Analysis of Shop Sign Colors in Joong-Gu, Seoul — Nadulgage and Convenience Stores

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Abstract

The South Korean government is attempting to revive small supermarkets by branding them as "Nadulgage." These efforts include support to change retail store signs; however, in reality, the government has only provided emblem designs thus far. Based on previous studies, this study reviews the current status and features of sign colors for both Nadulgage and convenience stores in the Jung-gu area. In addition, after analyzing color images using the Moon–Spencer Theory, PCCS tone chart and I.R.I Color Emotional Quotient as analysis tools, we compare the characteristics of Nadulgage and convenience stores and draw our implications. The colors of Nadulgage signs still display the characteristics of colors that were elucidated in previous research. Moreover, the dominant colors of Nadulgage signs have a higher ratio of colors belonging to the contrast area compared with those belonging to the other groups. This makes their impression confusing when compared with the impression of the colors of convenience store signs.

Therefore, reselection of the dominant colors that can portray the unique identity of a Nadulgage should be prioritized, and the color-matching relationship between dominant colors, assorted colors, and accent colors should be established in more detail. Thus, comparing Nadulgage and convenience stores may help in obtaining useful data.

Keywords: Nadulgage; convenience stores; sign; colors

1. Introduction

1.1 Background and Purpose

With the increasing number of enterprise convenience stores, neighborhood supermarkets are slowly disappearing. In South Korea, residential and commercial areas have witnessed concurrent growth, unlike Europe, with small supermarkets playing an important role in this environment. According to Sim (2014), these supermarkets have traditionally been "a meeting place" for locals and internal communities.

Against this backdrop, in an attempt to revive the disappearing small stores and strengthen their competitiveness, the government (SMBA) started the "Nadulgage 1 Supporting Initiative" in 2010. The details are as follows.

Table 1. Nadulgage Supporting Initiative Action

| Support Item           | Contents                                      |
|------------------------|-----------------------------------------------|
| 1. Promoting subsidy   | Support five-year loans                       |
| 2. Sign replacement    | Sign with Nadulgage BI                        |
| 3. Product redisplay   | Subsidize costs associated with support       |
| 4. Information system  | Installation of POP software                  |
| 5. Comprehensive       | Business area analysis, guidance on operation |
| 6. Owner education     | Field trip                                    |

However, as shown in Table 1., barring Item 2, the initiative is biased toward support for operation and administration of businesses. Hoffman et al. (2003) asserted that the reason the government and large businesses chose conversion was to establish "brand identity." In addition, Seo et al. (2012) found that Nadulgage owners participating in the business felt the need for implementing some measures to improve the visual environments of their businesses, such as remodeling and replacing signboards, which can better communicate the brand concept and contribute to effective consumer perception.

Although there have been continuous demands for improving consumer recognition and promoting the brand image with respect to the Nadulgage Promotion Initiative launched by the government (SMBA), the most crucial issue is considered to be the fact that there has been no discussion on approaches in terms of design, which may turn out to be an effective solution.

In particular, although there is a support item for sign changes, as shown in Table 1., it only covers Nadulgage BI and emblems, resulting in inconsistent
colors being used in Nadulgage signs across the country. This study aims to analyze and review the colors used in the signs of Nadulgage signs, compare them with colors used in enterprise convenience stores, draw conclusions, and provide useful information to help future research in determining a standard for Nadulgage signs and their color scheme.

1.2 Scope of the Study and the Processes Used

This study surveyed 40 shops in Jung-Gu, Seoul, including Nadulgage and convenience stores. The scope of the survey included analyses of the design features of signs, especially the characteristics of the color schemes. Jung-gu, located at the heart of the capital city Seoul, is one of the fastest growing areas in Seoul, has the most active population because of the balanced growth of both new and old retail districts in the form of large traditional markets and mega shopping centers. Therefore, Jung-gu was selected as the appropriate area for analyzing convenience stores and traditional small-sized supermarkets, which are the subjects of this study.

The direction of this study was established, and the basic information on the shops surveyed in this study was obtained through a literature review. The present status and the properties of sign colors were investigated through fieldwork. Based on the above information, this study compared and analyzed the color properties of the signs in Nadulgage and convenience stores.

2. Theory Review

2.1 Nadulgage and Convenience Stores

The classification of retail businesses in South Korea is shown in Table 2.

Table 2. Classification of Retail Businesses by Scale

| Brand | Typical Types of Businesses | Note |
|-------|----------------------------|------|
| Large-scale | Department stores, large discount stores | Super supermarket (SSM) is defined as a shop with floor area |
| Small- and medium-sized | SSM, convenience stores, small supermarkets | of less than 3000m² and larger than that of convenience stores |

7-Eleven was first introduced in South Korea with the opening of the Olympic Village in 1989. Convenience stores have the advantage of shortened shopping time, easy access owing to convenient locations, and a wide range of selected products in small quantities. The names of some popular convenience stores in South Korea and their symbolic colors are presented in Table 3.

Table 3. Brand Images and Symbolic Colors

| Convenience Store Brand | Targeted Image | Symbolic Color (Munsell Value) |
|-------------------------|----------------|-------------------------------|
| 7-Eleven                | Coexisting, environment-friendly | 7.5BG4/4, 7.5R5/16, 5YR7/12 |
| Mini stop              | Humaneness, rest         | 7.5YR8/14, 5PB2/16, 7.5R5/20 |
| GS25                   | Progressiveness, creativity | 10BG5/6, 7.5BG9/4, 7.5R5/16 |
| Cu                     | Dignity, refreshment     | 10PB3/16, 2.5GY8/12, 7.5GY6/10 |
| With me                | Divinity, freshness       | 7.5B7/10, N9/0, 2.5V8/12 |

The number of Nadulgage has grown consistently year-by-year, currently amounting to 10,706 stores nationwide. Small retail shops owned by individuals are eligible for Nadulgage application. The Small Enterprise and Market Service examines the application and grants certification to a shop if it meets the required criteria. The brand images and symbolic color, which are the characteristics of Nadulgage, are presented in Table 4.

Table 4. Nadulgage Brand Images and Symbolic Colors

| Brand Image | Targeted Image | Emblem Color |
|-------------|----------------|--------------|
| A store with a neighborhood atmosphere in which consumers feel comfortable and visit frequently | Friendliness, Compassion, Pleasure | 2.5BG4/6, 10PB5/10, 10P6/16, 7.5R7/12 |

The symbolic colors of Nadulgage have not been consistently applied to the coloring of Nadulgage signs and the elevation of the shops.

2.2 Sign Color and Brand Identity

People obtain most of their information through vision. A visual image generally comprises shapes and colors. Rudorf (1954), well-known as a Gestalt psychologist, said that colors have a stronger expressive power than shapes as they bear sentimental experiences.

Therefore, environmental design arrangements such as logos, signboards, and interior and exterior layouts utilize colors to effectively communicate and identify the brand concept with a commercial intent.

According to Faber and Kim et al. (2006), colors in outdoor advertisements are the first to be visually recognized and have psychological characteristics to send specific messages as well as brand identity. In addition, according to Parry et al. (1944), the harmony among the colors used in the sign is important for the sign to be effectively identified.

This study uses the Parry's color wheel harmony relationship diagram because it is considered to be an appropriate, effective tool for analysis, considering the relationship between colors adjacent to each other in the limited spaces of signs.

Table 5. Color Wheel Harmony Relationship Diagram

| Division | Definition |
|----------|------------|
| 1st | The relationship between the colors becomes ambiguous because their positions in the wheel are too close to each other. |
| 2nd | The relationship between the colors causes a feeling of discomfort because they are at awkward positions from each other in the wheel. |
| 3rd Contrast | The relationship between colors gives an impression of confusion in recognizing the main color. |

2.3 Review of Previous Studies

According to previous studies on signs, colors, and color images, Kim et al. (2004) analyzed background colors and letter colors separately, excluding building facades, in two commercial areas of Seoul. This research showed that the red, yellow, and blue color groups were the most popular of the chromatic colors used in the
signs placed in both these districts. In particular, the frequency of the red color group prevailed conspicuously in the Myung-dong area. Lee et al. (2010) also studied the differences and characteristics of colors used by different types of businesses, including restaurants, groceries, and entertainment spots. The study showed that in most of the signs in the Chinese-dominated streets in South Korea, the red and yellow color groups particularly dominate in a disproportionately higher frequency disproportionately higher than that of the other colors in most of the signs in Chinese-dominated streets in South Korea.

In contrast, Yeo et al. (2013) utilized the concepts of basic color, dominant color, assorted color, and accent color in the analysis of the present status on environmental colors in Icheon-si. This method is considered to be more appropriate than the color analysis that separates letters and backgrounds (used in previous studies) because "people's vision prefers colors to shapes," according to Rudorf (1954). Therefore, to analyze the properties of colors used in signs, this study will categorize sign colors as dominant colors, assorted colors, and accent colors based on the area each color occupies in the sign. The definitions of these terms are presented in Table 6.

Table 6. Definitions of Terms Associated with Colors

| Division   | Dominant color | Assorted color | Accent color |
|------------|----------------|----------------|--------------|
|            | Color occupying most of the area | Color assisting the dominant color and occupying less than 30% of the area | Color occupying less than 10% of the area and contrasting with the dominant and assorted colors |

The abovementioned study showed that the red group colors were the most prevalent in the commercial districts of South Korea, which is in agreement with the research findings of Lee et al. (1993), and Song et al. (2008). This suggests that the red group colors were always popular, regardless of the time period.

Im et al. (2009) studied sign colors in six commercial areas of Seoul. According to this research, the most frequently used colors in the streets of the Gangnam Station area, Nandaemun Market, Myung-dong, Insadong-gil, Chungdam-dong, and Hongdae area were R-series colors, the second-most used colors were the YR series colors, and the third-most used were the GY series colors.

Based on the findings of previous studies, this study investigates the following aspects.

1) The differences between Naduлагes and convenience stores and their characteristics, 2) the harmony of the relationship between the dominant colors, assorted colors, and accent colors used in the signs of Naduлагe and convenience stores, and 3) the differences between the color images of Naduлагe and convenience store signs.

3. Methods
3.1 Selection of Research Locations and Summary

In this study, all Naduлагes in Jung-gu were investigated to determine the color characteristics of the signs used by Naduлагe and convenience stores in the area. Of the 24 shops registered with SMBA as of July 2016, 20 Naduлагe were selected, excluding four stores that were preparing for opening. Four convenience stores per brand within 500 m of a Naduлагe were selected, and 20 convenience stores similar to Naduлагe were finally chosen. Thus, 40 stores were selected as research subjects in this study, and the list is shown in Table 7.

Table 7. Research Locations (N: Naduлагe; C: Convenience store)

| Div. | Shop Name         | Location         |
|------|-------------------|------------------|
| N1   | Yi. Cosa Mart     | Hangakdong 1562  |
| N2   | Daesung Super     | Hanghadong 811   |
| N3   | Saerona Mart      | Sindandong 164-16|
| N4   | Hanadu Mart       | Sindandong 152-7 |
| N5   | Uri Halin Mart    | Sindandong 164-1 |
| N6   | Dongiu Super      | Sindandong 52-107|
| N7   | Molwon Mart       | Sindandong 304-81|
| N8   | Thakq Mart        | Sindandong 249-68|
| N9   | Ok Mart           | Heungindong 111  |
| N10  | Hankuk Mart       | Sindandong 373-9 |
| N11  | Jinyang Sikpum    | Cungmuro 4ga 109-2|
| N12  | Damao Mart        | Guanheeding 1ga 30|
| N13  | New Hyundai       | Qanglimong 255-4 |
| N14  | Chingine Mart      | Sindandong 109-51|
| N15  | Hanarum Mart       | Sindandong 104-494|
| N16  | Hangun Mart        | Sindandong 104-415|
| N17  | Youngjin Mart      | Sindandong 338-1 |
| N18  | Jangchung Mart     | Sindandong 370-48|
| N19  | Dukjin Super       | Sindandong 373-43|
| N20  | Cosalmart         | Sindandong 533-297|
| C1   | 7-Eleven           | Sindandong 140-17|
| C2   | 7-Eleven           | Sindandong 67-44 |
| C3   | 7-Eleven           | Sindandong 104-165|
| C4   | 7-Eleven           | Hwagakdong 2523  |
| C5   | Mini Stop          | Toegairo 189     |
| C6   | Mini Stop          | Cungmuro 5ga 85-4|
| C7   | Mini Stop          | Cungmuro 5ga 62-8|
| C8   | Mini Stop          | Sindandong 368-67|
| C9   | Gs25               | Hwangakdong 787  |
| C10  | Gs25               | Hwangakdong 2484 |
| C11  | Gs25               | Heungindong 154  |
| C12  | Gs25               | Heungindong 13-3 |
| C13  | Cu                 | Uijiro 6ga 17-2  |
| C14  | Cu                 | Sindandong 160-4 |
| C15  | Cu                 | Cungmuro 5ga 19-9|
| C16  | Cu                 | Guanheeding 1ga 89-1|
| C17  | With me            | Hwangakdong 163  |
| C18  | With me            | Heungindong 119  |
| C19  | With me            | Uijiro 7ga 130   |
| C20  | With me            | Ssanglimong 146-2|
3.2 Research Method

The research method used in this study is described below.

First, fieldwork was conducted from July 15, 2016 to July 29, 2016 to understand the current state of the objects and the coloring.

Second, photographs were taken between 11 AM and 3 PM, avoiding direct sunlight, and a SONY NEX-5N camera was used in the Auto mode for the photo shoot. The front sides of the objects were photographed at a fixed height of 1.6 m (f number: 8.0).

Best efforts were made to ensure that the front sides of the objects were photographed as much as possible in locations where front-side photo shooting was not possible.

3.3 Analysis Method

The analysis method used in this study is described below.

First, color values were sampled using the RGB mode in Photoshop CS4, and the RGB values were converted to color values in Muncell Color using the Color Calculator available on the Easy RGB website.

Second, a comparative analysis between the hues and brightness from a negative perspective, whereas they feel serious and impure feelings.

Strong and impure feelings.

The highest frequency at 15%, i.e., colors of low brightness and high saturation were examined based on the I.R.I Hue & Tone Color System developed by the Image Resource Institute using Muncell Color values.

Finally, color adjective images were analyzed using the Adjective Image Scale, an I.R.I color mood measure.

4. Outcome and Consideration

4.1 Color Analysis of Nadulgage Signs

The colors used in the Nadulgage signs in Jung-gu and the analysis results are shown in Table 8.

1) Dominant Color Analysis

As dominant colors, the R-series colors marked the highest frequency (25%), while the B (Blue) and PB (Purple Blue) series exhibited the second-highest frequency (15%). The R-series colors showed the characteristics of low brightness and high saturation in general. This outcome corresponds with the results of previous studies and R-series colors still exhibit the highest frequency despite the existence of the designated typical colors for Nadulgage. The B- and PB-series colors, which showed the second-highest frequency, exhibited characteristics of lower saturation and higher brightness than the R- and YR-series colors.

In terms of tone, the S (Strong)-series colors marked the highest frequency at 35%, D1 (Dull) the second-highest frequency at 25%, and V (Vivid) the third-highest at 15%, i.e., colors of low brightness and high saturation were dominating in general and induced strong and impure feelings.

In other words, the colors feel heavy and disturbing from a negative perspective, whereas they feel serious and brilliant from a positive perspective.
2) Assorted Color Analysis
As assorted colors, the GY- and PB-series colors were observed most frequently, accounting for 25% of the colors. They were followed by the G (Green)-series colors (15%) and the N-series colors (10%). It was found that the frequencies of the R- and B-series colors as assorted colors were lower than those of the dominant colors, whereas those of the GY- and PB-series were higher. As dominant colors, the GY- and PB-series colors also showed a tendency of having a high saturation.

In other words, the colors with the highest frequency were different in the cases of dominant and assorted colors; however, both these color groups maintained a highly saturated tone.

Furthermore, as shown in Fig. 1., the analysis of the harmony relationship between assorted colors and dominant colors revealed that colors belonging to the contrast area included a part of GY, G, BG, B, and PB if we select R as the base color. As shown in Fig. 2., the total area of the colors belonging to the contrast area accounts for 80% of the circle.

That is, the colors of Nadulgage signs, in which the dominant colors were found to be the R-series ones, have a higher ratio of colors belonging to the contrast area compared with colors belonging to the other groups. Therefore, from a negative viewpoint, the sign colors feel disturbing, whereas from a positive viewpoint, they seem brilliant or lively.

Fig. 2. Color Harmony of the Base Color R

In terms of tone, the V-series colors marked the highest frequency at 40%, with S and B (Bright)-series colors at 15% and DI colors at 10%.

4.2 Color Analysis of Convenience-Store Signs
The colors used in convenience-store signs in Jung-gu and the analysis results are shown in Table 9.

Table 9. Current Status of CVS Sign Colors

| Object | Muncell Value | Object | Muncell Value |
|--------|---------------|--------|---------------|
|        |               |        |               |
| C1     | 7.5G3/4       | C11    | 7.5BP3/6      |
|        | 7.5R3/12      | C12    | 10BG7/8       |
|        | 10R4/10       | C13    | 7.5R4/18      |
|        | 10R5/12       | C14    | 2.5G2/8       |
|        | 10R7/10       | C15    | 5Y7/10        |
|        | 10R8/10       | C16    | 5Y5/5         |
|        | 2.5G6/12      | C17    | 5B7/8         |
|        | 5Y8/10        | C18    | 5B6/8         |
|        | 7.5R15/16     | C19    | 5B8/2         |
|        | 7.5R16/16     | C20    | 5Y8/10        |

3) Accent Color Analysis
As accent colors, the R-series colors marked the highest frequency (30%), whereas the RP-, Y-, and GY-series colors showed the second-highest frequency (15%). This study found that yellow group colors showed a high frequency as accent colors rather than as dominant or assorted colors. And the Y-series colors showed a wide range of variation of tones unlike the dominant and assorted colors.
1) **Dominant Color Analysis**

The colors used in convenience-store signs in Jung-gu and the analysis results are described below. The B-series colors marked the highest frequency at 35%. The usage ratios of the R- and YR-series colors considerably decreased from 35% to 5%, whereas those of the Y- and P-series colors slightly increased when compared with the dominant-color distributions of the Nadulgage sign colors. B-series colors showed a distribution of medium brightness or higher and high saturation.

Overall, compared with Nadulgage sign colors, there was a tendency of lower saturation and slightly higher brightness in the convenience-store sign colors. That is, it is considered that convenience-store signs give brighter and clearer impressions than Nadulgage signs. In terms of tone, the B-series colors marked the highest frequency at 35%, followed by the S-series colors at 20% and V-series colors at 15%. In other words, generally, colors of medium brightness or higher and high saturation were dominating.

2) **Assorted Color Analysis**

As assorted colors, the GY- and B-series colors were observed most frequently. B was highly distributed in dominant colors as well.

3) **Accent Color Analysis**

As accent colors, the R-series colors marked the highest frequency (60%), followed by the Y- and GY-series colors showed the second-highest frequency (20%). The R-series colors, whose frequency was low as dominant and assorted colors, exhibited the highest frequency. The feature of R-series colors used in convenience stores was that a single red color was used with high brightness and saturation. Moreover, the Y-series colors with high brightness and saturation were used, unlike the Y-series colors used as accent colors in Nadulgage signs.

These opposite characteristics contrast with the dominant and assorted colors of convenience-store signs, which used slightly bright and soft colors. In other words, highly saturated colors, which have a high awareness and visibility, tended to be frequently used as the dominant and assorted colors, producing more or less soft and bright moods. Only a few colors were used as the accent colors, producing strong and vivid impressions rather than soft and simple images.

4.3 **Color Image Analysis**

1) **Image Analysis of Nadulgage Sign Colors**

The single-color image scale of the Nadulgage signs in Jung-gu is shown in Fig.4. The Nadulgage sign colors were most densely distributed in the 4th quarter of the image map, especially along the "dynamic" horizontal axis.

The adjective areas, where the colors were densely distributed, were those representing "springy," "gorgeous," and "dynamic," featuring typical adjectives such as "lively," "diverse," "vivid," "progressive," "active," and "strong." Thus, in general, the colors have "dynamic," "gorgeous" images.

2) **Image Analysis of Convenience-Store Sign Colors**

The single-color image scale of convenience-store signs is shown in Fig.5. The image analysis revealed that the sign colors were most densely distributed in the 1st quarter of the image map, especially around "soft" vertical axis and "dynamic" horizontal axis. The adjective areas, where the colors were densely distributed, were those representing "soothing," "calm," and "soft."
Accordingly, it can be concluded that in general, the colors have "natural," "soft," and "springy" images. Furthermore, there were differences in the density of the color distributions of the dominant, assorted, and accent colors in the adjective areas.

5. Conclusion

This study investigated and analyzed the color properties of Nadulgage and convenience-store signs, focusing on the following aspects: 1) the differences between Nadulgages and convenience stores and their characteristics, 2) the harmony of the relationship between the dominant colors, assorted colors, and accent colors used in the signs of Nadulgage and convenience stores, and 3) the differences between the color images of Nadulgage and convenience store signs. According to our analyses,

Firstly, as dominant colors in Nadulgage signs, R series colors marked the highest frequency, while for convenience stores, B series showed the highest frequency at 35%. The general tone of dominant colors in Nadulgage signs has low brightness and high saturation, giving a dark but vivid impression, while convenience store signs tend to have higher brightness. As with the analyses by past studies, R series colors, which were found to be used as preferred colors in signs in South Korea, are still frequently observed in the Nadulgages, but that is not the case with convenience store signs. Compared with the Nadulgages, the dominant colors of convenience stores have a little brighter and clear image.

Secondly, as assorted colors in Nadulgage signs, GY and PB series colors marked the highest frequency. In terms of color harmony between dominant and assorted colors, the colors in the contrast area seemed to have a high ratio, which gave a brilliant or lively impression from a positive perspective but brought about a feeling of confusion from a negative point of view. Moreover, assorted colors in Nadulgage signs were used in high saturation such as dominant colors excluding achromatic colors. However, highly saturated color tones ensure high awareness and visibility but tend to cause irritation and fatigue. In contrast, as assorted colors, GY and B series showed the highest frequency in the convenience store signs. As colors have less contrasting colors against dominant colors and more similar colors in terms of color harmony, they bring about natural, stable feelings. In addition, it is believed that in terms of tones, dominant and assorted colors have higher brightness and lower saturation compared with the Nadulgages, thereby maximizing the effects of the colors.

As accent colors, R series colors were more prevalent both in the Nadulgages and convenience stores. In the case of Nadulgages, as the colors showed high distribution in the contrast area with properties of high saturation, using R series as accent colors may produce somewhat disturbing impressions. In addition, they look brilliant but have relative disadvantages in conveying consistent images as a wider range of colors are used as accent colors. In contrast, in the case of convenience stores, as dominant and assorted colors showed relatively less frequency in the contrast area, use of limited colors and accent colors of high saturation and brightness is believed to improve the effects of visibility and awareness.

The above analysis was in line with the findings of color image analysis. The color image of the Nadulgage signs belonged to the springy, gorgeous, and dynamic image areas, while those of the convenience stores were distributed in a bit more natural, soft, and gentle image areas.
This study focuses on colors, the perceptual effectiveness of which was proven the best among the design elements of signs. Given that this is not a comprehensive guideline considering other design elements, including text, graphics, symbols, and division and arrangements of the surface, it is believed that the study has its limitations.

However, as the study presented a comparative analysis of the colors used in the signs of two competitors, i.e., Nadulgage and convenience stores, in terms of the characteristics and harmony of dominant, assorted and accent colors, the author is sure that the conclusions of this study, will provide very useful information for the color-selection process.

Notes

1. Nadulgage means "a store that greets people with a friendly atmosphere and thus is frequently visited." This term was coined in January 2010 under the Small and Medium Business Administration's plan to boost the neighborhood supermarkets in Korea that are facing economic difficulties owing to the emergence of enterprise convenience stores and super markets.

2. Despite some differences depending on the times and researchers, the major design factors that contribute to the visual appeal of a sign can include background (such as the scale, size, and division of the surface), graphics, symbols, characters, and colors, as described comprehensively in some recent studies, e.g., Ga (2000), Park (2008), and Chen et al. (2009).

3. The American chromatist worked in various fields related to color, e.g., the color harmony theory.

4. Various measurement errors can occur in the measurement of color data from photographs. However, Kim Jung-Eun's (2003) validity test using a computerized color system proved that these errors are not significant. Moreover, this study performed the analysis in accordance with the guidelines of Lorenzo Garcia (2003) to identify the colors in digital photographs as true colors.

5. http://www.easyrgb.com

6. The initials PCCS stand for Practical Color Coordinate System. The PCCS color system integrated with several other color systems, such as Ostwald's color system, Muncell's brightness sensation system, Biren's harmonious color scheme, and the ISCC—NBS system of tone designation in the US, is suitable to comprehensively understand tone and color.

7. This study utilizes the I.R.I. Hue & Tone along with Japan's PCCS color system because they show the tone characteristics of each major color in a more intuitive manner.

References

1. Garcia, L. et al. (2003) Analysis of the exterior colour of agroindustrial buildings: a computer aided approach to landscape integration. Journal of Environmental Management, 69 (1), pp.93-104.

2. Ga, S. H. (2000) An analytical study on contribution of factors in signboard design, Masters thesis, University of Hunsung.

3. Chen, Y. L. et al. (2016) Design Factors Affecting the Reaction Time for Identifying Toilet Signs: A Preliminary Study Department of Industrial Engineering and Management, Perceptual and Motor Skills, 122(2), pp.636-540.

4. Hoffman, R. C. and Prebel, J. F. (2003) Convert to Compete: Competitive Advantage Through Conversion Franchising, Journal of Small Business Management, 41 (2), pp.187-204.

5. Im, S. et al. (2009) A Study on the Color Differences in the Shopping Districts of Seoul. Journal of Asian pacific planning review, 44 (5), pp.59-70.

6. Kim, J. E. et al. (2004) A Study on the formation of streetscape image by the billboard color design. The Architectural Institute of Korea Planning & Design, 20 (1), pp.7-14.

7. Kim B. Y. et al. (2006) A Study on Color Identity of Domestic Apartment Brand. Journal of Korea Society of Color Design Studies, 2 (3), pp.73-84.

8. Lee, J. S. et al. (1993) Studies on Color Scheme of City Street Buildings. Proceeding of conference in architecture of Korea, 14 (1), pp.21-28.

9. Lee, M. O. et al. (2010) Regional Characteristics of the Visual Representation of Outdoor Advertising Signboard - A Case Study of Korean-Chinese focused on Commercial Area. Journal of Integrated Design Research, 9 (2), pp.91-100.

10. Magill, A.W. et al. (1986) A color measuring system for landscape assessment. Landscape Journal 5 (1), pp.45-54.

11. Parry, M. et al. (1944) Geometric formulation of classical colour harmony. Journal of the Optical Society of America, 34 (1), pp.46-59.

12. Park, S. Y. (2008), Research on Urban Signboard Design Problem and its: Focused on Dongseongno Street, Jung-gu Daegu. Masters thesis, University of Gyemyung.

13. Rudorf, A. (1954) Art and visual perception, USA: University of California Press.

14. Seo, M. K. et al. (2012) A Study on Conversion Franchising Strategy: The Case of Nadle-Gagae. Korean Franchise Administration Research, 2, pp.74-99.

15. Song, M. J. et al. (2008) Analysis on the Present Condition and Problems of the Signboard's Colors in Korean Commercial Centers. Journal of the Korean Society of Design Culture, 14(1), pp.163-173.

16. Sim W. J. (2014) The History and Status of 'Mom and Pop Store', Seoul: The Society of Practice Folkloristics. The Study of Practice Folkloristics, 24, pp.89-125.

17. Yeo, H. S. et al. (2013) Research landscape information based on the color of the rural environment - A case of Incheon city Gyeonggi-do. Journal of Digital Design, 13(3), pp.393-402.