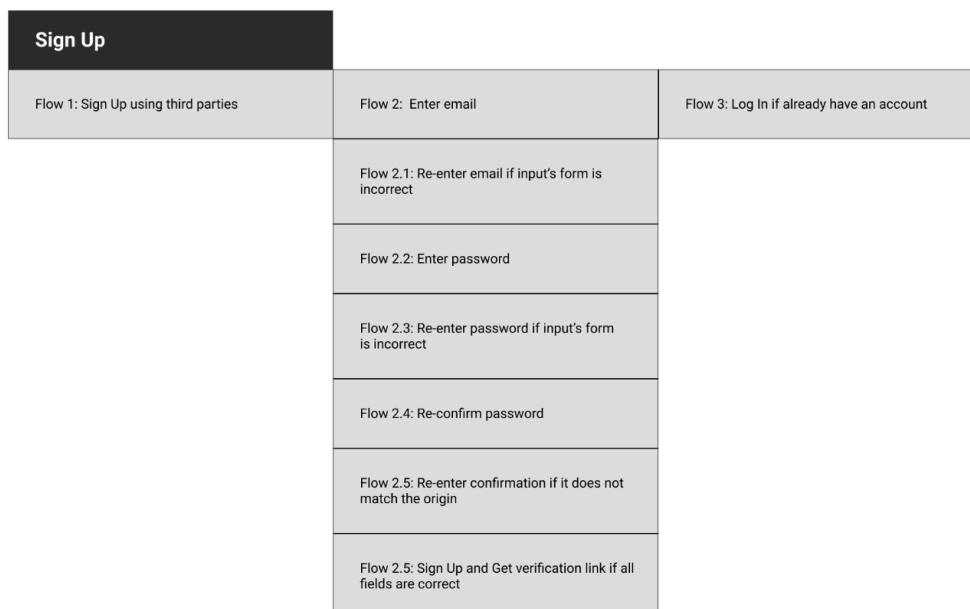| Flow 1: Sign Up using third parties	Flow 2: Enter email	Flow 3: Log In if already have an account
	Flow 2.1: Re-enter email if input's form is incorrect	
	Flow 2.2: Enter password	
	Flow 2.3: Re-enter password if input's form is incorrect	
	Flow 2.4: Re-confirm password	
	Flow 2.5: Re-enter confirmation if it does not match the origin	
	Flow 2.5: Sign Up and Get verification link if all fields are correct	

FIGURE 12. Sign Up use case.

With the figure 12, a close similarity with Log In function, Sign Up use case expands further in creating account steps because it requires another input which is the password confirmation.
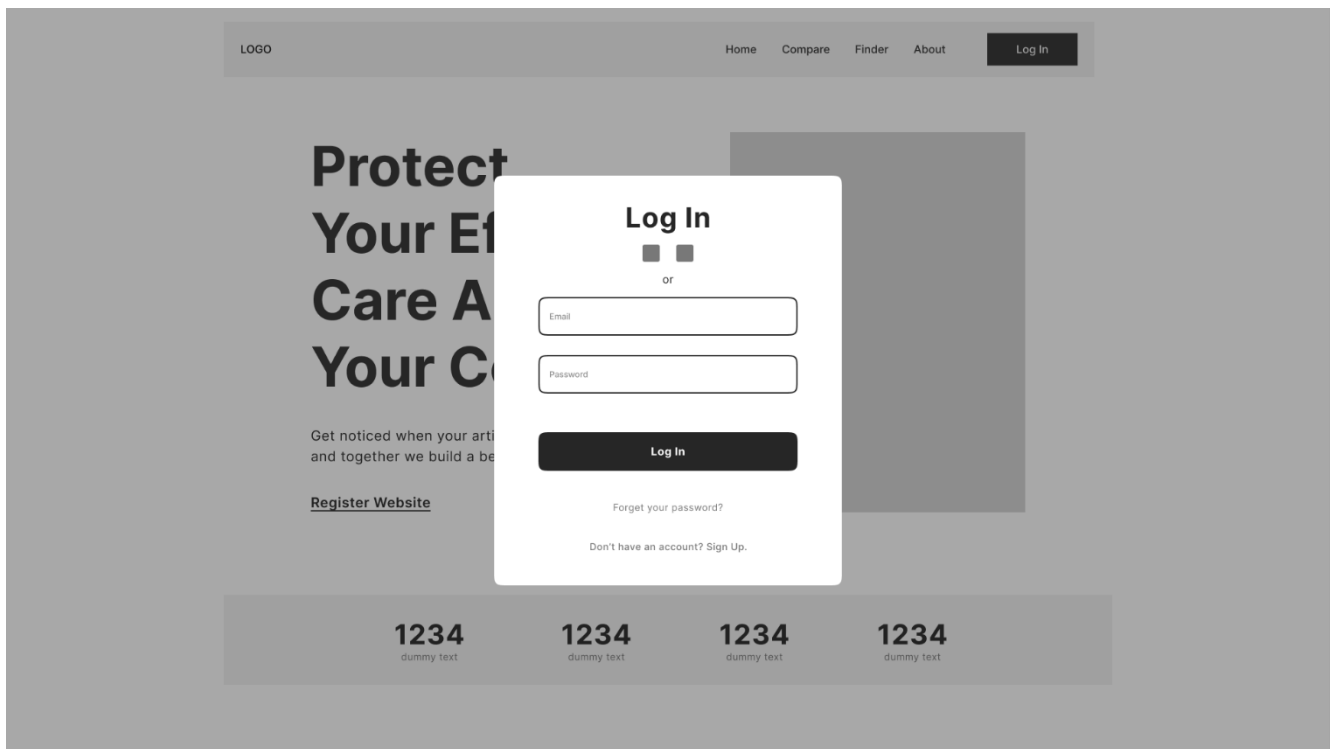

FIGURE 13. Log In wireframe.

In figure 13, the Log In pop-up has two inputs and a login button with the same size of the width. They are designed to follow the visual hierarchy that in the flow of similar frames, the following objects should be either longer or equal with the above ones. This also help the eyes of users could easily to navigate from the current field to the followings.
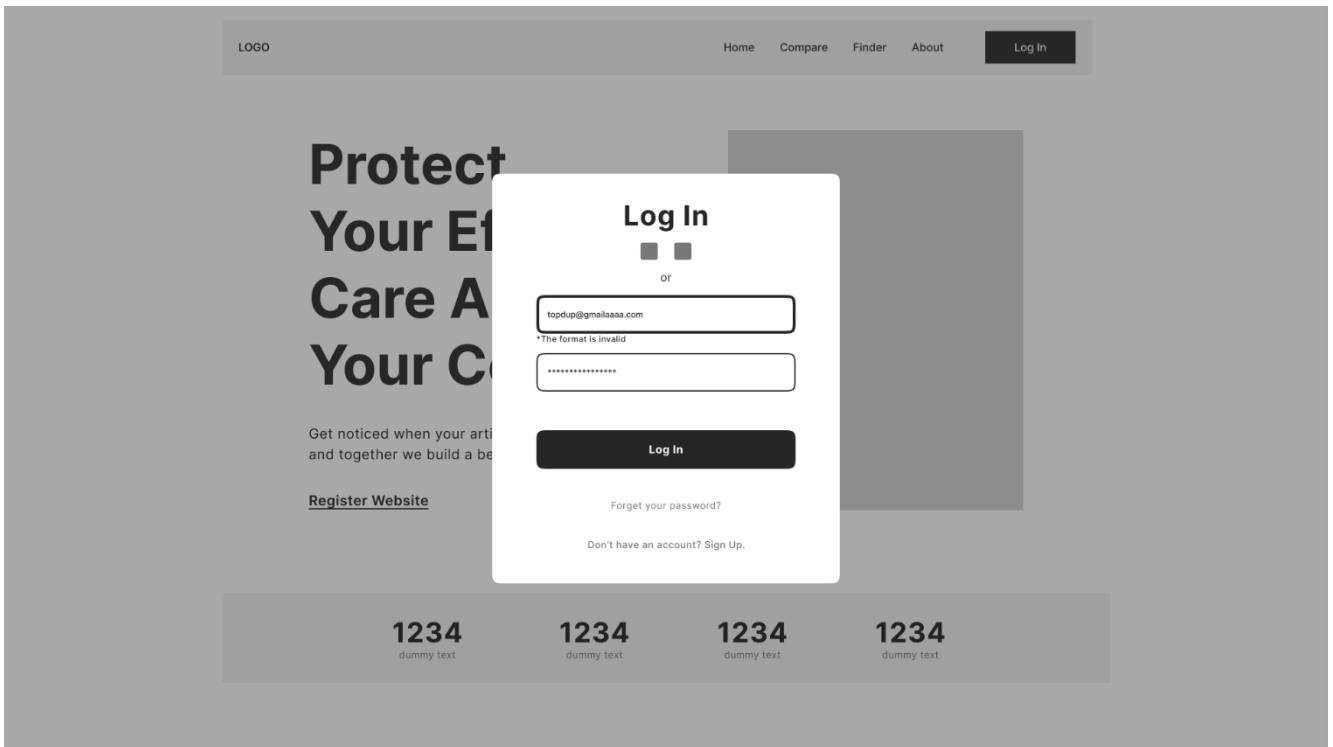
FIGURE 14. Log In with invalid email format.

Figure 14 displays one of an error flow when a user is having an issue while logging in. From this, it shows that intuitive design plays a major role in navigating users to a specific point and along with having a description for them to acknowledge the error. Besides assessing the authenticity of the information, the system also checks the format of the email to reduce the effort for users as much as possible.

3.4.3 Hi-fi prototype

In the hi-fi version as well as after applying colours for the frames, the red one is used based on the research of its alert meaning. The figures below are the interaction demo when every screen is connected. In this stage, the development team and testing users can experience the prototype as a closer realistic one.

Visual identity

Typography

Inter   **Bold**   Medium   Regular

Color palette

Primary

#262626	#F69E0C	#3571FF	#EF5A5A

Secondary

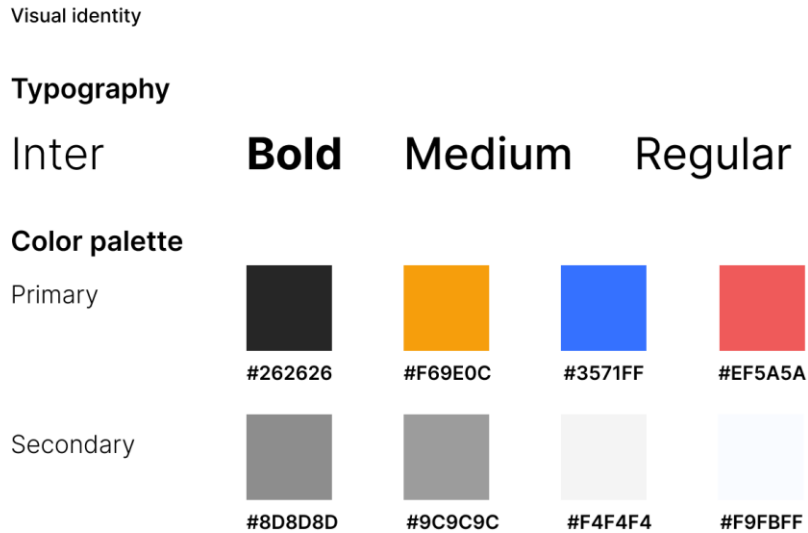|			
#8D8D8D	#9C9C9C	#F4F4F4	#F9FBFF

FIGURE 15. Visual identity used for creating the hi-fi wireframe.

Before starting to create the hi-fi wireframe, the team needs to have a visual package that has been formed by researching to match the market and brand identity. According to figure 15, the type of selected font is Sans-serif which are popular for new generation brand and easier to read on-screen because of its simpler design. Moreover, the various choices of font use are to create a gap between different lines of text and to deliver a clear message for each section (Kingston 2020). For instance, a heading in the Hero Section has the mission to express the main value of the company and is suggested to have at least two levels from the next text or sub-heading. It means that if a heading is set with Bold font-weight, the sub-heading or description should be Regular or Light because they usually have Semi-bold, Medium between that. Compared to the past, before UI and UX terms became popular, most companies preferred using a typeface for their logo and other documents based on their favourite. Therefore, the output usually was formed with the Serif because of the elegant vibe and bold style.
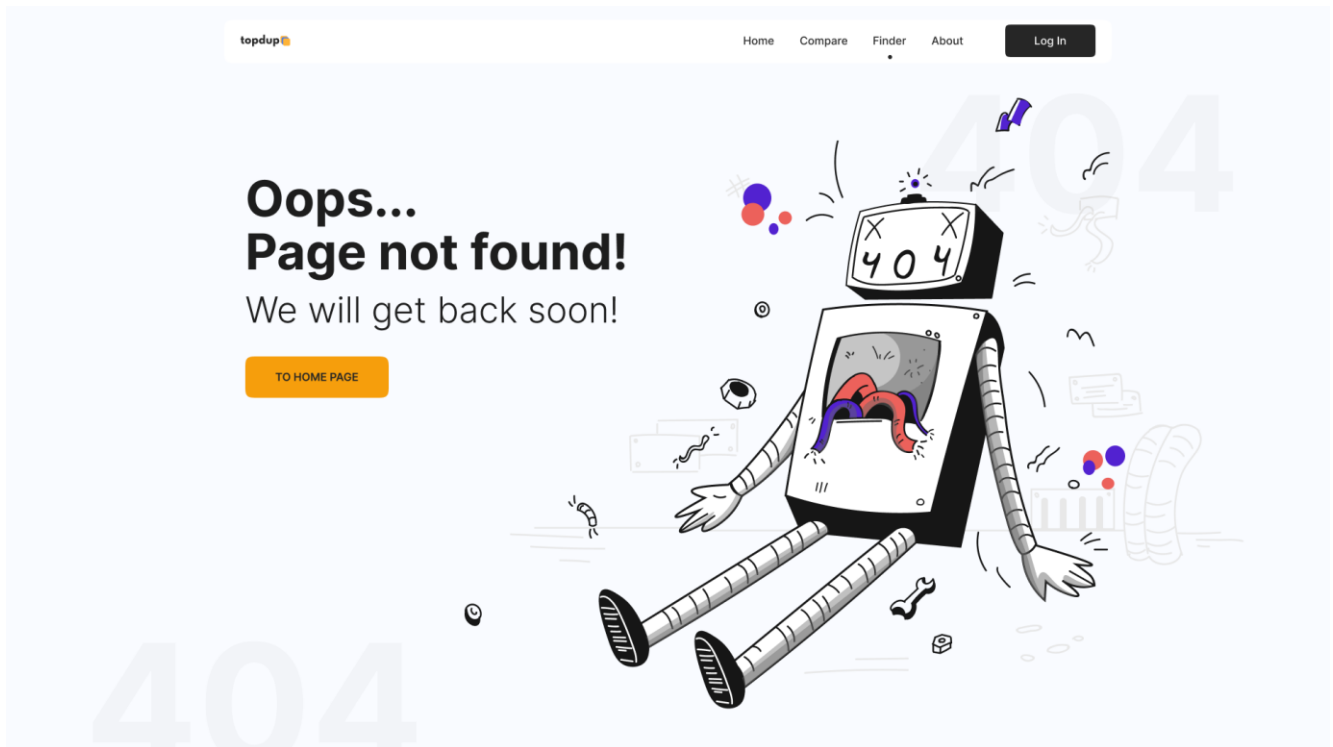
FIGURE 16. The error page to inform user that the website has crashed, or a page could not be found. An example of two gaps between heading and sub-heading (Bold & Light).

In the figure 16, the heading of "Oops…Page not found" follows the rule of having gaps between texts makes it be outstanding from the sub-heading and becomes the first sentence that users are about to read at the beginning of this issue.

For TopDup's colour palette, the primary is yellow and blue which are chosen to stand for the meaning of innovation, authenticity and credibility. One of the special things is the secondary colour in foreground (#262626) and background (#F9FBFF) are used without highest hex value. The reason for this is to keep the contrast between those two at an appropriate level. For example, according to the contrast checker standard for digital reading, a required ratio for normal text is at least 4.5:1 for normal text and 3.0:1 for larger text (Kramer 2018; Hinz 2016). If the text and background are used with maximum values which are #000000 and #FFFFFF respectively, it is likely to cause eyestrain while using the web.
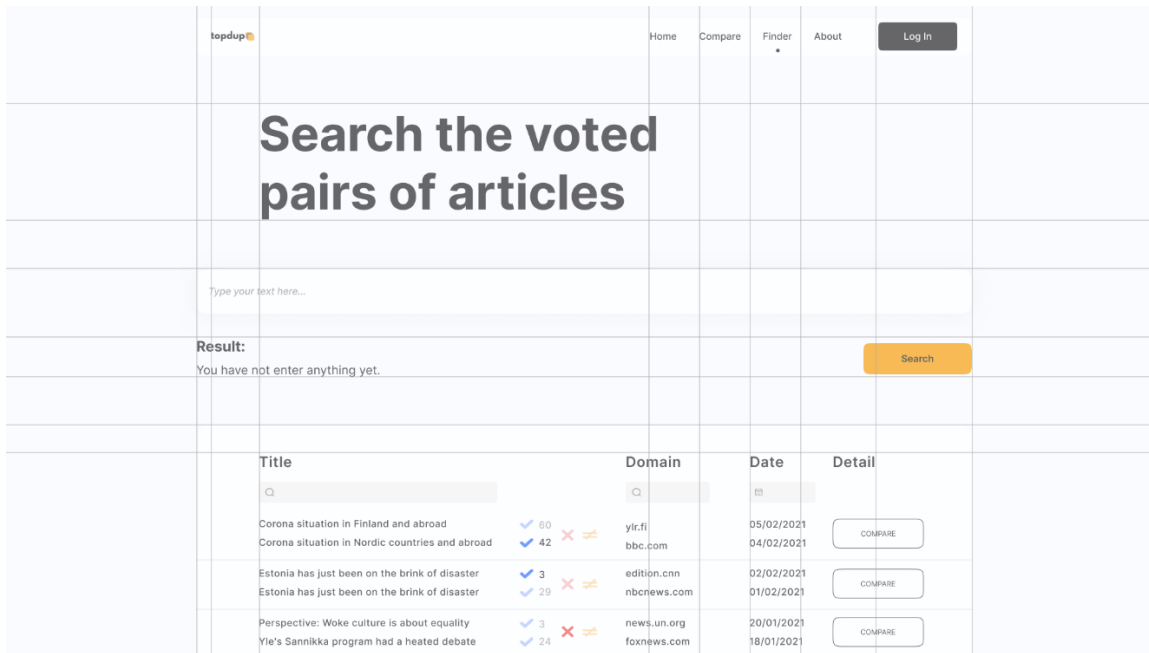
FIGURE 17. Grid applied for layout ratio.

Grid in designing provides the structure for elements, consistency and create the hierarchy. Additionally, applying in grid with constraints is useful for developer to enhance the responsive feature on web and mobile application (Lowry 2019). However, using grid does not always follow the same framework but flexible and can be generated based on the design' theme. The popular ratio for the distance between each element usually is common multiples of four and it is similar with the parameter of CSS-Bootstrap. In Figure 17, the applied grid depends on each section, and it scales the proportion for the following components.
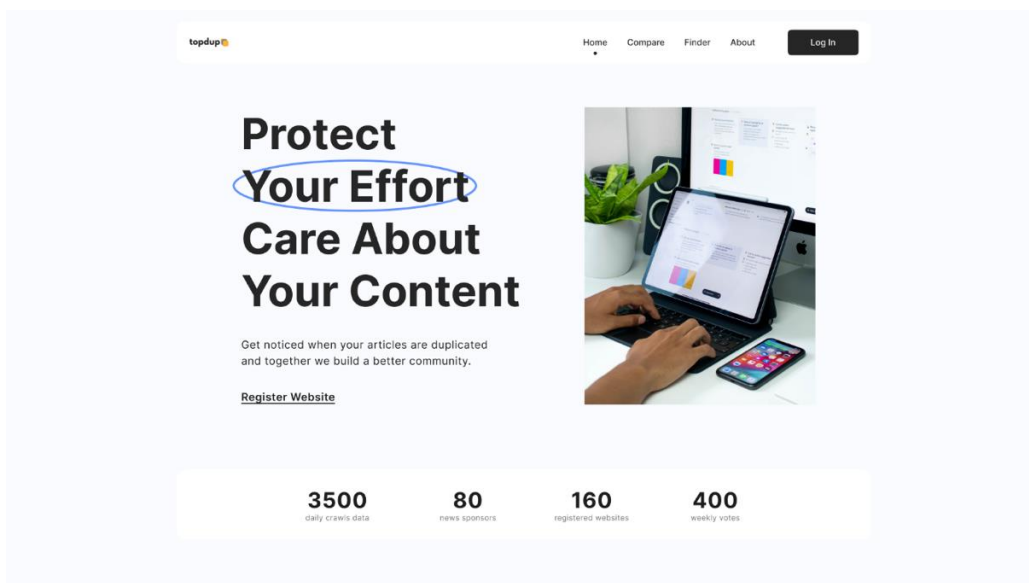

FIGURE 18. Home page of TopDup as hi-fi wireframe.

In Figure 18, besides following the visual hierarchy of typography, the oval shape is used to emphasize the main target of TopDup which is the content owner's effort. As every word in a line has been splitted intentionally, it separated the message to smaller parts that catch the attention of users.
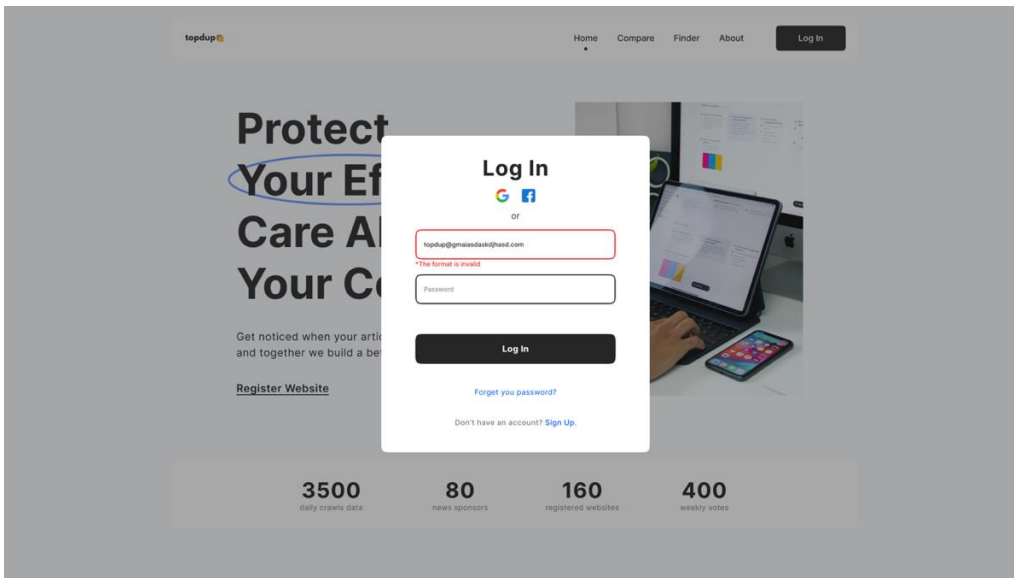

FIGURE 19. Invalid email format is alerting with red color.

Figure 19 displays the place that had been reported with the issue of incorrect input format. Pointing specifically to the error reduces the effort for users to search for that and it is going to improve better in filling forms from longer list of text fields.
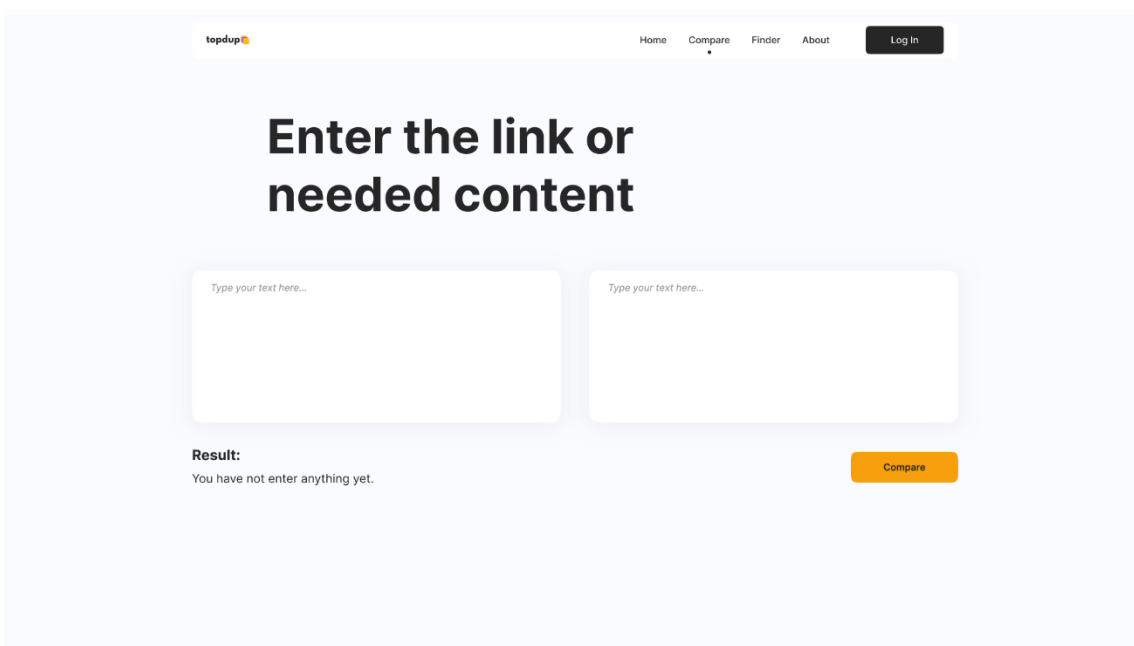

FIGURE 20. Compare page with two toggled input fields.

In the Figure 20, the Compare page is shown with expanded text fields that allow user to enter the link of an article or a short paragraph on content that they would like to compare with the other. The description below the title of Result is used to indicate the status when the input is empty.

4 CONCLUSIONS

Although the development of TopDup was not completed due to a shortage in manpower and budget, learning through a lot of research and having chances to apply knowledge into a practical environment did show the wide range of approaches to help elevate the product's efficiency. Moreover, summarising and preparing all the information for this thesis also help me to arrange my resources and discover alternative departments that could be merged in UI/UX such as marketing, business consulting and market analysis.

I was inspired to proceed with this thesis from my first year exploring UI/UX as well as had been encouraged during working with developers in the project of TopDup. Hence, I could experience the typical and risky business example of the top-down model which all the ideas were conducted by only the CEO or product owner and transferred directly to the development team. However, communication is the key in promoting and convincing to have the UI/UX concept implemented. Because in any scope of an organisation, every process requires a certain amount of cost of the team or the company. But in order to ensure a future profit and sustainable growth, investing in research or analysing the market is indispensable.

REFERENCES

Ahad, D. & Fauzl, Z. 2014. People Don't Read, They Scan. Available at: https://stampede-design.com/blog/people-dont-read-they-scan/#.YazC6y8Rrz9. Accessed: 08.12.2021

Churchville, F. 2021. User Interface (UI). Available at: https://searchapparchitecture.techtarget.com/definition/user-interface-UI. Accessed: 17.10.2021.

Dam, R. & Siang, T. 2021. Personas – A Simple Introduction.
Available at: https://www.interaction-design.org/literature/article/personas-why-and-how-you-should-use-them. Accessed 28.10.2021

Faller, P. 2019. Putting Personas to Work in UX Design: What They Are and Why They're Important.
Available at: https://xd.adobe.com/ideas/process/user-research/putting-personas-to-work-in-ux-design/. Accessed: 28.10.202

Fessenden, T. 2018. Scrolling and Attention. Available at: https://www.nngroup.com/articles/scrolling-and-attention/. Accessed: 06.12.2021

Gibbons, S. 2018. Journey Mapping 101.
Available at: https://www.nngroup.com/articles/journey-mapping-101/. Accessed: 27.10.2021

Grenier, L. 2021. How to create a simple, accurate user persona in 4 steps without leaving your desk.
Available at: https://www.hotjar.com/blog/user-personas/. Accessed: 28.10.2021

Hannah, J. 2021. What Exactly Is Wireframing? A Comprehensive Guide.
Available at: https://careerfoundry.com/en/blog/ux-design/what-is-a-wireframe-guide/. Accessed: 28.10.2021

Henry, S. & McGee, L. Accessibility. Available at: https://www.w3.org/standards/webdesign/accessibility. Accessed: 22.10.2021

Hinz, K. 2016. Designing for Accessibility: The Ultimate in UX. Available at: https://medium.com/tealmedia/designing-for-accessibility-the-ultimate-in-ux-e366165d0db7. Accessed: 10.12.2021

Interaction Design Foundation. User Interface Design.
Available at: https://www.interaction-design.org/literature/topics/ui-design. Accessed: 17.10.2021

Interaction Design Foundation. User Experience (UX) Design.
Available at: https://www.interaction-design.org/literature/topics/ux-design. Accessed: 19.10.2021

Interaction Design Foundation. Usability. Available at: https://www.interaction-design.org/literature/topics/usability. Accessed: 20.10.2021

Interaction Design Foundation. Accessibility. Available at: https://www.interaction-design.org/literature/topics/accessibility. Accessed: 22.10.2021

Interaction Design Foundation, 2021. Wireframing. Available at: https://www.interaction-design.org/literature/topics/wireframing. Accessed: 28.10.2021

Interaction Design Foundation. User Research. Available at: https://www.interaction-design.org/literature/topics/user-research. Accessed: 04.12.2021

Kingston, C. 2020. Key Principles of Visual Hierarchy in UX Design. Available at: https://xd.adobe.com/ideas/process/information-architecture/visual-hierarchy-principles-examples/. Accessed: 10.12.2021

Kramer, N. 2018. A Primer to Web Accessibility for Designers. Available at: https://uxplanet.org/a-primer-to-web-accessibility-for-designers-2c548448c612. Accessed: 10.12.2021

Lai, Y. 2019. Visual Hierarchy, Gutenberg Diagram, F & Z Pattern. Available at: https://lineindesign.medium.com/be-a-designer-who-can-also-help-with-writing-copy-2f4ea02a5646. Accessed: 05.12.2021

Lamprecht, E. 2021. The Difference Between UX and UI Design – A Beginner's Guide. Available at: https://careerfoundry.com/en/blog/ux-design/the-difference-between-ux-and-ui-design-a-laymans-guide/. Accessed: 19.10.2021

Lowry, T. 2019. Our grid pro quo: Everything you need to know about layout grids in Figma. Available at: https://www.figma.com/blog/everything-you-need-to-know-about-layout-grids-in-figma/. Accessed: 10.12.2021

Luca, J. 2021. What Is User Research, and What's Its Purpose? Available at: https://careerfoundry.com/en/blog/ux-design/the-importance-of-user-research-and-how-to-do-it/. Accessed: 05.12.2021

Mialki, S. 2021. What Is the Z-Pattern Layout & When to Use It? Available at: https://instapage.com/blog/z-pattern-layout. Accessed: 05.12.2021

Mortensen, D. 2020. User Research: What It Is and Why You Should Do It. Available at: https://www.interaction-design.org/literature/article/user-research-what-it-is-and-why-you-should-do-it. Accessed: 05.12.2021

Nielsen, J. 1997. How Users Read on the Web. Available at: https://www.nngroup.com/articles/how-users-read-on-the-web/. Accessed: 07.12.2021

Nielsen, J. 2012. Usability 101: Introduction to Usability. Available at: https://www.nngroup.com/articles/usability-101-introduction-to-usability/. Accessed: 20.10.2021

Norman, D. & Nielsen, J. The Definition of User Experience (UX). Available at: https://www.nngroup.com/articles/definition-user-experience/. Accessed: 19.10.2021

Quadros, M. 2021. 15 Call To Action Examples (and How to Write the Perfect CTA). Available at: https://adespresso.com/blog/call-to-action-examples/ Accessed: 02.12.2021

Ramirez, V. 2018. What is a Prototype? Available at: https://medium.com/nyc-design/what-is-a-prototype-924ff9400cfd. Accessed: 28.10.2021

Salazar, K. 2021. 7 Ways to Analyze a Customer-Journey Map. Available at: https://www.nngroup.com/articles/analyze-customer-journey-map/. Accessed 27.10.2021

Shah, A. & Sizer, A. 2020. Building an accessible product: our journey so far. Available at: https://www.esri.com/arcgis-blog/products/arcgis-storymaps/constituent-engagement/building-an-accessible-product-our-journey-so-far/. Accessed: 13.12.2021

Varga, D. 2020. A Beginner's Guide to User Journey vs User Flow. Available at: https://www.digital-natives.hu/blog/user-journey-vs-user-flow/. Accessed: 13.12.2021

What Is A Prototype: A Guide to Functional UX. Available at: https://www.uxpin.com/studio/blog/what-is-a-prototype-a-guide-to-functional-ux/. Accessed: 28.10.2021