◈pro metrics

ORIGINAL ARTICLE

Color as a visual element on website appeal and its impact on user experience (UX) in graphic design

Noura Alotaibi

Department of Graphic Design, Taif University Saudi Arabia, Saudi Arabia.
Corresponding author.
Email: nbotaibi@tu.edu.sa
ORCID: 0009-0004-8542-5557

ABSTRACT

The study explored the effective usage of colors in the creation of a user experience (UX) design that meets the needs of the user, regardless of cultural differences or preferences. The research design was primarily experimental in nature. To this end, a set of 10 websites employing a range of colors was developed. These websites were made accessible to individuals across the globe. The focal point of the investigation pertained to the impact of color. These websites uniformly conveyed specific information but differed in their color schemes and layouts. These websites were designed to promote products from various companies and to observe consumer behavior in regard to ordering. The primary objective of this study was to ascertain which color combinations were more appealing to consumers. The appealing visual impression was measured using the number of visitors and the products ordered. The findings were then subjected to regression analysis to ascertain the existence of a correlation between color, visitor count, and product ordering frequency. The study adhered to stringent privacy standards and protocols, ensuring that the rights of individuals were not violated. The scope of the study was confined to the analysis of color. It did not consider other aspects of graphic design, even though they might have contributed to the variation in the number of users visiting the website. Consequently, further research is necessary to explore this domain more extensively. The findings, subsequent to thorough analysis, demonstrated a robust correlation between the utilized color palette and the number of website visitors. This underscored the pivotal role that colors play in graphic design, underscoring the necessity for designers to develop a nuanced understanding of how to utilize them effectively.

Keywords: color; graphic design; user experience; visual element; color theory.

1. INTRODUCTION

THE FIELD of graphic design is inextricably linked to the study of color theory, as the selection of colors can significantly impact the visual perception of a design. In the artistic realm, graphic design can be regarded as a form of visual communication. A practitioner who aspires to achieve success in the domain of graphic design must possess a profound understanding of color theory. The impact of colors on the viewer is subjective and varies according to the specific chromatic choices made in a given design. It is imperative for graphic designers to comprehend the chromatic palette employed across diverse platforms when conceptualizing graphics. The selection of appropriate colors is paramount to meeting the expectations of

How to cite: Alotaibi, N (2025). Color as a visual element on website appeal and its impact on user experience (UX) in graphic design. *AWARI; 6,* 1-11. DOI: 10.47909/awari.744.

users. It is recommended that graphic designers employ user experience (UX) designs. In this regard, it is imperative for graphic designers to create colors that not only align with the organization's needs but also consider the specific impact they will have on customers (Alotaibi, 2024). This emphasis is particularly pronounced in the context of marketing platforms, where competition for consumers is fierce. Extant research has demonstrated the profound impact of colors on the psychology and physiology of individuals. They have the capacity to influence an individual's emotions, perceptions, and even their behavior. This study will explore the pivotal role of colors in graphic design and their potential for manipulation to achieve specific objectives for target audiences.

1.1. State of existing research

A number of studies have been conducted on this subject. A subset of these studies has focused on the effects of color on perception and attention. These studies have examined the impact of contrast on perception and attention. Additionally, research has been conducted to ascertain the impact of color on mood and emotions. The findings of these studies have indicated a robust correlation between color and mood. Additionally, research has explored the influence of graphic design color on consumer purchasing behavior. The findings indicate that the use of bright and attractive colors tends to attract a greater number of customers. Furthermore, specific colors have been identified as markers of brand personality and trustworthiness. These studies underscore the psychological and emotional implications of colors in graphic design. Moreover, studies conducted on user and interface design have demonstrated that graphic design elements, including layout, color schemes, iconography, and typography, can exert a significant influence on the user. This study demonstrates that a visually appealing interface enhances user satisfaction.

1.2. Research question

In the domain of graphic design, the employment of colors serves as a medium for conveying specific messages and exerting influence on target audiences across various platforms, including websites. This research endeavor seeks to address the following question: How does color influence the effectiveness and perception of graphic design?

2. LITERATURE REVIEW

A considerable body of research has been dedicated to investigating the impact of color on graphic design. A subset of these studies has examined the psychological impact of colors on individuals, while others have investigated the visual impact of graphic designs on users. A subset of these studies has examined the role of color in shaping brand loyalty. Furthermore, the impact of cultural and demographic factors on color selection has been a subject of investigation in several studies.

2.1. Psychological and emotional impacts of color in graphic design

In their study, Oladumiye and Ebenezer (2018) sought to ascertain the impact of color perception on consumer purchasing behavior. The central objective of their study was to ascertain whether the colors employed in graphic design exert an influence on the purchasing behavior of consumers who utilize the platform. To this end, the researchers employed a descriptive research approach, leveraging qualitative methodology and a survey design. The sample size was determined to be 385 individuals. This sample constitutes a finite population, a concept defined by Oladumiye and Ebenezer (2018) as a population with a predetermined number of elements that can be enumerated. The findings of this study indicated that the color utilized in graphic design exerts a significant influence on consumer purchasing behavior. The study found that 43.6% of consumers acknowledged that the color palette utilized in graphic design or on products influenced their purchasing decisions. Consequently, Oladumiye and Ebenezer (2018) concluded that the color used in a particular graphic design can influence the consumer's decision on purchasing behavior. However, the study does not account for the cross-cultural differences in color perception, which can influence the interpretation of visual stimuli. The study's reliance on self-reported emotions regarding colors introduces potential

biases. The reliability of self-reported perceptions and emotions is contingent on numerous individual factors, including biases and personal experiences, which introduce potential sources of variability and bias. To ensure the reliability of the study's findings, it is imperative to employ alternative methods that are not subject to such biases. This study will address these limitations by employing an experimental design.

Furthermore, the study by Wang (2021) sought to elucidate the role of color in the emotional and psychological responses of individuals. The study was predicated on the notion that different colors elicit disparate emotions in people. The study's empirical approach entailed the participation of 500 individuals. The findings of the study indicated that color does indeed have the capacity to influence an individual's emotional state. The study's findings underscore the potential impact of color, both in graphic design and in general applications, on an individual's emotional response. This study is significant because it underscores the importance of understanding that graphic designers can strategically employ colors that align with the objectives of a design. In a related study, Yu et al. (2020) examined the impact of color usage on Instagram for tourism marketing. This study involved the collection and analysis of data pertaining to lightness, chroma, and hue. The results of this study indicated that images with higher brightness and saturation levels garnered a greater number of customers. The findings of Yu et al. (2020) demonstrate that color exerts an emotional and psychological influence on individuals and can be strategically employed during the graphic design process to achieve specific objectives. In this context, the objectives and desires of the graphic designer serve as the focal point. However, the role of culture in shaping color selection and its impact remains unexamined in this study. Given the diverse interpretations of colors across different cultures, it is challenging to apply a single color identically across diverse cultural contexts. It is, therefore, imperative to address the cultural context of color in graphic design. This research aims to address this gap by employing experimental design to investigate the semantic and perceptual nuances of colors.

2.2. The visual impression of the graphic design on the user

King et al. (2020) conducted a study to test how the first impression of the webpage can affect the user. The researchers employed a multifaceted approach, encompassing aspects such as visual complexity and design complexity, to assess the frequency with which users would revisit the page. These features were evaluated within the persuasive model of web design. The complexity of the features examined in this case included engagement cues, behavioral intentions, and favorable initial response. The findings of the study by King et al. (2020) demonstrate a robust correlation between the visual complexity of web design and usability. The findings suggest that web designs with minimal visual complexity are unlikely to attract a significant user base. This finding underscores the potential of color selection to influence visual impressions, thereby enhancing user engagement. This technique can be employed on marketing platforms to reach a broader customer base (King et al., 2020). However, the primary limitation of this study is its exclusive focus on the visual complexity of web design, which may preclude its application to other forms of graphic design.

2.3. Colors and culture

The interpretation and impression of colors vary across different cultures. For instance, the color red, which symbolizes joy in some cultures, can be associated with sadness in others. In this regard, Liu and Liu's (2022) study on the development of visual communication strategies that align with consumers' expectations and stimulate their consumption desires is particularly relevant. The study involved the testing of traditional visual communications and enhanced visual designs, with each group comprising 100 individuals. The findings indicated that enhanced visual communication was successful in generating visual appeal. Furthermore, the study underscores the necessity of color comprehension for effective visual communication. The study underscores the importance of considering chromatic elements when designing a website within the context of Chinese society. This study focuses more narrowly on Chinese

society. Due to the influence of cultural differences, the perception and interpretation of colors in Chinese society may not be consistent with those observed in other societies, such as those in Europe, the United States, and the Middle East. This study, however, relied on self-reported measures, which are subject to bias and, as a result, may be unreliable. A further limitation of the study is its homogeneity; it was exclusively conducted among a specific group of people with the same cultural background.

2.4. Graphic design and brand loyalty

According to Wong and Haque (2022), the impact of graphic design on consumer brand loyalty is a subject that merits further investigation. They conducted a study on the influence of graphic design on brand loyalty. To this end, the researchers administered a survey of 229 e-commerce customers of a footwear company in Bangladesh. The study's findings are noteworthy because they demonstrate that the visual appeal of graphic design can influence brand loyalty (Wong & Haque, 2022). The study's results suggest a direct correlation between the effectiveness of graphic designs and the level of customer loyalty. Specifically, the analysis revealed that visually appealing graphic designs tend to lead to increased customer loyalty, while designs that are less appealing result in lower loyalty. These findings underscore the necessity to comprehend how to utilize colors in graphic designs to elicit strong visual impressions and enhance brand loyalty (Hsu *et al.,* 2018). To enhance brand loyalty, organizations must employ graphic designers who possess a comprehensive understanding of the impact of colors on diverse audiences. By leveraging this understanding, organizations can then tailor their graphic designs to align with the diverse needs and preferences of their target audiences, thereby fostering enhanced brand loyalty. A notable limitation of this study is its homogeneity. The study was conducted using a population sample from a specific demographic group, which may limit its generalizability. Additionally, the study does not specify the audiences or the colors that would be suitable for them. Consequently, the study's findings are based on generalizations, which may compromise their reliability.

2.5. Theory

This research is predicated on the principles of color theory. The term "color theory" refers to the principles and guidelines that explain how colors interact with each other and are perceived by the human eye. This comprehensive theory encompasses a multitude of aspects of color, including color mixing, harmony, and the psychological impact of color. The study further explores the impact of color combinations, a subject that has been extensively researched by Bleicher (2023). The application of color theory empowers artists, scientists, and designers to generate visually appealing impressions and communicate messages with optimal effectiveness. The foundational principles of this theoretical framework were established by Isaac Newton, who developed the color spectrum wheel. Subsequent scientists have further contributed to the development of this theory. Notably, Johann Wolfgang von Goethe expanded the theory to encompass the psychological impacts of color on individuals (Bleicher, 2023). This seminal contribution is articulated in his seminal work, *Theory of Colours*. The field of color theory encompasses several key areas, including the color wheel, color harmony, color temperature, and color psychology. The significance of color theory in graphic design stems from its ability to influence the perception of users. By grasping the principles of color theory, designers can strategically employ color to convey precise messages to their target audience (Bleicher, 2023). Furthermore, it enables designers to harness the power of colors to evoke emotions and establish a cohesive brand identity (Alotaibi, 2024). It is imperative for designers to comprehend the psychological impact of colors on individuals, enabling them to align the objectives of the design with those of the organization (Bleicher, 2023). In the context of marketing graphic design, for instance, designers can strategically employ color selections to attract customers and enhance trust. Additionally, designers must cultivate an understanding of color theory to ensure the creation of visually appealing layouts, typography, and user experiences (Ozenen, 2023). They should be able to use color hierarchy as well as contrast to highlight essential elements and guide the viewers.

3. RESEARCH METHODOLOGY

The objective of this study is to provide an answer to the following question: "How does color theory influence the effectiveness and perception of graphic design?" To this end, this study adopted quantitative research approaches. To measure the impact of color on individuals, statistical data were obtained from the created websites, with color serving as a variable aspect across all websites. The collected data underwent rigorous statistical analysis. This study involved the creation of 10 websites, each featuring diverse visual enhancements intended to promote products from multiple companies around the globe. The primary focus of this investigation was the role of color in enhancing the visual appeal of these web pages. The websites were made accessible to individuals worldwide.

3.1. Research design

In this study, a correlational design was utilized. The objective of a correlation design is to identify a relationship between two variables (Mohajan, 2020). In this case, the correlation was used to analyze the relationship between the colors employed in the graphic design and the number of users. To illustrate this, the objective was to ascertain which colors were associated with the highest number of respondents. The findings of this study will be used to determine the impact of different cultures on color perception. It is acknowledged that the associations of colors vary across cultures. It is, therefore, imperative to understand this impact and develop a UX design that addresses the cultural needs.

3.2. Data collection methods

This section involves gathering the information necessary for this study. The primary methodologies employed for data collection in this study encompass controlled experiments and observational studies. This study utilizes 10 websites enhanced with various graphic visualizations conveying analogous messages. The number of visitors to the site was observed and recorded. The data concerning these visitors were obtained and subsequently analyzed over the course of one month. The objective of this data collection is to ascertain the most frequently visited websites. The study also sought to identify the colors associated with various cultures. Additionally, the study sought to ascertain the correlation between graphic color and consumer demand for the advertised product. The collected data underwent regression analysis to derive meaningful insights. This analysis is pivotal in ascertaining the existence of a relationship between graphic design and color. This approach is advantageous as it establishes a relationship between two variables (Mohajan, 2020).

This method was the most effective among the available options. Primarily, the website's accessibility to the majority of the population facilitated effective monitoring of the controlled aspects of the experiment. Alternatives such as print media could be utilized; however, the methods by which the study's outcomes were measured were not readily discernible. However, the accessibility of print media is limited, which restricts the amount of data that can be collected. The utilization of e-commerce platforms for data collection was a viable option; however, it was accompanied by limitations in terms of researcher autonomy in accessing the necessary data. These platforms are often subject to stringent regulations and data access restrictions imposed by the companies that operate them. These restrictions potentially compromise the reliability of the collected data. The data provided by these companies is often objective in nature and may not be reliable. It is noteworthy that a significant proportion of the data provided by these entities may be subject to manipulation for the fulfillment of specific objectives, potentially diminishing its utility. The utilization of surveys and interviews as data collection methods introduces the potential for bias due to their subjective nature and the variability in individual perceptions. For instance, an individual's perception of a color may be influenced by their mood on that particular day, potentially resulting in unreliable data that can lead to erroneous conclusions.

4. RESULTS

The findings indicate that, despite presenting identical content, web pages are navigated and interacted differently by users. The chromatic

elements that were examined encompass the type of color. These features enhance the visual appearance of graphic design. The ensuing discourse will endeavor to address the research question, "How does color theory influence the effectiveness and perception of graphic design?"

Furthermore, an investigation was conducted to determine the impact of color theory principles, including hues, temperature, contrast, and saturation, on website traffic and consumer behavior based on cultures (Table 1).

Type of colors used in website layout	Africa	Europe	America (USA and Canada)	Asia (China)
Red	50	56	56	59
Black	20	23	21	15
Yellow	50	70	65	75
Purple	60	70	80	80
Orange	50	70	60	70
Grey	30	40	40	25
Blue	65	80	80	75
Green	45	50	50	51

Table 1. Representation based on cultures (visitors per region).

The analysis revealed that, in certain cultural contexts, the preference for warm hues over cold hues was associated with a higher volume of user engagement (Figure 1). This preference varies across cultures, with some, notably in Asia, such as China, demonstrating a distinct inclination toward cool colors. Conversely, Western cultures exhibited a preference for a warm layout in graphic designs. The utilization of bright colors was found to be associated with an increased number of orders from users across most regions. This phenomenon necessitates interpretation, as the prevailing assumption is that each culture possesses its own unique color scheme. However, this expectation was contradicted by the observation that the color trend exhibited a high degree of similarity across different cultures.

4.1. Data analysis

The subsequent data analysis endeavors to ascertain the correlation between the color employed in graphic design, users, and the products procured by customers, as delineated in Table 2.

Type of colors used in website layout	Number of users who visited the website	Products ordered
Red	300	50
Black	100	12
Yellow	260	43
Purple	290	45
Orange	200	30
Grey	150	23
Blue	255	41
Green	190	29
Combination of colors	500	100

Table 2. Representation based on the number of users and products ordered.

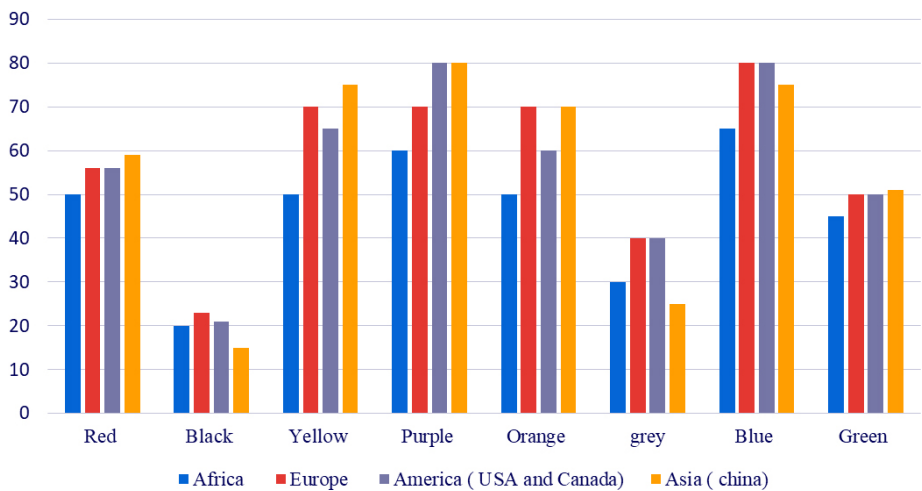**Figure 1.** Graphical representation of users based on region.

Regression analysis

$\hat{Y} = b0 + b1X$

$b1 = SPxy = \Sigma (xi - \bar{x}) (yi - \eta)$

$SSx \Sigma (xi - \bar{x}) 2$

$b1 = 6296.875 = 0.1815$

34696.875

$b0 = \bar{y} - b1\bar{x}$

$\bar{x} = 218.125$

$\bar{y} = 34.125$

$b0 = 34.125 - 0.1815*218.125 = -5.4609$

$SSRegression = (i - 2) 2 = 1142.7725 = 0.9912$

$SStotal \Sigma (yi - \bar{y}) 2 \ 1152.875$

The standard deviation of the residuals is:

$MS \ residual = S2res = \Sigma (yi - \hat{y}) 2$

$n - 2$

Y and X relationships

Source DF Sum of Square Mean Square F Statistic (df1, df2) P-value

Regression

(Between $\hat{y}i$ and $\bar{y}$) 1 1142.7725 1142.7725 678.7071 (1, 6) 2.11e−7

Residual

(Between yi and $\hat{y}i$) 6 10.1025 1.6837

Total (between yi and $\bar{y}$): 7 1152.875 164.6964

The regression analysis was employed to ascertain the relationship between the colors, resulting in an R-squared (R^2) value of 0.9912. This indicates that 99.1% of the variability in Y is attributable to X. The correlation (R) is 0.9956. This finding indicates a highly significant direct relationship between X and Y, as well as a standard deviation of the residuals (Sres) of 1.2976.

4.2. Ethical consideration

This study was conducted in accordance with the established ethical codes for data protection. The data of the individuals who participated in this research were safeguarded. The privacy of the individuals was not violated. All established protocols for safeguarding the rights and welfare of individuals and researchers were meticulously followed throughout the study.

4.3. Limitation

This research was constrained to the utilization of color in graphic designs. It is widely acknowledged that additional factors contribute significantly to the field of graphic design. These additional components encompass trends in color and the design itself. Consequently, this study may not fully encompass all the intricacies of graphic design. Further research is necessary to elucidate the dynamic interplay between colors and other components, such as font selection and page layout, within the broader context of graphic design.

5. DISCUSSION

The concept of UX design encompasses graphic designs that are aligned with the expectations of the user. In this context, user expectations encompass both layout and visual enhancement. It is imperative to acknowledge that diverse user demographics possess unique graphic requirements that are in alignment with their respective objectives. For instance, healthcare organizations may require graphic designs that convey trust and hope, while the beverage industry may employ graphics that embody happiness and vibrancy. It is, therefore, incumbent upon graphic designers to develop a nuanced understanding of color theory and its application in creating user-centered graphics. Empirical evidence has demonstrated a significant correlation between the color palette employed in website layout design and user behavior. Website graphic designs employing red garnered the highest number of users. This was followed by designs incorporating the colors purple and blue, respectively. The layout employing orange also garnered a notable number of users. Conversely, websites employing the color black had the lowest number of users, followed by gray and green. This outcome indicates that specific colors are associated with higher user engagement. This finding suggests that certain colors may possess a superior visual appeal compared to others. Furthermore, the combination of colors exhibited a greater number of users compared to the use of a single color. This finding underscores the significance of color combinations in UX design. This research also demonstrates that color selection exerts a significant influence on the psychology of individuals. The study's findings indicate that the utilization of bright colors is associated with a significant increase in user engagement and the number of orders for marketed products (Kimmons, 2020).

5.1. How colors impact psychology

In the majority of cultures, the color red is associated with concepts of love or danger, while blue is frequently linked to notions of sadness or calmness. The utilization of these colors in graphic design has been demonstrated to elicit specific emotional responses, thereby influencing the user's perception of the design (Kimmons, 2020). Colors can also serve as symbols; for instance, green is often linked to nature, while yellow is frequently regarded as a symbol of optimism in numerous cultures. Therefore, it is imperative for graphic designers to comprehensively grasp not only the symbolic meaning of colors but also the cultural context underpinning their use. This understanding is crucial for the development of effective UX designs. The application of colors serves to establish specific moods, thereby influencing the user's emotional response. A correlation exists between the establishment of mood and the utilization of color. Research has demonstrated that colors can elicit particular moods and atmospheres, potentially influencing individuals' emotional responses (Grzybowski & Kupidura-Majewski, 2019). Warm colors, such as red, yellow, and orange, are frequently linked to feelings of energy, particularly excitement and passion. Conversely, cool colors have been linked to feelings of calmness and sophistication. The results of the study indicate that bright colors had the highest number of users. Furthermore, the combination of colors has been demonstrated to meet the expectations and needs of users (Beaird *et al.,* 2020). Consequently, it is imperative for graphic designers to possess a profound understanding of color theory to engineer graphics that effectively cultivate the desired ambiance for the user.

5.2. Colors attract attention

The utilization of color has been demonstrated to attract the attention and focus of the user. The selection of particular hues can exert a discernible influence on the user's level of attention and their ability to focus (Sharma, 2018). For instance, the utilization of bright colors in graphic designs has been shown to effectively capture users' attention, facilitate

concentration, and enhance the comprehension of the information presented. This phenomenon is evidenced by the findings of this study, which demonstrate that the utilization of bright colors resulted in a significant increase in user visits to the website. Despite the uniformity in the information presented across these pages, certain pages were visited more frequently than others. This finding underscores the notion that color has a significant impact on user attention. The use of contrasting colors has been demonstrated to serve as an effective method for accentuating specific elements within a design, such as the headline on a given page (Sharma, 2018). Designers can leverage vibrant colors and other combinations to direct user attention to critical sections of a website. This enables graphic designers to achieve the desired objective of the design.

5.3. Color and culture

Culture plays a significant role in the interpretation of color. The interpretation of color varies across different cultural contexts. This variation in cultural interpretation of color has implications for graphic designers, who must adapt their designs to align with the preferences and needs of their target users. For instance, the color red is commonly associated with love in Western cultures, while in some cultures, it is linked to danger (Dwiputri & Swasty, 2019). When creating a graphic design that conveys love, it is crucial for the graphic designer to comprehend the cultural context of the color red. It is noteworthy that certain cultural contexts associate red with demonic beliefs, underscoring the complexity of its symbolism. Conversely, green is predominantly linked with nature and prosperity, and it is not as frequently associated with contradictory beliefs (Dwiputri & Swasty, 2019). A comparative analysis reveals that most Western cultures share similar beliefs about colors, while in Eastern cultures, colors can have conflicting meanings. The results of the study indicate that there are no significant cultural differences between Europe and North America. The color elicited a uniform response across cultures, as evidenced by the comparable website access and product ordering data. However, a

notable distinction emerges when examining Africa and Asia, where substantial variations in color perception are observed. These cultural divergences appear to have influenced the outcomes observed in the study. It is imperative for graphic designers to acknowledge these cultural variations and devise designs that resonate with the intended meaning across diverse cultural contexts (Thompson & Helfand, 2018).

5.4. Conceptualizing the text in graphic design

The significance of color varies according to its application within a given context. It is incumbent upon the designer to comprehend the context of the design. A designer must consider the purpose and message of the design. This meticulous approach is instrumental in ensuring the development of designs that are not only aesthetically pleasing but also effective in their functionality. For instance, in the context of designing a call-to-action graphic, the utilization of vibrant hues is strongly recommended, as it has been empirically substantiated to effectively capture the attention of users (Al Sanafi & Alzamil, 2022). Conversely, in contexts characterized by a muted or somber ambiance, the use of such attention-grabbing hues may be superfluous. In such cases, the utilization of muted colors such as purple or gray can be a more effective strategy.

5.5. Aspects of color that designers should understand

5.5.1. Contrast

The process entails the strategic placement of contrasting colors to generate visual intrigue and accentuate critical design elements. The magnitude of contrast can range from low to high. This element can be utilized to meet the UX design objective. By contrasting between white and black, for instance, a design can be created that attracts the user's attention. The employment of complementary colors can further enhance the user experience and align with the objectives of the designer, ensuring that the visual design meets both practical and aesthetic demands.

5.5.2. Saturation

Saturation, defined as the purity of the color used, is a critical aspect of color theory and application. A color can be characterized as highly saturated, medium, or low in saturation. The impact of these attributes on the individual is a subject that merits further investigation. Highly saturated colors are typically characterized by boldness and vibrancy, qualities that often appeal to the viewer. These colors can be strategically employed to capture the user's attention. Conversely, desaturated colors, characterized by their muted tones, might be perceived as less aesthetically pleasing. Designers can leverage this attribute in the pursuit of creating effective UX designs. The strategic application of saturation can serve to accentuate elements, establish a hierarchical structure, and evoke specific emotional responses. This design approach is poised to cater to the multifaceted needs of both the end-user and the organization.

5.5.3. Color temperature

The term "warmth" or "coldness" in relation to a color refers to the emotional response the color evokes. This attribute can be employed to modulate the ambiance created by the graphics. Warm colors include red and orange. These hues have been demonstrated to induce sensations of excitement and energy (Chen, 2022). In contrast, cool colors include blue and green. These colors, on the other hand, are associated with tranquility and calmness (Chen, 2022). Designers, therefore, are encouraged to leverage these color temperature variations to engineer diverse atmospheric experiences. A comprehensive understanding of temperature allows designers to create graphic designs that align with user needs and foster the desired atmosphere.

5.5.4. Harmony

The concept of color harmony pertains to the aesthetic combination of colors that is perceived as visually appealing. The psychological impact of color combinations on individuals has been a subject of interest in the field of psychology (Adams, 2017). The act of color harming can

entail the juxtaposition of colors that are diametrically opposed to each other, as depicted on the color wheel. It can also involve the use of analogous colors, which are colors adjacent to each other on the color wheel. Additionally, the use of triads, which involve three colors equidistant from each other on the wheel color, is a hallmark of harmonious color combinations (Frasie, 2017). The application of harmonious color combinations in graphic design fosters the creation of balance and unity, a principle that extends to the domain of UX design.

6. CONCLUSION

This research, therefore, provides a framework for understanding how color influences the effectiveness and perception of a graphic design. Colors can be strategically employed by designers to influence the psychology of the user and persuade them to achieve the desired objective. It is imperative for graphic designers to possess a firm grasp on color theory to engineer effective UX designs. These designs are intended to resonate with users irrespective of cultural differences. It is imperative to acknowledge that colors are imbued with distinct symbolic meanings, and graphic designers have the discretion to select and amalgamate them to elicit the intended effect. It is imperative for designers to understand the multifaceted meanings of colors, as they play a crucial role in shaping the user's experience. For instance, the color red, which symbolizes passion in some cultures, can signify peril in others. Conversely, blue is frequently linked to the sky, thus evoking sentiments associated with nature. Green, too, is closely associated with nature, and it, too, can be used to evoke feelings associated with nature. The use of yellow, in conjunction with other vibrant hues, can elicit feelings of excitement or warmth within the context of graphic design. Depending on the context, a designer can use these colors to manipulate the atmosphere. The resulting atmosphere can vary, encompassing emotions such as happiness, vibrancy, sadness, or calmness. It is imperative for artists to comprehend the multifaceted effects of colors, including contrast, hue, saturation, and harmony. These effects also influence the use of colors in graphic design. Designers can align with users' needs by meticulously

calibrating these color effects. Colors, in this sense, emerge as a pivotal instrument, capable of profound transformation within the realm of graphic design when wielded with precision.

Acknowledgments

Conflict of interest

The author declares that she has no conflict of interest or competing interests, and this article does not contain any studies with human participants performed by the author.

Statement of data consent

The quantitative data generated during the development of this study have been included in the manuscript. ●

REFERENCES

Adams, S. (2017). *Color design workbook: New, revised edition: A real world guide to using color in graphic design*. Rockport Publishers.

Al Sanafi, N., & Alzamil, F. (2022). The effect of color on human psychological health in interior design. ةيعونلا نونفلا و مولعلا يف ثوحب, *9*(1), 341-370. https://doi.org/10.21608/balexu.2022.255350

Alotaibi, N. (2024). Influential content design in graphic design. *International Journal of Scientific Research (IJSR), 3*(4). https://doi.org/10.59992/IJSR.2024.v3n4p17

Beaird, J., Walker, A., & George, J. (2020). *The principles of beautiful web design*. SitePoint Pty Ltd.

Bleicher, S. (2023). *Contemporary color: Theory and use*. Routledge.

Chen, L. (2022). Research on the influence of visual communication design on consumer psychology under color psychology. *Psychiatria Danubina, 34*(4), 492-492.

Dwiputri, A., & Swasty, W. (2019). Color coding and thematic environmental graphic design in Hermina Children's Hospital. *Journal of Visual Art and Design, 11*(1), 35-44. https://doi.org/10.5614/j.vad.2019.11.1.3

FRASIE, R. (2017). *Graphic design handbook*. Independently Published.

GRZYBOWSKI, A., & KUPIDURA-MAJEWSKI, K. (2019). What is color and how it is perceived? *Clinics in Dermatology, 37*(5), 392-401. https://doi.org/10.1016/j.clindermatol.2019.07.008

HSU, C. L., CHEN, Y. C., YANG, T. N., LIN, W. K., & LIU, Y. H. (2018). Does product design matter? Exploring its influences in consumers' psychological responses and brand loyalty. *Information Technology & People, 31*(3), 886-907. https://doi.org/10.1108/ITP-07-2017-0206

KIMMONS, R. (2020). *Color theory in experience design*. [Online]. https://edtechbooks.org/ux/color_theory?action=print

KING, A. J., LAZARD, A. J., & WHITE, S. R. (2020). The influence of visual complexity on initial user impressions: Testing the persuasive model of web design. *Behaviour & Information Technology, 39*(5), 497-510. https://doi.org/10.1080/0144929X.2019.1602167

LIU, B., & LIU, F. (2022). Research on the correlation between visual communication design and consumers' psychological expectations under color psychology. *Psychiatria Danubina, 34*(4), 3.

MOHAJAN, H. K. (2020). Quantitative research: A successful investigation in natural and social sciences. *Journal of Economic Development, Environment and People, 9*(4), 50-79. https://doi.org/10.26458/jedep.v9i4.679

OLADUMIYE, E. B., & EBENEZER, O. (2018). Emotion and colour perception: a psychoanalytical theory of graphic design in consumer of goods. *Journal of Fine and Studio Art, 7*(1), 1-11. https://doi.org/10.5897/JFSA2017.0050

OZENEN, G. (2023). Light and color theory. In: *Architectural interior lighting* (pp. 9-14). Springer Nature Switzerland.

SHARMA, A. (2018). *Understanding color management*. John Wiley & Sons.

THOMPSON, B., & HELFAND, J. (2018). *The art of graphic design*. Yale University Press.

WANG, M. (2021). The application of color psychology in art design from the perspective of psychology. *Psychiatria Danubina, 33*(7), 353-355.

WONG, A., & HAQUE, M. (2022). Understanding the brand and website effects of online loyalty: A mediation perspective. *Journal of Marketing Management, 38*(3-4), 333–368. https://doi.org/10.1080/0267257X.2021.1949378

YU, C. E., XIE, S. Y., & WEN, J. (2020). Coloring the destination: The role of color psychology on Instagram. *Tourism Management, 80,* Article 104110. https://doi.org/10.1016/j.tourman.2020.104110