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Automotive Industry video-commercials – A pluralistic research based on an eye-tracking experiment

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Abstract
Eye-tracking is an innovative way of finding where participants look in a video-commercial, at which car components from the automotive industry video-commercials and if they can express in words what they perceive with their eyes. The objective of this study is to see if the video-commercials are efficient to promote the main technology of famous brands car models, their unique features, the brand, the logo, the slogan presented during the commercial. We used 5 video-commercials freely available from YouTube™, the SMI™ Eye-Tracking Glasses and SMI™ Eye-Tracking Fixed-Device for performing the experiment on 37 participants, males and females. The analysis of the results was made with the BeGaze™ Software for the eye-tracking experiment and Radial Basis Function of the SPSS™ for the survey. Our results show that people look mostly at the spinning wheels and the grill of the cars during the movie, although only 1 participant could express also, in words what draw her attention at the car models presented during the commercial. This shows, that although people using their visual senses organs know what they need, they cannot rationalize it and express in words to the people in front of them.

Keywords: Eye-Tracking, Survey, Radial Basis Function, AOI.

JEL classification: C45, C53, C83, D87, M31, M37.

1. Introduction

The automotive industry tries to revolutionize their products, by bringing new features on the engine, design and technology that make a car efficient for the customers. These features are also promoted during the video-commercials of any car brands. The interesting aspect researched in this study, is if the consumers are looking at the improvements brought by the developers of the car from the video-commercial, or not. This paper has the following structure: in the beginning there will be a small resume about the main tools used in this research. The literature review presents a short history about the eye-tracking devices and neuromarketing, the first and the second cars brands used in experiment, signification of their logo and their slogan. The methodology presents the research and the results of it, while in the conclusions are presented the main ideas obtained from the research and the technical limitations we had encountered during this research.

2.Literature review

Neuromarketing appeared in 2002 and lead to controversial opinions among marketing specialists. The term of "neuromarketing" (Vlasceanu, 2013) was first used by the professor Ale Smidt. Due to the failure of the old methods of research, because they need the consumer consent to describe how they feel regarding that video-commercial and sometimes what they said they felt was not entirely true, it appeared this science which gives sincere results about the emotions of the consumers. The first companies that offered neuromarketing services were

Bright House and Sales Brain from US. Most of the researchers use the term "consumer neuroscience" (Ramsøym T.Z., 2015) or "decision science" (Dooley, 2015) besides different alternatives for this kind of field.

The early studies of eye-tracking began in 1800s by using direct observation. But, the first eye-tracking machine was developed "by Guy Thomas Buswell in Chicago, using beams of light that were reflected on the eye and then recording them on film" (Buswell, 1922 & 1937). Another significant personality who did research on this domain and stated in his book was Alfred L.Yarbus who explains that "Often an observer will focus his attention on elements that are unusual in the particular circumstances, unfamiliar, incomprehensible, and so on" (Yarbus, 1967). The human eye is a "device" that captures images and acts or reacts more rapidly than any other electronical gadget, even by doing this consciously or subconsciously based on primary instincts.

Eye-tracking is a domain that focuses on the consumers "point of gaze (where one is looking)" to evaluate the region on which they are focused. Also, this process can be used to see the movement of the eye in comparison with the head. The devices are used in marketing to find out the interaction between the consumer and videos performed on the computer, designing a new advertisement, focus on the key points that define the brand, medicine to evaluate the health and accuracy of the eyes capacity to see and psychology to see the behavior of the individual in comparison with the movement of the eyes. There are different types of eye-tracking devices: "eye-attached tracking" (Robinson, 1963), "optical tracking" (Crane & Steele1985) and "electric potential measurement" (Elbert & al., 1985). The eye-attached tracking uses a device that attaches to the individuals head and follows the movement of the eye and the dilatation or contraction of the eyeball. The optical tracking uses a machine that is mainly specialized for ophthalmology to see the accuracy of the eye. This evaluates the size, the shape and the distance where an object located in correspondence to the eye. The electric potential measurement is made for detecting the movement of the eyes by discovering the "electrooculographic signal (EOG). By placing the electrodes of our BYB headband so that each electrode lies on either side of the eye, we can detect left vs right movement" (Backyard Brains, n.d.). The video commercials on which the consumers are exposed virtually needs to provide a memorable souvenir stored in their long-term memory. This must contain the brand, the slogan that the commercial promotes, the product, the message and the special features of that company in comparison with another. The pictures captured from the video are randomly, mainly selected by the consumer's emotional preferences, and not by logical facts.

This kind of memories are stored in the short-term memory and are based by how the consumers felt by interacting with the advertisement. But the facts captured by the eye are compared with other information that already exist in the brain and helps to improve the general image on that product by providing more details about it. Although at the first interaction with the video commercial there are memorized plenty of details "the shorter the latency of brand memory is" (Wedel & Pieters, 2000). Because the information may be insufficient, a "systematic recency effect" (Wedel & Pieters, 2000) is made by showing the consumers the video commercial later to memorize the details from the first view. There were "found common patterns in these sequences" (Jacob & Karn, 2003) recorded by the subjects looking at a commercial. Researchers made studies to find out on which of the vivid pictures and on which place in the picture they fixed it with the eye. So, the video motion pictures they were seeing cannot be defined by the fixation or the preoccupation of the consumers to that specific detail. But their obsessive interest on that detail is linked to the rapid movement of the eye between fixation points.

"With a high-precision eye tracker, even small micro-saccades" (Jacob & Karn, 2003) can distract the subject's attention on that video. Although, these devices have their errors, in

time scientists have done improvements to them by changing the attaching type on the head, by improving the accuracy of the glasses when capturing the movements of the eyes. It is frequently used in usability case-studies. On those studies, the researchers are focused on the following metrics: "fixation", "gaze duration", "area of interest" and "scan path" (Jacob & Karn, 2003).

The SensoMotoric Instruments™ (SMI™) company was made at the initiative of "Dr. Winfried Teiwes in 1991" (Alio, 2014). The SensoMotoric Instruments received the "Innovation Prize of Berlin-Brandenburg for VOG - Video-Oculography, its video-based eye movement technology" (SensoMotoric Instruments, 2015) in 1992. This technology is used in ophthalmology, neurology, psychology, marketing and many other fields of research to test the consequences of different external factors to the human eye, and the capacity of the individuals to perceive certain elements that surround them in their natural environment or the artificial laboratory custom-made environment.

Besides the fields of research mentioned above, the eye-tracking devices are used also in the automotive industry to improve the quality of the products and to send the right message by promoting the desired car model to reach to the final consumer. Before, the car reaches its destination, the consumer navigates for information, mainly on social networks as YouTube™ and Facebook™ and gather information about it from different promotional tools, such as: television, smartphone, pc and laptop, tablet and advertising panels.

The first brand of car utilized in the experiment, is an expression which offers the personality of the firm and means "people's car" (Rodriguez, 2016) initially accessible to all the classes. The Company was founded by Ferdinand Porsche in May 1937, in Wolfsburg Germany. The origins of the logo are still unknown, although three leads are suggested for it, according to the website The News Wheel: "graphic designer Nikolai Borg, German artist Martin Freyer and Franz Xaver Reimspeiss" (The News Wheel, 2015). Another passionate on the auto brands design, Dr. Rex Curry finds similarities of the logo in these two different domains and legends: the swastika as an "intertwined "S" shapes symbolizing "Socialism" and "the Odal rune, was used as a symbol of the "Wiking Jugend" (Viking Youth, or Viking Young'uns)" (Curry, 2018)

The automotive industry of Daimler Company is designed for all three environments, air, water and soil. Daimler Company has as founders and pioneers the following people: Carl Benz and Bertha Benz, Gottlieb Daimler, Wilhelm Maybach. The incipient of the automobiles are strongly linked with the first car designed by Carl Benz, for which received the "Benz Patent Motor Car, in 1886 with the patent No. 37 435 – the birth certificate of the automobile" (Daimler Company, 2019). Although, they never met, in the same year Daimler also produced an automobile (Daimler Company, 2019). The brand is an important component of a video-commercial. For second brand of car utilized in the experiment its name is a patronymic name (the combination of the name of one of the daughter's clients and the inventor of the engine). "The trademark resulted (Daimler-Motoren-Gesellschaft) was registered on September 23, 1902" (Daimler Company, 2019). This trademark, was named after the daughter of Emil Jellinek and was initially addressed to well-known personalities from Germany. The logo is the element of visual identity for the specific brand. The history of the logo of the automotive vehicles is linked with the merger between the two companies Daimler and Benz&Cie which took place in 1926. Then, the logo became a "laurel wreath surrounding a three-pointed star" (The News Wheel, 2015) with the trademark of the company.

3.Methodology

3.1. Research objective

The objective of this study is to see if the main car components and elements that define the brand commercial from a psychological point of view are observed by the human eye of the consumer. Furthermore, the study tested the perception of females versus males regarding what they see in the movie, and their opinions about the car components and the elements that are present in the commercial: music, motion pictures and characters using the survey method.

3.2. Sample and method

The study was made using a sample of 37 people, mostly students and employees of the biggest university of economic study in Romania, from whom: 2 males with ages between 29-39 years old, 13 males with ages between 18-28 years old, 20 females with ages between 18-28 years old, 1 female with age between 29-39 years old and 1 female with age between 40-50 years old.

The experiment took place during March-May 2019 at the Bucharest University of Economic Studies, at the Marketing Laboratories using the neuromarketing instruments of the SensoMotoric Instruments Company and a PC Monitor of 24 inches on which the movie was viewed by the participants. On the other hand, at the quantitative research, to present the results from the survey analysis it was used the binning chart function and statistical graphs from the BeGaze™ software. It was outlined the duration of the time length for each participant for the AOI defined versus time, for each eye.

The movie utilized was made from 5 video-commercials that sum up to a total length of 5 minutes and 36 seconds. The distribution of the video-commercials in the movie is the following:

1. Never Stop Improving | 30 Seconds-0:10s- 0:44s with sound
2. Vision Van—0:44s-1:54s
3. Drive&Track—1:54s-3:17s
4. Infotainment—3:17s-4:05s
5. 60 seconds—4:05s-5:05s
6. Never Stop Improving | 30 Seconds-5:05s- 5:36s without sound.

Firstly, we made the experiment, with the SMI™ eye-tracking glasses manufactured by the SensoMotoric Instruments, which were connected at a Samsung™ smartphone. The calibration was made for each participant at 1-point, and at a distance from the PC monitor of approximatively 80 cm. The advantage of the eye-tracking glasses during this experiment was that the respondents were allowed the head movements and they were instructed to stay in a comfortable position while watching the movie. Some factors, which play a role in the efficiency of this experiment, were the ray of sunlight from the room which influenced the quality of the images from the movie, due to the direct interaction on the SMI PC Monitor. On the other hand, at the eye-tracking fixed device experiment, the participants were instructed to try to keep their head in a fixed position, to perform the calibration of the device accurately. The experiment using the eye-tracking equipment was performed at a Dell™ Precision M4800 laptop and with the REDN Scientific Eye-Tracker attached to the laptop. The calibration was of 5-point calibration at 30Hz combined with Smart Calibration and was made using the software iViewRED™, which is the controller software for the eye-tracking fixed-device.

The analysis of the questionnaire was made using Radial Basis Function, from the Neural Networks of SPSS™ with a random probability number of 29 people for training and 8 people for testing to build the models of prediction, chosen random from the respondents, but with the dichotomous dependent variable GENDER (1=MALE, 2=FEMALE), as a main factor in order to differentiate the choices of females versus males for promotional tools and social networks

on which they wish to watch commercials about cars.

3.3. Research results

For reasons belonging to the lack of the full options software for the video-analysis at the beginning of the experiment, the statistical results which are shown in the screenshot of the motion pictures captured from the movie are only from the REDN Scientific Eye-Tracker analyzed with the BeGaze™ software.

Figure 16.AOI-Bumping bar

Figure 2.AOI Spinning wheel

Figure 17. AOI - Vision Van - Future of Transportation

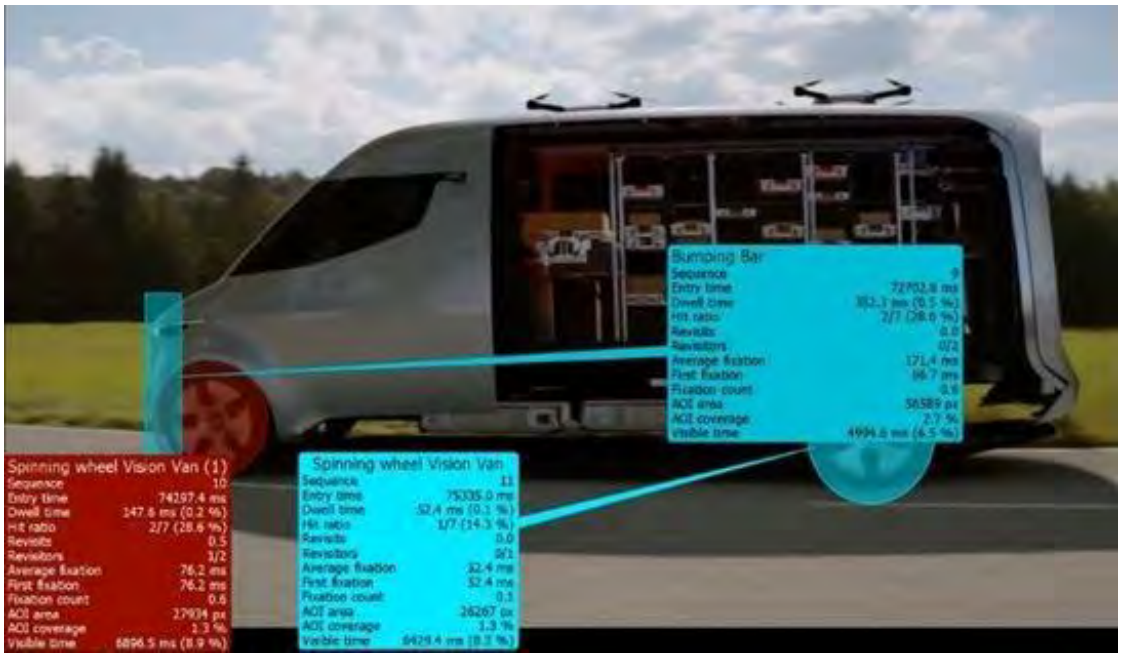

Figure 18. AOI Spinning wheel Vision Van

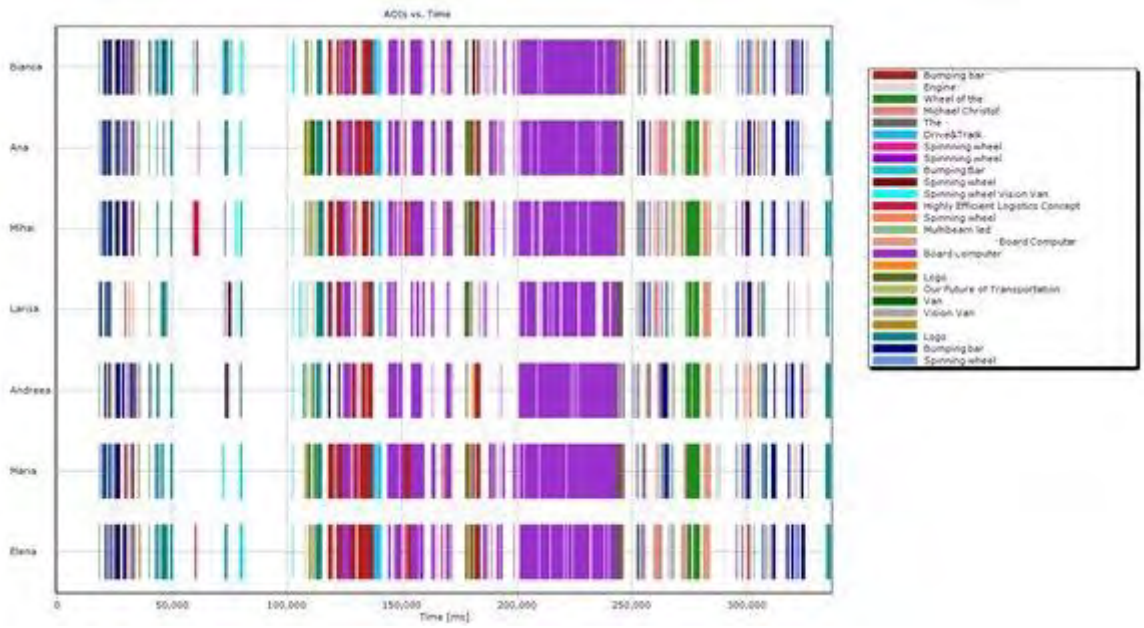

Figure 5.AOI vs.Time right eye

The respondents look first at the AOI Bumping bar of the second car brand and at the AOI Spinning wheel of the second car brand, Figure 1 to 4. The first maximum fixation duration was for the AOI Bumping Bar of the second car brand that was of 4532.8 ms, while the minimum fixation duration one was of 133.3 ms and the first fixation number of participants was of 4, Figure 5. The first fixation minimum duration was for the AOI Michael Cristof, Spinning wheel of the first car brand, Bumping Bar of the second car brand Vision Van which describes the front side of the Vision Van, that includes the engine, the grill, the headlights, Spinning wheel Vision Van and Spinning wheel of the second car brand.These AOI had no duration and 0 first fixation participation count. The maximum first fixation participation count

was for the AOI defined as Wheel of the second car brand, where all 7 participants looked at it. For this AOI, the fixation duration minimum was of 100.0 ms and the fixation duration maximum was of 566.6 ms. The first fixation participation count with 6 participants, which followed the maximum one, was the AOI The, that had first fixation duration maximum of 566.6 ms and first fixation duration minimum 100.0 ms.

Figure 6. The first car brand word map

Figure 7. The second car brand word map

The main words with which the respondents associate the brand of the first car brand is described with words such as technology while the second car brand are the ones design, quality, elegance, comfort. The technical specifications of the cars are explained in Romanian language, see Figure 6 & 7.

The model used for generating these predictions using Radial Basis Function, in SPSS™ was of 15 respondents for testing and 22 respondents for building the model according to the gender of the respondent. The main promotional tools, from which males prefer to gather information about cars are: TABLET (0,857%), PANNEL (0,786%), TV (0,714%), PC (0,357%) and SMARTPHONE (0,286%). On the other hand, according to the survey, females prefer to gather information from the following tool, in the descending order: SMARTPHONE (0,714%), PC&LAPTOP (0,643%), TV (0,286%), PANNEL (0,214%) and TABLET (0,143%).

To determine the percentage of males and females who search information from the following social media networks, the data was assigned, using the Radial Basis Function, as follows: 21,6% (8 people) for testing and for building the model of training were used 78,4% (29 people). The main social networks from which males research about the features of the car desired are the following: NETWORKS (3,058%), GOOGLE™ (2,923%), FACEBOOK™ (0,788%), YOUTUBE™ (-0,250%). Females search information about cars from these social networks in the following descending order: YOUTUBE™ (4,250%), FACEBOOK™ (3,212%), GOOGLE™ (1,077%), NETWORKS (0,942%).

Discussion and Conclusions

According to the analysis results, people prefer to watch video-commercials mostly on YouTube™. They would prefer on the future to see the commercials on smartphone or tablet. They give great importance to aspects such as information about car components and payment methods. Some of the respondents expressed their desire that the video-commercials of the first car brand viewed should be built around a story. At the second car brand viewed video-commercial, the respondents recommend providing more details about the car components during the video-commercials. The respondents focused their attention mostly on the spinning wheels of the second car brand viewed, the front side of the second car brand viewed, Board

Computer of the first car brand viewed. For the prototype car, there it is observed a pattern, all the participants look at what is written first about the technology of the car, and then this helps identify the specific segment. Here, the efficiency of the commercial, is increased by this fact. On the beginning, they are looking at the front-side of the car, then at the writing that indicates the first feature of the part of the car, then at the car itself. First, they read what's about that sequence, and then they analyze the car.

On these commercials of the second car brand viewed, the logo is placed at the end of it, on a black background. This could be considered a disadvantage for the company, because the people are distracted by the black background which is too dark comparing with the logo which is a transparent grey color and it doesn't get the attention of the human eye. For the logo, the combination of colors is not an efficient one, because, people need to identify the logo with the car. Here, it would be strongly recommended the changing of the background from black to a combination of warm and cold color scheme such as yellow and blue or other lighter colors.

Another important aspect is the speed of the video-commercial. The video frames should be in a slow pace motion, as for the consumers to perceive the elements of the car which are presented in the commercials. In addition, the music is not suitable for the video-commercials, since people are relaxing during the video-commercial, and their attention decreases.

Following the results of the research for the video-commercials of automotive industry, the consumers are "developing" their visual senses in order to filter the information that they receive from the commercials. When the advertising companies design a commercial for a car, they should also think at the purpose for which is developed and the physically, virtually devices and applications on which it will be promoted.

This research has some limitations regarding the number of people who attended in the experiment and their lack of knowledge about the automotive industry. Another limitation is the limitation of the software (not having the full license that would grant access to all options) used to analyze the data collected.

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