

BUILDING MOBILE USER INTERFACE BY APPLYING DESIGN PRINCIPLES

LAB University of Applied Sciences Bachelor of Business Administration, Business Information Technology 2022 Khanh Dinh

Abstract

Author(s)	Publication type	Published
Khanh Dinh	Thesis, UAS	2022
	Number of pages	
	32	

Title of Publication

Building mobile user interface by applying design principles

Degree and field of study

Bachelor of Business Administration, Business Information Technology.

Name, title and organisation of the thesis supervisor

Aki Vainio, Lecturer, LAB UAS

Abstract

The purpose of this thesis is to develop a mobile user interface applied design principles and enhances user perceptions of quality. Six design principles are mentioned in this research paper, which are Visual hierarchy, similarity, proximity, common region, common fate, and symmetry.

The empirical part of this thesis employs a qualitative research method, deductive reasoning, and design science research. Due to the empirical method starts with design principles as a theoretical part and applies them in a test designed for mobile interfaces, where two mobile interfaces are created based on the menu screen of food application.

The study shows that using design principles improved the aesthetic appeal and usefulness of mobile interface for users. It assisted users in precisely completing specified tasks in addition to pleasing the user's eyes.

Keywords

Mobile user interface, Use interface design, Design principles

Contents

1	INT	RODUCTION	. 1
	1.1	Research Background	. 1
	1.2	Research Problem	. 1
	1.3	Thesis Objectives and Research Questions	. 2
	1.4	Theoretical Framework	. 3
	1.5	Research Approach	. 3
	1.6	Methodology and Data Collection Methods	. 4
	1.7	Thesis Structure	. 7
2	LITE	ERATURE REVIEW	. 8
	2.1	User interface design	. 8
	2.1.	1 User interface design's principles	. 9
	2.1.	2 The significance of UI design	14
	2.2	Mobile user interface	14
	2.3	User perceived quality	15
3	EMI	PIRICAL RESEARCH	16
	3.1	The non-applied principles interface	16
	3.2	The applied principles interface	21
	*	Apply Principle of Visual Hierarchy:	22
	*	Apply Principle of Similarity:	23
	*	Apply Principle of Proximity	23
	*	Apply Principle of Common Region	24
	*	Apply Principle of Common Fate	24
	3.3	The comparison between two interfaces	26
4	COI	NCLUSION	27
5	SUN	/MARY	28
R	eferen	ces	29

1 INTRODUCTION

1.1 Research Background

Currently, it is essential for mobile applications to have a mobile user interface design that leaves a lasting impression on users (Mishra 2019).

Mobile user interface design focuses on a user's interaction with the output on the phone's screen. A good user interface (UI) design enhances the user experience (UX) by providing intuitive design components on the screen. UI designers concern with the visual appeal and usability of a website, software product or an application. (Harris 2018, 4.) When it comes to mobile app design, the importance of the mobile screen backdrop is evident. Over the past decade, users' preferences have developed and changed, which results in the introduction of several new trends in the design sector generally and mobile interface design specifically. UI designers all over the world have realized that employing components and adopting design principles may aid in guiding the user's eyes and enhancing text readability. (Costa 2018.)

The purpose of a great user interface is to make the user experience uncomplicated, fluid, and intuitive that requires the least amount of effort from the user to achieve the maximum desired result. The UI is essential for meeting user expectations because it reflects the accessibility, visual aesthetic, and ease of use. Additionally, UI anticipated the demands of the user and then satisfies those needs, an appropriate blend of effective aesthetics and efficient responsiveness will boost the mobile application's conversion rates. (Indeed Editorial Team 2021.)

1.2 Research Problem

When UI is executed correctly, users are unaware of it. However, when it is executed poorly, users are unable to get over it to meet their requirements on phone.

In a sense, badly designed user interfaces effect user experience directly by creating discontent, stress, financial loss, lower efficiency, and output in the absence of UI design principles. UI flaws can have a direct and immediate influence on the app's performance, leading to its failure if not corrected swiftly. Some basically common problems usually appear on mobile application which are easily caught such as color contrast, alignment, inappropriate button size, low contrast, typographical hierarchy, etc. (Sharma 2019.) They may result in:

- Users devote a greater amount of effort to adapt to the interface
- Causing discomfort for users
- Errors happen while users using application
- Make the total interface sloppy and complicated for users
- 1.3 Thesis Objectives and Research Questions

The researcher's clear sense of purpose and direction is more widely accepted as proof of research objectives. It is possible that either option will suffice. Because research objectives necessitate more rigorous reasoning, which is derived from the use of more formal language, they are more likely to lead to higher specificity than research or investigation questions. (Ayiro 2012, 166.)

Mobile application user interfaces can be the difference between a very successful program and one that fails to make an impression or, worse, leaves a lasting unfavourable impression on the user experiences. All components of mobile interfaces are critical when they are combined to design high-quality apps. As each app is unique and there is no single is to determine if applying UI design principles to the creation of a mobile user interface influences users' viewpoints. (Niebla 2021.)

To put it another way, the primary objective of this thesis is to develop a mobile user interface that applies design principles and improves user perceptions of quality. This research may aid UX/UI designers in determining the influence of design principles on mobile user interfaces and in understanding how to apply design principles to future design projects.

Research Questions

According to Ayiro (2012, 157), in quantitative or qualitative research, research questions are items that reduce the purpose statement to questions that researcher attempt to answer. These are created before focusing on the study's actual methodology, such as the sorts of data to be collected, analysed, and evaluated. The goal statements depict a single assertion; however, research questions may consist of many inquires designed to study a topic in depth. Both quantitative and qualitative research have research questions, but the elements or narration varies depending on the style of study being conducted.

The research analyses the main theme of UI design by applying its principles, to determine if they can improve user perceived quality. Hence, the research focuses on the main research question: How do design principles affect mobile user interface?

In the empirical research, the researcher precisely explains the conducting design principles in mobile user interface in order to support the main research question.

1.4 Theoretical Framework

In this thesis, the study framework and literature review were conducted to gain a fundamental understanding of how to design a better mobile user interface, and the focus was on the perspectives of users when interacting with a mobile application whose user interface is designed using UI design principles. This research framework is comprised of three primary concepts derived from the literature review study.

The first notion mentions user interface design for short in essence is creating visual interface for software and machines. Especially, it introduces the primary criteria of the research which is UI design principles and the significance of UI design. The second concept is mobile user interface which illustrates the typically touch-sensitive screen on mobile phone allows users to interact with the applications, features, and functions. The last concept is user perceived quality, which concentrates on the users feeling, thinking, giving feedback while experience services, products, etc.

1.5 Research Approach

The research approach is a strategy and technique that encompasses everything from board assumptions to particular data collecting, analysing and interpretation procedures. Consequently, it is determined by the nature of the research problem. The research approach is separated into two primary kinds which are the approach of data collection and the approach of data analysis or reasoning. (Chetty 2016.)





There are two main approaches of reasoning which are inductive and deductive. Generally, they are highly different, but can also be complementary. Deductive researchers begin with a plausible social theory before evaluating its implications using evidence. The deductive research method is most closely associated with this thesis. The researcher considers what others have done, reviews existing theories about what ever phenomenon which is researched, and then puts those theories to the test. Using inductive technique, acquiring data linked to the topic research is the initial stage. The researcher examines the data patterns and formulates an explanation for them. Typically, researcher starts with collection of observations and build up to a more board set of hypotheses based on those observations. Finally, they shift from specific to broad. (DeCarlo 2018.)



Figure 2: Deductive research (DeCarlo 2018)

This thesis applies deductive reasoning. Due to the empirical process begins with the principles of UI design (as a theory part) and applies all of them in a test intended for mobile interfaces. In a sense, it can be understood as moving from the general theory to the specific confirmation result.

1.6 Methodology and Data Collection Methods

The term "methodology" describes how the researcher approaches the problem and find out the answer. It also refers to how the research paper is carried out in the social sciences and thus, the assumptions, goals and objectives influence the applied method. (Taylor et al. 2016, 14.)

Quantitative research is based on quantity or amount measurement. It can be used to describe phenomena that have a numerical value. Qualitative research looks at qualitative phenomena such as quality or kind. (Kothari 2004, 3.) Furthermore, it also allows interviewees to express their emotions and opinion by using their own words. (Kuada 2012, 94.) Qualitative research method is characterized by the exploration and comprehension of a phenomenon. In comparison to quantitative research, qualitative research method is more adaptable in terms of expanding questions, learning about interviewee perceptions, developing theories based on participants' perspectives and gathering information from people sites. (Ayiro 2012, 87.) The third research method, known as mixed methods research, was created by combining these two above methods, qualitative and quantitative methods. This third method supports in connecting and improving the results sufficiently. The research may focus on several different aspects, so this method helps to diversify the study's viewpoint and since one method supports not enough data so the end-results may be inexplicable. (Saunders et al. 2016, 173.)

Obviously, this study puts qualitative research method into practice because this method enables to raise the topics, issues that the researcher has not anticipated and that may be essential to investigate. To construct concrete research, the first point to focus on is research problem, which mentions about what have been happened with the mobile user interface in this digital era, then leads to the main research question. To figure out the answers, it directs the research to the main point that is literature review, where the UI design principles are defined. The author decided to apply secondary research in this thesis due to all the theories are based on published literature sources method, which is one of the data collection methods and referred as secondary data collection. Specifically, information about UI design, design principles, mobile user interface and so on, is provided by the researcher, which can be looked for from Google books, LAB Primo, reliable academic websites, etc. Later, the researcher starts building from an original mobile user interface which is totally not applied any UI design principles. The following step, the author explains in detailed step by step how the principles work with the interface.

Therefore, this thesis concentrates on the design process of mobile user interface based on design science research, which is utilized in a variety of design and technology sectors to develop artifacts. According to Venable and Baskerville (2012), design science research is defined as the creation and evaluation of a new purposeful artifact to address a generalised kind of problem. (Teperi et al. 2021). In other words, design science research concentrates on developing improved solutions for certain problems. From the perspective of knowledge creation, design science research has a dual objective: the application of knowledge and the generation of knowledge. Specifically, the application of knowledge is the creation of original or innovative artifacts that result in the change or improvement of an existing problem. (Simon 1996, according to Baskerville et al. 2011, 544.) Hence, the researcher decided to apply this research model to conduct the report.



Figure 3: Design Science Research Cycles (Hevner et al. 2004)

There are three cycles of design science research which are relevance, design, and rigor cycles. First, according to the relevance cycle, when researcher constructs or designs an artifact utilizing theories as inputs, the artifact must be relevant and acceptable for the enduse output. Second, the rigor cycle ensures that the artifact is primarily concerned with research innovation and is based on a concrete knowledge foundation. The selection and use of appropriate theories and procedures by researchers and the assessment of the artifact form the basis of this cycle. Lastly, the core of any design science is design cycle, in which activities are iterated more swiftly between the development of an artifact, its evaluation, and subsequent feedback to modify the design future. (Hevner et al. 2004).

In this thesis, design principles are leveraged as theoretical inputs to construct a mobile user interface artifact. The design process is then analysed on a regular basis so that the mobile user interface may be adapted properly. Finally, the result may assist UX/UI designers in their future careers, therefore fixing the problem and achieving the thesis objective.

1.7 Thesis Structure



Figure 4: Thesis Structure

2 LITERATURE REVIEW

2.1 User interface design

In user interface design, communication is the essence of a specific interface and visual communication factors account for 83% of people's reception of external elements. User interface is the source of information which user interacts with while using the software. (Li et al. 2020). User interface design is the creation of interfaces with an emphasis on styling and interactivity. The process of UI design is crucial for every project that requires humancentred product design. According to Widawski (2021), typography, images, and other visual design elements are utilized in UI design to transform a plain interface into something comprehensible and usable. (Kreimer 2021.) Design principles illustrate how people observe the world visually, including digital interfaces and specifically describe how humans decide whether numerous separate pieces belong to the same group. Hence, these principles are connected in some manner to assist people in understanding and interacting with interfaces in general. When it comes to design principles, there are several crucial elements that go into designing a complete interface. The most significant element of design principles is colour; thus, the quickest approach to make users immediately impressed with the interface and draw more attention is to use context appropriate colours. Regarding the design process, the great majority of colours have their own unique connotations and tremendous communication potential (Li et al. 2020.)

According to Velarde 2019, the design principles most applicable to a UI designer are those that define the connection between items on a visual display and how to make them operate effectively together. The design principles apply to colours, lines, forms, backdrop, etc. In terms of design principles, which include simplicity, similarity, proximity, closure, figure and ground, continuity, order, symmetry, and synchrony. However, this thesis presents the definition of UI design, six selected design principles, and the significance of UI design. Following is a list of the chosen design principles:

- Principle of Visual Hierarchy
- Principle of Similarity
- Principle of Proximity
- Principle of Common Region
- Principle of Common Fate
- Principle of Symmetry

2.1.1 User interface design's principles

Principle of Visual Hierarchy

The manner in which designers structure a website or application has a significant influence on user experiences. Specifically, visual hierarchy concentrates on the arrangement of design elements in descending order of significance, with the most crucial information at the top and the less crucial information moving below as the page scrolls. Since users scroll from top to bottom, the most essential information should be located at the page's top. Theoretically, the design should include a clear hierarchy strategy. Users might become confused if there is no hierarchy in a design, they may leave the interface without interacting with anything or abandon the application out of irritation. Using a clear hierarchy in design helps designers attract more potential clients. (Nielson 2021.)

Viewers will always establish visual associations between visual items. Not only will they not know where to look first, but they will be also put off and finally leave if the design is unbalanced. This principle emphasizes size, alignment, placement, and spacing, among other factors. (Velarde 2018.)

+ Size: When something is larger than others, it will receive greater attention. The size of a header is always more than that of a subheading, and the size of a subheading is always larger than that of the body text. What users need to perceive initially is the information's primary purpose.

+ Placement, alignment and spacing: The way that elements are arranged also affects the hierarchy position. When objects are lined up, human eyes tend to follow the line. When objects are vertically aligned, the viewers will naturally follow them, like when reading a list by scrolling down.

Principle of Similarity

Even when comparable design elements are separated, the human eye interprets them as a single picture or shape. The brain appears to connect elements of similar essence. Human eyes excel at filling "gaps" and linking "dots". It naturally occurs. In other words, the shape, color, and size of elements affect similarity. When objects with greater levels of similarity are mixed with a group of different objects, the brain commits time and energy to create link between them to comprehend their connection. The similarity law can aid in the formation of linkages between related elements. This connection might be physical or intellectual. Designers may take advantage of this natural human inclination by assisting the users' eyes in identifying elements of their design that they wish to emphasize. (Soegaard 2022.)



Figure 5: Principles of Similarity elements (Soegaard 2022)

Furthermore, due to the law of similarity, related things generally appear categorized together. Respectively visual and auditory stimuli can be grouped. (Cherry 2021.) Especially, objects that are visually similar in size, shape and color will be visually grouped together, even if they are not in proximity (UXTOAST 2022).



Figure 6: Principle of Similarity colour elements (UXTOAST 2022)

Principle of Proximity

According to UXTOAST (2022), objects placed in close proximity will be visibly grouped together. Many of these principles appear to be self-evident, and this principle is no exception. The greater the visual association between two items, the closer they are put near one other. When it comes to UI design, this is crucial to understand. Otherwise, even if objects are different in colour, size, and shape, the distance (proximity) between some of the circles is the only thing that has altered (Oppermann 2020).



Figure 7: Principle of Proximity (Oppermann 2020)

As stated by Fitzgerald (2021), even though some of the objects have different colours, the three rows of objects on the left side belong to one group. And, while being the same size and colour as many of the shapes on the right stands out as a distinct group. This is since the three rows of forms on the left are closer together than the shapes on the right. (See figure 8)



Figure 8: Principle of Proximity (Fitzgerald 2021)

Principle of Common Region

The common region theory mentions that objects within a border are viewed as a group and are assumed to share some fundamental feature or functionality (Harley 2020). Figure 9 shows how the border around the three main circles unites them and separates them from the other, less-related surrounding circles. Hence, using a border or background colour to create a container for related objects in a user interface enables users to grasp the structure and interconnections of the UI quickly and effectively.



Figure 9: Principle of Common Region (Harley 2020)

Principle of Common Fate

According to Shikhrakar (2019), objects whose motions are coordinated in the same direction are considered to be more interconnected. Individuals see items moving in the same direction as more connected than those that are stationary or moving in different directions. The common fate principle categorizes related components so that users may connect them and demonstrates the relations between elements. People who are interested in one element may want to investigate others. Those who are not, on the other hand, will ignore similar elements, saving their time. Furthermore, by coordinating across design elements, common fate reduces the complexity of interfaces and clarifies the design. Consequently, this principle assists users in locating the primary point of emphasis. Objects in continual motion attract constant attention and become the figure element, which means they become the point of focus. The fundamental purpose is to quickly locate the interface's primary features.



Figure 10: Principle of Common Fate (Colomy 2021)

Principle of Symmetry

The center of an arrangement of symmetrical objects draws the viewers' attention. When UI elements are symmetrical to each other, it is simpler to identify patterns. Symmetry makes it easy to focus on the important. When navigation options are symmetrical, better stability is seen. This is an excellent method for designing gallery layouts on mobile interface. (Colomy 2021.)



Figure 11: Principle of Symmetry (Colomy 2021)

2.1.2 The significance of UI design

According to Aziz (2021), a good UI prevents designers from repeatedly redesigning interfaces, which saves time and cost. If a designer spends a significant amount of time on UI design, there will be less obstacles during and after the launch since users have no problems with the interfaces. Because a flawless interface does not require regular maintenance and upgrades. Moreover, according to Charles Eames, the duty of the designer is that of a gracious host who anticipates the guests' requirements. A good UI captures the user's attention and keeps them engaged. However, only an intuitive UI will keep people engaged. Therefore, when users land on an application, they should feel enticing to return as frequently as they like.

The primary objective of UI design is to make contents (pictures, text, and other design components) appear more engaging and navigation simpler. UI design facilitates comprehension, hence enhancing user happiness. A pleased customer is more likely to return to the application and suggest it to others. Positive evaluations will drive designers to further develop the product or service's usability to increase its value and outperform the competition. (Aziz 2021.) Furthermore, users can quickly access and operate a consistent application since they do not need to learn anything new. Obviously, users are encouraged to interact with the mobile interface, which improves its usefulness. A unified user interface promotes communication. The designers employ aesthetic consistency to make the content accessible, prioritize, and emphasize the most important aspects.

2.2 Mobile user interface

A mobile user interface is a mobile device's display or screen. It is the area where users interact with the displayed content. Most of these user engagements are touch-based and take place on vibrant touchscreen displays brimming with high-level interactions. Obviously, mobile UI design concepts differ from desktop UI design ideas. On the other hand, mobile UI relates to the behaviour and appearance of an app during user interaction. The UI is one of the final steps of app development and a crucial component of the user experience. The emphasis is on creating a pleasant and user-friendly experience for users. (Palko 2021.)

The first step in efficiently utilizing mobile device interfaces is to understand the use context. The design of mobile user interfaces is challenging, since designers attempt to gracefully show an almost infinite amount of information, and user experience difficulties are accentuated on mobile devices. Specifically, text-heavy interfaces lower engagement when user' eyes glaze over, and they turn to a different application. Therefore, design principles have always had a significant impact on design, as they describe how human mind receives and organizes information. (McWherter and Gowell 2012, 90-91.)

2.3 User perceived quality

In today's user-centric environment, both manufactures and service providers place a premium on service quality. In other words, the need of giving high quality service is so well recognized that certain firms demand it not just for success but also for existence. Consequently, attaining and sustaining user perceived quality is seen as a crucial approach for the effective delivery of total customer satisfaction and retention (Taylor and Baker, 1994; Reichheld and Sasser, 1990, according to Negi, 2009,700 -701.) Alternatively, the user's perception of a product's quality is known as user perceived quality. The sort of quality that production and service teams often analysed, such as pass/ fail criteria, tolerance values, dimensions, and defect analysis, is distinct from perceived quality. It is frequently defined by a person's initial observation and interaction with a product or service. (Espinosa & Assani, 2019.)

According to Dzida et al., 1978, "user perceived quality" is known as "user-oriented system behaviour" or "user friendliness". All these phrases refer to system characteristics, such as simplicity of use, tolerance of user failures, reduction of user error possibilities, minimum astonishment behaviour, etc., that are seen essential for efficient man-computer interaction. They relate to "how" systems behave to fulfil the limits and requirements of users.

3 EMPIRICAL RESEARCH

The author of the thesis created two mobile interfaces based on the menu screen of a food application to gain a broad understanding of the effect of design principles on mobile user interface. In this section, two mobile interfaces are mentioned, along with an explanation of whether each interface adheres to design principles. The interfaces are designed by using Adobe Illustrator, with iPhone X as a chosen model (1125x2436 pixels).

3.1 The non-applied principles interface

The first interface is designed without applying six design principles as they are mentioned in literature review part.



Figure 12: The non-applied principles interface.

• None of Visual Hierarchy:



Figure 13: Screen shot of food information section

As the screen shot image displayed above, the interface does not utilize Principle of Visual Hierarchy. The usage of same typeface with capital letters and almost same size for food's names and description may cause confusion among users. The price would be the most essential piece of information; however, it is not placed in an easily scannable location, causing users to instantly skip it.

Besides, the alignment of each food portion is inconsistent, the gap between information is extremely close and overlapping, and there is a slight vertical gap on the left, but none on the right, which may make users feel uncomfortable.

It is diametrically opposed to Principle of Visual Hierarchy when the orange text "Add+" has nearly analogous colour with the background. It provides low contrast to the text, and users with colour blindness may be unable to discern the text from the backdrop.

• None of Similarity

Figure 13 demonstrates furthermore that the interface did not adhere to Principles of Similarity as well. For example, not all food pictures have the same shapes which does not contribute to a unified interface.



Figure 14: Foods' names, descriptions, and prices

As the principle of Similarity mentioned in the theorical part, the brain seems to link items of comparable kind. Therefore, human eyes may collect the foods' names, descriptions, and prices as a group (see Figure 14).

• None of Proximity

Even if the navigation button "Add" is orange, which is distinct from other texts, human eyes nevertheless presume it is in the same group as others. Furthermore, the spacing between each meal item is too close and unequal (see Figure 13), making the user interface sloppy and unobvious.

• None of Common Region

As the principle of Common Region mentioned, objects inside a border are viewed as a group and are presumed to have some common information or functionality. The lack of this principle is shown in the special text in special offer meal, which should be arranged in a sperate location so that users may take a fast glance to comprehend the information. Therefore, to make the connection between the pictures and the related contents, border would

be an ideal solution to gather all of them in one area, which researcher will demonstrate later.

• None of Common Fate

The interface also lacks the Principle of Common Fate; thus, users may be unaware that each food section has a variety of dishes. However, they do not know to swipe right since there is no indication that there are other items on the next side. (See Figure 13). Since there is a gap on the left but none on the right, the interface has become more complicated. Instead of wasting time understanding out how the interface functions, users may exit immediately.

None of Symmetry



Figure 15: Screen shot of restaurant information and user's profile

The interface is imbalanced and asymmetrical due to the placement of "Restaurants", "Search", "Contact us", "Profile", and the middle bag displaying the amount of food that user orders. In addition, they occupy a substantial portion of the interface, which is unnecessary and inappropriate. (See Figure 15).



Figure 16: Screen shot of heading section

In addition, "Menu" section is located on the left side, close to food section, which is unobvious and makes user's comprehension difficult. (See Figure 16).

Hence, the researcher produces a strategy including objectives that will make the interface more appealing and satisfy the users when applying six principles:

- The whole user interface is depicted in clear detail by taking advgantage of the space and reshaping images of food to the same geometric forms.
- Balanced, straightforward, and symmetrical layout food products must be distinctly separated in terms of information, pricing, and images.
- The combination of dishes that are not seen on other sides of the interface may be easily identified by users by adding a few indications.

3.2 The applied principles interface

In this section, a food menu interface utilizing six design principles is demonstrated and the design process is detailed in detail. Here is the interface looks like (see Figure 17):



Figure 17: The applied principles interface

Apply Principle of Visual Hierarchy:



Figure 18: Screen shot of food information

The names and descriptions of foods altered in a distinguishable manner. The foods names are written in Bebas Neue typeface with capital letters to emphasize the primary information while the foods descriptions used Tahoma font with smaller size to highlight the name and price of food as Visual Hierarchy Principle mentioned in the theorical part.

Besides, the interface's alignment is greatly changed to make it more comprehensible, and the new interface makes use of space and gap to avoid making the information confusion.

Figure 18 also illustrates the alteration of the orange "Add+" in Figure 13 which is turned into a clicked button. Specifically, instead of using the orange color for "Add+", the researcher changed it to white, which is inherently a high contrasting hue of orange and painted a border around it on an orange backdrop to generate and draw users' attention.

Apply Principle of Similarity:

Since human eyes typically scan visuals first, of all information conveyed to the brain, almost is visual, then text; Figure 18 contains the visuals of foods are united into circle shapes and same size, which still depict the food elements in detail. Hence, the relationship between the food descriptions and images is displayed obviously, and the users can readily distinguish between the name, food information and the price.



Apply Principle of Proximity

Figure 19: The turquoise lines

In order to implement the Proximity principle, the researchers divided distance between each food section using turquoise lines. (See Figure 19). This resulted in an obvious arrangement, distinct separation of food sections, and adequate space.

Apply Principle of Common Region

Depicted in Figure 19 is the installation of a new area for special offer meals. This section allows users to quickly recognize if food is special offer or not. Additionally, each portion was created with a shadow border. This facilitates a clearer display of the specific information for each portion when the users receive information. Utilizing the Principle of Common Region ensures that interfaces are well organized, which conveys harmony and comfort to users.

Apply Principle of Common Fate



Figure 20: Dots sign

Principle of Common Fate is fundamental in motion design to guide human eyes in the aim side. Therefore, Figure 20 provides a sign consisting of dots which leads human eyes follow the correct direction; in this case, users are aware that they must swipe right to continue seeing many dishes behind.

Apply Principle of Symmetry



Figure 21: Menu section

The utility buttons such as search, restaurant, contact us, etc....were relocated to the bottom toolbar and grouped symmetrically around the shopping bag which makes the interface's layout more aesthetically pleasing and balanced. In addition, lowering these utility buttons created more rationale for the interface by providing more space for the previously mentioned special offer meal. After applying Principle of Symmetry, the "Menu" section was moved to the top middle of the interface to be separated with the food section and make the whole screen symmetrical. (See Figure 21).

3.3 The comparison between two interfaces



Figure 22: Food menu interface before and after applying Design Principles

After utilizing six design principles and taking account the goals outlined above by the researcher, the food menu interface has achieved all these goals. Generally, in the new interface, the names, descriptions, images, and pricing followed same style respectively to indicate that they belong in same group and perform comparable functions which affected by Visual Hierarchy, Proximity and Similarity Principles. The implementation of these three design principles (Common Region, Common Fate, and Symmetry) has resulted in an interface that is aesthetically pleasing, symmetrical, and easy for user to comprehend. Overall, design principles created a decent graphical user interface for any application or website, which provides users with clearer and simpler instructions for locating information.

4 CONCLUSION

Humans routinely embrace and accept design principles in a variety of contexts, including artworks, aesthetic products, and mobile interface design. In the empirical part above, the author described in depth the obvious differences between the two interfaces before and after applying six design principles in order to support the thesis question, which is: How do design principles affect mobile user interface? The non-applied design principles mobile interface now turns into an aesthetic mobile interface, which is more attractive and appealing to use, showing a high degree of user satisfaction. The study also confirmed six design principles are extensively used in mobile user interfaces and can help UX/UI designers learn more about aesthetic design principles.

Overall, design principles have helped to create a decent mobile user interface, which provides a clear direction for user to access information, makes tasks easier for users to complete and speeds up processes.

The conclusion of this research may be subjective because there was no user survey, which is one of thesis's limitations. As a result, the conclusion is based on the author's evaluation when developing two mobile interfaces. However, as the author pointed out earlier, this research conducted the design research process method, which entails providing a specific knowledge foundation on the research topic, then building a suitable artifact applied that theory foundation to make evaluation and development for subsequent projects in the future.

The recommendation of the author for the future research is that this thesis concentrates on six design principles specifically, there are a lot of other aspects of aesthetic department affecting mobile user interface, which need to be explored and examined in order to learn more the user experience, when user interface is becoming more advanced changes over time. Additionally, it is possible to conduct a survey which can make the thesis more objective and include more user's comment sections.

5 SUMMARY

User interface is crucial for living up to user expectations because it represents accessibility, aesthetic appeal, and usability. It is now common knowledge among UI designers that using components and implementing design principles help to guide the user's eyes and improve text readability. When UI is executed correctly, users are unaware of it. However, when it is poorly implemented, users are unable to overcome it to satisfy their phone's requirements.

The theoretical and empirical parts of this thesis are primary sections which are found in chapters 2 and 3, respectively. Chapter 2, which starts with the fundamental definitions relating to user interface design and mobile interface to help readers understand the general background of the topic, followed by the introduction of six design principles, the significance of user interface and user perceived quality.

In chapter 3, two mobile interfaces are developed to support the applying process of design principles. The artifacts are based on the menu screen of a food application to gain a broad understanding of the effect of design principles on mobile user interface. The significant differences between the two interfaces are explained at the end of this chapter, which is also an answer for the research question of this thesis.

Chapter 4 concludes the thesis, outlining the limitations and making some recommendations for more research in the future.

References

Written References

Ayiro, P. 2012. A Functional Approach to Educational Research Methods and Statistics: qualitative, quantitative, and mixed methods approach. New York: The Edwin Mellen Press.

DeCarlo, M. 2018. Scientific Inquiry in Social Work. Creative Commons Attribution-Non-Commercial-ShareAlike 4.0 International License.

Harris, P. 2018. What Is User Interface Design? 1st Edition. New York: The Rosen Publishing Group.

Kuada, J. 2012. Research Methodology: A Project Guide for University Students. 1st Edition. Frederiksberg: Samfundslitteratur Press.

Kothari, C. 2004. Research Methodology: Methods and Techniques. Second Edition. New Age International (P) Ltd.

McWherter, J. & Gowell, S. 2012. Professional Mobile Application Development. Indiana: John Wiley & Sons.

Taylor S., Bogdan R. & DeVault M. 2016. Introduction to Qualitative Research Methods: A Guidebook and Resource. 4th Edition. Canada: John Wiley & Sons.

Saunders, M., Lewis, P. & Thornhill, A. 2016. Research Methods for Business Students. 7th Edition. Essex: Pearson Education Limited.

Electronic References

Aziz, S. 2021. The Importance of User Interface Design in Mobile Applications. Retrieved on 9 July 2021. Available at: https://invozone.com/blog/the-importance-of-user-interfacedesign-in-mobile-applications

Baskerville, R., Kaul, M. & Storey, V. 2011. Genres of Inquiry in Design-Science Research: Justification and Evaluation of Knowledge Production. MIS Quarterly, Vol. 39. Retrieved on 13 June 2022. Available at: https://web-s-ebscohostcom.ezproxy.saimia.fi/ehost/pdfviewer/pdfviewer?vid=0&sid=6db781d1-84d9-4e92-bde1f34ed66deec4%40redis Colomy, M. 2021. How to implement Gestalt Principles. The Z Rule, and the Rule of Thirds in Design. Retrieved on 13 August 2021. Available at: https://feltmagnet.com/misc/The-Basics-of-Good-Graphic-Design

Costa, R. 2018. Graphic backgrounds: 6 great trends for mobile UI/UX. Retrieved on 07 November 2018. Available at: https://www.justinmind.com/blog/graphical-backgrounds-trends-mobile-ui-ux/

Cherry, K. 2021. Gestalt Laws of Perceptual Organization. Retrieved on 25 April 2021. Available at: https://www.verywellmind.com/gestalt-laws-of-perceptual-organization-2795835#:~:text=The%20law%20of%20pr%C3%A4gnanz%20is,appear%20as%20simple%20as%20possible

Chetty, P. 2016. Importance of Research Approach in a Research. Retrieved on 12 October 2016. Available at: https://www.projectguru.in/selecting-research-approach-businessstudies/

Chichi, U. 2020. Authentic Nigerian Fried Rice. Retrieved on 7 December 2020. Available at: https://www.mydiasporakitchen.com/authentic-nigerian-fried-rice/

Dzida, W., Herda, S. & Itzfeldt, D. 1978. User-Perceived Quality of Interactive Systems. IEEE Transactions of Software Engineering. Vol.SE-4. Retrieved on 4 July 1978. Available at: https://lut.primo.exlibrisgroup.com/permalink/358FIN_LUT/1hujjmv/cdi_proquest_journals_195574534

Espinosa, M. & Assani, K. 2019. Perceived Quality – What it is and why it is Important. Retrieved on 23 December 2019. Available at: https://userwiseconsulting.com/Perceived-Quality-What-it-is-and-Why-it-is-Important#:~:text=A%20user's%20perception%20of%20the,dimensions%2C%20and%20analysis%20of%20defects.

Fitzgerald, A. 2021. What is The Law of Proximity & Why Does it Matter in UX Design? Retrieved on 1 July 2021. Available at: https://blog.hubspot.com/website/law-of-proximity

Harley, A. 2020. The principle of Common Region: Containers Creates Groupings. Retrieved on 12 July 2020. Available at: https://www.nngroup.com/articles/common-region/#:~:text=Definition%3A%20The%20principle%20of%20common,part%20of%20the%20same%20group.

Hevner, A. 2004. A Three Cycle View of Design Science Research. Scandinavian Journal of Information Systems. Available at: https://www.researchgate.net/publica-tion/254804390_A_Three_Cycle_View_of_Design_Science_Research

Hevner, A., March, S., Park, J. & Ram, S. 2004. Design Science in Information System Research. MIS Quarterly, Vol. 28. Retrieved on 13 June 2022. Available at: https://www.re-searchgate.net/figure/Organizational-Design-and-Information-Systems-Design-Activities-Adapted-from-J_fig1_201168946

Indeed Editorial Team, 2021. What is a User Interface? (Definition, Types and Examples). Retrieved on 17 September 2021. Available at: https://www.indeed.com/career-advice/ca-reer-development/user-interface

Kreimer, I. 2021. User Interface Design: Definition, guidelines, and process. Retrieved on 20 May 2021. Available at: https://maze.co/collections/ux-ui-design/ui-design/

Li, X., Li, Y. & Jae, M. 2020. Neural network's selection of color in UI design of social software. Springer-Verlag London Ltd. Retrieved on 29 May 2020. Available at: https://lut.primo.exlibrisgroup.com/permalink/358FIN_LUT/1hujjmv/cdi_proquest_journals_2488036714

Palko, I. 2021. Mobile User Interface (Mobile UI): What is, Patterns, Examples & How To. Retrieved on 19 December 2021. Available at: https://shoutem.com/blog/mobile-ui/

Maggie, Z. 2020. Beef-Pan Fried Noodles. Retrieved on 29 June 2020. Available at: https://omnivorescookbook.com/beef-pan-fried-noodles/

Mishra, S. 2019. Significance of UI/UX design in mobile applications. Retrieved on 19 April 2019. Available at: https://uxdesign.cc/significance-of-ui-ux-design-in-mobile-application-f90b2c56c204

Negi, R. 2009. User's perceived service quality of mobile communications: experience from Ethiopia. International Journal of Quality & Reliability Management. Vol 26. Retrieved on 14 January 2009. Available at: https://www-emerald-com.ezproxy.saimia.fi/insight/con-tent/doi/10.1108/02656710910975769/full/pdf?title=users-perceived-service-quality-of-mo-bile-communications-experience-from-ethiopia

Niebla, H. 2021. 10 Common UI Design Mistakes (And How to Avoid Them). Retrieved on 06 August 2021. Available at: https://careerfoundry.com/en/blog/ui-design/common-ui-de-sign-mistakes/

Nielson, Z. 2021. Principles of Design. Retrieved on 20 July 2021. Available at: https://xd.adobe.com/ideas/process/ui-design/5-principles-design/

Oppermann, L. 2020. The Gestalt Principle of Proximity – in action. Retrieved on 29 December 2020. Available at: https://uxdesign.cc/how-to-enhance-your-design-with-the-ge-stalt-principles-of-proximity-a7828452058b

Savita, G. Spicy Soba Noodles Vegetable Stir Fry. Retrieved on 18 May. Available at: https://www.chefdehome.com/recipes/851/spicy-soba-noodles-vegetable-stir-fry

Sharma, O. 2019. Common UI Problems in Apps. Retrieved by 28 February 2019. Available at: https://www.appfutura.com/blog/common-ui-problems-in-apps/

Shikhrakar, S. 2019. Gestalt Principle: Common Fate (Using Coordinated Motion in Design to Associate Relations). Retrieved on 17 November 2019. Available at: https://ux360.de-sign/common-fate-design/

Soegaard, M. 2022. The Law of Similarity – Gestalt Principles. Retrieved on 5 June 2022. Available at: https://www.interaction-design.org/literature/article/the-law-of-similarity-gestalt-principles-1

Teperi, A., Gotcheva, N. & Aaltonen, K. 2021. Design thinking perspective for developing safety management practices in nuclear industry. Elsevier Ltd. Available at: https://www.sci-encedirect.com/topics/engineering/design-science-research

UXTOAST 2022. Gestalt Principles in UI Design. Available at: https://www.uxtoast.com/design-tips/gestalt-principles-in-ui#:~:text=Law%20of%20Proximity,-Objects%20that%20are&text=This%20rules%20states%20that%20the,form%20field%20and %20the%20label.

Velarde, O. 2018. Quick tips on how to use Hierarchy in design. Available at: https://www.freepik.com/blog/quick-tips-on-how-to-use-hierarchy-in-design/

Velarde, O. 2019. An Overview of the Basics of User Interface Design (UID). Available at: https://www.freepik.com/blog/overview-basics-user-interface-design-uid/