CHAPTER II

LITERATURE REVIEW

2.1 Website

Based on Abdullah's research, a website is various forms of information, such as text, images, sounds, and videos, that are either gathered together or shown separately in multiple pages, and require an internet connection to be accessed. Meanwhile, Sarwono (2015) defined website in simplified form, in which it is an information media that can be accessed using the internet. On a technical level, a website is built using HTML, which is the general coding language, which is then rendered visually to allow users to access and read information that is presented (Susilawati et al., 2020, p. 36). Its practicality and ease of access is the primary reason why the author chose to create a website for spreading information about PCOS.

2.1.1 Types of Websites

Generally speaking, websites consist of two types. Websites with quick interchangeable content are called dynamic websites. On the other hand, websites that require more time to update are referred to as static websites. Typically, dynamic websites involve the user in a form of interaction, such as signing up to become a member, posting comments, and so forth. As such, it allows the website to be updated in real-time, while preserving the original coding script. On the contrary, static websites do not involve users in any type of interaction. In order to update the contents, the website owner must modify the coding script manually (Astuti & Agustina, 2022, p.8).

2.1.1.1 Static Website

Geeks For Geeks (2024) stated that, in terms of technicality, static websites are much simpler. They rarely need any modification for information. As such, information will seldom change unless the developer inputs or modifies new content. Static websites require lesser time to load, cost less, and demand less work to make. Examples of content using static websites include portfolios, landing pages, and instructional sites.
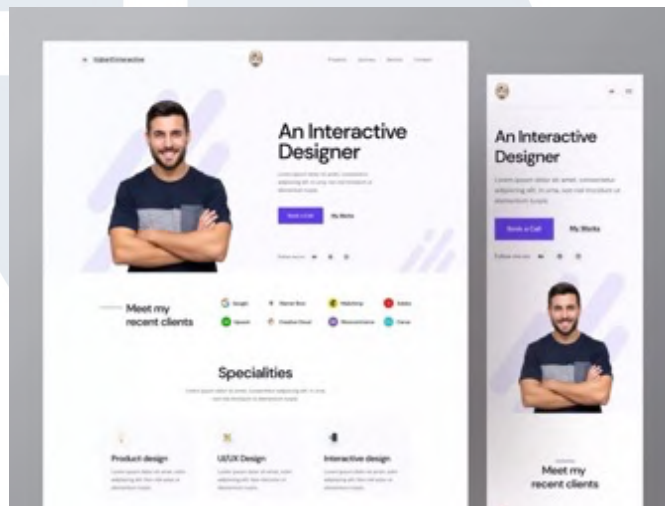

Figure 2.1 Example of Static Website
Source: https://www.linkedin.com/pulse/how-personal-portfo... (2023)

Usually, static websites are written in code, using languages such as JavaScript, HTML, CSS, and more. As such, the website immediately processes all inputs given to the server. Additionally, this means that static websites do not utilize databases. This also means they do not contain any applications built into the website.

2.1.1.2 Dynamic Website

As opposed to static websites, dynamic websites are better suited for platforms that rely on real-time interaction. Websites for social media, e-commerce, and content management systems are especially supported with features such as user accounts and live chats. They create personalized experiences, which means that they

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display content according to the user's preferences. As such, the uses of servers and databases are to store user data are common (Jolliffe, 2024).
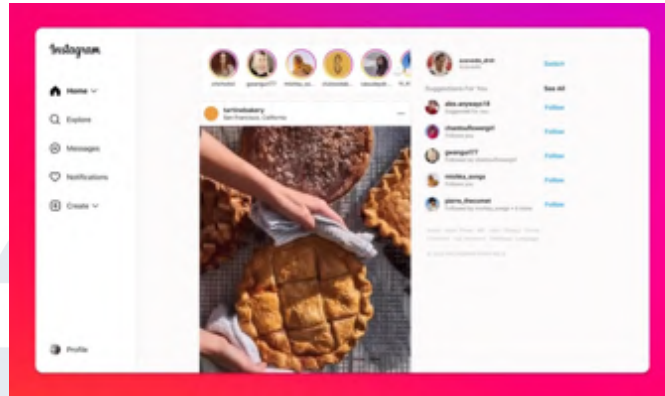

Figure 2.2 Example of Dynamic Website
Source: https://routenote.com/blog/instagram-redesigned-web... (2022)

Dynamic websites are considered to be more complex than a static website. This is due to data being constantly updated whenever a user inputs new information. As such, information within the web changes often. In general, dynamic websites contain applications from various other services, which causes it to take more time to load.

2.1.2 Website Function

As an information media, websites have various functions, which can be divided into a few categories, such as static and dynamic types of websites. Another factor that differentiates types of websites are the target audience, as it can affect how much information the website contains and the way information is presented. In general, websites can be categorized as personal website, blog, photo sharing website, e-commerce, educational, social media, portfolio, non-profit, magazine and news, and informational website (Geeks For Geeks, 2021).

2.1.2.1 Informational Website

Informational websites refer to websites that deliver information regarding a variety of topics. As the name suggests, its main purpose is to curate and collect quality information (Geeks For

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Geeks, 2021). Moreover, the information presented is not just surface-level, but also detailed. Features such as easy navigation, strong user interface, and a suitable color scheme are key to delivering information, especially for an informational website (EMB, 2022).
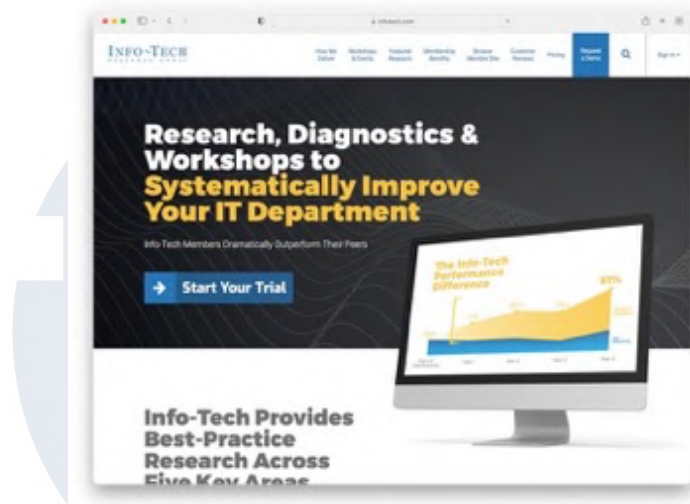

Figure 2.3 Example of Informational Website
Source: https://colorlib.com/wp/informational-websites/ (2025)

In general, an informational website has a structure. A few of them involve the interaction experience itself, such as user-friendly navigation, interface, mobile responsiveness, accessibility features, call-to-action elements, multimedia integration, search functionality, . However, a few parts of the structure involve the brand, such as consistent branding, social media integration and multimedia integration. These elements are important to maintain an accessible informational website (EMB, 2023).

2.1.3 Website Design

Website design is not just about creating a beautiful website. It is also about helping the user understand information faster by increasing their attention span, which in return, creates a subtle guide for the user. As Fitz's law states, the ability to take in information can also be affected by the size of the content, which is why it is important to adjust the ratio of content and design (Qing et al., 2024).

2.1.3.1 Website Design Principles

Much like graphic design, websites also adhere to the same design principles. Visual design principles are used in website design in order to reduce the burden on the user's mind when navigating through. These principles are not ultimate, meaning they do not have to be exactly the same. Instead, they act as a guide for creating a website design. According to Siang (2022), these visual design principles include unity, gestalt, hierarchy, balance, contrast, scale, and dominance, i.e.:

A. Unity

Unity refers to the harmony of visual elements on a website. It touches on how the placement of each individual element as a group makes the user feel. To aid in creating a pleasing user experience, grids can be utilized when placing visual elements. However, the use of grids can be modified accordingly.
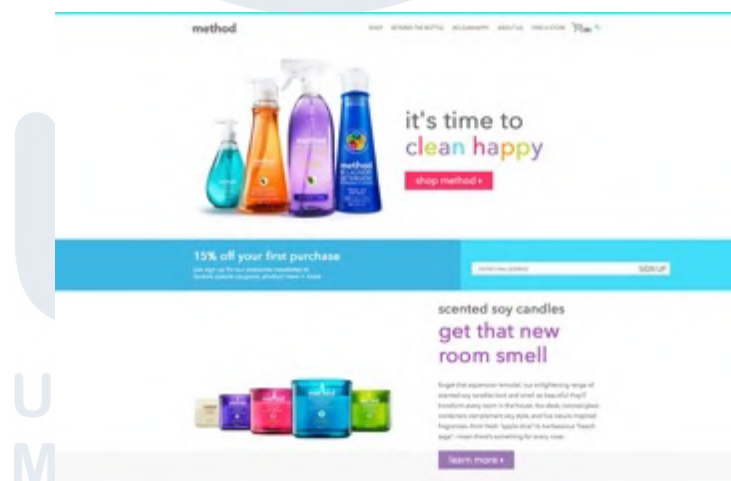

Figure 2.4 Unity in Website Design through Colors
Source: https://jilllynndesign.com/unity-design-principle-... (2017)

As unity refers to the harmonization of elements, all visual assets must complement one another. This includes elements such as shapes, images, colors, texts, and more. However, important elements or controls must always stand out. In general, there are two types of

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unity, visual and conceptual. Conceptual refers to the user experience itself, while visual unity refers to the visual elements (Geeks for Geeks, 2024a).

B. Gestalt

Can be referred to as the habit of viewing something as a whole. This principle is further supported by the fact that humans have a natural tendency to view the bigger picture first, before analyzing the smaller details. In website design in particular, visual elements with similar functions and information should be grouped together to avoid confusion. This can be done using white space or spacing to give distance between visual elements.
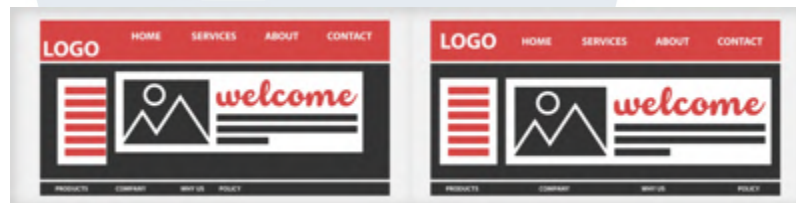

Figure 2.5 Before and After Gestalt Usage in Web Design
Source: https://www.smashingmagazine.com/2019/04/spaces... (2019)

The image above shows an example of gestalt usage in a website layout. Implementing gestalt as a principle must come with implementing other design principles, such as unity, proportion, and white space. The first image shows the usage of gestalt without applying both principles, which creates a sense of unease due to inconsistent spacing. As such, the second image shows a better application of gestalt, as it utilizes consistent spacing, but still groups similar information together.

C. Hierarchy

The principle often used to show an information's order of importance. Hierarchy can be achieved through many ways. One of which by using a variety of text sizes, where bigger texts will be read

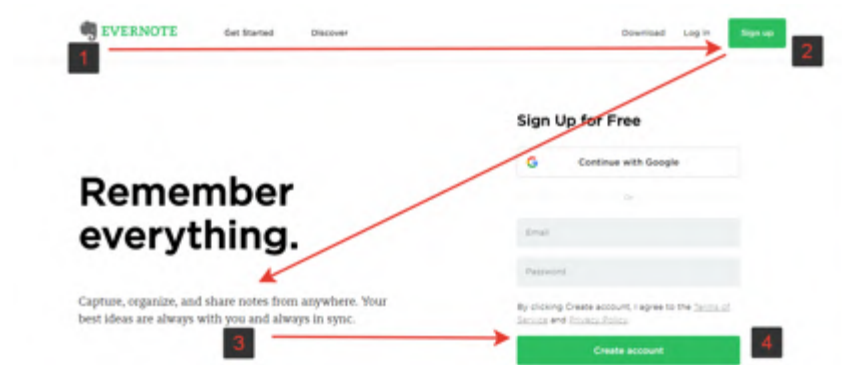first. Another way is to use different saturations and hues of colors to mark different levels of priority.

Figure 2.6 Hierarchy in Website Design
Source: https://www.breakfreegraphics.com/design-... (2019)

The picture above illustrates the usage of hierarchy in a website layout. The first layer of hierarchy lies in the navigation bar due to its positioning within the page. When compared to other elements, the logo stands out significantly. This is then followed by the green sign up button on the top right, which utilizes color to contrast itself with other elements. From there, the user's eyes will move towards the text in the middle, which is due to its larger when compared to other elements. Afterwards, the user's eyesight returns to the 'Create Account' button on the bottom right.

D. Balance

Refers to the balance between visual elements. Balance can be done both symmetrically and asymmetrically. However, the number of visual elements must weigh the same in order to keep things harmonious. Below are the examples of balance usage in a website.

Figure 2.7 Symmetrical (left) and Asymmetrical Websites (right)
Source: https://www.wix.com/blog/asymmetrical-balance (2022)

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Both websites are minimalistic in approach. However, each page balances its composition using different methods. The first page balances the imagery used by increasing the size of the logo, as well as placing the menus towards the middle. On the other hand, the second page utilizes typography to balance out the empty space, as seen by the quote in the middle of the page.

E. Contrast

Closely connected with hierarchy, as it can be done to make a visual element stand out. Contrast can help create a different impression to a visual element. Much like hierarchy, contrast in website design can be achieved through different values, colors, and text sizes. An example can be seen in the page below.
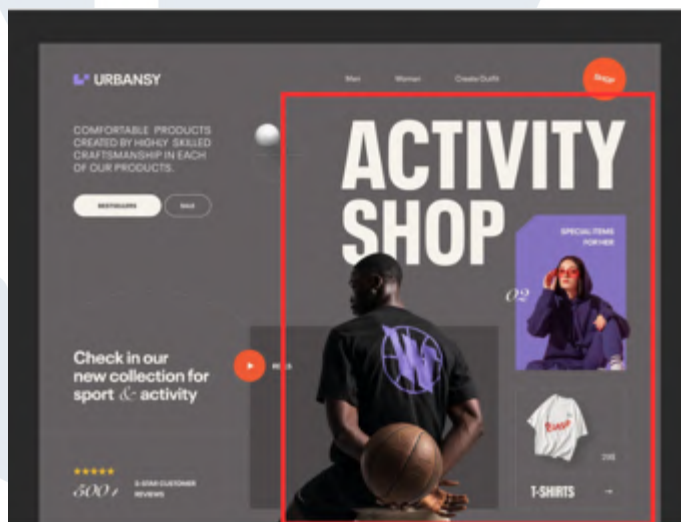

Figure 2.8 Contrast in Website Design
Source: https://www.halo-lab.com/blog/how-contrast-works-in... (n.d.)

The page above utilizes contrast to determine hierarchy. This is done through using various sizes of typography, color usage, and composition. Typography variants can be seen by the different sizes utilized for headlines, sub-headlines, quote, and buttons. Color usages include purple, grey, cream, and a hint of yellow for decorative elements. On the other hand, contrast through composition can be seen through the amount of visual elements gathered in one place.

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F. Scale

Scale as a principle can be considered to be closely related with contrast and hierarchy, as it is one of the many ways to create those principles in website design. Scale can also create a dynamic look, creating depth to visual elements that need to stand out more. In addition, it makes a visual element look more dramatic. Below is an example of scale usage in a website.

Figure 2.9 Scale as a Design Principle
Source: https://torchbox.com/wagtail-cms-services/blog-wag... (2016)

The name of the location, 'First Port of Empire', uses large text to emphasize itself, supporting the image behind it. Another element with a similar objective is the year date below the headline. When compared to other elements of the website, both text is much larger in scale. This allows users to register said information first before other elements.

G. Dominance

Dominance aims to create a focus on one element. This can be done through scale, shape, color, placement, or color. However, much like the other principles, the balance and unity between visual

elements must still be upheld to keep the aesthetically-pleasing look of the website. Below is an example of dominance applied to a website.

Figure 2.10 Dominance in Website Design
Source: https://www.halo-lab.com/blog/how-contrast-works-in... (n.d.)

When compared to other elements, the headline is the first thing users see. This is due to the larger size of the text in comparison to other elements. As such, it can be referred as the most dominant element of the web. The text's dominance is also further supported by the decorative elements placed behind the text.

2.1.3.2 Website Components

Websites come in various kinds of designs. They also come in various unique layouts. However, it is always guaranteed that it is made up of these five basic components. According to Beaird et al. (2020), websites are structured with parts such as container, logo, navigation, content, footer, and whitespace, i.e.:

A. Container

Containers are the borders of the content, meaning they contain all of the visual elements on the website. Usually referred to as the page's body tag or all-containing body tag, if taken out, the visual elements will leave the borders of the website. Containers are flexible, meaning they follow the width size of the browser. Although

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they are more involved in coding, website containers can help designers map out the basic layout of a page's content.

Figure 2.11 Website Containers
Source: https://elementor.com/help/what-is-a-container/ (2024)

In general, containers do not have a certain template, as they are quite customizable. Not all websites can utilize the same template while being able to reach their goals. As such, the number of containers depend on the type of website. The amount also depends on the website's section, as they may vary depending on use.

B. Logo

Logos represent the identity of the company or organization that own the website. Typically, websites are used as a marketing collateral, or collateral in general. Logos can vary in appearance, ranging from simple text, using vector images, or a combination of both. The most common placement for logos is on the top of the website, as it indicates the page that the user is looking at, as well as supporting brand recognition.
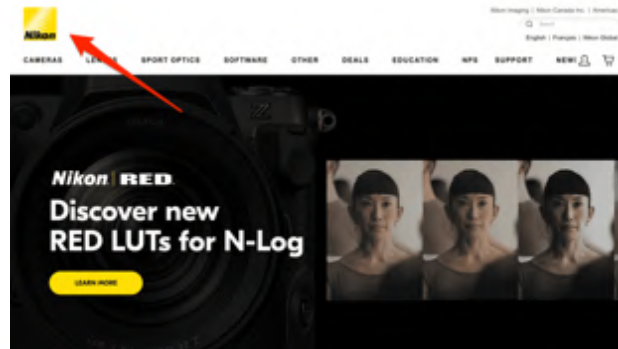
Figure 2.12 Logo Usage in a Website
Source: https://snappa.com/blog/best-logo-size/ (2024)

There are no limitations as to what logo style is best used. However, it is important to take the logo's visibility into consideration. An example can be taken from the picture above. Given that the logo is a combination mark, its visibility must be enough to be readable by the user.

C. Navigation

Navigations are commonly used to traverse the website and allow faster and ease of information access for users. As a basic rule, all navigations should sit on the top, either placed horizontally or vertically. It also has to be "above the fold", meaning the content must end before the scroll goes down. In general, the main objective is to allow ease of accessibility for users.
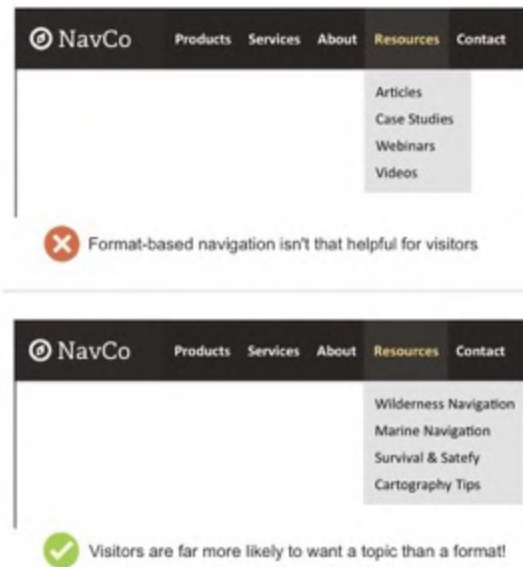
Figure 2.13 Navigation Bar Usage in a Website
Source: https://www.orbitmedia.com/blog/website-navigation/ (n.d.)

An example can be seen from the picture above. Since the main objective of navigation is to create a smooth and easy experience, the designer must make sure all options are relevant to the user's journey. The first picture gives a navigation bar preview of menu choices that are irrelevant, or unhelpful, to the audience. However, the second picture shows specific menu names, which can aid users better in searching for information they needed.

D. Content

Content refers to the material, or everything that fills the website. This point can be crucial, as it determines whether a user stays or not, as too much, or too little, can make them leave if they don't find the information they want. As such, the main information must be placed within focal point. This ensures that users can easily skim through the information without feeling confused.
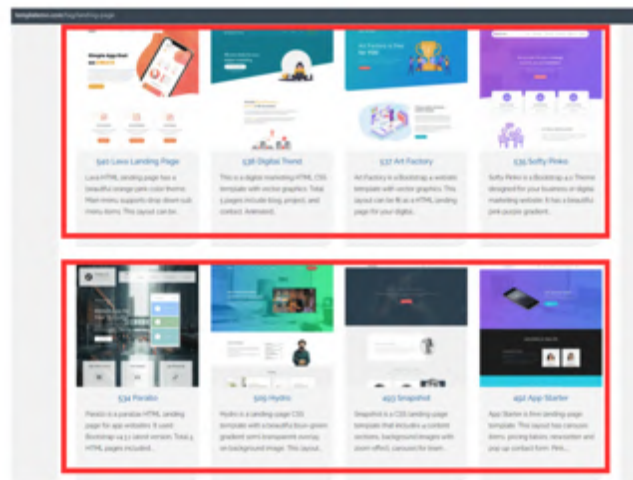
Figure 2.14 Example of Content in a Website
Source: https://linkdoctor.io/website-content-template/ (2021)

Content can come in the form of words or images. For example, the picture above contains various blog articles. The content in the picture above refers to the images, titles, and description of each article. Each title and description are concise to avoid overwhelming users. However, the length of website content varies. Modifying the content to the intended audience is important to ensure it is neither overwhelming nor overly minimal.

E. Footer

Footers are usually found on the bottom part of the page. Generally, they contain information such as contacts, copyright, main website page, and other legal information needed. Moreover, they commonly serve as an indicator that a user has scrolled to the bottom. Footers do not have a specific template, as they can be modified accordingly to the website's needs.
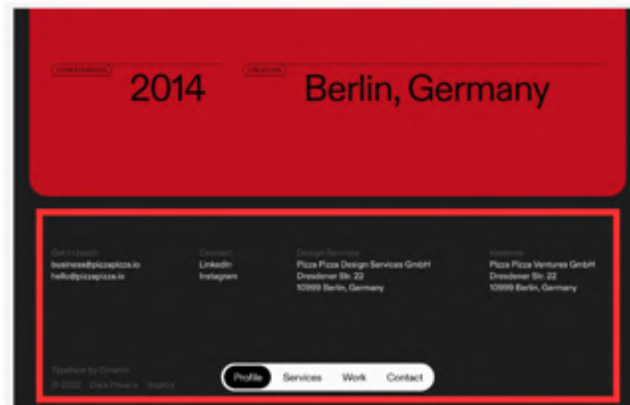
Figure 2.15 Example of a Footer in a Website
Source: https://www.halo-lab.com/blog/website-footer-...(n.d.)

However, footers can also be considered unimportant due to its positioning. Nevertheless, it is an essential part of a website due to a few factors. This website component can provide the latest updated year, which can affect content relevancy. They also act as a container for additional information users may want to find, as not all content can fit into the main page (Dreikon, n.d.).

F. Whitespace

Whitespace is the area that contains no visual elements. It is mostly related to the layout and spacing of contents. As such, it is one of the website components that can provide users a sense of relief. In addition, it allows users to read the information easily, giving users a sense of balance and unity.
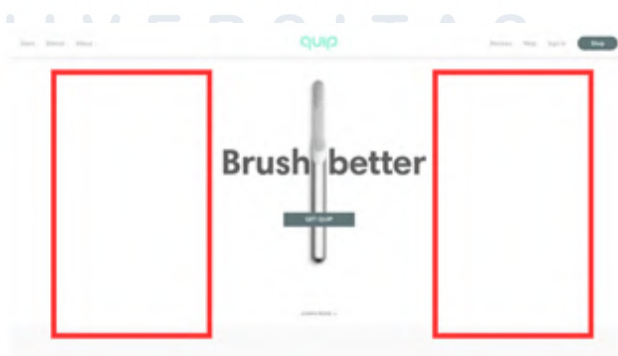

Figure 2.16 Whitespace Usage in a Website
Source: https://www.halo-lab.com/blog/website-footer-... (n.d.)

The picture above shows an example of a website that utilizes white space to create a sense of minimalism, while maintaining harmony. The image and headline acts as the main focus point. This effect is also helped by the scaling and minimal usage of colors. However, the white space also helps to emphasize this effect further by grouping visual elements in the middle section.

2.1.3.3 User Experience

User experience (UX) is what a user goes through when interacting with a product or a service, involving aspects such as emotional response, satisfaction, perception, and efficiency as they use the product. Hassenzahl (2013) stated that user experience involves creating a meaningful and satisfying experience (Mayasari & Heryana, 2023, p. 1). Although related, user experience and user interface are two completely different things. User interface usually pertains to visual elements that make up a design, such as color, layout, buttons, icons, and other interactive parts, while user experience involves the process as a whole (p. 2).

A. Visual Design and Aesthetics

Aesthetics play a major role in creating a great user experience. Elements such as color, icons, typography, and graphics can increase the user's satisfaction and overall impression of the product. However, it can only be achieved under a few conditions, such as good font readability, consistent color scheme, and usefulness to the user. In addition, the design must pay attention to contrast and alignment, as it creates harmony between elements (p. 12).
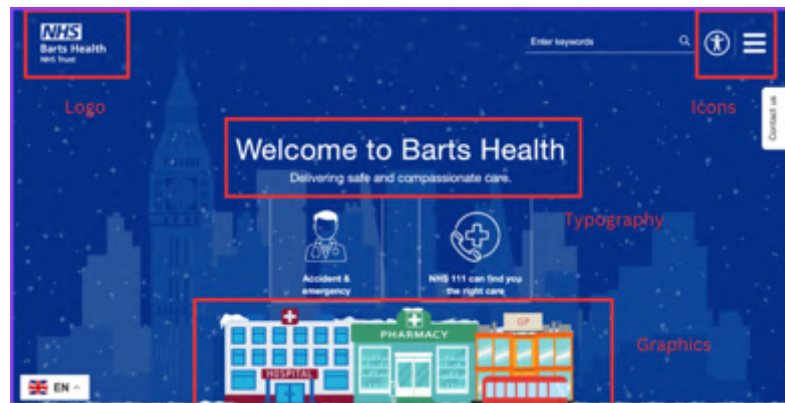
Figure 2.17 Usage of Colors, Icons, Typography, and Graphics
Source: https://www.bartshealth.nhs.uk (n.d.)

An example can be taken from the picture above. Although the background utilizes a dark color, visual elements such as typography and icons use white to maintain readability and visibility. As such, it attracts the user's eyes to the middle section, where most of the page's contents resided. Additionally, all vector art used a brighter selection of colors, further focusing the user's attention to the middle. All these elements combined create consistency that pleases the eye

B. Interactivity and Responsivity

This specific user experience component refers to how a user engages with a product. There are two possible responses: input and output. Inputs include triggers such as buttons, voice-activation, and gestures. On the other hand, outputs are results such as interfaces changing, appearing, or paired with an audible response.

Figure 2.18 Types of Interfaces Based on Inputs
Source: https://www.interaction-design.org/literature... (2016)

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A design principle that can be utilized to ensure smooth interactivity is affordance. It refers to an object's ability to send signals or cues to guide the user. An example can be seen when a button is labelled with 'push', which informs users to know how to interact with it. In addition, response times can significantly affect a product's satisfaction (p. 13–14).

C. Information Architecture

Information architecture (IA) is a main component of UX used to sort information, starting from the order to the contents itself. It involves a system of intuitive and clear navigation to help the user locate information. Additionally, menu structure and selected visual signs play an important role in creating a smooth user experience. One concept example often used in creating an information architecture is taxonomy (*pohon kategorisasi*), which categorizes information based off of hierarchy.
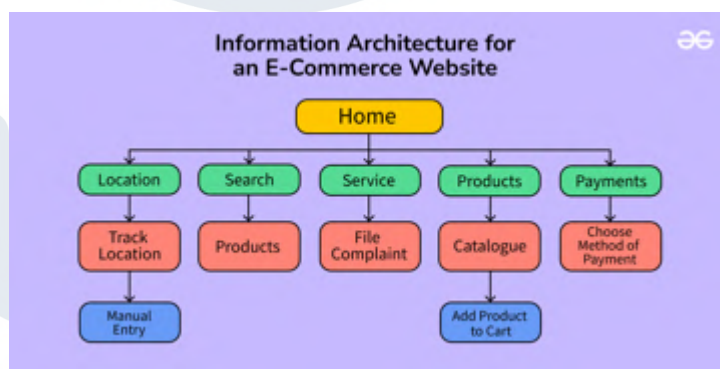
Figure 2.19 Example of Information Architecture
Source: https://www.geeksforgeeks.org/what-is-information... (2024)

According to Morville and Rosenfeld (2007), a designer must understand the needs and behaviors of the users in order to create an intuitive information architecture (p. 14–15). The picture above is an example of an information architecture. It can be deciphered that the website contains five menus: location, search, service, products,

and payments. Each page contains approximately 1-2 sections of information.

D. Consistency and Pattern Usage

In creating a user experience, a designer must pay attention to the consistency of visual elements used. For instance, the use of a consistent menu icon across all interfaces can aid user comprehension of its function. Another example could be using a certain shade of color for buttons that signify "confirm" to help differentiate its purpose with other buttons. Keeping consistency allows users to learn the interface faster, which increases efficiency.

Figure 2.20 Example of Pattern Usage in UI Design
Source: https://maze.co/collections/ux-ui-design/ui-design... (2021)

Moreover, using design patterns that are commonly found in other products can help create a better user experience. According to Schneiderman & Plaisant (2010), using familiar design patterns has proven to increase interaction speed, reduce user mistakes, and reduce mistakes that could have happened (p. 15–17). An example can be inferred from the picture above. Using the same pattern allows users

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to build a sense of familiarity with the website. Compared to the second picture, users who are unfamiliar with the website, or websites in general, can take longer to understand.

E. User feedback

Focusing on providing information regarding a consequence or action is a part of giving users feedback. It supports in determining the next step a user should take. Users can also reduce their error rate, as the feedbacks allow them understand the consequences, which assists in increasing efficiency next time (Sears and Jacko, 2009). Additionally, it helps users understand how the product functions. The type of response varies, ranging from audible responses to visual ones. Therefore, it is important that the feedback is delivered right after the action (p.17–19).

2.1.3.4 User Interface

User interface involves elements that are already familiar to the user, such as icons, buttons, and all components involved in displays. For website design in particular, these elements include text, color, image, and layout (Qing et al., 2024, p. 1). Generally, user interface is comprised of a few controls such as buttons, dropdown, menu, link, tab, breadcrumb, vertical navigation, menu bar, accordion, validation, and tooltip (Balsamiq, 2020).

A. UI Elements

The user interface elements referred to below pertaining to website design. As such, it encompasses all assets that require visual design. Beaird et al. (2020) states that user interface elements comprise of layout and composition, color, texture, typography, and imagery. In order to create an aesthetically-pleasing design, a designer must adhere to a few guidelines. i.e.:

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1. Layout and Composition

When creating a layout for a website, a designer must conduct research about the company's goals beforehand. Once decided, the data will be analyzed to further grasp the scope of information that will be delivered, as well as to divide them into categories (p. 12–14). The layout can only be designed once the components have been decided. To aid in the process, various kinds of grid theories can be implemented in the design.

a. Grid Components

As with visual elements, grids also have various types of components. These components apply for any type of media that requires layouting. However, the amount depends on each media and design style. According to (Tondreau, 2019), grids contain columns, modules, margins, spatial zones, and flowlines, i.e.:

1) Columns

Columns come in the form of a vertical container. Their primary role is to structure and hold both text and image elements. The size varies, depending on the width of content or screen (p. 10). Below is an example of columns used in a website.
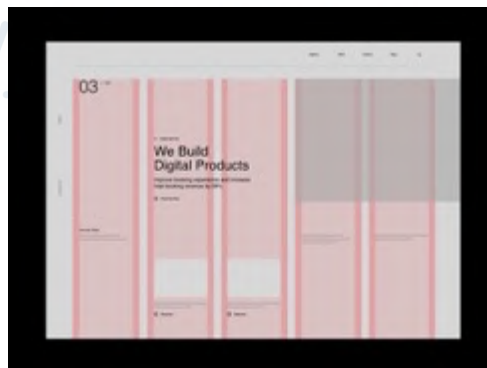

Figure 2.21 Column Usage in a Website
Source: https://www.flux-academy.com/blog/how-to-use-a-grid... (n.d.)

The number of columns depends on the type of design and information presented. Based on the picture, it can be inferred that the website utilizes an abstract and minimalistic approach. Each column is already filled with some form of content, whether text or images. The example utilizes 5 columns to give variety in its layout and maintain simplicity.

2) Modules

Modules are separated spaces created by a cross between the column and row area. Generally, the size remains consistent, as it follows the width and height of the columns and rows. Modules can be combined together to create new rows or columns (p. 10). As such, each section's modules depend on the design.

Figure 2.22 Module Usage in a Website Layout
Source: https://www.themxgroup.com/resources/modular-web... (2023)

The picture above shows modules in both desktop and mobile layout. As seen above, the desktop and mobile layouts have different amounts of modules. The former utilizes one module on top, before dividing itself into various sections. On the other hand, the latter utilizes single and double modules

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3) Margins

Margins are the space between the content and the edge of the page. They can be considered as buffer zones, as they give spacing between content. Additionally, they encompass gutter size as well. Typically, they can also store other information like notes and captions (p. 10). The size of margin depends on the grid. As mobile websites use responsive grids, the size of margin depends on the breakpoint system of the phone's size. In general, smartphones utilize a 24 px margin and a 20 px gutter (Hartmann, n.d.)
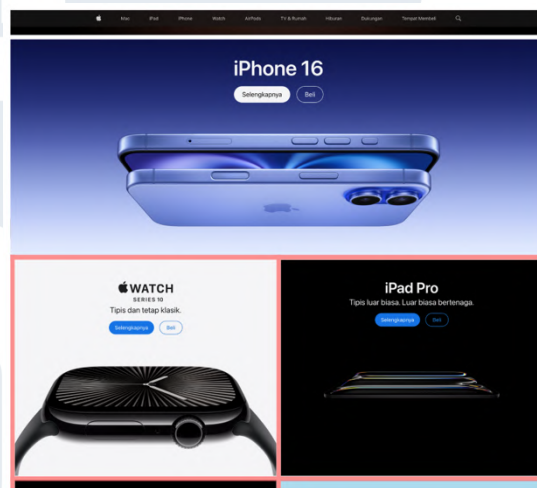

Figure 2.23 Margin in Website Design
Source: https://www.apple.com (n.d.)

An example can be seen in the picture above. The margin is indicated using the red area. Depending on the design approach, margins can be dismissed for assets involving imagery, as seen in the first section of the page. However, elements such as text and controls align with the margins to prevent any responsiveness issues.

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4) Flowlines

Usually form the border of a row, flowlines are not considered as an actual line. However, it is used as a guide to give space in between modulars. In addition, flowlines are generally used to show users the reading flow of the content (p. 10). Below is an example of flowlines usage in a website layout.
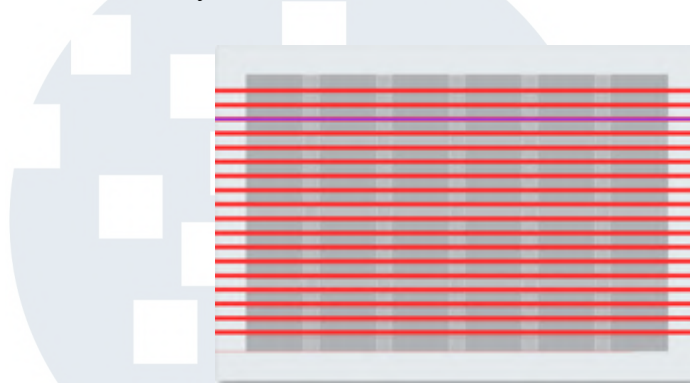

Figure 2.24 Flowlines in Website Layouts
Source: https://juliannakunstler.com/vislit_grids.html (n.d.)

Flowlines act as the stopping edge for elements. They divide a section into a few more parallel sections, as seen in the picture above. To maintain consistency, elements such as texts and images are placed along the flowline (Velarde, 2024). As such, the amount of flowlines depend on the visual approach used.

b. Grid Types

Grids in website design also use the same principles found in graphic design and photography, such as the golden ratio and rule of thirds. Basic grids such as multi-column is often found in website designs. Additionally, there are grids that are specifically used for website design, such as responsive grids. This is because it adapts with various device displays (Interaction Design Foundation, 2016).

1) Multi-column

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Multi-columns offer much more flexibility compared to single or two-column grids. This is because the number of columns is customizable. They are often used in websites and magazine es, which allows for customization according to the design needs (Tondreau, 2019). Below is an example of multi-column usage in a website.

Figure 2.25 Multi-column Grid in a Website
Source: https://onextrapixel.com/the-more-the-better-great... (2014)

The number of columns depend on the design. However, it is best that the amount is sufficient, meaning that each column is utilized well. An example can be inferred from the picture above. Althougn the page only utilizes three columns, all columns are filled with its own content.

2) Responsive

Responsive grids offer the best flexibility for website design. This is because the goal is to create adaptability across all devices. As such, responsive grids offer adaptability to all screen sizes and orientation. Configurations for components such as columns, margins, and gutters all depend on the device's display.
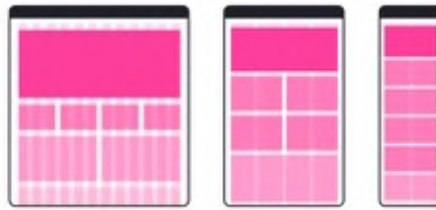
Mobile Website Design…, Tesalonika Rosmery Cantika, Universitas Multimedia Nusantara

Figure 2.26 Responsive Grid in a Website
Source: https://app.uxcel.com/glossary/responsive-grid (n.d.)

However, responsive grids also have a breakpoint, which is the minimum layout requirements for different kinds of screen sizes. As such, breakpoints also determine the number of margins and gutters recommended for different screen sizes (Interaction Design Foundation, 2016). An example can be seen from the pictures above. Based on the device type, a website can have different amounts of sections.

c. Website Structure

According to UXPin (2024), a website structure is described as the method of organizing and connecting information with one another. It aids users in navigating when searching for information. As such, it is usually decided upon first before creating the website. Website structures are comprised of four types, one of which is hierarchal, i.e.:

1) Hierarchal

The definition of a hierarchal website structure lies in the presence of a parent page and child pages, also referred to as the main page and the categories. Hierarchal websites allow users to explore other categories, while also allowing easy access back to the home page. It is commonly found in many websites.

Figure 2.27 Website Utilizing Hierarchal Structure
Source: https://www.uxpin.com/studio/blog/web-structures... (2024)

An example can be inferred from the picture above. The first six sections are the Solutions, Merge, Examples, Enterprise, Pricing, and Resources. The other section is marked by the "Try for free" button. From this, we can infer that the website has approximately seven different menus. However, the homepage is the first page users encounter, which serves as the primary point of access to these sections. As such, the website is considered to have a hierarchal structure.

2. Color

Colors can affect aesthetics, usability, and the identity of the website. It involves many aspects such as the psychology of each color, temperatures, chromatic values, as well as color schemes. In general, two-color models exist: RGB and CMYK. For design, websites normally use RGB, which is also known as red, green, and blue (Beaird et al., 2020).

a. Temperature

Color temperatures refers to color impressions that are caused by both culture and nature. An example can be seen from water tap indicators that signify hot and cold water. In general, red is used to indicate hot water. On the other hand, blue is used to indicate cold water. In color, here are two kinds of temperatures, i.e. (p. 113):

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1) Warm

Colors such as red, pink, yellow, and brown are considered to be warm colors. These colors are mostly associated with heat and motion, as they are often linked to fire and the sun. When placed beside a cool color, warm colors tend to stand out more, creating an emphasis. As such, it is ideal to use for elements that require the user's immediate attention.

Figure 2.28 Warm Colors
Source: https://www.robertnajlis.com/color-theory/warm... (n.d.)

Using warm colors can create a few different effects. Users can feel more intimate and closer. However, it can also be used to express enthusiasm. Additionally, it is the perfect color scheme to use for elements that act as call-to-actions, or CTAs (Uddin, 2025).

2) Cool

Examples of cool colors can range from green, blue and violet. However, violets can lean into both categories depending on the color composition used. This is due to purple being an intermediary color of green and blue. The aforementioned colors can release a soothing and calming effect towards the user, making them ideal for larger elements and backgrounds.

Figure 2.29 Cool Colors
Source: https://www.robertnajlis.com/color-theory/warm... (n.d.)

Aside from calmness, cool colors can deliver a sense of professionalism. This is also supported by the fact that many brands in tech, finance, and health utilize cool colors. Cool colors are easier on the eyes. As such, they are ideal for designs that mainly utilize text (Uddin, 2025).

b. Chromatic value

Chromatic value is a measurement of how dark or light a color is. As such, colors can have different varieties of tints, shades, and saturations based on how it is implemented. Tints are created when a color is given white, while shades are created when a color is given black. Additionally, saturation refers to the intensity of a color, meaning how vivid or dull the color is.
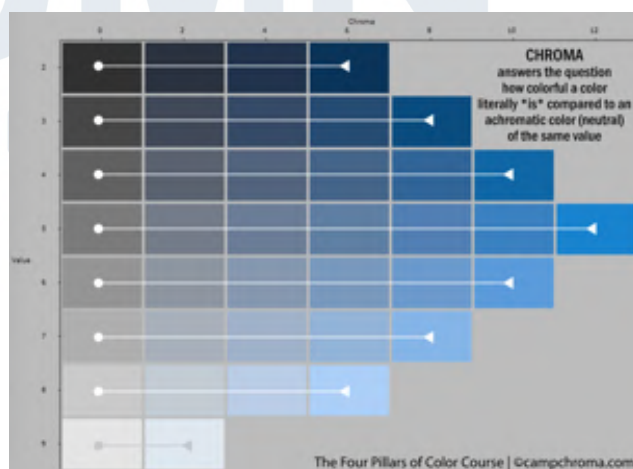

Figure 2.30 Example of Chromatic Value
Source: https://campchroma.com/chroma-explained-in-plain... (n.d.)

The usage of chromatic values depends on the design theme. An example can be inferred from the chart above. If the theme relates to nightlife, then it is advised to use darker variants of certain colors (p. 113–114). However, if the theme involves something light and fun, then it is advised to use colors in the lighter spectrum.

c. RGB

Websites utilize RGB, also known as an additive color model. RGB color models are made up of certain percentages of red, green, and blue light. If the intensity of all colors is maximized, the outcome would result in white. However, if all the colors are minimized, the result would be black (p. 114–115).
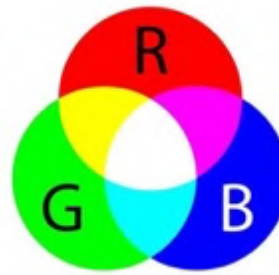

Figure 2.31 RGB Color Model
Source: https://pakfactory.com/blog/rgb-color-model-print... (2022)

RGB colors are known as additive colors. In comparison to CMYK, which uses a subtractive model. The difference lies in how colors are created. CMYK utilizes cyan, magenta, yellow, and black inks. When mixed together, the colors create black (p.115).

d. Color schemes

One of the methods to create a harmonious website is to use color schemes. Color schemes are the basics of mixing color combinations. As such, a designer must first consider the objective, then determine the suitable colors. In general, there are

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six types of colors schemes, of which include monochromatic and analogous, i.e. (p. 119):

1) Monochromatic

Monochromatic is a color scheme that relies on one single color hue. Various shades are allowed to be used. This also applies for tints. However, if the colors used involve mixing another color, then it is no longer considered as monochromatic (Soegaard, 2025).
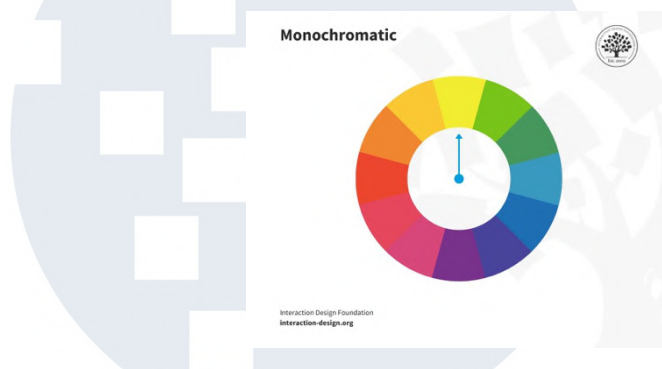
Figure 2.32 Monochromatic Color Scheme
Source: https://www.interaction-design.org/literature... (2025)

An example can be taken from the color palette above. If the main color of a website is yellow, then its monochromatic variants can have multiple outcomes. Lighter variants can include pastel yellow, all the way to white. On the other hand, darker colors can go from muddy yellow to black.

2) Analogous

A step up from monochromatic is the analogous color scheme. This color scheme takes three colors that are close to one another. Much like the previous color scheme, various tints are allowed to be used. This also applies for shades.

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Analogous

Interaction Design Foundation
interaction-design.org

Figure 2.33 Analogous Color Scheme
Source: https://www.interaction-design.org/literature... (2025)

The color palette above takes light green, yellow, and light orange as its color palette. As such, the inclusion of dark green by a designer can still fall within the classification of an analogous color palette. This also applies should the designer include the darker shade of range. A color palette can still be considered analogous as long as it uses three main colors.

3. **Texture**

Textures give a feel, or distinctive appearance, to an object or design. It refers to the sensation, or memory, that can be triggered from the memory of the user. As such, it involves creating visual elements. Texture can be achieved by using basic elements of graphic design such as points, lines, and shapes (Beaird et al., 2020, p. 163), i.e.:

a. **Point**

Comparable to a pixel, points create an image when combined together. For example, a screen using 1,310,720 pixels uses 1280 x 1024 pixel resolution. This means there are that amount of pixels that create image seen on screen. If not placed in a frame, a point by itself holds no scale (p. 163–164).
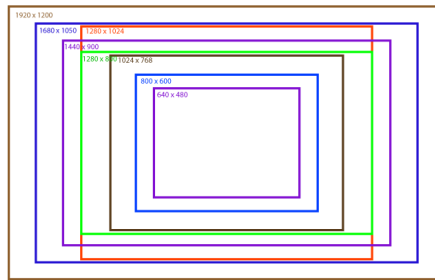
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Figure 2.34 Various Kinds of Website Pixel Ratio
Source: https://www.the-web-mechanic.com/what-size-should... (n.d.)

The amount of points depend on the device's screen resolution. The comparison can be seen through the picture above. Resolutions such as 1280 x 1024 and below can be considered lower quality. On the other hand, resolutions from 1440 x 900 and above can be considered higher quality.

b. Line

Formed by connecting two dots. Lines can be expressive and evoke various senses depending on the thickness and direction of the line. It can give a sense of excitement when used diagonally. Additionally, it can provide texture by being used as a horizontal background. In the context of website design, lines can be more than just for borders, stripes, and dividers.
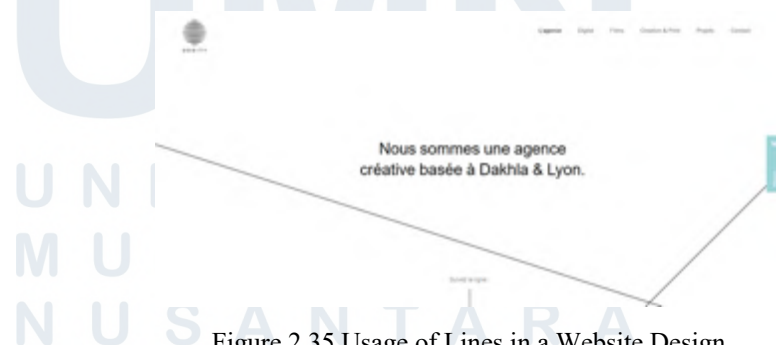
Figure 2.35 Usage of Lines in a Website Design
Source: https://speckyboy.com/lines-web-design/ (2023)

Lines have various styles to be utilized. For a sense of frantic, a designer can use jagged lines. To give a sense of relaxation, a designer can utilize curvy lines. Another example

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can be seen in the picture above. Utilizing lines with angles can convey sharpness (p. 164–165).

c. Shape

A shape is considered to be made when two end points of a line meet. There are two types of shapes, geometric and freeform. geometric shapes consist of shapes such as diamonds, stars, and semi-circles. The straight lines of geometric shapes can evoke a feeling of being mechanical. On the other hand, freeform shapes are more fluid as they are made up random angles, non-geometric curves, and irregular lines, which can convey a sense of spontaneity and informality (p. 165–166).

Figure 2.36 Usage of Shapes in a Website Design
Source: https://www.prototype.ae/blog/web-design-shapes (2020)

One example can be inferred in the picture above. As mentioned before, geometric shapes convey a sense of rigidity. However, the shapes in the website above follow an unnatural direction. As such, it also gives a sense of spontaneity.

4. Typography

Typography is a field of design involving the usage of typefaces to create usable, readable, and user-friendly experiences and interfaces. It can be considered as an important element. This is because more than 90% of information is text-based. As such, it can determine the experience of the user when interacting with the product (Fitz-Patrick, 2022).

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a. Typography Terms

There are a few terms relating to typography as a whole. Some refer to the anatomy of the letters. On the other hand, others mention about the technical aspects like spacing between words and letters. Below are some of the terms that are relevant in creating a great user experience, i.e.:

1) Typeface

A typeface consists of various font types. It is also referred to as a font family. Typefaces have many different styles, and each one has their own weights. An example can be seen with Helvetica.

Figure 2.37 Helvetica Typeface
Source: https://www.designandpaper.com/the-story-of... (2022)

The amount of typefaces available depend on the creator of the font. Some fonts only include necessary ones such as bold and italic. However, there are some fonts that also include a large variety. An example can be seen from Helvetica, which includes Standard Helvetica, Condensed Helvetica, Expanded Helvetica, Neue Helvetica, and Helvetica Now.

2) Font

Refers to a specific weight in a typeface. Generally, only 2–3 fonts are recommended for projects. This is because these font variations will become the base of the

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design. As such, it must maintain consistency in expressing the brand. An example would be Georgia, which has various fonts such as Georgia Bold, Italic, and Regular.

Figure 2.38 Georgia Font Variations
Source: https://itsions.wordpress.com/2014/12/16/the-stran... (2014)

The example above showcases four different font types of Georgia. The default font is represented by Georgia regular. Designers can use the other font variants depending on its usage. If the text is in another language, Georgia Italic can be utilized. However, if the text needs emphasis, designers can utilize Georgia Bold. This applies for other typefaces with the same variety, and usage depends on the designer.

3) **Baseline**

A baseline refers to an invisible line which acts as a guide for all letters to sit. In general, baselines are determined based on the number of rows and columns in the grid. As such, the amount and spacing depends on the designer. The only exception is with the lowercase 'q', in which the end hangs below the baseline (Beaird et al., 2020, p. 229).
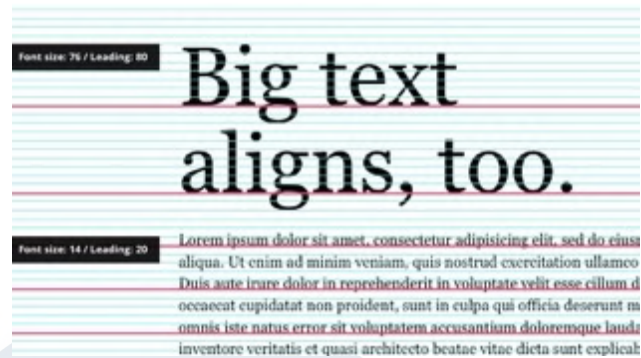
Figure 2.39 Baseline Usage in Text
Source: https://mockitt.com/dictionary/what-is-baseline... (n.d.)

Baselines are closely related to flowlines, as mentioned beforehand. However, the amount depends on how many columns and rows exist. Additionally, it also depends on how much spacing exists in between the flowlines. When viewed in a grid, baselines are lines that reside on the bottom part.

4) Weight, Height, and Size

Alludes to the overall size, including length and thickness of the font. The factors above allow for more flexibility in creating variety. Modifying the weight, height, and size also aids in creating emphasis of the text (Fitz-Patrick, 2022). Below is an example of variety in font weight and size.
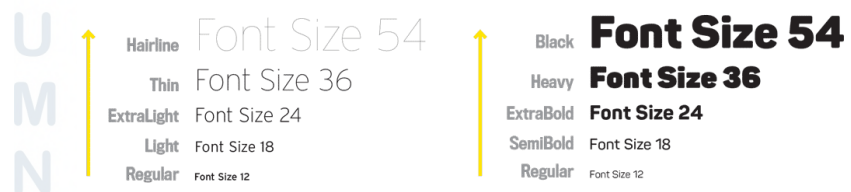
Figure 2.40 Various Font Weights, Heights, and Sizes
Source: https://type-ed.com/resources/rag-right/2017/11... (2017)

Fonts can give different impressions depending on the combination of size, weight, and height. Fonts that are larger and bolder can quickly attract user's eyesight. On the

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other hand, thinner and smaller text can be used for additional information. However, the weight must be appropriately selected to prevent being overlooked by users.

5) **Alignment**

Alignment is how the text positions itself. In general, there are four types of alignment. These include left, right, middle, and justify. Out of the four types, centered and justified have a lower chance of causing legibility issues (Beaird et al., 2020, p. 234).
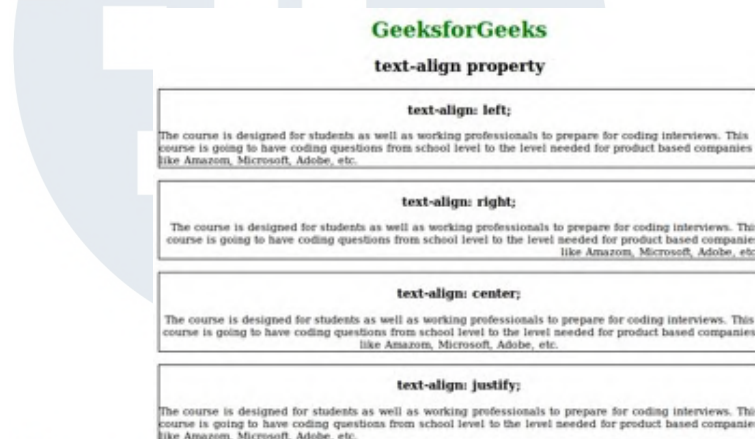
Figure 2.41 Text Alignments Types
Source: https://vimsky.com/examples/usage/css-text-align... (n.d.)

The picture above illustrates the four types of text alignments. In general, there is no specific rule on what type of text alignment should be. However, websites usually utilize centered or left-aligned texts. However, to allow ease for reading, left-alignment is recommended (Harvard University, n.d.).

6) **Tracking**

Tracking is used to adjust the overall spacing between each letter's block. It specifically refers to the horizontal space on each letter. If increased, it creates a more

Mobile Website Design…, Tesalonika Rosmery Cantika, Universitas Multimedia Nusantara

open feel to the text (p. 232). As such, if reduced, the text becomes more compressed.

Figure 2.42 Tracking in Typography
Source: https://creatypestudio.co/tracking-typography/ (n.d.)

The example can be seen in the picture above. The default text is the second variant. On the other hand, the modified versions are the first and third variant. The first variant showcases tracking that is reduced from its regular setting. On the contrary, the third variant showcases tracking that is increased from the previous setting.

7) Kerning

On the other hand, kerning adjusts the spacing between two letters. It is used to adjust whenever two letters seem too close. This also applies if the letters are too far from one another. As such, it offers flexibility in exploring variations of feels (p.232).
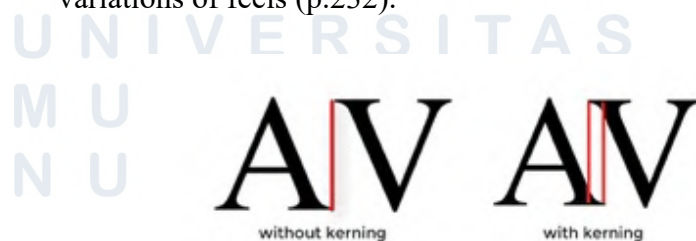

Figure 2.43 Kerning in Typography
Source: https://design.tutsplus.com/id/articles/typography... (2017)

An example of how kerning affects letters can be seen in the picture above. By default, fonts already have their

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own kerning. As such, designers can customize its kerning to their needs. This offers more flexibility in creating alternative typography results.

b. Typography Principles in Website Design

Like graphic design, there are more specific principles to determining typography. In website design, there are a few things that need to be prioritized. These principles are important in order to create a satisfying user experience. Therefore, the following are recognized as key typography principles in website design (Fitz-Patrick, 2022), i.e.:

1) Simplicity

Using a variety of fonts is highly not recommended. This is because it increases the likelihood of the user being confused. On a technical level, it not only increases loading time on the user's end, but also in size. It is advisable to use fonts that are commonly found in user's phones.

2) Compatibility

The fonts chosen must be compatible with one another. However, the flexibility in creating contrast must also be considered important. A way to achieve this is by combining one sans serif font and one serif font. Below is an example of compatible and incompatible font pairings.

Figure 2.44 Example of Good Font Pairing
Source: https://www.interaction-design.org/literature/arti... (2022)

The point of combining two different fonts is to give nuance towards the text. The second pairing is considered bad as it is similar in style. As such, there is no emphasis. On the other hand, the first pairing allows for emphasis due to both fonts being two distinct styles.

3) Readability, Legibility, and Accessibility

One of the factors that must be considered when choosing a font is the conditions of the user when interacting with the product. The font must be understandable. This can be achieved by adjusting contrast, color, or both. As such, it is important to always test and see what works.

4) Hierarchy

Much like hierarchy in general design principles, hierarchy in text helps users skim through information easily. How the text is presented, whether by size, typeface, or weight, determines the order of importance. As such, it is important to create emphasis on text that have higher priority. Below is an example of text hierarchy.

Figure 2.45 Hierarchy in Typography
Source: https://www.interaction-design.org/literature/arti... (2022)

As mentioned beforehand, text hierarchy can be determined through size. This is visualized through the image

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above, in which the headline holds the largest font size in comparison to other texts. Next, the user's sight goes towards the sub-headline, which is the second largest font on the image. This is followed by the brief description on the bottom right, which utilizes a smaller size compared to the sub-headline. All three texts utilize a heavy weight font, further emphasizing its placement in the hierarchy. On the other hand, the body text and caption above the title use smaller sizes, as well as thinner font weights, positioning them lower in the typographic hierarchy.

5) Scalable

In context of creating a website, the design must be able to adapt with various screen orientations and sizes. Hence, it is important to determine the base scale at the beginning of the design process. However, the designer must also take into consideration about factors such as platforms and different operating systems (OS). As such, it is important to determine which platform the media will be published on.

c. Typeface

It is always recommended to choose a typeface that holds various fonts. Otherwise, it will be difficult when the design needs a bold or italic font. However, the font variety also depends on the needs of the designer. Examples of typefaces include sans serif and serif fonts, i.e.:

1) Serif Fonts

Serif fonts have a 'foot' on the end of the typefaces (Fitz-Patrick, 2022). There are various types of serif fonts such as old-style, transitional, slab, and modern serif. The type of serif font depends on the style needed. However, to

give a more pronounced feel, it is recommended to use modern serif (Beaird et al., 2020, p. 238–240).

Figure 2.46 Serif Font
Source: https://logo.com/blog/best-serif-fonts (2023)

Serif fonts can be used in a few different contexts. In general, serif fonts can be found in formal and traditional branding, luxury and high-end products, and editorial designs. That is not to say they do not exist in other types of media. In many cases, serif fonts can be found in print materials such as magazines, books, and newspapers. This is due to the fact that serif fonts have great legibility and readability (Geeks for Geeks, 2024b).

2) **Sans Serif Fonts**

Unlike serif fonts, sans serif fonts do not have a 'foot' on the end of typefaces (Fitz-Patrick, 2022). They are considered extremely legible and practical for most media. Initially it was a product of experimentation, as using serifs on fonts was considered to be a tradition. As such, it gives a more contemporary and cleaner feel, allowing it to stand out well when paired with body texts using serif fonts (Beaird et al., 2020, p.242).
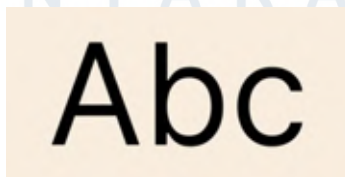

Figure 2.47 Sans Serif Font
Source: https://logo.com/blog/best-serif-fonts (2023)

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In website design, sans serif fonts are commonly used. It allows for better readability, which allows user experience to be enhanced. Sans serif fonts can be used for various types of uses, however it is also commonly used in printing media such as newspapers. Additionally, formal and business designs often utilize the font type as it uses a simple design (Geeks for Geeks, 2024b).

5. **Imagery**

Majority of users, in the context of websites, process images faster than text. Imagery refers to both text and pictures, as well as audio and video animation. As one of the main components of web content, images have a pivotal role in creating usable UX. There are a few types commonly found as website imagery (Shrey, 2023), i.e.:

a. **Illustrations and Vector Art**

Custom graphics have become a trend of web design in modern web design. In addition to creating a strong visual base, illustrations and vector art allow for more flexibility in aiding quicker understanding towards information on a page. Illustration is much more artistic. On the other hand, vector files are more consistent in ways as they are made up of mathematical formulas.

Figure 2.48 Usage of Vector Art in Website
Source: https://www.duolingo.com (n.d.)

One example of illustration that is often used in website design are character illustrations. Illustrations within this category are frequently used in various contexts, such as marketing, entertainment, and reinforcing a brand's identity. In terms of style, character designs can range from simple to highly detailed appearances (Folio Art, n.d.). Apart from elevating the website's appearance, it helps engage the audience into understanding the information better (Oodles Studio, 2019). There are a few styles utilized for illustrations in a website, one of which are flat illustrations.

Figure 2.49 Flat Illustration
Source: https://blog.tubikstudio.com/how-to-create-original... (n.d.)

Flat illustrations refer to a two-dimensional visual style that bears minimal resemblance to their real-world counterparts. They can be detected from the usage of various perspectives, as well as depth created by the motion (Aparaschivei, 2022). As the term originated from flat design, flat illustrations are characterized by their minimalism. The style has found popularity within digital design, specifically in user interfaces (Yatsuba & Yalanska, n.d.).

b. Backgrounds

Images as backgrounds do not particularly refer to photos only. It also refers to solid color, patterns, and gradients. However, in order to create a satisfying user experience, the quality of each image, especially photos, must always be high-

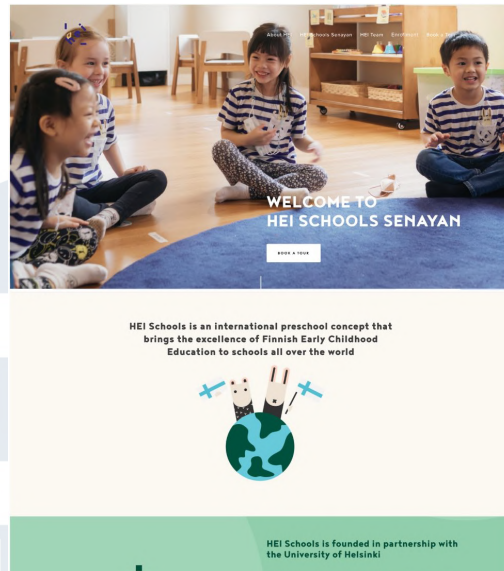quality. Backgrounds can utilize various images to create an intriguing feel.

Figure 2.50 Website Background Example
Source: https://www.heischools.co.id (n.d.)

An example can be inferred from the website above. For its landing page, HEI Schools Senayan utilizes two types of backgrounds: photos and solid color. Photos are used to further emphasized the brand's service. On the other hand, the solid color not only acts as a page breaker, but to allow easier readability of the information delivered.

c. Logo

A website can give a sense of belongingness if it utilizes visual assets that support its brand image. However, it is vital that a website has logo. Not only does it strengthen the brand image of the website, but it can also impact the website's navigation (Shrey, 2023). There are a few types of logos, one of which is combination mark (Adobe Express, 2023).

Figure 2.51 Examples of Combination Mark Logos
Source: https://www.logodesignvalley.com/blog/combination... (2024)

Combination mark logos are created by combining text and image into a new logo. It provides an advantage as it allows for a strong brand identity and awareness, helping to distinguish itself among competitors. Furthermore, the logo's adaptable nature allows it to be utilized as either imagery or typography. As such, it still aligns with the overall brand image (Ali, 2024).

B. UI Controls

User interface controls are considered important components of a software interface. It is important to know when a control should be used, as it determines the experience of the user. Users can make decisions through interacting with the controls. According to Balsamiq (2020), there are various types of UI controls, i.e.:

1. Button

A button is an interface element that triggers an action. The usage of a button should be obvious to the users. As such, the more buttons are added, the less prominent and important it becomes. Apart from its normal appearance, buttons also come with icons, and allow users to open a new menu with options that drop down (p. 19–22).
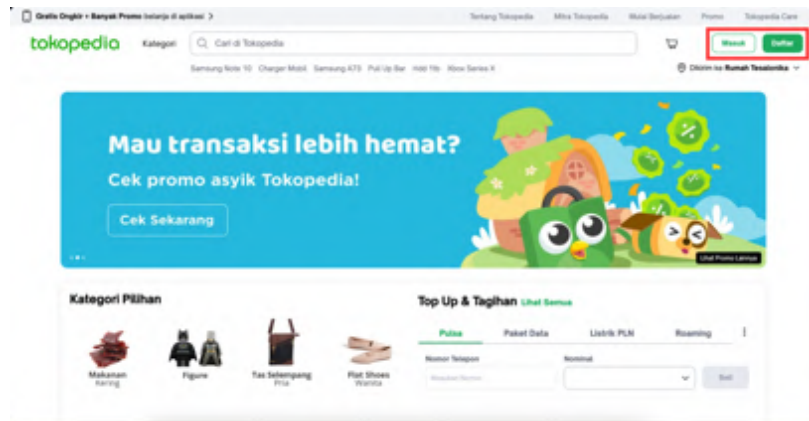
Figure 2.52 Button Usage in Website
Source: https://www.tokopedia.com (n.d.)

The image above shows Tokopedia's landing page as a good example of button usage. The landing page itself only has two prominent buttons on the right top corner, which are *Masuk* and *Daftar*. Both utilize green to differentiate itself from other elements on the site, which emphasizes their importance. The *Daftar* button utilizes solid color to further push its relevancy towards the user.

2. Text Input

Text inputs allow users to fill in information. It is often combined with other elements, but can also stand as a feature itself. The information needed in these inputs usually involve passwords, phone numbers, or comment. Additionally, text inputs are often utilized for search, chat, and comments (p. 24).
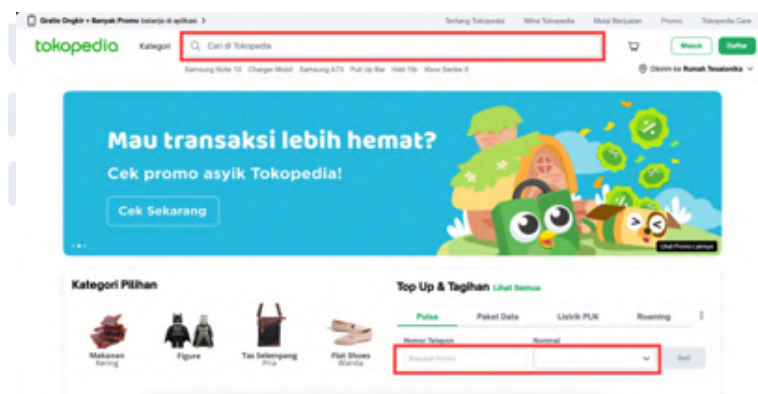

Figure 2.53 Text Input Usage in Website
Source: https://www.tokopedia.com (n.d.)

The website above utilizes two text inputs. The first one is located in the navigation bar, which functions as a search bar for products. On the other hand, the second text input is located inside a section for adding credit to a prepaid mobile account. As such, the text input functions as a shortcut for purchasing prepaid mobile account credit.

3. Dropdown Menu

When dropdown menus are pressed, it reveals other menus from the website. Referred to as many names, such as combo box, picker, pull-down menu, and select menu. Generally used to show a variety of menu options while saving up on space for other elements. According to the U.S. Web Design Standard, the optimal items should stay between 7 and 17 (p. 29–30).
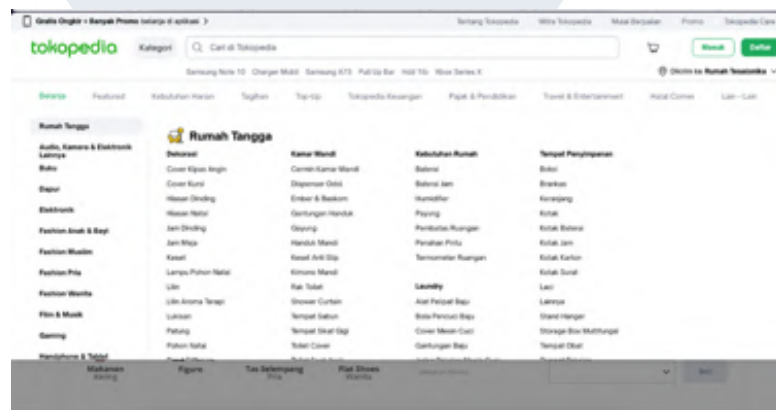
Figure 2.54 Dropdown Menu Usage in Website
Source: https://www.tokopedia.com (n.d.)

Clicking the *kategori* button reveals a set of products sorted by categories. Although the dropdown contains many menus, the text colors help to emphasize the name of each category. Additionally, the font type supported emphasis, in which category names utilize a thicker font. On the other hand, the items within the categories themselves utilize a thinner font type.

4. **Link**

Known as hyperlinks, or hyper-text links, it is originally used to navigate around pages. Since its uniqueness lies in the simplicity of the control, hyperlinks can be embedded into text without hindering the user's experience in digesting content. In navigation, links can be used generously. However, they must be used in moderation, as it can cause reduction in usability (p. 40–41).
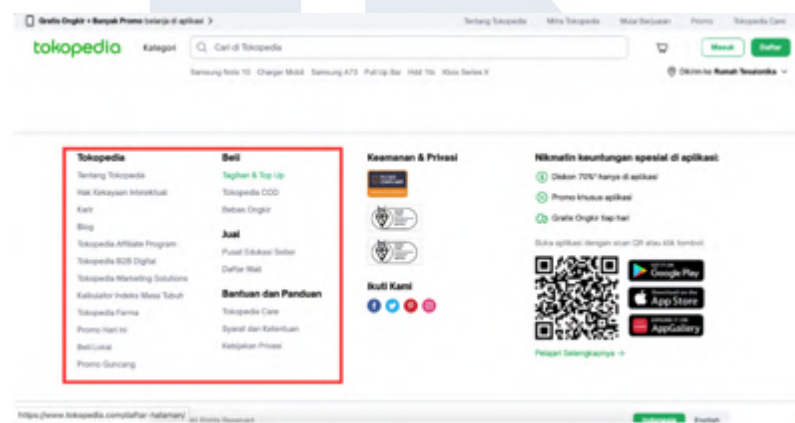

Figure 2.55 Link Usage in a Website
Source: https://www.tokopedia.com (n.d.)

Scrolling below reveals the footer of the website. As mentioned before, footers commonly contain information such as terms and conditions, legal information, and more. The same can also be seen in the footer for Tokopedia. In this case, the footer contains various links for the brand, *Beli, Jual, Bantuan dan Panduan, Keamanan dan Privasi,* and *Ikuti Kami*.

5. **Breadcrumb**

A compressed way of showing navigation hierarchy, which shows users their current position on the web. Although very familiar to most users, breadcrumbs should only be used as secondary navigation. According to The Nielsen Norman Group, there are no downsides to using breadcrumbs. It is advisable to use this UI control if space is limited, especially on horizontal orientation such as mobile (p. 51–52).
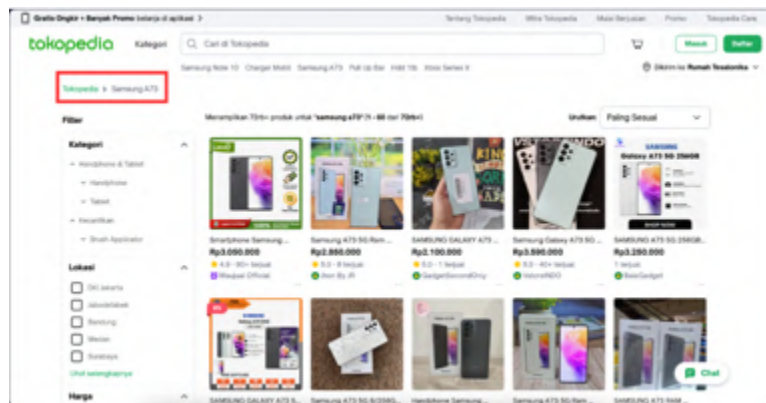
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Figure 2.56 Breadcrumb Usage in Website
Source: https://www.tokopedia.com (n.d.)

The usage of breadcrumbs is found after users search for a product. The breadcrumbs will appear on the left top corner should the users need to backtrack. Users can backtrack to return to the search results. However, after selecting a product, users are able to navigate back to its category even if they did not originally access it through the categories section, which contributes to a more seamless user experience.

6. **Vertical Navigation**

Commonly known as 'sidebar', vertical navigations are used to show the overall content structure of a website. It allows users to choose items upon opening. It is considered the norm, especially in mobile orientation, by using slide out "navigation drawer" pattern. As it is considered a "safe" control to be used, vertical navigations should be used for contents with many categories. As such, it is not advisable to be used when the horizontal space is limited (p. 55–56)
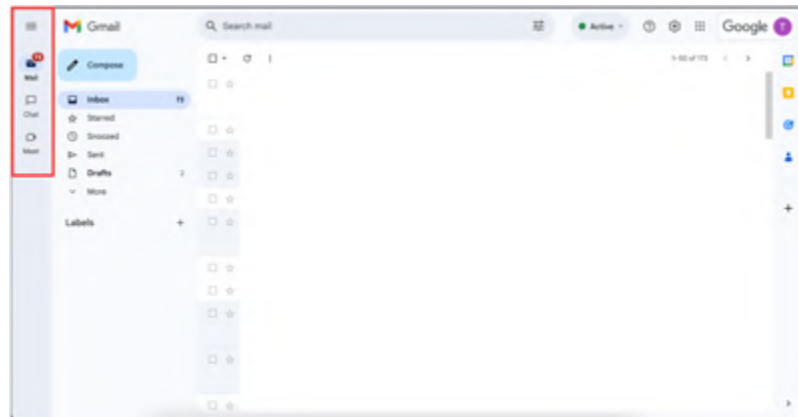
Figure 2.57 Vertical Navigation Usage in Website
Source: Gmail

As an example, the author chose Gmail, as the previous example did not have a vertical navigation. Users can find Gmail's vertical navigation on the left side of the web, as all navigation bars usually reside in. There are three menus to choose from: Mail, Chat, and Meet. All three menus are shortcuts to access the varying features available in Gmail.

7. **Menu Bar**

Menu bars are constantly present and unchanging. As such, they frequently reside on the top of the web. Specifically used for primary navigation, menu bars should be utilized for categories in moderate amounts. The advantages of using menu bars are its constant presence, which allows easier access to other pages (p.60).

Figure 2.58 Menu Bar Usage in Website
Source: https://www.tokopedia.com (n.d.)

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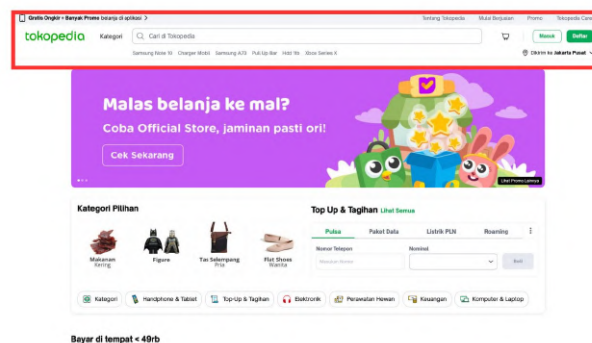In Tokopedia, the menu bar contains a few visual elements. Users can log into their account by accessing the *Masuk* button, while registering a new account can be done through the *Daftar* button. Aside from the brand logo itself, the menu bar contains a search bar to allow users to search for products. After adding a product shopping cart, users can view the items through the shopping cart icon.

8. **Accordion**

Accordions allow for more space while also being able to showcase more information. Often referred to as expand/collapse control and expansion panel, the accordion can be utilized as content or navigation. However, its usage must be in a moderate amount, as using it as a control is already less intuitive. Additionally, according to the book "Designing Web Interfaces", accordions are suitable for collapsed sections of content, but must be used at a reasonable amount, as it has a strong visual style (p. 65–66).
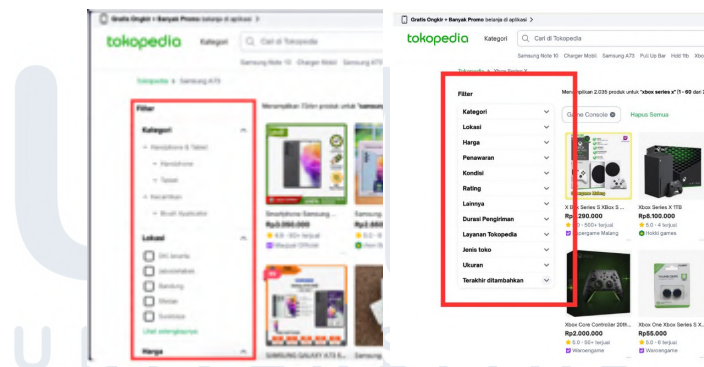
Figure 2.59 General Accordion Usage
Source: https://www.tokopedia.com (n.d.)

The example above shows Tokopedia product filter, which can be found once users search for an item. The filter contains 12 menus, all of which affect the search results. When users encounter the filter, an interface will be presented. However, if users find it intrusive or bothersome, they can easily dismiss it by closing the accordion.

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2.2 Polycystic Ovary Syndrome

Polycystic ovary syndrome (PCOS) is a condition characterized by an imbalance of reproductive hormones, leading to ovarian dysfunction and often resulting in an inability to ovulate. Generally, PCOS starts to appear as of puberty age (Pratama & Tanjung, 2022, p. 34). Women with PCOS experience various symptoms, such as androgen and estrogen metabolism disorder and increase in androgen production. These symptoms lead to inconsistent menstrual cycles, anovulation, and hyperandrogenism effects.

Initially referred to as Stein-Leventhal Syndrome, the condition was discovered in 1935 by American gynecologists Stein and Leventhal in Chicago. However, the name was modified as the results of an operation. Studies found that women who wanted to remove the condition by having their ovarium tissues cut experienced a recurrence 1–2 years later. Hence, it was concluded that the causing factor was due to an abnormality in the ovaries (Muharam et al., 2020, p. 14–15).

2.2.1 PCOS Causes

As of now, the cause of PCOS is still undetermined (Salsabila et al., 2024, p. 164). In regards to biological factors, all ethnicities and races have an equal risk of developing PCOS. Women that have a history of female family members having PCOS have higher risks of having PCOS themselves (Pratama & Tanjung, 2022, p. 43). Internally, there are two reasons as to why PCOS happens, i.e.:

2.2.1.1 Insulin Resistance

Insulin resistance happens when the body has difficulty regulating blood sugar levels, causing insulin to surge. This condition often happens with women who are overweight and obese. Generally, a good indicator for insulin resistance is if the individual experiences feelings of weakness, nausea, or headaches when trying to reduce portions or go on a diet (Muharam et al., 2020, p. 23). Additionally, this condition causes androgen production to increase. Hence, it creates difficulty for the ovarian follicles to grow large each month,

causing anovulation. There are two ways to know if a woman has insulin resistance (Pratama & Tanjung, 2022, p. 43–44), i.e.:

A. Fasting

Under the guidance of a doctor, an individual must fast for 10–12 hours. If the ratio between blood sugar levels and insulin while fasting is below 10, there is a possibility that they have insulin resistance. A more accurate method is by counting using the Homeostatic Model Assessment for Insulin Resistance. Another method is by doing an Oral Glucose Tolerance Test (OGTT).

B. Skin Disorders

Skin disorders such as acanthosis nigricans. Easily identifiable by the dark, velvety area in the armpit, back, groin, crotch, and neck. As of now this indicator does not have a specific cure. However, the source of cause can be healed.

2.2.1.2 Increase of Luteinizing Hormone (LH)

The increase of luteinizing hormone (LH) starts from the master gland, or also known as the pituary gland. Once LH is excreted, it goes into the corpus luteum, or *sel teka*, and converts cholesterol in the ovarian follicles into androgens. These androgens are then sent to the granulosa cell to be converted as estrogens with the help of aromatase enzyme and follicle stimulating hormone (FSH), which is also produced by the master gland. The luteinizing hormone works alongside the follicle stimulating hormone (FSH) to enlarge the follicles, allowing it to ovulate. As women with PCOS tend to produce more androgen, the hormones become unbalanced. This is proven by the number of androgens that are not converted fully into estrogens, as there are too much androgens in the granulosa cell. Thus, this is what causes women with PCOS to experience hyperandrogenism (p. 45).

2.2.2 PCOS Symptoms

Symptoms of PCOS cannot be defined into a certain trait, as it varies for each woman. In general, however, most women experience symptoms of hyperandrogenism, which is also accompanied by inconsistent menstruation cycles. If a woman has both of these symptoms, it is advisable to visit an obstetrician and gynecologist doctor to get medical attention. The symptoms are as follows:

2.2.2.1 Inconsistent Menstruation Cycles

Commonly known as the main showing symptom of PCOS, inconsistent menstrual cycles are caused by failure of egg development. This condition is also known as chronic anovulation. A woman can be considered to have inconsistent menstrual patterns if they experience oligomenorrhea, which are menstrual cycles start around 35 days – 6 months of each other, with a frequency of less than nine times a year. Another prominent sign is if they have secondary amenorrhea, in which a woman does not experience menstruation for over six months and only happen around 4–6 days.
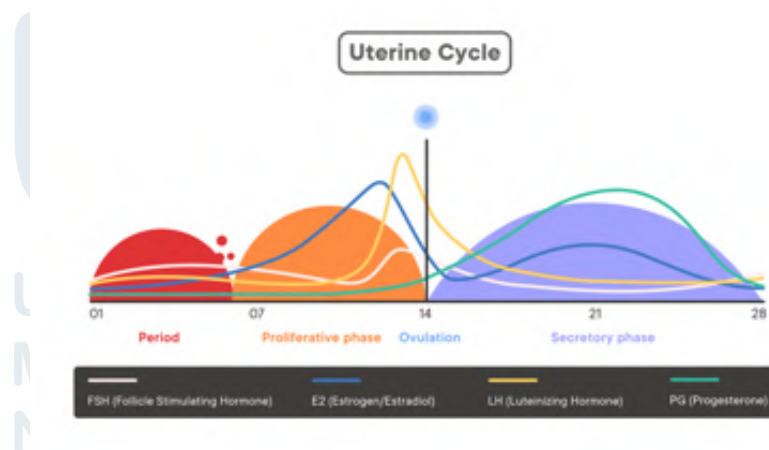
Figure 2.60 Menstrual Cycle Patterns
Source: https://helloclue.com/articles/cycle-a-z/the-menst... (2018)

Inconsistent menstrual cycles can happen due to a lot of factors. Aside from health-related factors such as pregnancies and diabetes mellitus, chronic anovulation can be caused by the

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overproduction of various hormones such as thyroid, known as hyperthyroid, and prolactin, commonly known as hyperprolactinemia. Lifestyle factors such as diets, excessive exercise, and high levels of stress are also another cause for inconsistent menstrual cycles. Conditions relating to weight such as underweight or overweight, along with eating disorders like anorexia and bulimia, can also be considered as a driving factor in chronic anovulation (p. 10).

2.2.2.2 Hirsutism

One of the most common symptoms for hyperandrogenism. Hirsutism is the growth of excessive hair above the lips, chin, around the nipples, ear, and around the middle line of the stomach. The hair growth caused by hirsutism often grows fast, thick, and dark in color. If hirsutism is accompanied by menstrual disorders, there is a possibility that it is indicating abnormalities of the adrenal glands, pituitary glands, and ovaries (Muharam et al., 2020, p. 19–20).

Figure 2.61 Example of Hirsutism in Women with PCOS
Source: https://conquerpcos.org/hirsutism-in-polycystic... (n.d.)

Hirsutism affects each race differently. This is because Caucasian women tend to have a higher degree of hirsutism. However, it can cause a few mental side effects. These effects include lack of self-esteem, lack of confidence, anxiety, and depression amongst teenagers and young adult women (Pratama & Tanjung, 2022, p. 37).

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2.2.2.3 Hair Thinning

Also known as alopecia, hair thinning in women is often caused by hyperandrogenism. The symptom often occurs in males. Although similar, hair thinning and hair loss due to age are different. Women with PCOS can experience hair thinning after birthing, lasting over six weeks to two years.
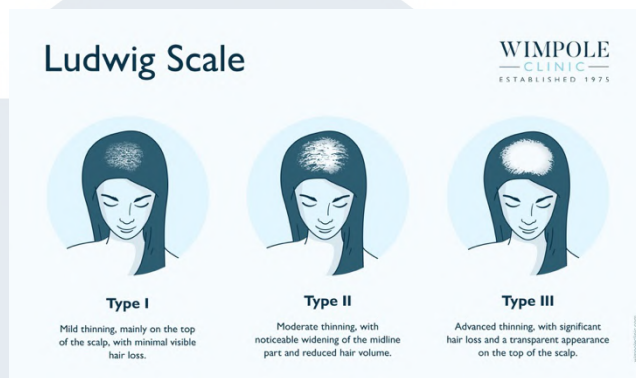
Figure 2.62 Alopecia Pattern on Woman with PCOS
Source: https://wimpoleclinic.com/blog/pcos-and-hair-loss/ (2025)

However, this symptom is not considered as a key predictor in determining whether a woman has PCOS. It can be caused by other factors. These factors include nutrition, medication side effect, trichotillomania, genetics, and many more. Additionally, Illnesses such as lupus, alopecia areata, and certain bacterial infections may cause hair thinning (Muharam et al., 2020, p.20–22).

2.2.2.4 Excessive acne

Another symptom caused by hyperandrogenism. Excessive acne can be measured by seeing if the acne disappears after treatment. If it persists, it is most likely caused by hyperandrogenism. As androgen levels increase, so does the production of oil glands, which causes blockage and creates acne.

Figure 2.63 Excessive Acne on Women with PCOS
Source: https://pcosweightloss.org/how-to-get-rid-of-horm... (2023)

Other factors might include menstruation, pregnancy, and birth control pills. In general, teenagers will experience the acne breakout phase. However, it is generally treatable and does not leave scarring. Excessive acne can only be considered as a PCOS symptom if it persists until the age of 20 (Muharam et al., 2020, p. 22–23).

2.2.2.5 Increase in Weight or Obesity

Obesity causes women with PCOS to commonly store fat around the hip area. The cause for increase in weight relates to sugar cravings caused by insulin resistance. This is because the body struggles to regulate insulin. As such, insulin resistance and obesity are often related to one another.
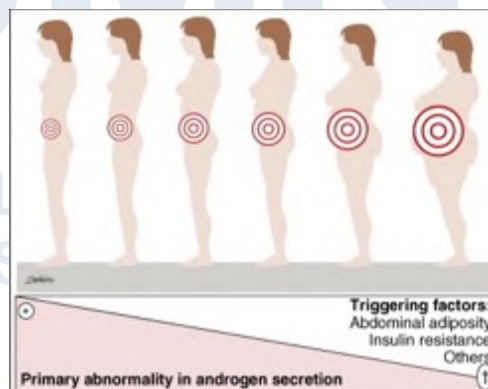

Figure 2.64 Obesity in Women with PCOS
Source: https://www.sciencedirect.com/science/article/abs... (2007)

Additionally, women with this condition are at risk of worsening their PCOS symptoms. This is because the more they gain weight, the more prominent their insulin resistance side effects will be. As such, it can also worsen their insulin resistance. As such, it can increase the risk of diabetes mellitus and heart disease (p. 23).

2.2.2.6 Acanthosis Nigricans

A skin condition that causes dark areas around the folds of the body. If found in teenagers and children, there is a possibility that it relates to insulin resistance (p. 23–24). Aside from insulin resistance, *acanthosis nigricans* is commonly found in women with obesity and diabetes. As of now there is no cure. However, the cause can disappear by itself (Pratama et al., 2022, p.44).

Figure 2.65 Acanthosis Nigricans on the Skin
Source: https://ai-care.id/penyakit/memahami-penyebab-acan... (2024)

The prevalency of this symptom can be considered high. Muharam et al. (2020) states that around one out of ten obese women with PCOS have *acanthosis nigricans*. Appearance-wise, they are characterized with thickening skin. As such, there is often a misperception towards this symptom, as most Indonesians believe it is due to infrequent bathing (Muharam et al., 2020, p. 23)

2.2.2.7 Skin tags

Skin tags are a piece of brown-colored flesh growing on the skin. Although it can be considered as a PCOS symptom, skin tags can

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also indicate insulin resistance. This is particularly found in women under 40 years old (p.24). Generally, they appear on the eyelids, groin, breasts, neck creases, and underarms.

Figure 2.66 Skin Tags on Women with PCOS
Source: https://www.janiceselectrolysisclinic.co.uk/skin... (n.d.)

Skin tags are also common amongst women with acanthosis nigricans. Usually, skin tags are considered harmless. However, they can be considered otherwise if they start to bleed, irritate, or hinder eyesight. Additionally, sudden pain can become an indicator to remove the skin tags (Ludmann, 2023).

2.2.2.8 Liquid from Breasts

Another symptom that does not determine PCOS. However, it does indicate an excess production of prolactin from the pituary gland, also known as hyperprolactinemia. Generally, the liquids are colored grayish-white. This symptom can also happen due to antipsychotic drugs (Muharam et al., 2020, p. 24–25).

2.2.2.9 Polycystic Ovaries

Polycystic Ovaries start to occur when a dominant follicle keeps the eggs inside the ovaries. This causes the vagina to go through an anovulatory cycle, in which a woman experiences regular periods with no ovulation. When this happens repeatedly, it causes cysts to

pile up, building up a group of cysts. The reason this happens is still unknown, but is suspected to be caused by increase in androgens (p. 25–26).
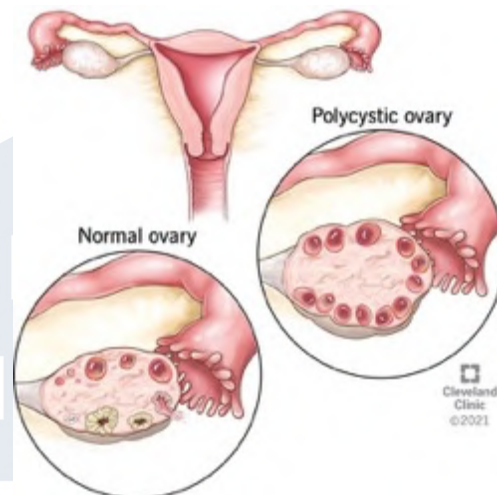

Figure 2.67 Comparison of a Normal Ovary and Polycystic Ovary
Source: https://my.clevelandclinic.org/health/diseases/83... (2023)

However, it is important to note the difference between PCO and PCOS. Polycystic ovaries, abbreviated as PCO, is a condition where a woman has cysts in her ovary, but still experiences periods consistently. Other PCOS symptoms like increase in androgens are also not present. On the other hand, PCOS includes inconsistent periods and hyperandrogenism symptoms (Pratama & Tanjung, 2022, p. 51).

2.2.3 PCOS Indicators

PCOS adheres to the Rotterdam Criteria. Set in 2003 by the Rotterdam European Society for Human Reproduction. There are other methods to indicate PCOS, such as the NICHD criteria. However, this method is also combined with a modified version of the Rotterdam Criteria (Dewi, 2020, p. 703). The Rotterdam Criteria states that a female can be diagnosed with PCOS fulfill two out of the three criteria's, i.e.:

Table 2.1 Modified Rotterdam Criteria

Feature	Recommended Diagnosis	Considerations
Biochemical Hyperandrogenism	A. Elevated total or free testosterone, or calculated indices of free testosterone (FAI, BioT). B. DHEAS and ANSD can be considered	C. High quality assays should be used for the evaluation of analytes
Clinical Hyperandrogenism	A modified Ferriman–Gallwey score of ≥4 to ≥8	Threshold level should be considered in the context of patient ethnicity
Oligo-anovulation	Oligo-amenorrhea (cycles >35 days apart of <8 menses a year)	If highly suspicious for PCOS but does not have oligo-amenorrhea, consider serum progesterone or luteinizing hormone assessment
Polycystic ovarian morphology	D. ≥20 follicles per ovary in either ovary E. ≥10 cm^3 ovarian volume	Based on transvaginal ultrasonography with a transducer frequency ≥ 8 MHz

There are three main points in the Rotterdam Criteria. Hyperandrogenism refers to the increase of androgens. There are two indicators for hyperandrogenism, such as biochemical and clinical. Oligo-anovulation refers to inconsistent menstrual patterns that lead to no ovulation.

Polycystic-ovarian morphology is detectable by doing an ultrasound, or USG, (Pratama & Tanjung, 2022, p. 35–37), i.e.:

A. **Clinical Hyperandrogenism**

Referring to the increase of androgens, clinical hyperandrogenism is usually signified by excessive hair growth, hair thinning or loss, excessive acne caused by increase in oil production, and alopecia (p.37). Hyperandrogenism happens due to the imbalance of LH and insulin. As such, it does not allow for the follicles to grow, which causes oligo-ovulation. To measure hyperandrogenism, an indicator known as the Ferriman-Gallwey Score is used.
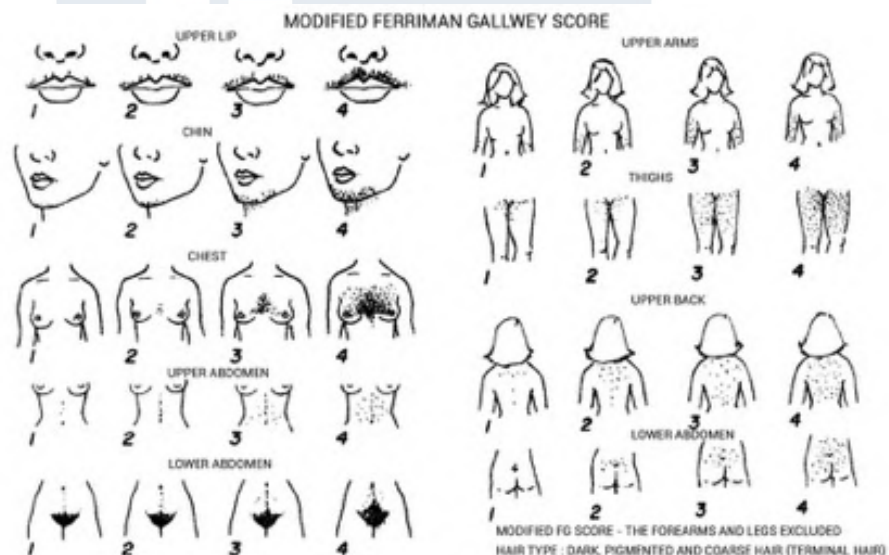
Figure 2.68 Ferriman-Gallwey Indicator for Hyperandrogenism
Source: https://myendoconsult.com/learn/ferriman-gallwey-... (n.d.)

By using areas such as chin, above the lips, chest, lower and upper back, thighs, arms, upper arm, and stomach area, each part of the body will earn a score between 0–4. When summed up, that will be the diagnosis for whether a woman has hyperandrogenism or not. Each race has different scores. For Indonesia, a score or more than 5 is considered to indicate signs of androgens increasing, as it counts as abnormal (p.41).

B. Biochemical Hyperandrogenism

Although hyperandrogenism can be indicated through physical changes, there are also a few laboratory tests that need to be conducted. It is still unclear which androgen-checking method is the best. As such, there are a few tests that doctors conduct to determine a woman's PCOS condition. Below are the available methods for checking androgen levels (Muharam et al., 2020, p. 35–37), i.e.:

1. Free Androgen Index (FAI)

The first method is by testing for Free Testosterone, or Free Androgen Index (FAI), which detects the levels of androgens in the body. The most recommended method by the Indonesian Reproductive Endocrinology and Fertility Society (HIEFRI), this method is often used as free testosterone is more sensitive. A woman is considered at risk of PCOS if her FAI tests results show a score of more than 5%. This method also utilizes sex hormone binding globulin (SHBG) into the calculations.

2. Luteinizing Hormone (LH)

Levels of luteinizing hormone and follicle-stimulating hormones (FSH) will also be checked. It is commonly found in around 70% of women with PCOS. These women also do not have obesity. Generally, an increase in LH/FSH ratio above 2 is considered to be a sign of PCOS.

3. Lipid Levels

Another available method for checking androgen levels. Lipid levels are measured by the amount of fat in the body. Uses levels of triglycerides, LDL cholesterol, and HDL cholesterol to measure insulin resistance. This test can also be utilized to determine the possibility of heart diseases and type 2 diabetes.

4. **Blood Sugar Levels**

Blood sugar levels can indicate the existence of hyperandrogenism. It can also be tested to determine if the woman has risks of heart disease or type 2 diabetes. Often measured by fasting, however the Oral Glucose Tolerance Test (OGTT) offers much more accurate results. However, it may cause unreliable results due to its complicated process.

5. **Thyroid Gland Hormone Levels**

In addition, thyroid gland hormone levels can also indicate hyperandrogenism. There are times where thyroid gland hormones such as thyroid-stimulating hormone (TSH) and thyroxine (T4) are tested to see if the woman has any other hormonal conditions. Additionally, it is also used to find any other underlying conditions that may appear due to PCOS. To aid this test, doctors generally use adrenal stimulations or cortisol suppression tests using adrenocorticotropic hormone, or known as ACTH.

C. **Oligo-anovulation**

Every patient has different menstrual patterns, whether irregular or infrequent. A normal cycle usually happens every 21–35 days, meaning that a woman can be considered to have menstrual disorders if her menstrual cycle happens in less than 21 days or more than 35 days. However, consistent menstrual cycle or not, what needs to be analyzed is if the woman experiences ovulation, which can be done through various methods. An LH kit or USG scan is advisable around fertility period, as almost 10% of PCOS patients still have normal cycles, but do not experience ovulation (Pratama & Tanjung, 2022, p. 36).

Figure 2.69 LH Strips for Testing Ovulations
Source: https://id.made-in-china.com/co_diagnos/product_Di... (n.d.)

Additionally, if the menstrual cycle continues for more than 8 days, or more than 80ml of blood, a visit to a specialist is advised as prolonged effects can lead to anemia. Generally, this is caused by a benign tumor called a uterine myoma, that is found on the uterine muscles (p.11). Prolonged durations of menstruation can also be caused by adenomyosis, which is a condition where the endometrial tissue grows outside the uterus (NHS, 2023). The condition also involves the thickening of the uterine wall (Pratama & Tanjung, 2022, p. 11).

D. Polycystic-Ovarian Morphology

The final method is by using ultrasound, or USG, and are usually done by OB-GYN doctors. There are different ways to approach an ultrasound, based on if a woman is married or not. For married women, usually doing a transvaginal ultrasonography is ideal. As such, it is ideal for them to relieve themselves before the ultrasound. For teenagers and unmarried women, the ideal methods are by doing a transabdominal or transrectal ultrasound. Before doing a transabdominal ultrasound, women are advised to drink as much as they can, and hold their bladder for a minimum of two hours.
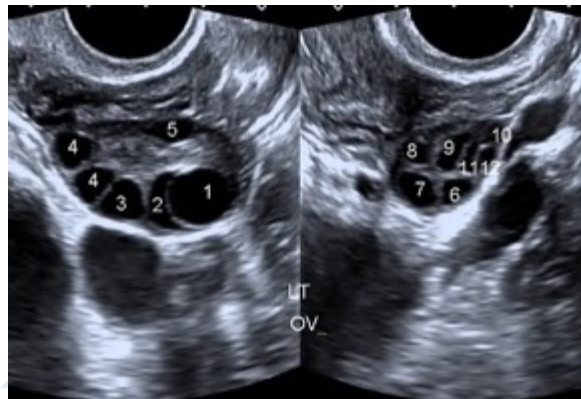
Figure 2.70 Polycystic Ovaries on Ultrasound
Source: https://radiopaedia.org/cases/polycystic-... (n.d.)

If they have PCOS, the scans will show polycystic ovaries, which is detectable from the number of small eggs that exceed more than 12. If they used a transabdominal ultrasound, then the indicator is based from the volume of the ovarium. If it reaches more than 10cc, that means their ovaries are enlarging. The difference in methods only lie in the advantages, in which transvaginal and transrectal ultrasonography provide more accuracy.

2.2.4 PCOS Types

As of now, PCOS is advised to be diagnosed using the modified Rotterdam criteria (Table 2.1). It is considered present under the condition that two of the following are found: polycystic appearing-ovarian morphology on ultrasound, evidence of oligo-anovulation, and clinical or biochemical hyperandrogenism (Christ & Cedars, 2023). Although PCOS effects can vary, there are four main types of PCOS. These types include insulin-resistance PCOS, inflammatory PCOS, hidden-cause PCOS, and pill-induced PCOS (Ferticity IVF, 2022).

2.2.5 PCOS Effects

According to Muharam et al. (2020), there are about 10–15% of women within the age range of 15–40 years old that suffer from PCOS. If left untreated, PCOS could cause many unwanted effects. These effects can even

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cause a 47% chance of dying at a younger age (The Endocrine Society, 2023).
Below are the effects of PCOS:

A. Type 2 Diabetes

One of the side effects of leaving PCOS untreated is the chance of diabetes mellitus occurring. Type 2 Diabetes can happen due to resistance of insulin or impaired insulin secretion (Goyal et al., 2023). Approximately more than half of women under the age of 40 years old have a risk of having diabetes mellitus (Pratama & Tanjung, 2022). As such, the risk of type 2 diabetes can increase the more it is untreated.

B. High Blood Pressure

Another effect that can be experienced is high blood pressure. Compared to women without PCOS, women that are diagnosed are more susceptible to high blood pressure. It can also happen when a woman with PCOS is pregnant. As such, it can cause cardiovascular diseases such as heart attacks and strokes (Pratama & Tanjung, 2022, p. 47).

C. High Cholesterol

Referring to LDL Cholesterol. Women with PCOS tend to have higher levels of LDL cholesterol, which is considered as 'bad' cholesterol. As such, they have lower HDL cholesterol, which is considered to be the 'good' cholesterol. If a woman with PCOS has high levels of LDL cholesterol, the chances of strokes and heart attacks happening increase.

D. Sleep Apnea

Sleep apnea is a condition where the body stops breathing while resting. It can happen frequently during night time. The correlation to PCOS lies in the fact that many women with PCOS

suffer from obesity, which can cause sleep apnea. Additionally, the chances of diabetes and heart attacks occurring increase.

E. Depression and Anxiety

A common effect amongst women with PCOS. Around 27–50% of women diagnosed with PCOS have depression. In comparison to 19% of women that have depression, but do not have PCOS, this can be considered as a drastic difference. These symptoms can occur due to infertility problems, symptoms that occur due to hyperandrogenism, and the increase of cortisol, also known as 'stress hormones.

F. Endometrium Cancer

Endometrium cancer can occur if the walls of the uterus continue to thicken. This phenomenon is caused by endometrium hyperplasia. It is a condition in which the constant production of estrogen is not met equally with the amount of progesterone being produced. As such, uterus continues to thicken due to the excessive release of estrogen, increasing the chances of endometrium cancer.

2.2.6 PCOS Prevention

PCOS is not curable, as it is a chronic condition. However, there are a few ways to reduce its effects. Each person has different needs, so it is advisable to consult with a health professional, such as an OB-GYN doctor, clinical nutrition specialist, psychologist, internist, or a dietician. Nevertheless, there are a few ways to reduce or control the effects of PCOS (p.58), i.e.:

A. Lifestyle Changes

One of the most important ways to reduce the effects of PCOS is to have a balanced diet. It can be done by balancing calories, as well as regular exercise. Contrary to popular belief, this applies to all women of different weights. Whether a woman is of ideal weight,

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obese, or overweight, it is important to make sure their daily nutrition requirements are fulfilled.

B. Medicine for Insulin Resistance

A medicine often recommended to those with insulin resistance is metformin. Once consumed, the metformin will not only boost the insulin's ability to lower blood sugar levels, but also lower testosterones, LDL cholesterols, and aid in reducing body weight. Additionally, metformin helps medicate women with type 2 diabetes. Effects will start to take place after 3–6 months of using metformin. PCOS symptoms will reduce, which allow for regular menstruation and ovulation. Side effects of this medicine include feeling bloated, vomit, nausea, and diarrhea. However, the body should get used to it after 6–8 weeks. Usage of metformin must be done under the supervision of a health professional (p. 80).

C. Medicine for Fertility

According to the Indonesian Reproductive Endocrinology and Fertility Society (HIEFRI), a PCOS patient is allowed to be given letrozole and clomiphene citrate should they wish to have a child. The medicine aids in helping women with PCOS experience ovulation. Data shows that after being given these two medicines, 75–80% of patients experience ovulation. Married couples can then try for a baby once the ovum grows more than 17mm in diameter. If the egg has not developed, then the process will be repeated with a higher dosage (p. 82).

D. Medicine for Menstruation Regulation

One of the ways that teenagers and unmarried women can regulate their menstruation back is by taking birth control pills or progesterone. However, this is only if the woman has tried to exercise, diet, and lose weight, but still have inconsistent menstruation. Birth control pills enable women with PCOS to have more consistency in

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their menstruation. As such, it reduces the risk of endometrium cancer (p.89).

2.3 Relevant Research

To dive further about PCOS media in Indonesia, the author conducted a study on existing research that is relevant to the topic. The study will use various sources that the author believes represent the current condition of PCOS media in Indonesia to further strengthen the research. In addition, this section will define the novelties from this research. Based on the research conducted, the author gained many insights and knowledge regarding PCOS as a condition, further highlighting the lack of awareness in Indonesia due to a minimal amount of information medias.

Table 2.2 Relevant Research

No.	Research Title	Author	Research Outcome	Novelty
1.	The Influence of Video-Based Health Education in Modifying Early Screening Efforts for Polycystic Ovary Syndrome (PCOS)	Ni Komang Surya Ariani, Ni Luh Putu Dina Susanti, Ni Wayan Manik Parwati, Ni Putu Sri Haryati	The testing of an educational video regarding PCOS towards senior female high school students in Denpasar.	**A. The output:** The previous research produced an educational video; however, it is not the main focus of the research, but rather a tool. As such, this research serves as literature review for the author regarding PCOS media and awareness in Indonesia. **B. The topic:** The

			topic is about PCOS awareness and educational media in Indonesia.
2.	Screening and Determinants of Polycystic Ovary Syndrome Incidence in Adolescents	Devi Anggita Sari, Erna Yovi Kurniawati, M.Any Ashari	A research result about the clinical profile and PCOS determinants of female teenagers in Yogyakarta	**A. The output:** This previous research did not produce any medias. As such, it will be used as literature review regarding PCOS prevalence in Indonesia **B. The topic:** The topic is about PCOS determinants amongst female Indonesian teenagers in Yogyakarta.
3.	Polycystic Ovary Syndrome Therapeutic Approach	Ni Luh Putu Rustiari Dewi	Therapy for women with PCOS	**A. The output:** No media was produced from this research. However, a therapy method was created to treat PCOS. As such, this research will

				become literature review for the available methods of PCOS treatment in Indonesia. **B. The topic:** The topic touches on PCOS treatment in the form of therapy, which involves medication.

Based on the author's research, there is minimal number of studies regarding PCOS as a condition in Indonesia. Most information is cited from foreign countries, further reducing available data for Indonesian women. The first and second source only provide brief context about PCOS and refrain from explaining further as it serves as background context for the specified study. In contrast, the third source not only provided new insight towards PCOS statistics in Indonesia, but also explained the condition in full context. In terms of media output, the first source carries the most similarity, which creates a video-based health education about PCOS. Both serve information and aim to spread awareness. However, the video output was neither included nor referenced in the report, as it served solely as a tool for the primary study rather than being a central focus of the research.