CHAPTER II

LITERATURE REVIEW

2.1. Visual Design

2.1.1. Visual Design Principles

In determining a design, a designer is required to use design principles that rule the various elements in the design work. Malamed (2015) divide design principles into five parts:

2.1.1.1. Color and Emotion

Color is known to evoke emotions and can even affect a person's overall experience with color objects. Everyone has different perceptions of the same color. It is influenced by psychology, cultural background, and beliefs of each person. There are responses and the same reactions from some people to specific colors (Malamed, 2015).

1. **Pleasure from color**. There is a consistent emotional effect arising from brighter and more saturated colors compared to hue. Most people will find pleasure in bright, saturated, and vivid colors.
2. **Color preferences.** Color preference itself emerges from the effect colors give on someone so that the color preferences are not universal.
3. **Stimulating colors.** The yellow and red have a stimulating effect, and the result is a feeling of excitement or arousal.
4. **Serene colors.** Green and blue are usually considered calm and relaxing colors.

5. **Dark colors.** Dark colors generally have a dominating effect on aggression and strength compared to bright colors.
6. **Bright colors.** Bright colors are associated with striking traits. On the other hand, paler shades give off a calming effect
7. **Neutral colors.** Colors like white and light gray give off a holy and elegant effect.
8. **Symbolic meaning.** Most people associate a color with particular objects or events. So that memory dramatically affects their perception of color.
9. **Colors to avoid.** According to some research on color, some colors are not well received, for example, bright orange, harsh pink, and lime green.

2.1.1.2. Use Color to Enhance Learning

Color is an essential element because it can influence a person's emotions and psychology, especially in the learning process. However, many designers use color palettes arbitrarily and then do not get satisfactory results (Malamed, 2015). Here are some techniques used to enhance the learning experience with color.

1. Color and Motivation

   It takes a positive effect so that the learning experience becomes more exciting and fosters a feeling of motivation to stay focused on learning. Color is an essential part of this process that can evoke this positive effect. Although colors cannot guarantee a compelling visual, learners will be more focused and enthusiastic when using colored graphics instead of black & white.

2. Color and Meaning

The primary purpose of designing a learning media is to reduce the cognitive effort in understanding the material. Most people get information faster through color (Malamed, 2015).

a) **Improves visual discrimination.** When a person is learning how to read a radiograph, it helps if the hard-to-see parts are painted with a more striking color.

b) **Improves retention with color coding.** The use of color-coding in the learning process can help learners to pay more attention to important parts of a text so that it can increase one's memory of the material.

c) **Enhance storytelling.** Color plays a vital role in increasing the meaning of a story. Color can convey emotional responses to advance understanding of the text.

3. Color and Usability

Usability refers to things like whether the application can be used and how easy it is to use the application and whether the application provides a satisfying experience. When designing instructional media, usability must always be considered. Because of the excellent usability of an application, users will get a positive effect during learning. Here are a few ways to improve usability with color:

a) **Use color consistently.** Use consistent colors in the user interface because, with consistent colors, users will easily recognize parts of the application and increase comfort to the application user.

b) **Use color as par of a visual hierarchy.** Color is one of the factors that helps designers to create a visual hierarchy in an application. A brighter color is usually used as a marker of the most important thing because it will efficiently and quickly attract attention.

c) **Use a limited color set.** Humans can only receive several colors simultaneously, so try not to use more than seven colors.

d) **Create functional areas in a layout.** Color can be used to differentiate and organize graphic space. Color is also handy when used as content boundaries, such as sidebars and a bunch of text.

e) **Use cues in addition to color.** Avoid using color as the only element that separates information that is important and what is not. This is one way to help users with color vision deficiencies.

f) **Use culturally appropriate colors.** Be careful in choosing colors because it can offend people with certain cultures/beliefs.

2.1.1.3. Color Interaction

Color selection can be very complicated because, in reality, you rarely find standalone colors. In general, humans see several colors at once. This means that so far, the colors we see are relative colors, depending on the eyes of each person. This is caused by changes in color perception when juxtaposed with other colors. To get complete control over the design created, a designer must start paying attention to how colors interact with other colors. According to Malamed (2015), there are five types of color interaction, namely:

1. **Light and dark effects.** The same color will appear darker if given a light background while appearing brighter if the same color is placed on a dark background.

Figure 2. 1 Color Interaction

(Malamed, 2015)

2. **Emphasis from complementary colors.** Complementary is a combination of colors that cross each other on the color wheel. The two colors have a very striking contrast. For easy emphasis, place complementary colors next to each other. Both colors will stand out, and emphasis will be created.
3. **Contrast through value.** Another way to create contrast is to choose colors with different values (lighter or darker).
4. **Shifting adjacent colors.** When non-complementary colors are placed close together, especially if the two colors are adjacent on the color wheel, they will appear to shift towards their complementary color.
5. **Gray effects.** Gray is an adaptable color, looks warmer when placed on a blue background, and will look cool when paired with a red background.

2.1.2. Visual Hierarchy

Visual hierarchy is a design setting where users will be directed to focus on a single point. Several techniques can be used to create a hierarchy in the design (Malamed, 2015).

2.1.2.1. Techniques for Creating Emphasis

There are several ways that design elements can have more strength than others. Combining several techniques into one technique can increase the certainty that the hierarchy in the design is clear.

1. **Position.** Any text or images placed at the top or upper left corner will get the first attention because readers move their eyes from left to right and from top to bottom.
2. **Color.** The human eye is more sensitive to bright and warm colors like yellow, orange, and red. Suppose these colors are applied to the hierarchy of design. They will stand out and grab the audience's attention.
3. **Image.** An image is a design element capable of grabbing an audience's attention quickly compared to a collection of text.
4. **Scale.** Scale refers to the size of an element. Visually, a more massive object will appear closer to the audience. Humans are also used to seeing larger elements first.
5. **Isolation.** Isolating an element can give that element a striking impression. Objects surrounded by white space can attract attention faster because they contrast the space around them.

6. **Density.** Another way to create a hierarchy in design is to place several objects close together to form a dense group. Objects with high density can also grab the audience's eyes.
7. **Motion.** The human eyes are very easily attracted to moving objects.
8. **Visual cues.** Most people will follow visual directions like arrows and dotted lines.
9. **Numbering.** If a design has a monotonous impression where all the elements have the same position, then numbering the design elements can create a hierarchy. This is due to the habit of the audience who will read from number one.
10. **Short and powerful phrases.** Text that is short and clear will attract the attention of the audience more than text that is long and wordy.

2.1.3. Unity and Wholeness

The average person will look at the whole before paying attention to the details. In design, there must be unity, and the importance of unity is to create a consistent impression, which is generally very difficult to obtain.

2.1.3.1. A Unified Design Supports Learning

A unified design has elements that coordinate with one another. It is aesthetically pleasing, but consistency and a unified design can help the learning experience in several ways.

1. **Reduces cognitive effort.** When there are similarities and matches between design elements, users will learn how to use the application faster and feel more comfortable because their cognitive effort is not wasted.

2. **Creates a focused message.** In a unified design, the message that is trying to convey will be clear and not scattered. A design must reduce the number of elements in it so that users are not distracted by other details that are less relevant.
3. **Improves the aesthetic experience.** One of the crucial things of a design is the beauty or aesthetics provided. Visuals that can create unity are a pleasing design and will provide a positive experience for users.

2.1.3.2. Repetition

The easiest way to create unity is by repeating one of the elements. Repetition also creates rhythm and a sense of motion in the design to appear more unified. For example, elements that can be repeated are the typeface, style of an image, and other visual features, line thickness, or texture.

Figure 2. 2 Unified Design

(Malamed, 2015)

2.1.3.3. Unity Needs Some Variety

Even though unity is an activity where cohesion is formed, users will always be interested in something that stands out or is different from the others. Therefore, trying to make a design look unified is not enough. A design will seem boring if there are no variations in elements.

2.1.4. Contrast

Contrast is one of the most critical principles because it is based on how the human brain works. The human brain will look for similarities and differences to recognize an object. The level of contrast of an element determines how easily the element is identified. The greater the contrast made and the sharper the image, the easier it will detect its shape.

2.1.4.1. The Effect of Contrast

The contrast gives the design the ability to communicate visually. This principle can make an object more striking, increase the appeal of a visual, and organize information to make it more focused.

1. **Contrast creates emphasis.** Contrast can make an image, shape, or text more dominant than other elements. Contrast affects the content order of design. Using multiple levels of contrast is one way to create a visual hierarchy.

Figure 2. 3 Contrast Creates Emphasis

(Malamed, 2015)

2. **Contrast creates visual interest.** The human brain will always try to find something different, so the contrast is very influential in increasing the visual appeal of a design. Viewers tend to get bored more easily with monotonous designs. Without contrast, a design will be neutral, and there are no elements that attract attention. This can have a confusing effect on people because it is difficult to understand the gist of the design.
3. **Contrast creates meaning.** Contrast is one aspect of visual language that can create meaning and convey a message similar to a sentence.

2.1.4.2. Show Emphasis with Text

By enlarging and giving color to text, it will bring out a contrasting impression on typography. According to Malamed (2015), there are five ways to create contrast in the text:

1. **Headlines and titles.** The size and thickness of the headline and titles contrast sharply with the body text. Its definite top position also supports this type of text to be the center of attention.
2. **Reverse colors.** Use a light color if the background is dark and vice versa to create contrast.
3. **Sideways direction.** Emphasis can also be achieved by placing a short title/headline on the side of the body text in a vertical state. However, make sure that the title is still readable by the audience.
4. **Typeface contrast.** Use a typeface that can reflect the emotion and meaning that we want to convey.
5. **Scale.** Text that seems bigger or thicker will be much easier to attract the audience's attention.

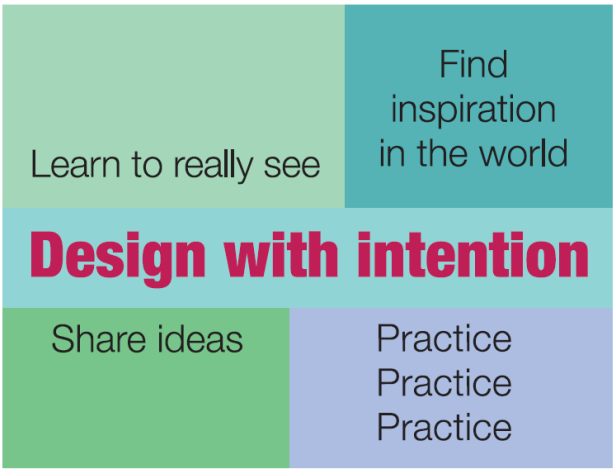

Figure 2. 4 Show Emphasis with Text

(Malamed, 2015)

2.1.5. Visual Design Benefits to Learning

When looking at a picture, our eyes held the information for less than a second, and those data are sent to our working memory. Through some perceptual

processes, we choose what do we want to pay attention to based on the detail that catches our eyes, and patterns may become very handy in this kind of situation. When we look at an image, some visual chunks stay in our working memory for a few seconds. With our experience and knowledge, we can interpret and transmit the information into our long term memory. If the visual is easy to understand, this process could happen very quickly. Research shows that if visual like pictures or images accompany the text, it will help to improve the learning experience rather than using text alone (Malamed, 2015).

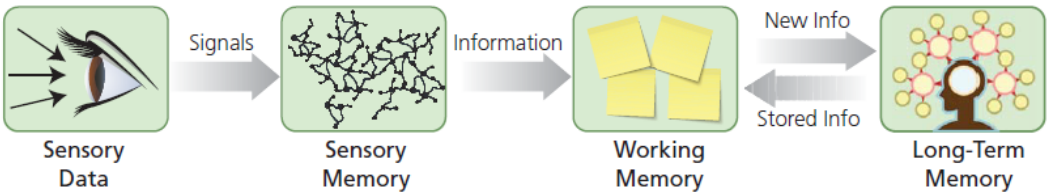

Figure 2. 5 How We Process Visual Information
(Malamed, 2015)

2.1.6. The Purpose of Design

According to Malamed, there are four purposes of design. Here are some ways to look at the many different objectives of design (Malamed, 2015):

1. Design Creates Solutions

   The primary purpose of design is to devise the best solution to a problem. Every problem has its constraints, and the design process uses these constraints as a stepping stone for designing creative solutions.

2. Design Communicates and Informs

   The point of visual communication is to pass on ideas and information in a directed manner. The communication itself is divided into content (the

information) and form (how it is designed). Effective designs convey an accurate message in both form and content.

3. Design Instructs

   When education is the target of design, the visual form is expected to improve the audience's potential to apprehend the information. A design that instructs provides a logical structure, draws attention to the vital point, and clarifies complex content through pictures or words.

4. Design Persuades

   Sometimes the purpose of design is to persuade. The persuasion intends to alter attitudes, values, and beliefs to change behaviors. Both the visual form and the content must be encouraging to attract attention and elicit emotions. A persuasive design must have a deep meaning for the audience.

2.2. UI/UX

UI or user interface is a visual representation of a digital product. One of the products in question is an application. UI is the link between the user and the functionality of the product. It helps humans to achieve the desired results. The interface itself combines grids, layouts, typography, colors, animations, and micro-interactions. UI is everything we see from the digital product.

On the other hand, UX, or user experience, is an activity that studies how an application works. UX also includes research on potential users and stakeholders. The UI will be made following the target audience's needs and not deviating from the primary goal.

2.2.1. User Experience

User experience comes from the Latin word ‘oeti’ which means to employ, exercise, perform, and ‘experientia’, which means knowledge gained from repeated experiments. So the full meaning of user experience is the knowledge obtained from doing something. User experience is divided into two types, namely, user experience design (UXD) and user experience research (UXR).

User experience design involves activities related to design. Things that are designed can be in the form of products or services, for example, a designer who makes an application to manage a salon. In comparison, User experience research collects data before implementing the design process, for example, by conducting interviews with the salon, reading reports from visitors, and paying attention to the salon visitors' habits (Stull, 2018).

2.2.1.1. UX Principle

According to Grant (2018), in the UX design process, there are 101 principles, but the authors sort these principles based on the level of relevance to the application to be made, namely:

1. **Do not use more than two typefaces.** Instead of using too many typefaces, it is better to limit the number of typefaces to just two types. The first typeface is used for headings and titles, while the second typeface is used for body text. Use variants of the typeface like **bold** and *italic* instead of adding a new typeface (p. 6).

2. **Use type size to depict information hierarchy.** This principle is straightforward. Just by changing the size of a text, we can first tell the most crucial information (p. 12).

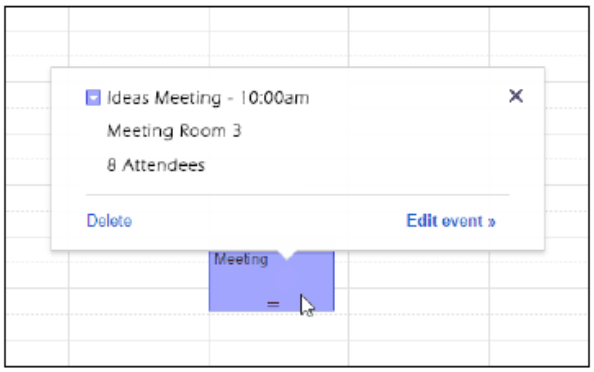

Figure 2. 6 Type With Same Size

(Grant, 2018)

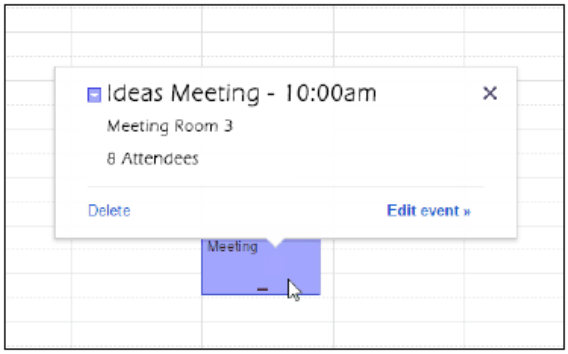

Figure 2. 7 Type With Different Size

(Grant, 2018)

3. **Use a sensible default size for body copy.** Do not use excessive sizes, such as too small or too large. Text that is too small will make it difficult for users to read. At the same time, the type that is too large will be too overwhelming. Use a typical body text size of 16px with 1.5 spacing (p. 16).

4. **Make your button look like buttons.** Do not use flat design because if all buttons are flat, the user will have difficulty distinguishing buttons and

objects. Also, the user will be confused because of the unawareness of what will happen after they pressed the button (p. 22-23).

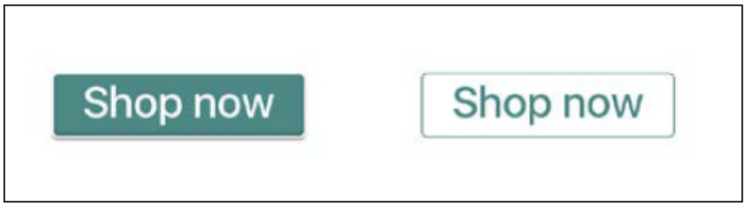

Figure 2. 8 Buttons

(Grant, 2018)

5. **Make "Getting Started" tips easily dismissable.** There are many cases where an application forced its user to look at "getting started" or "tutorial for using this application" pop-up guide. Not everyone wants to see the tutorial. Therefore it is known that a button to skip the tutorial is provided (p. 72).

Figure 2. 9 Skip Tutorial Button

(Grant, 2018)

6. **Make buttons a sensible size and group them together by function.** Do not make the buttons too big or too small, and give the space between the buttons less error-prone (p. 26).
7. **Make the whole button clickable not just the text.** Some developers create buttons, but only the text is clickable. Trivial things like that can negatively affect one's perception of the application (p. 30).

8. **Do not invent new, arbitrary control.** We, as designers, are provided with various types of buttons and controls. Do not create new controls that can reduce someone's experience because those new controls are too difficult to understand (p. 32).
9. **Think about what's just off the screen.** By showing a small part of an object on the interface, we can indicate that there is more for the user to discover (p. 54).
10. **Use consistent icons across the product.** A UI that does not have an icon with a different visual style will confuse the user (p. 100).
11. **Never use text on icons.** Icons should simply be made in the form of an image. Nevertheless, never put text on the icon. If this icon is used for a website or app that can be translated by google translate, the text on the icon will not be translated and will confuse users (p. 110).
12. **Always give icons a text label.** The label is not placed inside the icon. A text label is generally placed under the icon in question, is small, and is useful as a marker for the icon (p. 114).
13. **Emoji are the most recognized icon set on earth.** If the primary purpose of making this icon is to create an image that is simple and easy to understand, use emojis. Everyone who is accustomed to using a computer or smartphone must be familiar with emojis (p. 118).
14. **Obfuscate passwords in fields, but provice a "show password" toggle.** Obfuscating passwords using stars or circles is very good to use because it cannot be denied that there are still many chances that someone will try to

snoop when a user is entering a password. However, always provide a show password so that the user can double-check the password he has written and can quickly correct the wrong part (p. 126).

15. **Always allow the user to paste into password fields.** Many apps and websites have started not allowing their users to paste passwords even though this will significantly help users who use long and complex passwords. It is better not to allow copying of the password because irresponsible parties can misuse it. If this feature is removed, it will indirectly force users to use weak and easy-to-remember passwords (p. 130).
16. **Don't ever make your UI move while a user is trying to use it.** Never make the UI move because it will result in the user being distracted from the primary purpose of using the app. If a designer wants the user to control the apps they make, then do not make the control move because it will be very detrimental for both parties (p. 144-145).
17. **Pre-fill the username in "forgot password" fields.** If the user tries to log in and then fails because the password is entered incorrectly, pre-fill the username based on the previous entry, and the "forgot password" button would appear. Then send the code to reset the password to the user's e-mail (or SMS) for a limited time (p. 152).
18. **Be case-insensitive.** In the username column, make sure that the user does not need to pay too much attention to uppercase and lowercase letters because, after all, it will still be read by our application. Because if an

error in the username or password appears, the user will be confused because he does not think there is anything wrong with the e-mail he entered. What he does not realize is that he use capital letters to write the first letters of their e-mails. This can be frustrating because he cannot find any mistakes in writing a username or password. In contrast, the password field must be case-sensitive because the password is related to someone's account security (p. 156).

19. **Never show an animated, looping progress bar.** A disaster that can happen to a UI is the use of a loop in the progress bar where when it is almost at the end, it restarts back to zero, and it repeatedly happens until loading is wholly finished (p. 212).
20. **Use a "linear" progress bar if a task will take a determinate amount of time.** A progress bar with a start, end, and gradually fills in as the progress has been made is an excellent UI form. There is no ambiguity in the progress bar, and the user can easily find out the approximate time it will take again to complete the task (p. 204).

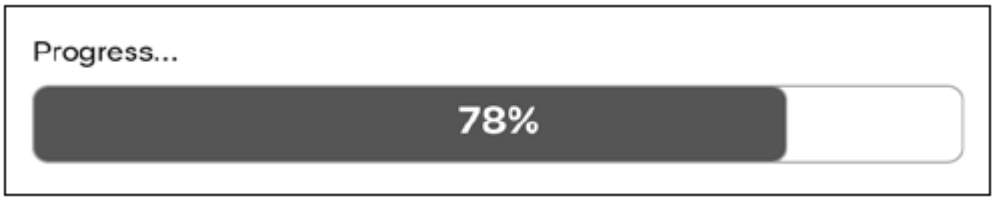

Figure 2. 10 Perfect Progress Bar

(Grant, 2018)

21. **Show a "spinner" if the task will take an indeterminate amount of time.** If our application cannot know or determine when a task will finish.

It is better to use a spinner, but if something goes wrong, make the spinner stop so that the user does not wait forever for this uncertain thing (p. 208),

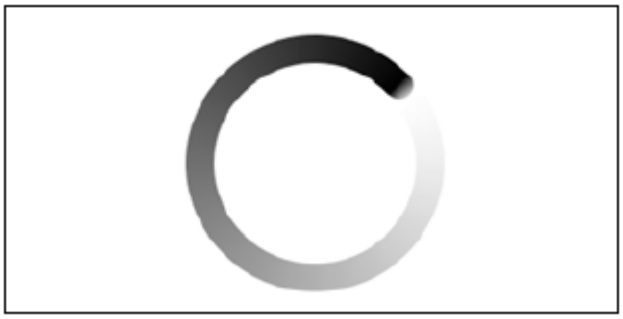

Figure 2. 11 Spinner

(Grant, 2018)

22. **Show a numeric progress indicator on the progress bar.** Enter the percentage as a number on the progress bar. Apart from being information for users about the percentage of progress made, the percentage is also understood universally. However, do not use the numeric percentage if the progress is short, and there is no time to read the numeric (p. 214).
23. **Don't only use color to convey information.** Color can be a problem for some users, especially those with color blindness, so do not rely too much on color to convey information. Also, use text to describe the meaning of the color for clarity (p. 240).

Figure 2. 12 Color Blind-Friendly Interface

(Grant, 2018)

24. **Write clear labels for controls.** Write a label on the interactable part of the UI so that the user can clearly understand the purpose and use of the interface. If necessary, the addition of a “placeholder” (or “watermark”) is also recommended to increase the clarity (p. 252-253).

Figure 2. 13 Label and Placeholder on UI
(Grant, 2018)

25. **Make tappable areas finger-sized.** If the apps that are going to be created will use a touch screen, a designer must consider the size of the button to suit the user’s finger size. Do not be too small because it will make it difficult for the user to press the button. Leave a distance of at least 2 mm on each button. This is done to avoid accidentally pressing two buttons at once (p. 260-261).
26. **A user’s journey should have a beginning, middle, and end.** User journeys have various types ranging from short user journeys like just trying to change the settings to the whole journey of the apps from signing in to reaching the user’s destination. (p. 264).
27. **The user should always know at what stage they are in any given journey.** Just like the real world, we as designers must provide “landmarks” so that the user can know their current position on our user

journey apps. Users will not immediately notice, but they will feel more comfortable if given a few hints about their position (p. 268).

28. **Do not nag your users into rating your app.** Do not force users to fill in the app's rating on the play store. Most of these pop-ups appear at the wrong time and make the user experience worse. Therefore, we should not show pop-ups like that in any application. Users will leave positive and negative reviews by themselves, depending on the experience they get (p. 290-291).
29. **Make your favicon distinctive.** Do not forget to create icons for apps that are being designed. First, test the icon created on the 16-pixel canvas to determine whether it is suitable for use. A bright, bold icon or a word is enough to grab the user's attention, rather than just a white box without any images (p. 296).
30. **Show, don't tell.** This principle aims to let the reader get experience through practice, not just dull reading. Most users will not read the text even if it is provided. Therefore it is better not to describe something with text but show it directly through practice (p. 316).
31. **Use "sign in" and "sign out", not "log in" and "log out".** Use the terms "sign in" and "sign out". The terms "log in" and "log out" are used by sailors to report the time and distance they have traveled for the day (p. 322).
32. **"Sign up" makes more sense than "register".** It is best not to use the term "register" as it sounds pushy, and no one will feel good about being

forced to create an account. “Sign up” seems friendlier and has the same feel as “join”. Moreover, “sign up” also has a rhythm similar to “sign in” (p. 324).

33. **Use “forgot password” or “forgotten your password”, not something obscure.** Provide the “forgot password” menu because there must be a period where the user will accidentally forget his password and need to reset the password. (p. 326).
34. **Build upon established metaphors – it’s not stealing.** It is okay to use buttons or terms that already exist or are already used by other designers. This is not stealing or plagiarism because to achieve good UX, we as designers must understand the target user's behavior. If we create a UI with a completely new style, most people will be confused about using it and choosing not to use it at all (p. 354).
35. **Test with real users.** The last principle and most important is the prototype test. If an app is good but a real user does not try it, it will be of no use. An app that has been made must be tested on the target user. Not just anyone or even colleagues. This stage aims to get feedback from the user to be improved to suit their needs (p. 380).

2.2.1.2. Compete with Everything

Many things happen in everyday human life, for example, watching television, playing with friends, taking out the trash, paying bills, taking vacations, etcetera. Trying to get people’s attention to visit the website or application that has been created is an enormous challenge. A designer is challenged to create an engaging

digital experience for users and how to attract their attention so that they prefer to use our applications over other things. Competition from an application designer is not just another creator, but everything that exists at this very moment (Stull, 2018).

2.2.1.3. Embrace, Not Accommodate

Every user, of course, really cares about themselves. They are looking for the most appropriate solution to the problem at hand. However, whatever problems they have, they will prefer to embrace the solution rather than accommodate one.

Users will embrace whatever solution they choose best and benefits them. If they need information, they will look for media information that matches their personality. If they did not find the right solution, users will accommodate their solution, but this will only provide temporary satisfaction until a better solution is present (Stull, 2018).

2.2.1.4. User Journey

A user chooses to stop using an application that has been created in the same way as a marathon runner who chooses to quit the race. People will be distracted by other things that they think are more interesting. Although some people will quit, others will succeed. In general, a person's experience is similar to a marathon, where at first it seems like a straight line from start to finish. However, if we look closely, we will find a complicated journey, starting from several places with different results.

An easy way to create a user journey is to imagine a marathon full of drunken people. Everyone hopes to reach the finish line, but they are physically

vulnerable to fatigue and easily distracted. Their senses are dull, and they do not know how to get to the finish line. The path they took also contained several intersections. Without guidance, the person will be confused. It is moments like that that determine a person's success or failure.

1. **Where the user was.** The user begins his journey from an intersection where then the path he chooses to meet ours. Users came from other places before meeting our path. When a user's path meets ours, the user will decide to join or ignore us. There are times when we even fail to get the user's attention because there are too many other distractions trying to get their attention.
2. **Where the user is.** With a little persuasion, the user will, of course, choose to continue his journey to our path but at the next intersections where he is required to pay in order to get more complete facilities. Then there will be two possibilities: the user chooses to continue the journey with us or leave because they are more interested in other offers. A designer can predict when the intersection will appear based on the results of research on user behavior.
3. **Where the user is going.** If the research is carried out on target and with a little help from luck, the upcoming intersections can be anticipated. With this knowledge, we can design according to the user's needs or interests so that the user will continue to walk the path we created.

2.2.1.5. Context

Context can affect the user's ability to appreciate design. An application commonly used for office work may not work when used while cycling. All experiences will either stick with the person or will bounce off. It all depends on the designer's ability as a provider. If the designer can provide something useful for the user, it would be even better to provide it on time and according to their needs.

2.2.1.6. Speak User's Language

As designers, we create a new language that the user has to define for himself. The languages created are not as tricky as hieroglyphs, but they are foreign languages to the user's ears. Designers can easily understand the language, but users do not. People also need to know what exactly we are making, and the job of a designer is to provide a language that is easy for the user to understand.

2.2.2. User Interface

If interpreted literally, the user interface is a screen display that is seen directly by the user. UI is everything that we see from an application (Malewicz & Malewicz, 2020). Here are some discussions about UI, including:

2.2.2.1. Screen

Nowadays, the screen of the gadget already has a very high resolution. In comparison, the screen on the 90's CRT has a resolution of 1/6 the screen of a smartphone. The first thing to consider in creating a UI is the number of pixels per inch (PPI). The pixel size on the page that is designed is determined based on the

gadget's screen size and how far away people will see the UI. There are currently five iPhone screen sizes and many more on Android.

In mobile applications, designers must consider the range and reach of a UI. Reach can help determine how easy the application is to use. The typical hamburger button on the top left is a bad UI example for a right-handed person. For tablets that are larger than smartphones, tablets are generally held in two hands so that the reach of tablet users is greater than that of smartphones (Malewicz & Malewicz, 2020).

2.2.2.2. Grid & Layout

The grid is a line structure that is very helpful in the UI layout creation process. The grid is also very useful in creating a hierarchy of elements in a design. Although, in general, the grid will not appear in the finished product, it can have a significant impact on the final result of a design. The consistency of a design can also be created through the grid. According to Malewicz & Malewicz (2020), there are several types of grids, namely:

1. **Horizontal.** This grid consists of several vertical columns and a distance between them. These distances are referred to as gutters. Both have flexible sizes, depending on the needs of each design. This grid is usually used to trim elements horizontally (p. 59).
2. **Vertical.** This grid is less frequent to use. In general, this grid has a function as a determinant of the height of a UI element. This grid consists of several horizontal lines (p. 59).

3. **Fluid grid.** In this grid, the gutters define the columns' size so that the size of the columns can be different, but the size of the gutters will remain the same (p. 60).
4. **Fixed grid.** This grid has a predefined gutter and column size and cannot be changed. If the screen size is larger than the grid size, there will be blank space on the grid's side. This grid is commonly used for websites because if the content is stretched from one end to another, it will reduce the readability, so it is better to leave it like that (p. 60).
5. **The red square method.** A square is an easy object for anyone to process, and then the red color is used to signal something important. This red square is used to check the grid's alignment and its elements (p. 71).

Users are used to not reading, but they will scan. This scanning activity has two patterns that are formed from human eye movements. The first pattern is the F-pattern. This pattern is quite popular among European and American people, where readers will only see the image and title from left to right. Meanwhile, the second pattern is called a Z-pattern. Z-pattern occurs in content with an image or video that is large enough in the middle of the text to immediately break the F-pattern and change the direction diagonally to the left side of the screen (p. 76).

2.2.2.3. Objects

Various vector objects dominate all kinds of UI. The box model is the most basic way of defining an interface both in design and code. Most of the UI is done using the box model (Malewicz & Malewicz, 2020).

1. **The inner margin.** Another name is padding, which means that the wider the area in an object, the greater the object's safe area (p. 80).
2. **Outer Margin.** The area outside the object is called the outer margin. An object can have a safe space between other objects by creating an outer margin around the object (p. 80).
3. **Size.** Width and height determine the size of an object. Commonly abbreviated as W and H. Width is a measurement on the horizontal axis, while height measures the vertical axis (p. 81).
4. **Position.** The position of an object is determined from the X and Y axes. X is the horizontal axis, while Y is the vertical axis (p. 82).
5. **Angle.** The angle defines the object's rotation degree. All objects must start from a neutral angle or 0 ° and will rotate clockwise. If a designer wants to create a consistent interface, make sure not to rotate objects manually but take advantage of the computer features to help rotate objects. (p. 83).

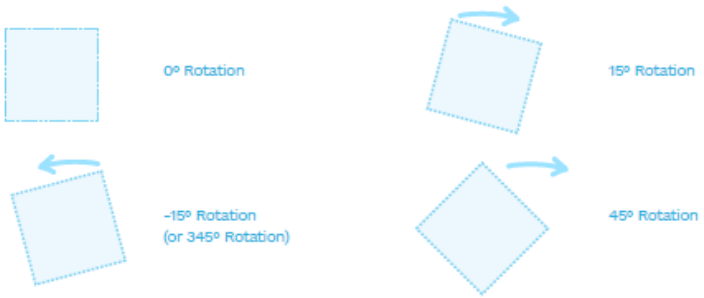

Figure 2. 14 Angle

(Malewicz & Malewicz, 2020)

6. **Border radius.** The border-radius is a number that determines the level of roundness of an object's corners. Usually, a shape with a blunt tip will be

considered more friendly than a sharp tip. However, it should also be noted, in creating a UI, consistency is essential. This consistency must also be reflected in the size of the roundness shapes found in the UI (p. 84).

7. **Fill.** Fill is commonly referred to as an object's background. It can be a color, a gradient, or a photo. Fills can also vary in opacity. If an object has no fill or border, the shape will not appear on the screen (p. 85).
8. **Border.** A line around a shape has another name, which is a border. There are three types of borders: inner border, center border, and outer border (p. 86).

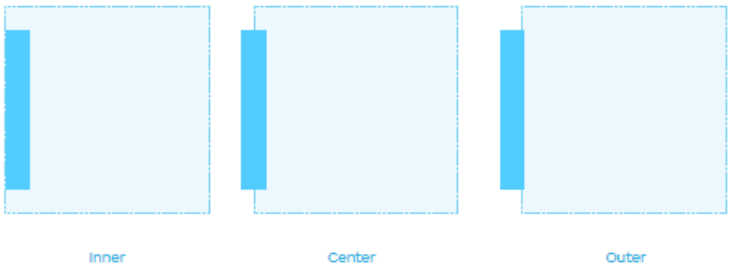

Figure 2. 15 Borders

(Malewicz & Malewicz, 2020)

9. **Drop shadow.** Shadows that look natural have a significant impact on a design. Avoid using black as a shadow color. Use a shade from the color used for the shape, then apply a drop shadow with a slightly darker color than the shape's color so that the resulting shadow will look more natural. Drop shadow can not only be used to make the effect of an object appear pop but can also be used to make the interface appear to have holes or indentations (p. 90).

2.2.2.4. Color

As explained in the visual design section, according to Malewicz & Malewicz (2020), color is an essential element in UI. Color also relates to a person's emotional condition, so do not use color only as an aesthetic medium.

1. **Blue.** Blue is most people's favorite color. Blue is also associated with trust, professionalism, experience, and wisdom (p. 100).
2. **Green.** The human eye is susceptible to green and can see various shades of green. The green color means harmony, stability, growth, security, and energy (p. 101).
3. **Red.** This color can cause adrenaline in humans compared to other colors. Red is also used as a warning sign. Red has positive meanings (energy, passion, strength, love) and negative (danger, adrenaline, warning, aggression). (p. 102).
4. **Yellow.** This color can create a lot of positive feelings. Yellow is often associated with enthusiastic, self-confident, happy, optimistic, and fun. Sometimes, yellow is also interpreted as a warning because humans will unconsciously react to the color (p. 103).
5. **Orange.** A very energetic and optimistic color. Like yellow, this color can have a positive effect but can also be considered a warning color (p. 104).
6. **Pink.** Stereotypically, this color is associated with something that smells feminine. This color is widely interpreted as woman, motherhood, innocence, youth, romance, and gentleness (p. 105).

7. **Purple.** Purple is a scarce color to be found in both digital products and in nature. Purple means luxury, power, wealth, and secrecy. Another meaning of purple is professionalism, wisdom, trust, high quality, and modernity (p. 106).
8. **Black and grey.** An intense and emotionally neutral color. This color is associated with elegance, minimalism, professionalism, and luxury. Black is also often referred to as the absence of color (p. 107).
9. **White.** White is the color of minimalism, perfect for giving a clean impression to a design. This color is defined as clarity and sterility. White, according to some studies, is a combination of all existing colors (p. 108).

According to Malewicz & Malewicz (2020), There are several ways to determine the color palette for design, namely:

1. **Analogous.** A collection of adjacent colors on the color wheel. The disadvantage of using this color is the lack of contrast in color choices (p. 112).
2. **Complementary.** Use colors that are opposite each other on the color wheel. The colors in this palette have very high contrast. However, pay attention to the color saturation because complementary colors tend to clash with one another (p. 113).
3. **Triadic.** This palette is made up of a color triangle on the color wheel. This palette tends to be more colorful and playful (p. 114).

4. **Split-complementary.** This palette can be achieved by specifying one color first and then selecting two complementary colors. The goal is to have an interesting contrast, but make sure not to overdo it so the color choices will still harmonize (p. 115).
5. **Rectangular.** An easy way to get this color palette is to determine two complementary colors to form a rectangle. This palette is quite balanced when it comes to warm and cold colors (p. 116).
6. **Square.** Similar to rectangular, but the color selection has a further distance of one from the others. However, selecting the color remains the same, namely choosing two complementary colors and a square shape on the color wheel (p. 117).

2.2.2.5. Typography

In a design, typography is an essential element that can help color create a mood. Choosing the right typeface will significantly affect the final result of a design. After determining the typeface, the next challenge is to choose an appropriate font. There are various types of fonts, ranging from those with special characters, different thickness levels, various levels of complexity, and various readability. The structure of a font can affect the perception of the user. Fonts with a neat and firm structure will look formal, while messy will give a playful impression (Malewicz & Malewicz, 2020).

2.2.2.6. Icons

An icon is a small pictogram that symbolizes a function or status. Most of the icons are shaped like simplified everyday objects. However, keep in mind that

icons must have meaning because no matter how transparent the icon is, there will still be parties who misinterpret it. We recommend keeping the text below the icon to increase clarity (Malewicz & Malewicz, 2020).

2.2.2.7. Buttons

Buttons are interactive elements that can generate an action. For example, if there is a button that says “save,” it is likely that the application will save the progress that has been made. The button should also look like something that can be pressed and is striking so that it is not mistaken for another object. Use familiar shapes like rectangle and rounded rectangle. The size of a button is also critical if the control used is a touch screen, a designer should consider the button size with the user’s finger size (Malewicz & Malewicz, 2020)

2.2.2.8. Modals & Pop-ups

Several modules appear unexpectedly or result from an action the user performs on an app’s interface. Modules have various types, namely, pop-ups, overlays, and action sheets. Pop-ups and overlays are generally small and include an x to close them. Meanwhile, action sheets do not have an x and can only be closed by pressing the cancel button or swiping the screen down (Malewicz & Malewicz, 2020).

Figure 2. 16 Modals and Pop-ups

(Malewicz & Malewicz, 2020)

2.2.2.9. Navigation

Navigation is an essential part of an interface. The slightest problem in navigation can cause massive user drop-offs. The difficulty in using the application is also a navigation problem. Therefore, when designing navigation, always pay attention to small details because everything will be very influential. According to Malewicz & Malewicz (2020), there are three types of navigation:

1. **Visible.** Its position is always clearly visible on the screen. Sometimes the shape is a set of tabs, and the current one will be highlighted.
2. **Hidden.** This navigation depends on hidden menus that will not appear before activation. The most common hidden navigation is the "hamburger menu."
3. **Contextual.** This type of navigation includes links or buttons within the object itself. For example, a product that can be clicked on will then take the user to a product page.

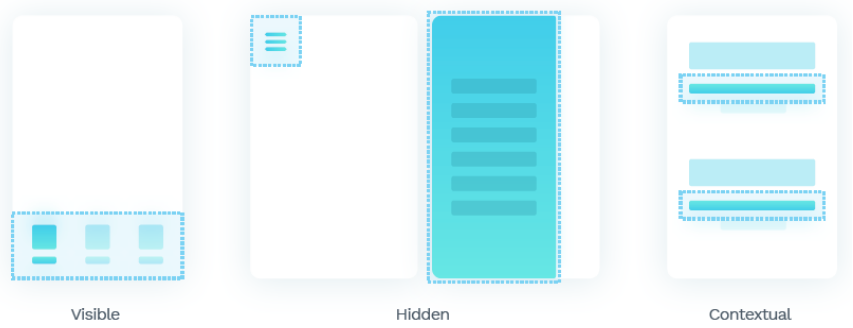

Figure 2. 17 Navigation

(Malewicz & Malewicz, 2020)

2.2.2.10. Animation

The animation is an indispensable part of a UI. Change of shape over time is the definition of animation. Under certain conditions, an object will move in various aspects (scale, position, shape, or rotation). Animation in the UI can help navigation and provide information by showing the user's progress with animation. Animation can also be used as decoration to entertain the user. However, limit the number of animations in the UI because if there are too many objects moving simultaneously, it will confuse users (Malewicz & Malewicz, 2020).

2.2.2.11. Illustration

Using illustrations in the UI can enhance the unique feel of an app. An illustration can also add emotion to the content and make the overall interface more friendly. Illustrations also help in remembering content and building relationships between brands and users. Illustrations can also be a mascot to help in the application tutorial process. An example is an application called Duolingo, with its owl mascot (Malewicz & Malewicz, 2020).

2.2.2.12. Language

The language written in an app can affect user reactions, so a designer must pay attention to its language. Only use languages that are commonly used in apps or other software. This is not included in theft or plagiarism. Try to keep the text short and precise. However, avoid using “OK” or “Next” on the buttons. Change it to something more action-specific, for example, “Save changes” or “Add to Favorite” (Malewicz & Malewicz, 2020).

2.3. Javanese Language

According to mustgo.com (2014), Javanese is a member of the Austronesian language family. The languages which are still similar to Javanese are Malay, Sundanese, Madurese, and Balinese. Javanese is the Austronesian language with the second largest number of speakers after Indonesian. Javanese is also one of the world’s classical languages with literature that is more than a thousand years old. The oldest inscriptions in Javanese are from 804 AD.

2.3.1. Sound System

Typical syllables in Javanese language usually have nasal consonants (/m/, /n/, /ng/) + an approximant (/y/, /r/, /l/, /w/) + vowel + consonant.

1. Vowels

   Like Malay and Indonesian, the Javanese have six vowel phonemes, i.e., sounds that make a difference in words.

Table 2. 1 Vowels
(mustgo.com, 2014)

	Front	Central	Back
Close	i		u
Mid	e	ə	o
Open		a	

- /ə/ = *a* in *about*

2. Consonants

The unique feature in Javanese phonology is retroflex consonants or can be described as the tongue's curled tip so that it touches the roof of the mouth. According to some experts, this consonant is the result of the influence of the Indo-Aryan language.

Table 2. 2 Consonants

(mustgo.com, 2014)

		Bilabial	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Glottal
Stops	voiceless	p	t			ʈ		k	ʔ
	voiced	b	d			ɖ		g	
Fricatives	voiceless			s	(ʃ)	(ʂ)			h
Affricates	voiceless				tʃ				
	voiced				dʒ				
Nasals		m	n			(ɳ)	ɲ	ŋ	
Laterals			l						
Trill			r						
Approximants		w					j		

- /ʈ, ɖ, ʂ, ɳ/ are retroflex consonants with no equivalents in English.
- /ʔ/ = sound between the vowels in *uh-oh*
- /ʃ/ = *sh* in *shop*
- /tʃ/ = *ch* in *chop*
- /dʒ/ = *j* in *job*
- /ɲ/ = first *n* in *canyon*
- /ŋ/ = *ng* in *song*
- /j/ = *y* in *yet*

Figure 2. 18 Retroflex Consonant

(google.com, 2020)

2.3.2. Grammar

Javanese is an agglutinative language where the grammatical relationship can be expressed through prefixation, infixation, suffixation, circumfixation, encliticization, and reduplication

Nouns:

1. Number, gender, or definiteness not marked by Nouns. These categories are usually inferred from the context unless there is an important distinction to be made.
2. The reduplication of a noun can express plurality. For example, *wong* ‘person’ and *wong-wong* ‘people’.
3. The demonstrative pronouns *si* and *sang* representing definiteness. Indefiniteness can be indicated by the numeral *sak* ‘one’ (abbreviated to *se-*), for example, *sebuah rumah* ‘a house’. Indicate a gender using words such as ‘male’ or ‘female’.

4. Quantifiers usually consist of a numeral, followed by a classifier. There are dozens of classifiers, some for small round objects, others for stick-like items, and others.

2.3.2.1. Pronouns

Javanese is rich in pronouns.

a) Personal pronouns mark a person.
b) Most pronouns mark familiarity and formality.
c) There is an inclusive first-person plural pronoun, specifically, one that includes the addressee, and an exclusive first-person pronoun, i.e., one that excludes the addressee.
d) In all formal situations, personal names, kinship terms, or titles are used in place of second-person pronouns.

2.3.2.2. Verbs

a) Verbs did not mark for person or tense. These categories are inferred from context or expressed by adverbs, time words, or clauses. There is only one real tense marker in the language, namely the future tag.
b) Mood (indicative, imperative, subjunctive) and voice (active and passive) are marked by affixes, adverbs, or other auxiliary words.

2.3.2.3. Word Order

The general word order of Javanese is Subject-Verb-Object. However, other word orders are possible, depending on emphasis and style. For example, words constituting a sentence (part of the sentence that contains the most important or

new information) usually appear at the beginning of the sentence. Modifiers naturally follow the noun they modify. Quantifiers generally precede nouns.

2.3.2.4. Register (Styles)

Javanese speech styles vary from one social context to another. Different social contexts require different registers. Each one of them has its vocabulary, grammar, and even intonation. This is not unique only to Javanese. The other Austronesian languages, East and Southeast Asian languages, particularly Korean, Japanese, and Thai, also use registers that vary from one social context to another.

There are three styles in Javanese:

a) *Ngoko* (informal)

   Javanese *Ngoko* is used for communicating with friends or close relatives. It is also used by someone with higher status when addressing someone with lower status, such as elders addressing younger people or bosses talking to subordinates.

b) *Madya* (polite informal, neutral)

   Javanese *Madya* is an intermedial style that is neither informal nor formal. It is used in informal situations, for example, a conversation between strangers on the street.

c) *Krama* (polite formal)

   Javanese *Krama* used between individuals of equal status in formal situations. This register is also used in formal announcements and public speeches.

Besides, Javanese uses humilifics and honorifics to show sensitivity to status, such as age, social position, etcetera. Humilifics are used when someone talks about themself; they have to be humble. On the other hand, Honorifics are used when one speaks about someone of higher status or one who wants to show respect.

Table 2. 3 Registers

(mustgo.com, 2014)

Ngoko	*Aku arep mangan.*	'I want to eat. '
Madya	*Kula ajeng nedha.*	
Krama neutral Krama humble	*Kula badhe nedha.* *Dalem badhe nedha.*	
Honorific question (speaking to a person of higher status)	*Bapak kersa dhahar?*	'Do you want to eat? Literally, 'Does father want to eat?'
Reply (1) to person of lower status, expressing one's superiority	*Iya, aku kersa dhahar.*	'Yes, I want to eat.'
Reply (2) to person of lower status, without expressing one's superiority	*Iya, aku arep mangan.*	
Reply (3) to person with the same status	*Inggih, kula badhe nedha.*	

2.3.3. Vocabulary

Most Javanese vocabulary is Austronesian in origin. Native Javanese bases are bisyllabic. New words are formed by reduplication or compounding. For instance, nuwun sewu 'excuse me' means 'ask a thousand' (nuwun 'ask' + sewu 'a thousand').

Numerous borrowings from other languages have enriched the vocabulary of Javanese. The earliest sources of borrowing were Sanskrit, from which around 25% of the old Javanese vocabulary came. Nowadays, many Sanskrit words are still in use for formal speech and writing. Some Javanese words are borrowed from Arabic, Dutch, and Malay.

Table 2. 4 Phrases

(mustgo.com, 2014)

Good day	*Sugeng*
Goodbye	*Pamit*
Thank you	*Matur nuwun*
Please	*Mangga*
Excuse me	*Nuwun sewu*
Yes	*Inggih*
No	*boten/mboten*
Man	*Lanang*
Woman	*Wadon*
Child	*Anak*

Table 2. 5 Numerals

(mustgo.com, 2014)

1	2	3	4	5	6	7	8	9	10
siji	*loro*	*telu*	*papat*	*lima*	*nem*	*pitu*	*wolu*	*sanga*	*sepuluh*

2.4. Mascot Design

According to some research done on the mascot, a mascot can help attract children's attention and is believed to trigger higher stimuli in the child's brain so that it can improve the ability to remember both short and long term.

2.4.1. Shape Up

Cara paling mudah untuk membuat karakter yang menarik yaitu dengan cara mengingat basic shapes; lingkaran, kotak, dan segitiga. Segala jenis karakter dapat dibedah dengan hanya menggunakan tiga shapes tersebut. Membuat mascot dapat dilakukan dengan cara menggabungkan beberapa shapes menjadi form yang baru. Bentuk-bentuk yang paling umum digunakan untuk membuat sebuah karakter adalah; sphere, teardrop, bean, dan cylinder.

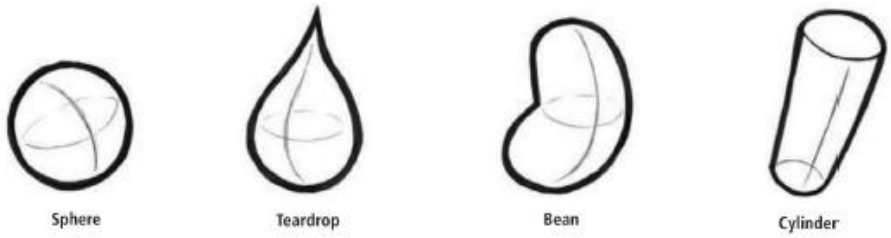

Figure 2. 19 Body Forms

2.4.2. Let's Face It

There are various types of eyes, mouths, noses, and ears that can be used to create facial expressions for characters.

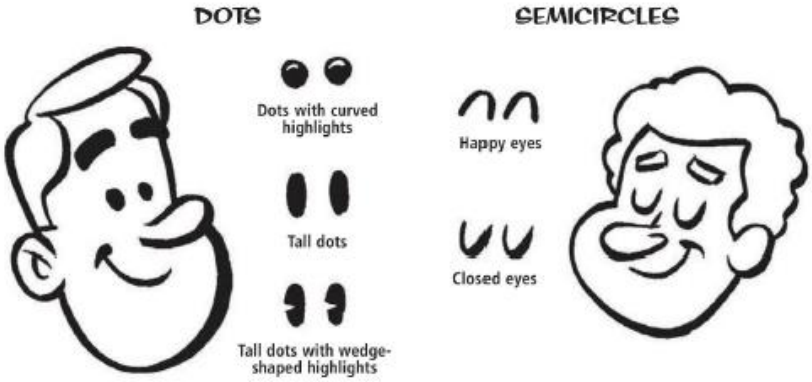

Figure 2. 20 Eyes

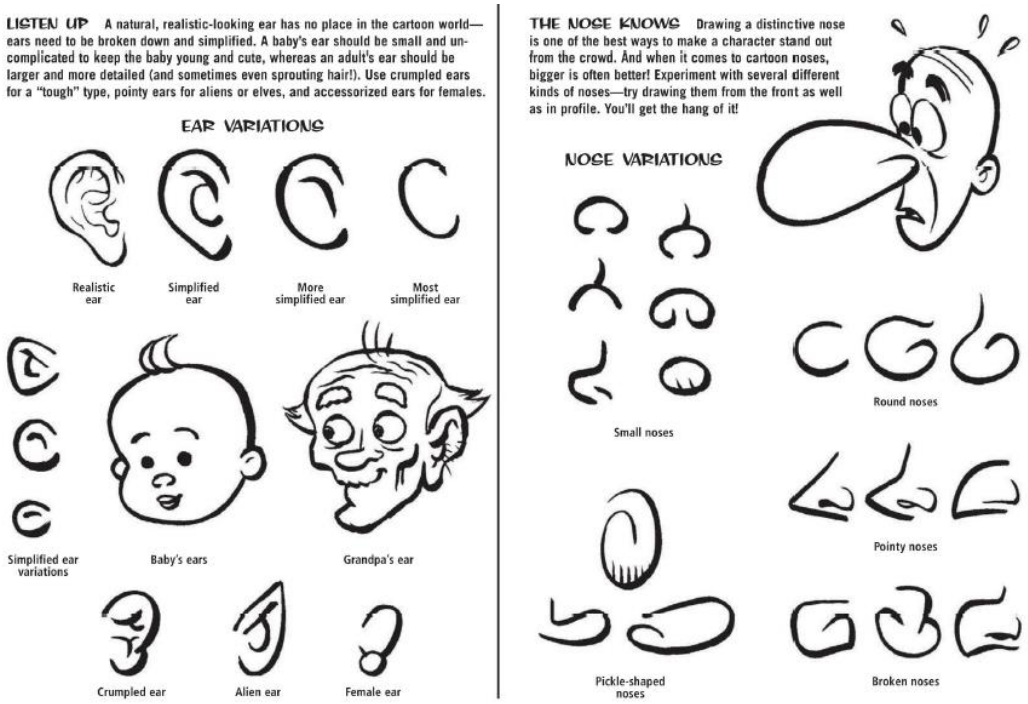

Figure 2. 21 Ears and Noses

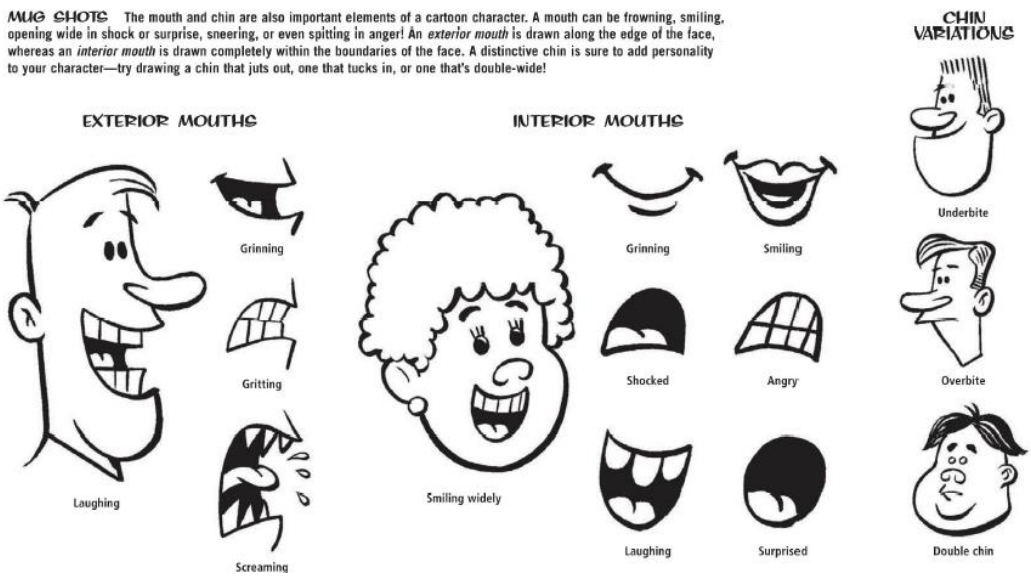

Figure 2. 22 Mouths

2.4.3. Body Building

After creating basic forms and facial expressions, the next step is to create a body shape that matches the character's nature and role.

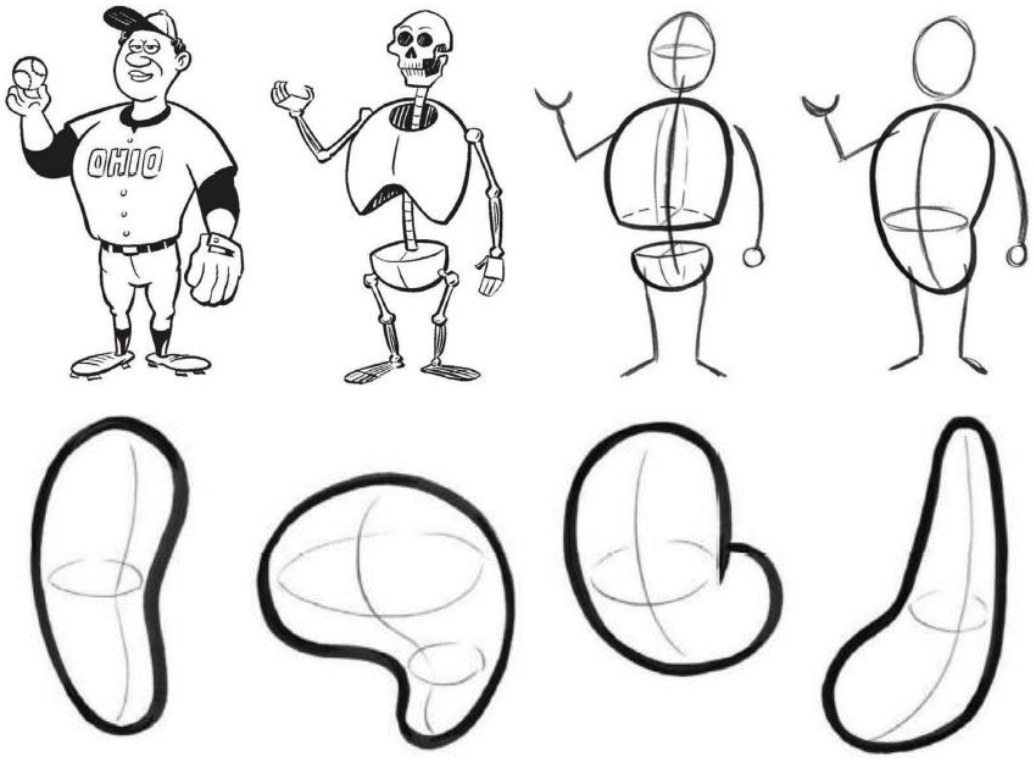

Figure 2. 23 Body Building

2.4.4. Body Language

Characters or mascots can express themselves by using facial expressions, but to feel their emotions more intensely, body language are needed. Starting from how to stand, walk, to generate certain emotions or behavior, the ability to exaggerate is needed. Because with the right facial expression and the right body language, it can produce a character that can explain itself to the audience.

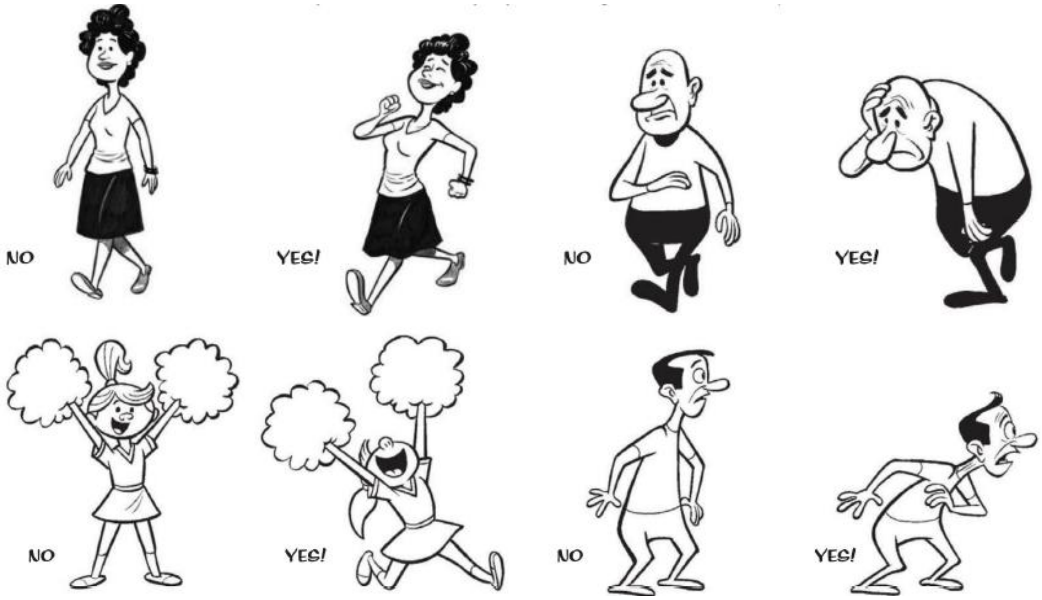

Figure 2. 24 Body Language