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Cross-cultural variation of color preferences

Abstract. *Color plays an important role in life, which affects our perception, shifting meanings of symbols, emphasizes or suppresses communication of pictograms, logos, brands, acts of emotional perception, affects mood. Color is very important for designers; graphics, artists, and it can significantly affect the acceptance of the artwork, merchantability or relationship to the artwork. It is important to know how the color affects the humans. For pictograms there is a tendency to place priority on shape to color. But sometimes the similar pictograms have different meanings when the color is added. This is the same for design, for example great chandelier can cause a calming effect or support activity only with a change of color. Correct use of color helps with orientation in symbols, e.g. pictogram for hot and cold water or designation of toilets is understandable with color. Conversely, wrong use color can confuse. The purpose of this project is, a) relationship of colors and words; which color people associate with certain words; b) influence of culture on word and color association. In this article were tested the habits of Czech, Japanese and Russian nation. Among the concepts evaluated were found to group words, which are characterized by strong emotional attachment to the expressions given by the change in both cultures, similarities respectively.*

Keywords: Colorimetry, color association, color emotions, psychology.

Introduction

The power of color comes from its symbolic meaning for the people. Colors can represent experiences, emotions, status, and other types of information that are difficult to convey in written or spoken language. Modern industrialism and a well-developed technology have made it possible, even necessary, to color our surroundings. We now use color everywhere as an environmental factor similar to e.g. shape and pattern Colors evokes different emotional reactions. Although some reactions are subjective, colors have common characteristics, which coincides with most people. Personal preferences, memories or associations affect color perception. There is no standard for designers and graphic designers, which would determine the correct use of color.

In the conceptual phase of the design process, line diagrams are used to represent an abstract relationship of the essential parts of a building. These parts can be described metaphorically or formally. The relationship and juxtaposition of these parts to one another creates the generative idea that is the concept and point of departure for the design. These drawings are usually monochromatic. If one assigns color to the parts in these diagrams representing, in the designers' eyes, the character of the part, then color contrasts or juxtapositions between the parts will represent the dynamic relationship of the parts. Red/blue contrasts may be active/passive; saturated hues may dominate, and muted hues subordinate. These new juxtapositions can represent events in the experience of architecture, i.e. hierarchy, opposition, separation, connection, transition and assimilation. The color choices in the conceptual phase, although abstract and diagrammatic, will begin to influence choices in lighting, materials, and surfaces that continue throughout the design process [1].

An application of colors is on their emotion and intuition. Color can impact state of mind, change moods, and uplift the spirits. Color may also change our perceptions of some physical qualities in our environment, such as thermal comfort. The physical environment includes elements such as layout, interior architecture and décor, lighting, music, aromas and cleanliness. Researchers have found that the colors have certain behavioral connotations, and when used in a resourceful and dynamic manner within the designed environment, can influence the users' mental and emotional balance [2].

This work aims to approach the color selection process from a methodological context to clarify the relationship between color and information. Pictograms facilitate communication between people with different languages and cultures. Although the importance attaches particular shape of pictogram, color is the main thing that will affect the final information [3]. The purpose is to determine whether it is possible to set a uniform standard that will be possible to use, e.g. for pictograms, in design and generally in communication. This test also examines the impact of culture on the perception of information, which associates a color. Culture is one of the most important factors that influence the words and color associations. We can describe our culture's with general color associations. It has been no meaning a description to be memorized and taken as "gospel." Color psychology is complex, which affected by many considerations, but if you can combine this information with a light hand and sensitive eye, it may prove to useful. The purpose of this study was to examine the roles of consumer emotional responses, attitude towards to apparel shopping, and subjective norms in social influence, individual differences and demographic factors for Czech and Russian consumer apparel purchase intentions and their actual purchase behavior.

Materials and methods

For this research, we were using 56 words in 28 pairs. Those words are listed in Table 1. These words are taken from the previous survey Michiko Iwata, Research on the Adaptation to the Sign of the Color Image Result of the Laboratory Experiment, Setsunan University [4].

Words in the survey were selected for frequently used in our daily life and are recognizable to anyone. For this purpose, we used a standard textbook by Japanese to foreigners [5], which was chosen by these 56 words.

PCCS was developed by the Japan Color Research Institute in 1964, based on psychological elements. The psychological intervals of individual attributions (hue, lightness, and saturation) are constant. The feature of the PCCS is "Hue–Tone system." Tone consists of lightness (value) and saturation (chroma). Color is usually represented by three attributes—hue, value, and chroma—but the PCCS can represent a color by two attributes, hue and tone, hence the name "hue–tone system." [6]

Table 1. Couples of antonymous words

No	Antonymous words		No	Antonymous words	
1	Up	Down	15	Open	Close
2	Push	Pull	16	Clean	Dirty
3	Get on	Get off	17	Bright	Dim
4	Off	On	18	Fast	Slow
5	In	Out	19	Near	Far
6	Comfortable	Uncomfortable	20	Occupied	Vacant
7	Warm	Cool	21	Dry	Wet
8	Young	Old	22	Depart	Arrive
9	Heavy	Light	23	Big	Small
10	Safety	Danger	24	Move	Stop
11	Allow	Deny	25	Good	Bad
12	Many	Few	26	Man	Woman
13	Sweet	Bitter	27	Strong	Weak
14	Necessary	Unnecessary	28	Noisy	Quiet

Used chromatic colors are divided by the three attribute of color and 12 hues that have the even numbers in the 36 hues circle were chosen as listed in the Table 2, followed by 5 achromatic steps. The names of these colors were referred as yellow, yellow-green, green, green-blue, blue-green, blue, blue-purple, purple, red-purple, red, red-orange and yellow-orange in the numeric order in the table which shown in Figure 1:

	Colour	A	B	C	N
1	Yellow	1A	1B	1C	1N
2	Yellow-green	2A	2B	2C	2N
3	Green	3A	3B	3C	3N
4	Green-blue	4A	4B	4C	4N
5	Blue-green	5A	5B	5C	5N
6	Blue	6A	6B	6C	
7	Blue-purple	7A	7B	7C	
8	Purple	8A	8B	8C	
9	Red-purple	9A	9B	9C	
10	Red	10A	10B	10C	
11	Red-orange	11A	11B	11C	
12	Yellow-orange	12A	12B	12C	

Fig.1. A set of color used in the test

These 36 chromatic colors were arranged into three colored circles (A, B, C) according to their saturation and brightness. Trinity colored circles added N scale of five achromatic colors run the gamut from black to white at the bottom to the top in form of colored square chips in a 2cm widdth, as shown in Figure 2:

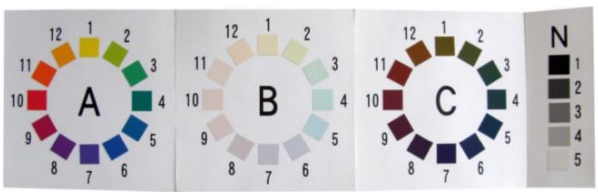

Fig.2. Arrangement of color used in the test

Colorimetric parameters of used samples are illustrated

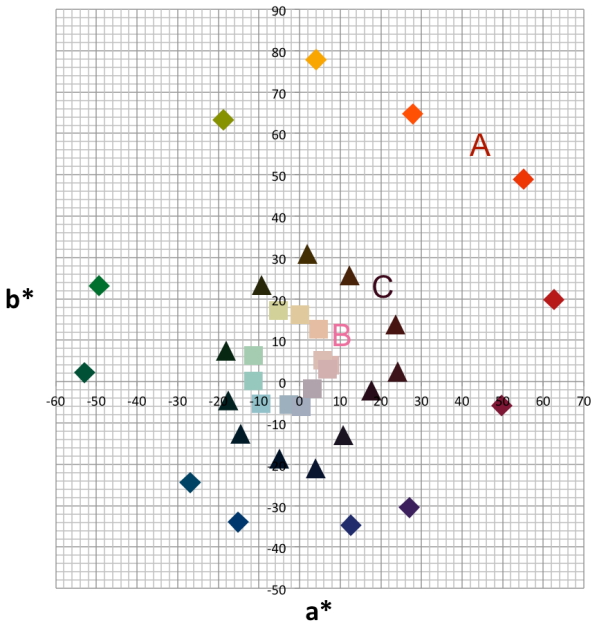

Fig.3. Arrangement of colored chips on chromaticity plane of CIELAB color space

Voluntarily participated in the survey overall 40 respondents, who were composed of 25 women and 15 men ranging in age from 17 to 73 years. Most respondents came from the Northern region of the Czech Republic. An eight people created a comparative group of Russian people in age from 17 to 35 years, all were women's, in most cases they were academically educated people or college students. The overall average in the survey respondents marked the colors 3.81 per word.

For proper visual conditions were used colorimetric cabinet ICS-Texicon Multilight Light Cabinet. For all respondents, was used by a light source D65.

Each respondent was explained for what purpose of the survey, the reason why is used colorimetric cabinet and how to fill out a questionnaire sheet. The color chart was presented to the respondent into the colorimetric cabinet, which was located in a quiet room without interfering light sources. Furthermore, respondent had blank questionnaires available to individual words and black and white circles in the PCCS diagram. The survey was not limited by time, also not limited by the number of colors associated to the individual words.

Results and discussion

The most frequent association of the words was assessed in terms: hot, stop, go, deny, clean, cold, dangerous, man, woman and occupied in Czech research. These terms have been selected as the highest compliance of the respondents in the marked color. Of these ten expressions is 6 words associated with the bright red color of the A10 (hot, stop, deny, dangerous, woman and occupied). Association for the "go" is determined by bright green color (A3). The "man" is associated with a bright blue color (A6). The term "cool" is the only one on this list mentioned a pale shade of blue (B6). White achromatic color is represented conceived clean (N5).

With these concepts is given a strong attachment to the color shades. If these colors are used in some form of marking, they should clearly express the necessary

communications and attract the necessary attention. These linkages should be mainly in the Czech conditions strongly rooted in our subconscious. Among the concepts evaluated were found to group words, which are characterized by strong emotional attachment to the expressions given by the change in both cultures. Generally, we can say that respondents from Russia (RU), which were coincidentally all women, have scattered answers, while the Czechs (CZ) are more consistent. CZ answers are very similar to ingrained words; RU answers are similar only in some cases.

Radial graphs are used for presentation of weighted frequency by factor 0.4 of associations with specific colors due to better visibility of effect. For example in graphs in Figure 3a are shown weigted frequencies of associated colors with word “warm” were are documented associations with “warm” colors red, red-purple and red-orange. Highest frequency was for red color 12 units means 30% frequence of positive answers for this color.

As was mentioned before, the most striking results are for words “warm – cold; young – old” there is bilateral agreement; see Figure 3, for word “warm” and Figure 4 for “cool”, where also were significant answers relating to pale colors.

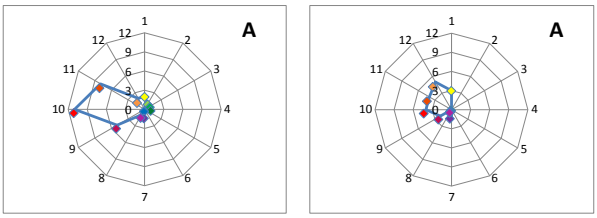

Fig.3. WARM, a) CZ answers; b) RU answers

It is visible that word “warm” was associated only with colors from group A – saturated colors contrary to word “cool”, which was represented by pale and saturated color with similar frequence and blue-green shade.

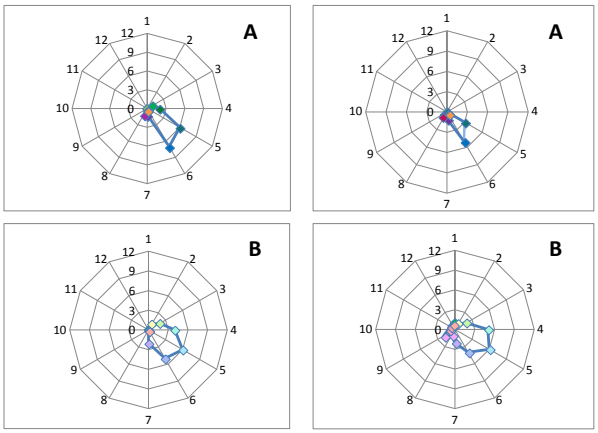

Fig.4. COOL, a) CZ answers; b) RU answers

For a pair of words “warm – cool” is a clearly visible automatic selection of opposite colors blue - red. Blue color in vivid and pale sampler is dominant for both cultures for word “cool”. Czechs and Russians chose the red color for “warm” but Czechs choice was more explicit. In contrast, for pair “move – stop” were selected complementary colors. In this case colors green and red. The answer for word “stop” is supplemented by an achromatic color chart. Again, the answers are more explicit for Czech respondents.

Pairs of words “good – bad; man – woman; move – stop” have only CZ very similar answers, see Figure 5. Where is the example “move” and Figure 6. where is the word “stop” represented.

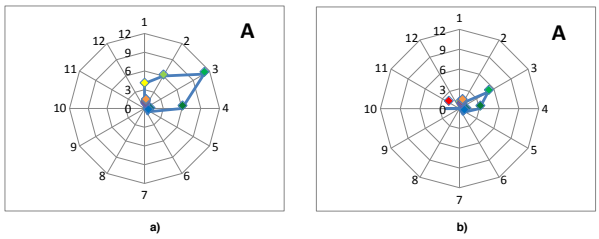

Fig.5 MOVE, a) cz answers; b) ru answer

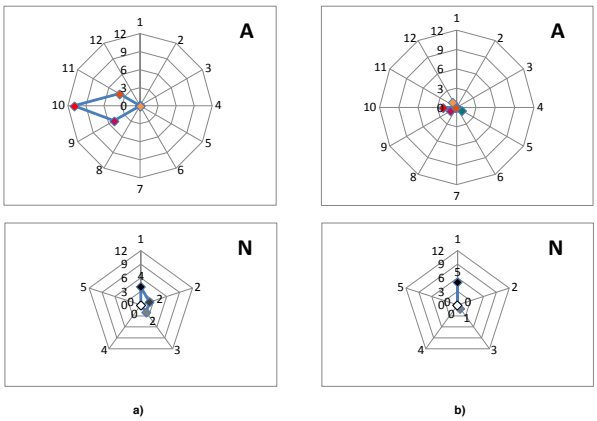

Fig.6. STOP, a) cz answers; b) ru answers

In contrary to graphs on Figure 4 there are visible associated answers in grey scale. That is interesting, because graphs on Figures 5 and 6 show strong relations to traffic light [4]. Here is clearly seen similarity between the answers of the Czechs and Russians for a pair of words “move – stop”. The only difference is that the Czechs are more consistent in their responses while the Russian responses are not so uniform. It´s interesting that for this pair of words Russians haven´t clear answers. Clearly complementary colors have been chosen by Czech respondents, Russian respondents chose similar colors for both words.

Into Figures 7 and 8 is seen a clear agreement for selecting the color swatch – pale colors. Still, we can say that both cultures perceive this pair of words equally and generally choose the same color. Here is a difference between “dry” and “wet”, the association is stronger for “wet” word that most people associate with the word “water”, while the word dry is evaluated more subjectively, as is evident from diffuse answers.

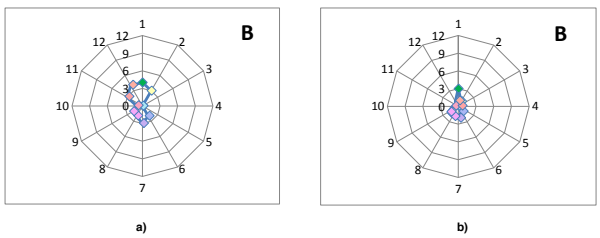

Fig.7. DRY, a) cz answers; b) ru answers

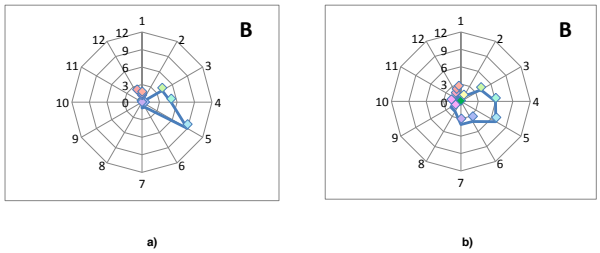

Fig.8. WET, a) cz answers; b) ru answers

Between groups of highly subjective associations may include terms such as: get off, many, big, small and comfortable for example. In these terms dominates no strong consensus in the selection of specific colors. For some subjectively chosen words regarding conformity with saturation. Prevails here the choice of pale or saturated shades. In contrast to the color associations with dominant match, here occurred mostly bright colors.

Conclusion

Some respondents thought too, and not selected color purely on the basis of associations. Therefore, it might be appropriate to reduce testing time. It often happened that the respondent chose all the colors of one group, which distorts the result; even number of selected color should be limited. Testing will continue to expand test group and the results will be more evident. The testing will be continuing with other nationalities later. It would be also good for divided test group into three categories according to age. It is generally believed that older people are choosing more pastel colors and young people tend to vivid colors. Differences in results between Russian and Czech respondents aren't so strong as between Czech and Japanese respondents [7], where found significant cultural differences were in terms such as "go" or "off". For the word "go" Czech respondents most often chose a green shade A3, the strong consensus is associated with the color of traffic signs, when green traffic light allows going-on in driving. On the contrary, on the Japanese territory is this traffic command represented by blue light. This option is mainly found in men, while most Japanese women have opted for red and reddish-orange, this phenomenon may point to the fact that men in Japan are much more affected than women by road markings, which are primarily traditional female role. Also, the term "off" is an interesting cultural difference. The result is between Czech, Russian and Japanese research completely contradictory. Here Czechs and Russians elected achromatic black color, probably with a connection to dark and end. By contrast, Japanese respondents clearly identified achromatic color white. This fact can be explained by the fact that historically has this color symbolized by leaving and end.

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REFERENCES

[1] Minah, G: Colour as Idea: The Conceptual Basis for Using Colour in Architecture and Urban Design, *Colour: Design & Creativity* (2) (2008): 3, 1–9

[2] Wells, W. V., Need, A. L., & Crowell, N. Color connotations: A study of color block testing, *Journal of Interior De- sign*, 6(1), (1979), 56-59.

[3] Iwata, M.: Study on the impacts that multiple factors attributed to room temperature and surrounding colors have on psychological and physiological evaluations, *International Conference on Colour Emotion Research and Application*, Kyoto Institute of Technology, Japan, November 14-15, 2009

[4] Iwata, M. *Research on the adaptation to the sign of the colour image*. Japan, 2007. 7 p. Referat Setsunan University.

[5] Akiyama, N., Akiyama, C.: Japanese and English Idioms - Completely Bilingual - Commonly used Japanese and English idioms illustrated with sample sentences, Barron's, New York. 1997, ISBN: 4-925080-00-8

[5] Wakata, T., Saito, M: The impression of hue in Practical Color Coordinate System (PCCS), *The 1st Asia Color Association Conference: ACA THANYA 2013: Blooming Color for Our Life* 11 - 14 December 2013, in Thanyaburi, Thailand

[6] Vodickova, R, Vik, M, Vikova, M: *Words and Colour Associations*, available at https://www.researchgate.net/publication/260206347_Words_and_Colour_Associations

[7] Jansen, Harrie (2010). The Logic of Qualitative Survey Research and its Position in the Field of Social Research Methods, Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, 11(2), Art. 11, http://nbn-resolving.de/urn:nbn:de:0114-fqs1002110.

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