International Journal of Management, Accounting and Economics
Vol. 3, No. 8, August, 2016
ISSN 2383-2126 (Online)

www.ijmae.com

Effect of Visual Advertising Complexity on Consumers' Attention

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Abstract

The main mechanism of market economy – competition – has forced organizations to search factors influencing advertising effectiveness. Relying on the maxim "unseen – unsold", the visual impression of advertising becomes crucially important. First visual impressions do often influence mid- and long-term human behavior and are influenced by factors such as context or visual complexity. The aim of this research is to determine the effect of visual layout complexity of advertising on consumers' attentional resources engaged in processing an advertisement as well as evaluation and classification time of the advertisement regarding different levels of visual layout complexity. To reach the aim of the article, P300 event-related brain potential is recorded and analyzed. In the context of visual complexity of advertising, recording and analysis of P300 component reveal whether high visual advertising complexity leads to more attentional resources engaged in processing an advertisement as well as whether advertisement with high visual complexity is evaluated and classified slower. Moreover, questionnaire research is provided for the participants in order to assess the differences in attitudes towards the brands advertised with different layout complexity levels. As a research results, the effect of visual advertising complexity on cognitive processes such as attention allocation and its influence on the attitude toward the object is revealed and the managerial implications for creating effective advertising are provided.

Keywords: Advertising, complexity, electroencephalography, evoked potentials, P300, visual attention.

Cite this article: Pilelienė, L., & Grigaliūnaitė, V. (2016). Effect of Visual Advertising Complexity on Consumers' Attention. *International Journal of Management, Accounting and Economics, 3(8)*, 489-501.

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Introduction

The impact of advertising complexity on consumers' attention has been discussed among marketing scholars and practitioners for a long time. Moreover, it is broadly recognized that different kinds of complexity exist. The three primary frameworks where advertising complexity is analyzed are verbal, visual, and informational. Each framework represents the amount of elements (characterized as a part of that particular framework) within an advertisement. E.g., Pieters, Wedel, and Batra (2010) analyzed visual complexity which was characterized by feature complexity (advertisements are visually complex when they contain dense perceptual features) and design complexity (advertisements are visually complex when they have an elaborate creative design); Michailidou, Harper, and Bechhofer (2008) proposed that visual complexity reflects design complexity of an advertisement; other scholars provided a research of advertising complexity in a verbal framework analyzing syntactic complexity (Lowrey, 1992, 1998) and lexical complexity (Chamblee et al., 1993); Phillips and McQuarrie (2004) described advertising complexity in terms of rhetoric complexity; Putrevu, Tan, and Lord (2004) provided a term of informational complexity.

The object of this research is the layout complexity of print advertising. According to Chamblee and Sandler (1992), although layouts represent the culmination of all the components that make up print advertisements, minimal attention has been paid to the effectiveness of the various styles of layouts. Paradoxically, the topic of the effectiveness of advertising layouts is rarely analyzed in scientific literature. El-daly (2011) emphasizes that many studies of advertising do separate out components of ads, concentrate on one or a few and ignore the others. The research provided by Rayner, Miller and Rotello (2008) revealed that the nature of the ad per se can influence where viewers look in ads. Therefore, it might be hypothesized that advertising layout is an important predictor of advertising effectiveness. The aim of this research is to determine the effect of visual layout complexity of advertising on consumers' attentional resources engaged in processing an advertisement as well as evaluation and classification time of the advertisement regarding different levels of visual layout complexity.

Stating that the number of arrangements and patterns of print advertising are almost endless, Nelson (1975) proposes that it is possible to fit most print-medium advertisements into ten basic categories or layouts: Mondrian / Grid; Picture-window / Ayer No.1; Copy-Heavy; Frame; Circus; Multipanel; Silhouette; Big-Type; Rebus; and Alphabet-Inspired layout. According to Chamblee and Sandler (1992), one of the most popular and most widely used layouts is Picture-window (also called Ayer No.1). In Picture-window layout, the main attention is given to a picture or illustration, leaving the headline, subhead, and copy unimportant (Feasley, Stuart, 1987). According to Ong (2010), this kind of layout is very effective nowadays, because reading has lost its appeal to a new generation that is fed on a diet of fast-paced multimedia technologies. We consider this type of layout as the most suitable to provide a simple message due to visual advertising simplicity (low complexity). At the other extreme we found to be the Circus layout which generally deals with a larger-than-average number of components (Feasley, Stuart, 1987). According to Nelson (1975), it slows down the reader, making things more difficult to take in; and in the process of working through the disorder, the reader may

remember more. Therefore, we consider this type of layout as the most suitable for our research by reflecting visual advertising complexity.

Research methodology

Experimental stimuli

Event-related brain potentials (further – ERPs) are regarded as neural manifestations of specific psychological functions (Fabiani, Gratton, & Federmeier, 2007). The specific P300 ERP (large positively-deflected peak occurring approximately 300 to 800 ms following stimulus onset (Pontifex, Hillman, & Polich, 2009)) provides information about the neural activity of fundamental cognitive operations (Ma et al., 2008). The amplitude of P300 is proportional to the amount of attentional resources engaged in processing a given stimulus and it is not influenced by factors related to response selection or execution; moreover, P300 varies with the emotional value of the stimulus to the perceiver (Gray et al., 2004). P300 peak latency is proportional to stimulus evaluation timing (Polich, 2007). Hence, in the context of the advertising complexity, recording and analysis of P300 component can reveal whether a complex layout in the advertisement leads to more attentional resources being engaged in processing an advertisement as well as whether a complex layout generates higher emotional value to consumers. Additionally, latter analysis can reveal whether a complex layout in the advertisement is evaluated and classified slower than a simple one. Therefore, in this research authors analyze the differences of P300 peak amplitude and latency regarding different advertising complexity levels in the context of convenience product category, hypothesizing that those different advertising complexity levels lead to different amounts of attentional resources engaged in processing the advertisement and different advertisements' evaluation and classification times.

P300 is usually assessed using an "oddball paradigm" (see Gray et al., 2004; Fabiani, Gratton, & Federmeier, 2007; Polich, 2007; Mayaud et al., 2013). As such it was applied for this research. The visual stimuli consisted of two target stimuli (probability = 0.05 for each), distractor stimulus (probability = 0.1) and standard stimulus (probability = 0.8).

For the target stimuli, advertisements of well-known convenience product category brands reflecting different levels of layout complexity (representing Picture-window and Circus layouts) were chosen. The choice of these particular advertisements was based on such prevailing characteristics of layouts: copy (no copy / heavy copy); color (up to 3 colors / plenty of colors); spokesperson (no / yes); brand (positioned in the same place; similar visual complexity levels). Six experts of marketing and advertising participated in the procedure and validated the correct choice of the target stimuli.

All visual stimuli were presented in the center of computer screen (resolution: 1366x768) for 631 trials totally. The stimuli were presented in a randomly generated order for the participants using Matlab R2012b software package. The stimulus was always presented at fixation for 800 ms each; the interstimulus (black screen) time interval varied from 0.3 s to 1.5 s in random order (average interstimulus interval – 900 ms).

Recording electroencephalographic activity and analysis of P300 ERP

EMOTIV EPOC EEG headset was used for the experiment. Based on Mayaud et al. (2013), it was setup front-side-back. The 14 single-use felt pads were located at the extended 10/20 locations Fp1, F7, CP5, T7, P7, P3, PO3, Fp2, F8, T8, CP6, P8, P4, and PO4. The EMOTIV headset uses a common mode sense (CMS) electrode at F4 location and a driven right leg (DRL) electrode at F3 that can be related to the ground and reference in more traditional acquisition systems. Electrode impedances were controlled visually with the EMOTIV control panel and EMOTIV TestBench. Signals are internally digitized at 2048 Hz (16-bit) and subsequently low pass filtered (43 Hz) and down sampled to 128 Hz before transmission to the acquisition module.

All of the participants were instructed to respond to the target photo (both target stimulus) by pressing on a response box with their right index finger and not to respond otherwise. The distance between computer screen and the participants' eyes was about 30 centimeters and the screen was centered in their line of sight. Markers that indicated the precise stimulus onset time were sent from the Matlab R2012b software to the EMOTIV TestBench v1.5.1.2 software via com0com serial port.

The recorded EEG file of each participant was imported from the EMOTIV TestBench to the add-in programs of the Matlab R2012b software: EEGLAB 13.14.3b (Delorme, & Makeig, 2004) and ERPLAB 4.0.3.1 (Lopez-Calderon, & Luck, 2014). In these programs data pre-processing was done by applying independent component analysis (ICA) to remove blink and saccadic movement artefacts from the EEG data, an automatic EEG artefact detector based on the joint use of spatial and temporal features – ADJUST 1.1 and band pass filter (0.1 – 30 Hz). Data were organized in epochs corresponding to intervals [-100; 800] ms, centered on a stimuli onset. Epochs were rejected according to ± 100 μV threshold criterion. In total, 28 ± 3 epochs per participant (n = 30) per target stimuli were obtained. A time window of 100 ms before stimuli onset was used as baseline. Averaged ERPs were generated for every participant and for every electrode for each stimulus. Latencies and amplitudes of P300 were compared for the different stimuli by applying Student T Test in IBM SPSS Statistics V.20 software package. As the EMOTIV EPOC EEG headset does not contain midline electrodes, the analysis was provided for the electrodes P3 and P4.

Questionnaire research

References In order to determine the differences between brand recall, advertising recognition, and attitudes toward the brand and advertisement as well as purchase intentions regarding the brand advertised in advertisements with different complexity levels, questionnaire research was provided. The questionnaire contained three parts:

1) The section containing questions concerning brand recall and advertising recognition;

2) Attitudes toward the brands, advertisements, and purchase intentions:

Attitudes were measured on a semantic differential scale by 11 items each:

• attitude toward the brand – low quality / high quality, unlikable / likable, bad / good, worthless / valuable, unattractive / attractive, not advisable to choose / advisable to choose, not distinctive / distinctive, useless / useful, inferior / superior, negative / positive, ineffective / effective;

• attitude toward the advertisement – dull / interesting, unpleasant / pleasant, not important / important, unattractive / attractive, inappropriate / appropriate, not useful / useful, not informative / informative, not persuasive / persuasive, irrelevant / relevant, ineffective / effective, bad / good.

A 7-point Likert scale was used to measure purchase intentions regarding the specific brand provided in the advertisement with specific complexity level;

3) Socio-demographic data (age and gender).

Consequently, the hypotheses were made that the levels of brand recall and advertising recognition are different for the advertisements with different layout complexity levels; and that the attitudes toward the brand and advertisement as well as the level of purchase intentions are different for the advertisements with different complexity levels.

Descriptive and inferential statistical analyses using IBM SPSS Statistics V.20 and XLSTAT 2014 software packages were provided to assess the differences in attitudes, recall, recognition, and purchase intentions regarding brands advertised in different complexity level advertisements.

Participants

The EEG experiment was continued until there were 30 appropriate sets of participants' data. Consequently, 34 participants participated in the experiment and 30 participants' (12 female) data was used for the analysis. All of the participants were right-handed with normal or normal-to-corrected vision. 26 participants (out of 30) were at the age group of 18-29 years, 4 participants were 30-39 years.

All of the participants were volunteers and had not been paid for the participation in the EEG experiment. Before the experiment each of the participants was informed in detail about the experiment and signed consent forms. The experiment was held in Lithuania, Vytautas Magnus University, August-October, 2015.

All of the participants of the EEG research completed the questionnaire research. Further questionnaire research was conducted on university students, using the same questionnaire given to subjects of the EEG research. Thus, 162 respondent in total participated in the questionnaire research (37 percent of male, 63 percent of female; 97 percent of respondents were at the age group of 18-29 years, 3 percent of respondents were at the age group of 30-39 years). Again this research was conducted in Lithuania, Vytautas Magnus University, August-October, 2015.

Research results

All The grand-averaged amplitudes of P300 component for different advertising complexity levels (i.e. highest and lowest) in the different parietal channels (P3, P4) are provided in Table 1. As it can be seen, the amplitude of P300 is a little higher for the lowest advertising complexity level in channel P3, but in channel P4 it is higher for the highest advertising complexity level.

Table 1 P300 amplitudes (μV)

Complexity level	Channel	Min	Max	Mean	S. D.
Highest	P3	2.517	12.987	7.577	3.744
Lowest	P3	2.051	15.470	8.064	4.617
Highest	P4	1.929	12.667	7.482	3.379
Lowest	P4	2.000	16.250	6.253	4.253

It can be seen from the Table 2 that in the channel P3 lower advertising complexity level elicited larger P300 amplitude than the higher one, but the difference in latter channel of the amplitude of P300 component regarding those complexity levels is statistically non-significant. On the other hand, in the channel P4 the highest advertising complexity level elicited larger P300 amplitude than the lowest one as well and the difference in latter channel of the amplitude of P300 component regarding those complexity levels is statistically significant. Thus, the assumption can be made that the source of P300 event-related potential is in the right hemisphere. Consequently, it could be stated that the highest advertising layout complexity level leads to more attentional resources being engaged in processing an advertisement as well as higher emotional value (positive or negative) to consumers when compared to the lowest advertising layout complexity level.

Table 2 Differences of the mean P300 amplitudes regarding advertisements with different complexity levels (high – low complexity)

Channel	Mean difference	S. D.	S. E.	95 % Confidence Interval of the difference		t	df	p-value
				Lower bound	Upper bound			
P3	-0.486	3.441	0.496	-1.486	0.512	-0.979	47	0.332
P4	1.229*	3.760	0.531	0.160	2.298	2.312	49	0.025

*$p < 0.05$.

The topographic map of the difference of P300 amplitude in the parietal channels regarding different advertising layout complexity levels (highest – lowest) is provided in Fig. 1 below, and it substantiates the assumption that the source of P300 event-related potential is in the right hemisphere, where the highest advertising layout complexity level elicits statistically significantly larger P300 amplitude than the lowest advertising layout complexity level.

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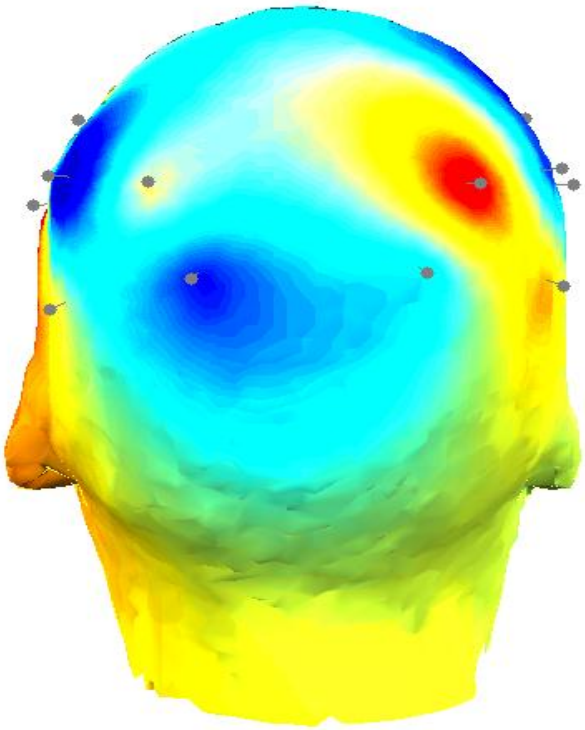


Figure 1 Topographic map of the difference of P300 amplitude in the parietal channels (high – low complexity)

The grand-averaged latencies of P300 component for different advertising layout complexity levels (i.e. highest and lowest) in the different parietal channels are provided in Table 3. The longer latencies of the P300 component in the channel P3 as well as in the channel P4 are elicited by the highest advertising layout complexity level. As higher complexity refers to the abundance of elements, meaning the greater the number of items that must be scanned in short term memory, hence it requires longer processing time which is reflected in the longer P300 latency.

Table 3 P300 latencies (ms)

Complexity level	Channel	Min	Max	Mean	S. D.
Highest	P3	304.690	398.440	348.635	31.318
Lowest	P3	296.880	375.000	332.031	25.199
Highest	P4	304.690	390.630	336.807	23.793
Lowest	P4	281.250	375.000	322.916	23.937

Differences of the mean P300 latencies regarding advertisements with different advertising layout complexity levels (high – low complexity) are provided in Table 4. In both channels (P3 and P4) the difference of P300 latency is statistically significant. This leads to the conclusion that the speed of processing the advertisement is quicker when advertisement's layout complexity level is the lowest.

Table 4 Differences of the mean P300 latencies regarding advertisements with different complexity levels (high – low complexity)

Channel	Mean difference	S. D.	S. E.	95 % Confidence Interval of the difference		t	df	p-value
				Lower bound	Upper bound			
P3	16.603*	17.290	2.495	11.582	21.623	6.653	47	0.000
P4	13.891*	27.042	3.824	6.205	21.576	3.632	49	0.001

*p < 0.05.

When analyzing unaided brand recall, it is important to mention that all of the respondents (100 percent) remembered at least one of the brands that they saw during the research procedure. Nevertheless, brand advertised in the lowest complexity level advertisement was the first to come to mind for 90 percent of respondents, while brand advertised in the highest complexity level advertisement was the first to come to mind only for 10 percent of respondents (see Table 5). Thus, brand presented in the advertisement with simple layout creates much deeper recall than the one presented in the advertisement with complex layout.

Table 5 Unaided brand recall levels

Complexity level	Lowest	Highest
Brand recall	146 (90 %)	16 (10 %)
N	162	

To compare aided brand recall and advertising recognition levels regarding different advertising layout complexity levels, the McNemar test is applied (two dependent samples; non-normally distributed data with dichotomous variables). As can be seen in Table 6, aided brand recall is statistically significantly better when brand is presented in the advertisement with simple layout. Nevertheless, the difference in advertising recognition regarding advertisements with different layout complexity levels is not statistically significant.

Table 6 McNemar test

Statistics	Aided brand recall (comparing brands presented in the ads with highest and lowest complexity levels)	Advertising recognition (comparing ads with highest and lowest complexity levels)
N	162	162
p-value	0.012*	0.388

*p < 0.05.

Mean evaluations of attitudes and purchase intentions are provided in Table 7. Attitude toward the advertisement is more positive when advertisement contains high layout complexity. On the other hand, attitude toward the brand is better and the level of

purchase intentions of the advertised brand is higher when brand is presented in the advertisement containing low level layout complexity.

Table 7 Mean evaluations of attitudes and purchase intentions

Variable	Lowest complexity		Highest complexity	
	Mean value	S. D.	Mean value	S. D.
Attitude toward the advertisement	3.975	0.414	4.443	0.433
Attitude toward the brand	4.744	0.414	4.635	0.482
Purchase intentions	3.703	0.706	3.416	0.062

The analysis of the research results revealed that the more attentional resources are engaged in processing an advertisement and the higher emotional response is elicited when the highest advertising layout complexity level is chosen. Moreover, latter advertising layout complexity level leads to a more positive attitude toward the advertisement. On the other hand, the analysis of the research results revealed that the lowest advertising layout complexity level requires shorter processing time, because of the smaller number of items that must be scanned in short term memory. Furthermore, the brand presented in the lowest complexity level advertisement is recalled better, additionally, attitude toward that brand is more positive and purchase intentions of that brand are higher. Nevertheless, there is no difference in advertising recognition regarding advertisements with different layout complexity levels.

Discussion and managerial implications

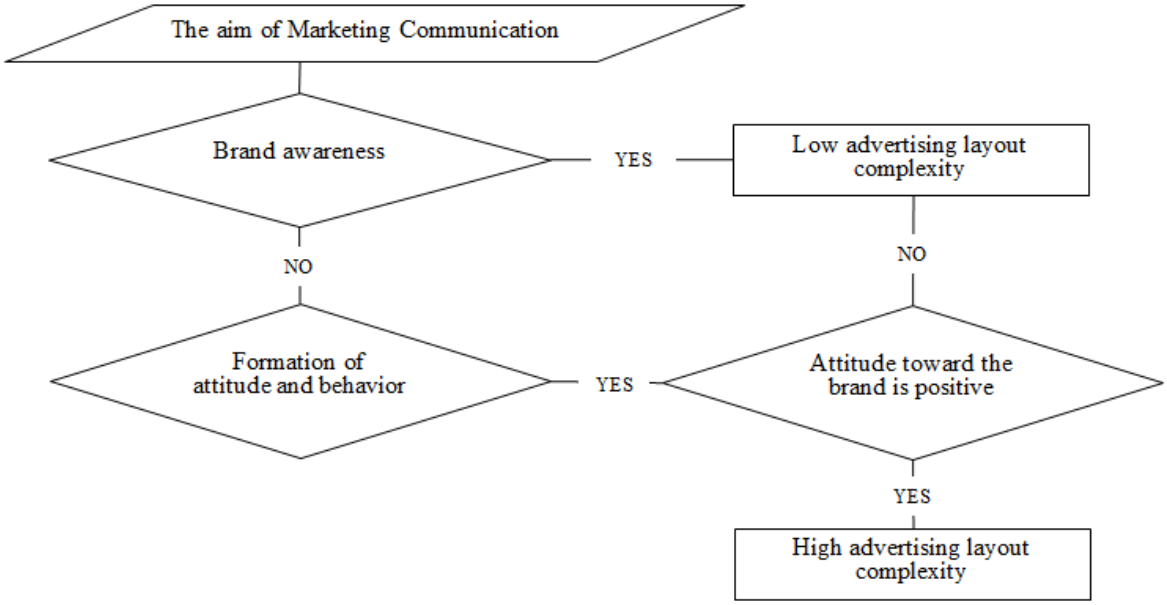
This study contributes to the knowledge advancement in the marketing and advertising literature and industry in two ways. First, it examines the effect of advertising layout complexity on consumers' attention, recall and recognition, attitudes toward the advertisement and the brand, and purchase intentions. Second, neuromarketing research methods are applied in this research to explore the effect of advertising layout complexity on consumers' cognitive operations.

The results obtained in the current study show that more attentional resources are engaged in processing an advertisement and higher emotional response is elicited in case when the highest advertising layout complexity level is chosen. Moreover, higher advertising layout complexity level leads to a more positive attitude toward the advertisement. The assumption can be made that more positive attitude toward the advertisement with the highest complexity level is related to the higher emotional response elicited by this advertising complexity level (of course assuming that the emotional value elicited by certain advertisement is positive). On the other hand, the level of brand recall is very low when brand is presented in the advertisement containing the highest complexity level. Bearing in mind that brand recall forms attitude toward the brand, which influences purchase intentions, it is not surprising that attitude toward the brand presented in the advertisement with the highest complexity level is worse and purchase intentions of latter brand are lower than of the brand presented in the advertisement with the lowest complexity level. In contrast, there is no difference in

advertising recognition regarding advertisements with different levels of layout complexity. The highest level of advertising layout complexity means the greater number of items that must be scanned in short term memory, thus it requires longer processing time and considering that attention is in some sense capacity-limited, the brand (one of the elements) can be left outside the conscious consideration. Consequently, it could be stated that when the aim of marketing communication is to enhance brand awareness or to form attitude toward the brand, the highest level of advertising layout complexity is not appropriate. Subsequently, when consumers' attitude toward the specific brand is positive, it is useful to use the highest level of advertising layout complexity, because in this case the whole advertisement receives more attention and the attitude toward the advertisement is more positive, suggesting that the advertisement will be seen and liked (see Fig. 2).

Figure 2 Algorithm for the selection of the level of advertising layout complexity

The lowest advertising layout complexity level requires shorter processing time,



because of the smaller number of items that must be scanned in short term memory and the assumption can be made that this creates the possibility to better later recall of each of the elements seen (the lowest advertising layout complexity level implies that there is no more than few elements in the whole advertisement). Furthermore, the brand presented in the advertisement with the lowest complexity level is not only recalled better, but also attitude toward that brand is more positive and purchase intentions for that brand are higher. Consequently, it could be stated that when the aim of marketing communication is to enhance brand awareness or to form attitude toward the brand, the lowest level of advertising layout complexity is appropriate to reach the aim of marketing communication. Then again, as the attitude toward these advertisements is worse than to those containing high layout complexities, meaning that advertisements with the lowest layout complexity level can soon start to be annoying to consumers, it is advisable to switch to the highest level of advertising layout complexity when the positive attitude toward the brand is formed.

By following the provided recommendations organizations can improve the chances of creating successful and effective advertising campaigns.

Conclusions

Consumer attention capturing is one of the relevant topics in recent research of advertising effectiveness. However, in order for advertising to be considered as effective, attention capturing is not enough. Brand recall and recognition, attitudes toward the advertisement and the brand, and purchase intentions have to be assessed as well. This study contributes to the discussion on the effectiveness of advertising layout complexity by providing the results that the level of advertising layout complexity has a different impact on the cognitive processing of advertisements as well as on consumer recall, recognition, and purchase intentions.

The research results enabled to draw a picture of the strategic usage of advertising layout complexity: initial usage of the low complexity of advertising layout (Picture-window layout) helps organizations in creating brand awareness and familiarity; after the brand gains its position in consumer memory, the higher level of advertising layout complexity has to be provided (Circus layout) to create an emotional value.

However, due to the highly complex experimental procedure, current research considered only two forms of advertising layout: simple (Picture-window) and complex (Circus). In the further researches other advertising layouts have to be tested for their effectiveness. Moreover, different colour spectrum, different types of advertising spokesperson, different product categories might be chosen for the researches.

Acknowledgement

This research was funded by a grant (No. MIP-098/2014) from the Research Council of Lithuania.

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