International Journal on Engineering, Science and Technology
2022, Volume 4, Issue 4 ISSN: 2642-4088

The Effect of the Control Light on the Result in the Transformation of Design Studies into Printed Products

Mustafa Kisa
Konya Technical University, Turkiye, mkisa@ktun.edu.tr, https://orcid.org/0000-0002-0035-5077

Abstract: The aim of visual design is to ensure that the product reaches the target audience in a high-quality way and is accepted by the target audience. Quality printed products attract the attention of the target audience and provide an idea about the product. The product printed closest to the original will also create a positive impression and a sense of trust about the brand and business. In addition, a high-quality printed product is an indication of how much the target audience is valued and how much they care. Printed products will create a positive or negative impression to the target audience about the main product it contains. The visual quality of the packaging will also increase the confidence in the product. In the study, the effect of ambient light and control panel light lighting intensities, which are among the factors affecting quality, on the printing result, was examined. The visual designer and the printing operator who performs the printing of the product perform all the stages from the graphic to the end of printing in order to obtain a quality product. Although the lighting intensity of the control table where printing controls are performed has no effect on either the carrier or the structure of the ink, it has been found that it directly affects the print result and quality due to the negative effect it has on the visual perception of the operator. In the study, it was observed that the lighting intensities of the lights used in the workshop environments where printing takes place and the printing control units below the daylight values or do not have close values have negative effects on the print quality.

Keywords: Light, Printing, Color, Visual design

Introduction

Visual communication design is an important tool for businesses and organizations to communicate with their target audience. Visual communication design is the process of conveying a visual message from a sender to a receiver using images, using typography, images, and layout. Images can be anything from text to images and symbols. The purpose of visual communication design is to create attractive visuals that are effective in conveying the message and make it easier for the receiver to understand. The most common use of visual design is in the form of graphic design, which involves the creation and editing of printed materials such as brochures, magazines and posters. In addition to its industrial uses, it can also be used for more meaningful purposes, such as in art or advertising.

The field of design also constitutes the process of creating effective visual content for digital and print media. It refers to the process of producing visual solutions consisting of any non-verbal printed products that use the sense of sight. Designers use art and technology to design and visually communicate a message to its target

audience. They use their skills and knowledge of layout, typography, image editing and graphic design to create designs that help convey information and make a positive impact on the target audience. The stronger the designs made by the designer, the stronger the effect it leaves on people (İncearık, 2011).

The most important method of transferring information to the target audience is the method of transferring information through printed products. After the designer's work passes through certain stages, it goes to the printing stage and takes shape visually on paper and other carriers. The product range of visual design as printing consists of a very wide area. Sometimes in a scientific book, sometimes in a product package purchased, and sometimes in printed media and magazines, we see printed products in which design is embodied in many fields that we cannot count. One of the most important purposes of visual communication design is to ensure that the message to be conveyed is conveyed to the target audience in an accurate and understandable way (Akseki, 2022). In order to convey this message correctly, the first step on the product is the design dimension. The second stage is the print size. In order to obtain the right product, the designer must be educated and knowledgeable about all the design and production stages. Because a design error or printing error that may occur will cause the message and product to be conveyed to the target audience to be conveyed incorrectly or not accepted. The fact that the printed products do not have the same structure and features as the original product or design constitutes a major quality problem. Many companies with corporate brand value want their products to be in design and printing standards to a certain extent. A product must have the same color tone values of the printed product, no matter which region or city it is in. Differences in the color tone values of the products will reduce the confidence in the product for the consumer and cause the feeling of counterfeiting. The design and printing errors that will occur will both cause the product owner to lose prestige and cause damage by creating negative effects on the consumer. Considering that printed products are valuable papers and valuable papers, the size of the damage and negativities that may occur will be much larger.

Although the visual designer has knowledge about all the production stages, many parts of the production develop outside of his control. The most important of these is the print size. In the printing environment, there are many factors that affect the result outside of the preparation stage. Transferring the work to the mold, the bathing stage of the mold, the technical characteristics of the printing press, the structure of the ink, etc. there are many factors that are not counted yet. In the research conducted for our study, recognizing that we have fulfilled all of these listed characteristics, research and studies have been conducted on the printing control light and ambient light, which are not taken into account in the industry, which are a very important factor in the transformation of design into a product.

Light

Light is defined as electromagnetic radiation with wavelengths Decently visible to the human eye, between 380 and 750 nm. Light is a kind of wave, like sound waves. Waves carry energy from one place to another. The dimension of light perceived by the human eye is called visible light, the imperceptible dimension is called invisible light. Visible Light refers to electromagnetic radiation, which is usually detectable by the human eye. Light is made up of particles called photons. Each photon carries the energy and intensity of light on it.

Electromagnetic radiation, that is, light, performs fluctuations in electric and magnetic fields with a speed of ~ 300,000 km/s in space. This speed is called the speed of light in the literature. Each photon particle acts moves linearly along at the speed of light. The movements of the photon particles group are circular. A photon is the smallest amount of energy that can be transported (Avci, 2014).

Vision and Color

The basic tool for the formation of the image and for the realization of the act of seeing is light. Visible light is all the colors we can see. Color can create different meaning effects on people, both psychological and physical. Many experiments and studies conducted on this subject reveal the result that colors evoke positive and negative effects on people (Özsavaş, 2016). Color spaces are used to obtain the codes of the colors we perceive with our eyes in nature. While most of the color spaces obtain the colors seen, they also transform some colors into very close tones (Sağocak, 2005). Rainbow colors or color tones formed by the refraction of white light passing through a triangular prism are the lights we can see. Our eyes are sensitive to a certain light called visible light. Rainbow colors or color tones formed by the refraction of white light passing through a triangular prism are the lights we can see. But there are many more types of light that we cannot see. Some of them are ultraviolet and X-rays et al. are lights. Doctors use it in X-ray film exposure to see x-rays as they pass through our bodies. Three basic elements are required for the realization of vision;

-Source of light

-Article

-It consists of the perceiver or eye that performs the act of seeing.

In order for vision to take place, there must be a light source and the light emitted from the source. The light undergoes changes by interacting with the object it comes on. Since the photons absorbed or reflected by the matter will have a characteristic energy, they form the concept of color by sensing the light interacting with the matter. Light comes onto an object and is partially damped by the object surface, and the rest is reflected again at a reflection angle. Reflected light is perceived by the sensor in its final physical state and visualization is performed. In order for the vision process to take place in an ideal way, the light coming from the source must be daylight, in other words, white light (Glykasab, 2004). If the light coming from the source is in a color other than white light, the colors of the light that our eyes will perceive will be different from the original. When a light from a yellow light source hits a blue object and is reflected back, it will be perceived as green by our eyes. For example, today, the color factor has an important place in extracting features such as recognizing and commenting on objects using image processing techniques. Software algorithms created to minimize the perception disorders caused by colors are processed by transforming images into different colors (Civcik, Yilmaz, Özbay, & Emlik, 2015). Physically, all colors are present in the structure of white light. In order for true colors to occur, the light reflected by the light source must be daylight, that is, white light. The intensity of light also directly affects whether the color perceived by the eye is in real color values. If the illumination intensity of the light from its source is low, the sensor or the eye will perceive the color of the object in a darker tone than the perceived color.

Purpose

Before printing, typographic shapes and various visuals are used for the targeted product. There are standards that all typographic shapes and visuals used should be at the production stage. After the realization of the visual design in the digital environment, the next stage is the physical stage, which we call the printing stage.This stage constitutes the part where all the efforts and labor put into flesh and bone. Design works that fail to give a sufficient effect visually after the printing stage and fail to convey the message contained correctly cause the message to disappear (Civcik & Kısa, 2019). The printing stage is very important for the quality and accurate transmission of the messages that come with the design to the consumer. At the printing stage, there are many factors that affect the color and tone values of the printed product from the design stage to the printing stage. If all the stages are performed by taking into account the factors affecting the result output, the desired pressure will be obtained (Ünal, 1994).

In the study, it was aimed to Decipher the effects of ambient light and control panel light on quality and result among the factors affecting product output. For the study, ambient observations were made at the workshops of the printing house site in Konya province. In the observations we have made, it has been investigated that almost no workshop pays attention to the lighting intensity of the ambient lights nor to the lighting intensity of the control table lights and it is not enough. In the study, the negative effect of ambient light and control light on the printing and ink settings made by the printing operator was examined in detail, and it was aimed to investigate whether designers and printing operators have enough light information and the effects of light on the printing result with an experimental study.

Method

In the study, offset printing workshops, where the design is transformed into a printed product, which is the most important unit in which the design is transformed into a product, were examined. The light intensity of the illumination light of the environments where the printing operations of the workshops take place and the printing machines are located has been examined. Secondly, the light intensities of the illuminated control tables where the printing controls performed on the printing machine were examined. Measurements of the light intensities of the ambient and control tables of ten enterprises with sufficient technology for this process were made. Company and person names were not used in the measurements made upon the requests of company officials. In the measurements made in the workshops, the ambient light was measured in the lowest 55 lux December and the highest 85 lux range. The measurements made on the control panel lights were in the lowest 75 lux December and the highest 125 lux range. An experimental study was conducted based on the December values obtained. Ambient and control panel light measurements were made with the “VC-1010A” series digital luxmeter measuring device with the “TT Technic” brand and model, which was calibrated. The measurement results were taken as luxury in value. Roland record offset printing machine with illuminated control unit was used in the study. In order to examine the effect of ambient light on printing in the test printing, the visual work performed on the printing machine and the printing plate were kept constant. The operator who performs the printing is an experienced operator with professional qualifications. The operator was asked to perform the

printing controls on the illuminated table, where three separate light intensities will be applied. On the illuminated control table, the light intensities on the table were applied as 75, 100, 125 lux, respectively. The colors cyan, magenta, yellow and black were used in the study. It is planned to place a printing control strip on the skirt or scissors part of the layer to be printed for control purposes and to make color controls of printed products through printing control strips.

Figure 1. Digital Luxmeter Measuring Device

Print Control Strips

In the field of visual design and printing, print control strips are used to maintain quality in printing, to control color tone formation, and to ensure continuity in production in accordance with the original standards. In color prints, a print control strip is used to provide standard color formation for each printed color (Özsoy, 2007). If color control strips are used with a densitometer in printing, the risks that may arise from operator errors are largely removed (Özer, 2010). As the printed paper surface grows, control will become more difficult, and there will be many color tone errors on the printing floor that the operator cannot see. Since the color tone errors that usually occur after printing are not the closest or the same to the Original that the customer wants, the work will be printed again. This situation causes quality, time and material losses.

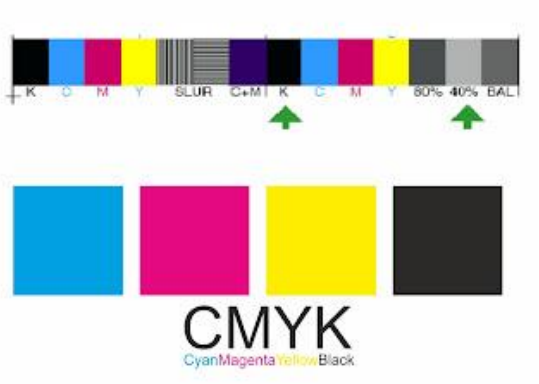

Figure 2. CMYK Color Rulers

Printing Control Table

The print control desk is the section where all the settings of the printing are made in computer controlled machines. The control light is the light source that illuminates the table where the printed works are controlled.

Experimental Test Work and Application

In order to obtain a healthy image in printed products, printing quality control studies are carried out by the printing operator during printing. Printing quality control studies are carried out in order for the printing result to have the same color and tone values as the product or design called the original. It uses an optical device called a densitometer that controls the color so that the color and tone values are at the desired values during printing. The designer adds color rulers to the top of the work so that color control can be done during printing. These color scales have standard numerical values that must be densitometrically. It has a density value of C:1,20 M:1,15 H:1,20 K:1,55 for first pulp paper (Megep, 2007). Values below or above these values indicate that the printing result is outside the desired values.

In the study, the design work with CMYK color rulers was printed on 80 grams of first pulp paper with a roland record offset printing machine. The printing process was carried out in three stages using the same design and mold. At each stage, the lighting intensities of the printing control lights were changed and the printing process was carried out by the operator. The operator was asked to visually adjust the ink according to the color and tone values that occur again during each printing attempt at each different light intensity. The printing operator has performed all the settings manually, as he does in a normal working environment. Color controls in the sector are carried out with the visual controls of the operator. As a result of visual controls, the suitability of the image formed on paper compared to the original image was checked. The operator has reduced and multiplied the consumption of the ink transferred from the ink control unit to the mold according to the condition of the colors obtained in the image according to the needs. During the first, second and third printing stages with different light intensity, the operator carried out checks of the color rulers placed by the designer on the paper during printing for all stages.

Figure 3. Densitometer Color Measuring Device

In the controls, a densitometer device was used to check whether the inks were transferred at the appropriate values. Light intensities were applied as 75, 100, 125 lux, respectively, on the light control table where the experimental study was carried out. The colors cyan, magenta, yellow and black were used in the study.

Figure 4. The ”A" Sample

Figure 5. The ”B" Sample

Figure 6. The ”C" Sample

Findings

With a Roland record offset printing machine, the printing with CMYK color rulers was carried out on 80 grams of first paper. The printing process was carried out in three stages by the operator using the molds without removing them from the machine. The printing was carried out by the operator by changing the illumination intensities of the printing control lights at each stage. The operator has adjusted the ink according to the color and tone values again on the machine for each different light intensity environment. The printing operator has performed all the settings manually according to the light condition. In all stages, three three separate samples were taken while the machine was in the normal printing position after the adjustment prints. Print samples taken were measured with an optical measuring device called densitometer to make color controls. The measurement results obtained are as shown in the table below.

Table 1. Obtained Densitometric Values

		Densitometric Values Obtained for Each Color			
	Light Intensity	C	M	Y	K
A Sample	75	1.01	0.92	0.99	1.29
B Sample	100	1.05	0.97	1.03	1.34
C Sample	125	1.08	1.01	1.06	1.38

Discussion and Conclusion

As a result of the values obtained, standard ideal values could not be achieved as a result of the printing process performed by the ingenuity of the operator during the testing stages, where three different light intensities were applied during the transformation of the design into a printed product. **A:1,20 M:1,15 Y: 1,20 K:1,55** in measurements made with three separate light intensities with reference to standard density values;

For the **"A"** sample, in an environment with **75** lux light intensity, **C:1.01 M: 0.92 Y: 0.99 K: 1.29** density values were obtained. The resulting values are far from the standard values and it has been observed that the printed product has different color tone values than the original under normal daylight conditions.

For the **"B"** sample, **C: 1.05 M: 0.97 Y: 1.03 K:1.34** density values were obtained in an environment with a light intensity of **100** lux. The values that came out had better values compared to the "A" sample, but remained below the standard values that should have been.

For the **"C"** sample, **C: 1.08 M: 1.01 Y: 1.06 K: 1.38** density values were obtained in an environment with a light intensity of **125** lux. The obtained result shows that the C sample is closer to the standard values than the A and B samples. Only because the values obtained are far from the standard values, the printed product was formed in different color tone values than the original, which did not come out in the desired quality.

As can be understood from the values obtained from the experimental study, ambient light affects the color tone values of printed products. The fact that the printing operator perceives the colors as more intense (dark color)

when the intensity of the light is low, under the influence of ambient light, has caused a lower amount of ink transfer. Low ink transfer caused the image to take on lighter color tone values than it should have been. As the light intensity increased, the color perception of the operator also increased and approached the normal values. It has been observed that the printing changes direction towards normal as the light intensity of the environment approaches the daylight intensity.

In order for a design study to be at the desired values and quality, studies must be carried out by taking into account all the factors affecting the quality from the design to the printing stage. In the research study, it was observed that densitometers are not used in many of the workshops at the printers in Konya province. The absence of the use of densitometers, the fact that the printed product is of the desired quality and values is entirely up to the professional competence of the printing operator. Although the professional qualifications of the operators are at a high level, the insufficient lighting intensity of the ambient light and control lights, as can be understood from the study, caused the color and tone values to come out outside the desired values.

In order to obtain quality products in the sector and to prevent damage and waste that may occur due to improper production, sector representatives and employees should be informed about the issues mentioned in the study through in-service training. The competencies of the workshops will be ensured with simple technical modifications.

References

Akseki, S. (2022). Yakın Dönem Gelecekte Dijital Reklamcılığın Metaverse Dönüşümü ve Markalara Etkisi. *Sosyal Bilimlerde Özgün Çalışmalar-3* (s. 99-125). içinde Ankara: Iksad Publications.

Avcı, S. (2014). Bilimsel Renk Bilgisinin Resim Sanatındaki Yansımaları. *Yedi: Sanat, Tasarım Ve Bilim Dergisi*(11), 53-67.

Civcik, L., & Kısa, M. (2019). Mizanpaj Tasarımında Kullanılan Renklerin İnsan Algısı Üzerindeki Etkileri. *The Pursuit Of History International Periodical For History And Social Research, 21*, 361-370.

Civcik, L., Yilmaz, B., Özbay, Y., & Emlik, G. D. (2015). Detection of micro calcification in digitized mammograms with multistable cellular neural networks using a new image enhancement method: automated lesion intensity enhancer. *Turk. J. Electr. Eng. Comput. Sci.*, 853-872.

Glykasab, M. (2004). Workflow and Process Management in Printing and Publishing Firms. *International Journal of Information Management*(24).

İncearık, M. (2011). *Grafik - tasarım rehberi.* içinde Kod Lab.

Kısa, M. (2019). Grafik tasarım ve ortamında kullanılan görsellerin rgb renk uzayından cmyk renk uzayına dönüşümü esnasında oluşan renk ve ton kayıplarının önlenmesi. *Humanities Sciences (NWSAHS)*, 25-30.

Megep. (2007). *Ofset Baskı Teknikleri.* Milli Eğitim Bakanlığı.

Özer, E. H. (2010). Ofset Baskı Mürekkeplerine Yapılan Fiziksel Testlerin Uygulamalı İncelenmesi. *Yüksek Lisans Tezi*. Marmara Üniversitesi Fen Bilimleri Enstitüsü.

Özsavaş, N. (2016). İç Mekân Tasariminda Renk Algisi. *Güzel Sanatlar Fakültesi Sanat Dergisi-ART E*, 451.

Özsoy, S. A. (2007). Ofset Baskıda Kullanılan Kalite Standartları Ve Türkiye'ye Uygunluğu. *Yüksek Lisans Tezi*. Marmara Üniversitesi Fen Bilimleri Enstitüsü .

Sağocak, M. D. (2005). Ergonomik Tasarımda Renk. *Trakya Üniversitesi Dergisi*(77), 77-83. http://www.trakya.edu.tr/Enstituler/FenBilimleri/fenbilder/index.php adresinden alındı

Ünal, H. (1994). Ofset Baskida Kalîteye Etkîyen Faktôrler Ve Bunlarin Optımızasyonu. *Marmara Üniversitesi Fenbilimleri Enstitüsü-Doktora Tezi*. İstanbul.

Images

https://burcuaramaci.com/2021/04/14/renk-ve-ton-yapisi-bakimindan-baski-turleri/