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**Colour temperature in advertising and its impact  
on consumer purchase intentions**

**JEL Classification:** M31; M37

**Keywords:** *advertising; behaviour economics; consumer behaviour; structural equation modelling*

**Abstract**

**Research background:** The conditions of globalization lead to a situation where consumers are overloaded with commercial information. Moreover, abundance of various promotional techniques makes consumers indifferent to many companies' efforts. On the other hand, organizations are allocating tremendous parts of their budgets to create advertisements which sometimes remain unnoticed or do not stimulate consumer purchase intentions. Therefore, a wide body of scientific re-search on advertising effectiveness has emerged in recent years. Many aspects of advertising have been analysed, e.g. the effectiveness of advertising spokesperson, appeal, layout, etc. However, the research on advertising colour temperature and its impact on advertising effectiveness is still scarce.

**Purpose of the article:** Considering the intensifying competition in the retail sector, creating attractive and stimulating advertisements becomes an important task for many organizations. The aim of this research is to determine the impact of the colour temperature used in advertisements on consumer purchase intentions.

**Methods:** In order to determine the impact of advertising colour temperature on consumer purchase intentions, a questionnaire survey was provided. The questionnaire was elaborated based on the analysis and synthesis of scientific literature.

**Findings & Value added:** The theoretical analysis substantiated the different influence of colours and colour temperature on consumer perception. Therefore, the assumption was made: all other parameters being constant, the colour temperature of an advertisement might have a different impact on consumer perception. The results of empiric research revealed the differences of the impact of colour temperature on consumer purchase decisions in terms of an attitude toward advertising and the brand, reported brand-related behaviour. The colour temperature related to insights for the enhancement of advertising effectiveness and guidelines for future research are provided.

## Introduction

Colour is a dominant visual feature affecting consumer perceptions and behaviours (Kareklas *et al.*, 2014, pp. 87–95). Giving us different impressions of objects that we see, colour shapes human perceptions of the world in which we live (Lee & Barnes, 1989, pp. 25–30). Colour is light carried on wavelengths absorbed by the eyes that the brain converts into colours that we see; light can be decomposed into a spectrum of six distinct colours: red, orange, yellow, green, blue, and violet (Singh, 2006, pp. 783–789). Light enables vision, but also plays an important role in our physiological and psychological functioning — regulation of sleep and wakefulness, alertness, cognition, and mood (Smolders & de Kort, 2017, pp. 80–93); being refreshing, mysterious, exotic, or pure colour can excite or calm (Lee & Barnes, 1989). Moreover, Michael *et al.* (2010, pp. 418–428) emphasize that specific sensations are frequently associated with specific colours (e.g., green is frequently associated with mint flavour, mint taste and cooling nasal and palatal sensations), and early and long-lasting exposure to these associations produces cross-modal correspondences and is responsible for colour-induced changes on other sensory modalities.

Singh (2006) states that psychologists have classified colours into warm (red and yellow) and cool (blue and green); moreover, the distinction between warm and cool colours is relative, depending on the context of exposure. Moreover, colour, as an aspect of appearance has to be within an expected range of acceptance and the degree of acceptability is judged within that range (Garitta *et al.*, 2013, pp. 48–52).

Previous research (see: Pilelienè *et al.*, 2016, pp. 107–116) enabled to conclude that the proper selection of colours can stimulate impulsive buying behaviour, while inappropriately selected colours can decline sales; moreover, damage the image of the company. Nevertheless, research regarding the impact of the colour temperature of advertising image on con-

sumer perception is scarce. Hence, this research provides a significant and novel contribution to the field of marketing and particularly advertising, by solving a scientific problem: what is the impact of the colour temperature of advertising image on consumer perception? The aim of this research is to determine the impact of the colour temperature used in advertisements on consumer purchase intentions.

## **Research methodology**

Considering the idea that colours might have certain psychological effects on consumers (Patil, 2012, pp. 60–73), colours used in advertising are gaining their attention by researchers worldwide. Ben-Zeev and Dennehy (2014, pp. 486–489) divide colours into feminine and masculine, providing the idea of colour-object congruence. According to the idea, it could be assumed that gender-specific colour usage might enhance or weaken product's perception as feminine /masculine. Analysing colour temperature, Patil (2012) emphasizes that warm colours lean towards activity, and cold colours are passive. Moreover, stating that colour is also known to influence the perception of temperature, Suzuki *et al.* (2017) support the idea that colours can be categorized in accordance with their temperature: red and yellow as warm colours, and blue and green as cold colours. Colour temperature is often measured in Kelvins (K) and lightning is classified according to colour temperature, into the three following groups: Warm (2900 K), White (4200 K) and Cool (6000 K) (Kapogiannatou *et al.*, 2016, pp. 135–140).

In order to substantiate the different impact of advertising colour temperature on consumer reactions, the decision was made to compare consumer reported behaviour after viewing an advertisement with warm versus cool colours. The partial least squares structural equation modeling (PLS-SEM) is preferred and applied in this research in order to test the impact of the colour temperature used in advertisements on consumer purchase intentions because of the non-normally distributed data and small sample size. Grounded in the theoretical framework, three latent variables constitute the general research model provided in Figure 1 below.

The same model is applied for two segment-specific cases (advertisement which colour temperature is 3000 K and advertisement which colour temperature is 6000 K). Consequently, statistical testing of the general model and of the latter cases will allow to determine the impact of advertisement colour temperature on consumer purchase intentions.

Three latent variables are measured by manifest variables. The mode of the measurement model is reflective. Attitudes were measured on semantic differential scale and 7-point Likert scale was used to measure purchase intentions regarding brands presented in the advertisements with different colour temperature. Manifest variables for three latent variables are provided in Table 1 below.

Hence, these measures were included into the questionnaire as well as demographic questions (age and gender). Moreover, half of the questionnaires contained colourfully-printed advertisement whose colour temperature was 3000 K, and half of the questionnaires contained colourfully-printed advertisement whose colour temperature was 6000 K. Except for the colour temperature, advertisements were the same — the same picture of widely known female celebrity and the same picture of a product (mineral water was chosen to represent the category of fast-moving-consumer-goods) with the unknown brands presented on the product (brands were not existing, created for the experiment only, and both brands differed just in one letter) in order to eliminate the influence of the pre-existing attitudes toward the known mineral water brands. The positions of the spokesperson and the brand in the advertisements were the same as well.

The questionnaire research was provided in Lithuania, Vytautas Magnus University, February-March, 2017. The total sample size was 70 (48 percent of male; respondents were in the age group of 18–29 years). 35 of the respondents saw the advertisement whose colour temperature was 3000 K and filled the questionnaire regarding that advertisement; 35 of the respondents saw the advertisement whose colour temperature was 6000 K and filled the questionnaire regarding that advertisement.

As it is suggested using a minimum sample size of ten times the maximum number of paths aiming at any construct (Hair *et al.*, 2012, pp. 414–433) and three paths are analyzed in this research, hence, the sample of this research is considered appropriate to reach the aim of the article.

Descriptive and inferential statistical analyses were applied in this research. Moreover, structural equation modelling (SEM) using partial least squares (PLS) path modelling methodology was applied for statistical analysis; in order to assess whether segment-specific path coefficients differ significantly, PLS path modelling multi-group analysis (PLS-MGA) was presented. IBM SPSS Statistics V.20 and SmartPLS V.3 (Ringle *et al.*, 2015) software products were used for the statistical analysis of the research results.

## Research results

The analysis of research results reveals that attitude toward the advertisement whose colour temperature is warm (3000 K) is generally more positive than attitude toward the advertisement whose colour temperature is cool (6000 K) (see Figure 2 below). As it can be seen, advertisement whose colour temperature is 3000 K is evaluated as more interesting, important, appropriate, useful, informative, persuasive, relevant, effective, and good. On the other hand, advertisement whose colour temperature is 6000 K is evaluated as more pleasant and attractive. Nevertheless, the average score of the attitude towards the advertisement is better regarding advertisement whose colour temperature is 3000 K.

When analyzing the attitude towards the brand presented in the advertisement whose colour temperature is 3000 K and attitude towards the brand presented in the advertisement whose colour temperature is 6000 K (Figure 3), it could be observed that the attitude towards the brand presented in the advertisement whose colour temperature is 3000 K is generally more positive than attitude toward the brand presented in the advertisement whose colour temperature is 6000 K. Brand, presented in the advertisement whose colour temperature is 3000 K is evaluated as of better quality, more reliable, good, valuable, recommended for others, advantageous, important, superior, positive, and effective. The brand presented in the advertisement whose colour temperature is 6000 K is evaluated as more attractive and exclusive. Hence, the average score of attitude towards the brand presented in the advertisement is better regarding advertisement whose colour temperature is 3000 K.

As it can be seen from Figure 4 below, the intention to try / buy / recommend the brand presented in the advertisement whose colour temperature is 3000 K is much higher compared to the intention to try / buy / recommend the brand from the advertisement whose colour temperature is 6000 K. Accordingly, the average score of the intention to try / buy / recommend the brand presented in the advertisement is better regarding the advertisement whose colour temperature is 3000 K.

As the data of the questionnaire research are non-normally distributed, Mann-Whitney Test is applied in order to evaluate the differences between two independent samples (see Table 2). As it can be seen, the attitude toward the advertisements differs statistically significantly regarding only one attribute — advertising informativeness. Warm advertisement whose colour temperature is 3000 K appears statistically significantly more informative than advertisement whose colour temperature is 6000 K. Regarding all of the remaining attributes of the attitude towards the advertisement,

there are no statistically significant differences in the evaluations.

When analyzing the attitude towards the brand presented in the advertisements of different colour temperature, it could be seen that the brand presented in the advertisement with colour temperature of 3000 K appears statistically significantly of better quality than brand presented in the advertisement whose colour temperature is 6000 K. Despite this, the difference in evaluating all of the remaining attributes regarding the attitude towards the brand presented in the advertisement whose colour temperature is 3000 K and the attitude towards the brand presented in the advertisement whose colour temperature is 6000 K is statistically non-significant.

Finally, when analyzing the intention to positively behave regarding the brand presented in the advertisements of different colour temperature, it can be seen that the intention to try as well as the intention to buy the brand presented in the advertisement whose colour temperature is 3000 K is statistically significantly higher when compared to the intention to try as well as the intention to buy the brand presented in the advertisement whose colour temperature is 6000 K. Moreover, the intention to recommend the brand presented in the advertisement whose colour temperature is 3000 K is statistically significantly higher when compared to the intention to recommend the brand presented in the advertisement whose colour temperature is 6000 K.

In order to determine the impact of the colour temperature used in advertisements on consumer purchase intentions, path coefficients are analyzed. Before the analysis of path coefficients, validity and reliability of the model is tested and approved. As it can be seen from Table 3, general model reveals that attitude towards the advertisement has statistically significant positive influence on the attitude towards the brand and on the purchase intentions; moreover, attitude toward the brand has statistically significant positive influence on purchase intentions.

Based on the sequence *attitude toward the advertisement — attitude toward the brand — purchase intentions*, segment-specific models are generated and their validity and reliability is approved. Furthermore, an analysis of path coefficients by segment-specific groups based on the provided advertisements with different colour temperature is applied.

As it can be seen, in the case of the advertisement whose colour temperature is warm (3000 K), the attitude towards advertisement has statistically significant positive influence on the attitude towards the brand, and the attitude towards the brand has statistically significant positive influence on purchase intentions. Nevertheless, the influence of the attitude towards advertisement on purchase intentions is statistically non-significant. Hence, the assumption can be made that the attitude towards advertisement influ-

ences purchase intentions indirectly, through attitude toward brand.

On the other hand, in the case of the advertisement whose colour temperature is cool (6000 K), the attitude towards advertisement has statistically significant positive influence on the attitude towards the brand. Despite this, the influence of the attitude towards advertisement on purchase intentions, and the influence of the attitude towards advertisement on purchase intentions are statistically non-significant.

Even though the differences in path coefficients are statistically non-significant, the obtained results substantiate previously generated results. Advertisement whose colour temperature is 3000 K evokes more positive attitude towards it. As the attitude towards the advertisement influences the attitude towards the brand, the brand presented in the advertisement whose colour temperature is 3000 K evokes more positive attitude towards that brand. Finally, as the attitude towards the brand influences purchase intentions, the brand presented in the advertisement whose colour temperature is 3000 K elicits statistically significantly higher purchase intentions. Contrarily, in the case of the advertisement whose colour temperature is 6000 K, none of the analyzed variables influence purchase intentions; hence purchase intentions are relatively low and the proportion of variance explained by the fit regarding purchase intentions of the brand presented in the advertisement which colour temperature is 6000 K is comparatively little. Consequently, an assumption can be made that purchase intentions regarding the brand presented in the advertisement whose colour temperature is 6000 K are not influenced by the colour temperature used in advertisements.

## **Conclusions**

The analysis of the research results reveals that colour temperature used in advertisements has significant impact on consumer purchase intentions. Based on the results, specific colour temperature (in this case — 3000 K) can generate more positive attitude toward the advertisement, which positively influences attitude towards the brand presented in that advertisement. The attitude towards the brand, in turn, positively influences consumer purchase intentions. Another specific colour temperature (in this case — 6000 K), under the same other conditions, can generate less positive attitude towards the advertisement, and neither the attitude towards the advertisement nor the attitude towards the brand influence consumer purchase intentions. Consequently, the right selection of the specific colour temperature used in the advertisements can enhance the possibility of creating effective marketing communication messages.

The limitation of the research is the use of only one product — mineral water, for the analysis. The possibility exists that in the case of other products representing the category of fast-moving-consumer-goods, or in the case of other products' categories the results can be substantially different. The other limitation of current research is the choice of female as a spokesperson. Based on the evidence from scientific literature that colour temperature might be gender-specific, the results of current research are to be applied as substantial only for advertisements with a female spokesperson. Hence, the limitations of this research become the direction for future research. Moreover, the direction for future research is the use of different advertising content for the analysis of the impact of the colour temperature used in advertisements on consumer purchase intentions.

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## Annex

**Table 1.** Manifest variables

Attitude toward the advertisement	Attitude toward the brand	Purchase intentions
dull / interesting	low quality / high quality	intention to try
unpleasant / pleasant	unreliable / reliable	intention to buy
not important / important	bad / good	intention to recommend
unattractive / attractive	worthless / valuable	
inappropriate / appropriate	unattractive / attractive	
not useful / useful	not recommended / recommended	
not informative / informative	not distinctive / exclusive	
not persuasive / persuasive	disadvantageous / advantageous	
irrelevant / relevant	insignificant / important	
ineffective / effective	inferior / superior	
bad / good	negative / positive	
	ineffective / effective	

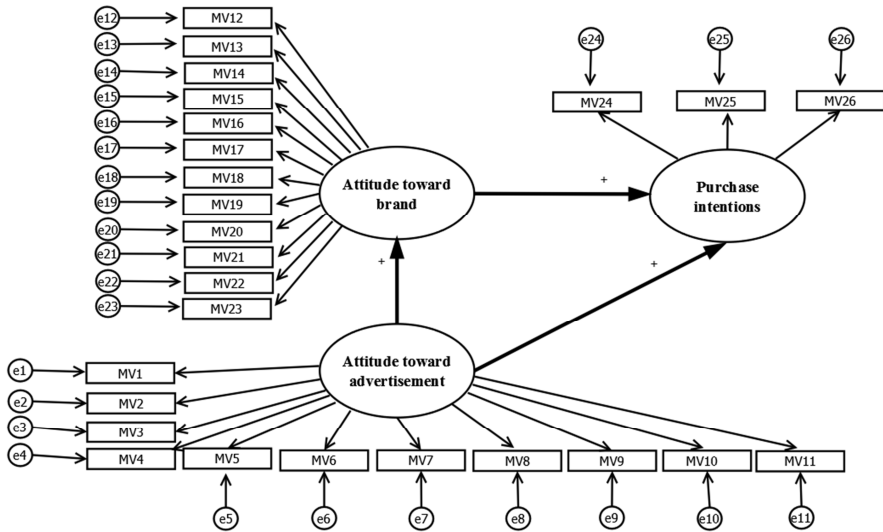
**Table 2.** Results of Mann-Whitney test

Statistics	Attitude toward advertisement				Attitude toward brand				
	Mann-Whitney U	Wilcoxon W	Z	p-value	Statistics	Mann-Whitney U	Wilcoxon W	Z	p-value
Interesting	525.5	1155	-1.04	0.298	Good Quality	446.5	1076	-1.97	0.048
Pleasant	587.5	1217	-0.30	0.764	Reliable	580.5	1210	-0.38	0.702
Important	504.5	1134	-1.29	0.197	Good	588.5	1218	-0.28	0.774
Attractive	589.0	1219	-0.28	0.779	Valuable	580.0	1210	-0.38	0.697
Appropriate	521.0	1151	-1.08	0.276	Attractive	611.5	1241	-0.01	0.991
Useful	488.0	1118	-1.49	0.135	Recommended	554.0	1184	-0.70	0.482
Informative	451.5	1081	-1.98	0.047	Exclusive	549.0	1179	-0.75	0.448
Persuasive	452.5	1082	-1.93	0.054	Advantageous	545.0	1175	-0.81	0.418
Relevant	483.5	1113.5	-1.54	0.124	Important	470.0	1100	-1.70	0.089
Effective	434.0	1064	-2.12	0.033	Superior	601.5	1231	-0.13	0.896
Good	531.0	1161	-0.98	0.325	Positive Effective	554.5	1184	-0.72	0.471
						595.0	1225	-0.20	0.835
Intentions									
Statistics	Mann-Whitney U	Wilcoxon W	Z	p-value					
To try	395.0	1025	-2.61	0.009					
To buy	346.5	976.5	-3.29	0.001					
To recommend	370.5	1000	-3.04	0.002					

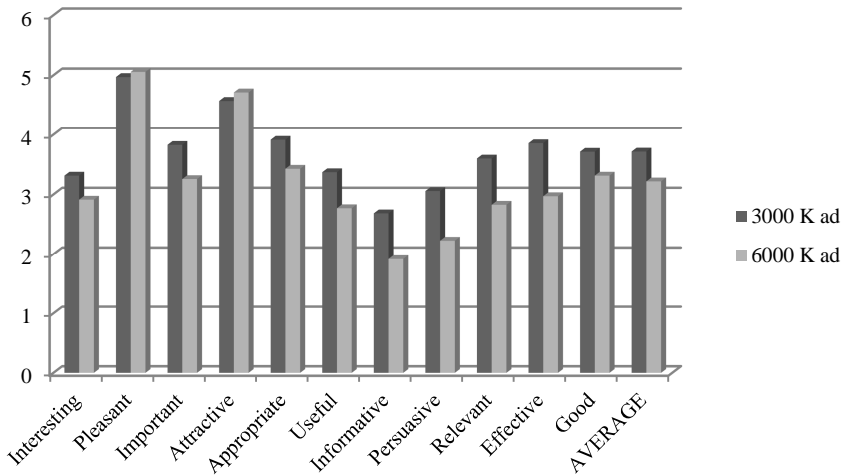
**Table 3.** Path Coefficients for general model and for groups by advertisements of different colour temperature

General model						
Variables	Path Coefficient	T Statistics	p-value	R <sup>2</sup>		
Attitude toward advertisement -> Attitude toward brand	0.758	13.379	0.000	Attitude toward brand: 0.575 Intentions: 0.494		
Attitude toward advertisement -> Intentions	0.391	2.969	0.003			
Attitude toward brand -> Intentions	0.359	2.834	0.005			
Models by advertisements						
Variables	Segment-specific model for 3000 K advertisement		Segment-specific model for 6000 K advertisement		T (multi-group analysis)	
	Path Coefficient	p-value	Path Coefficient	p-value	Path Coefficient	p-value
Attitude toward advertisement -> Attitude toward brand	0.821	0.000	0.694	0.000	0.127	0.216
Attitude toward advertisement -> Intentions	0.264	0.121	0.403	0.061	0.139	0.607
Attitude toward brand -> Intentions	0.512	0.003	0.320	0.184	0.192	0.512
R <sup>2</sup> Attitude toward brand	0.674		0.481		-	
R <sup>2</sup> Intentions	0.553		0.444		-	

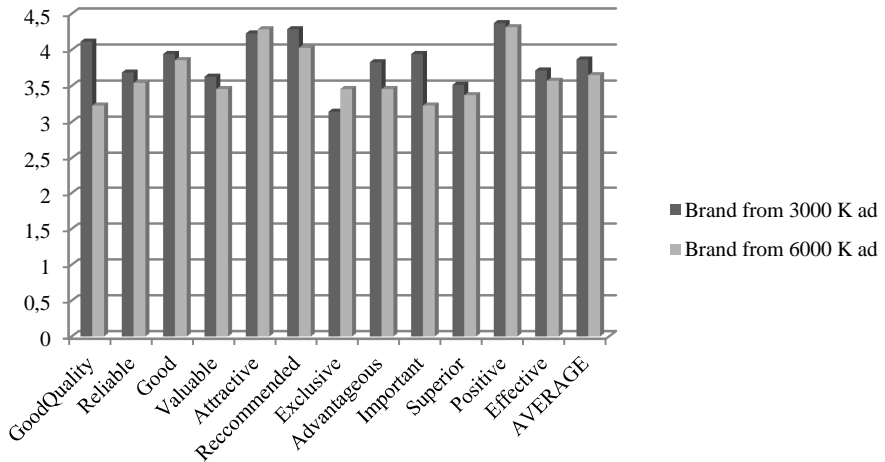
**Figure 1.** Research model



**Figure 2.** Attitude towards advertisements of different colour temperature; Cronbach's Alpha: 0.940 (3000 K ad) and 0.917 (6000 K ad)



**Figure 3.** Attitude toward brands presented in the advertisements of different colour temperature; Cronbach's Alpha: 0.923 (3000 K ad) and 0.922 (6000 K ad)



**Figure 4.** Intention to buy brands presented in the advertisements of different colour temperature; Cronbach's Alpha: 0.941 (3000 K ad) and 0.883 (6000 K ad)

