

THE USE OF EYE-TRACKER AND FACE READER AS USEFUL CONSUMER NEUROSCIENCE TOOLS WITHIN LOGO CREATION

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Abstract

Traditional methods of conducting consumer behavior do not provide enough detailed information and therefore the paper aimed to demonstrate the use of consumer neuroscience when examining a selected product policy tool by using biometric methods to identify emotions and subjective consumer preferences. Consumer neuroscience tools provide valuable information to decide on the success of the company in the future, so we consider it as essential to inform entrepreneurs and subjects alike about this modern way of studying consumer behavior. The subject of the research was the original logo of the selected company and the design of three new logo variants that were created using the online graphical tool. Primary data collection was realized under laboratory conditions using the Eye Tracker and Face Reader. Overall, based on the results of our research, we rated the proposal no. 1 as the best one because it kept the views of respondents for the longest time and each respondent looked back at this color combination. The same results were confirmed as well by heat maps. The new logo found for the selected company, however, is recommended for further testing, such as AB testing involving consumer neuroscience tools, to verify the validity of the research undertaken.

Keywords: consumer neuroscience, consumer behavior, logo, biometric methods, EyeTracker, Gazepoint, FaceReader 6.1, Noldus, fixed points, heat maps

INTRODUCTION

Strong competitive market struggle, demands, and changing customer needs have resulted in the need for more comprehensive and more detailed information on the target and potential market segments. The crucial way to obtain this information is through marketing research (Nagyová *et al.*, 2014a). Traditional methods of

market research are long used and useful as well, but there is still a lack of information about consumers' attitudes towards a product and actual consumer behavior at the point of purchase. People tend to say one statement, while their behavior suggests something completely different (Lindstrom, 2008). More than 90% of the information is processed in the subconscious of the human brain. It is precisely this mental processing of information that plays

an essential role in decision-making consumer behavior. As the traditional research methods to understand consumer behavior failed to penetrate into the depth of unconscious processes, the results of research and specific consumer behavior were inconsistent and not aligned (Agarwal and Dutta, 2015).

To guarantee scientific development, there was a need for expansion in the application of different and multidisciplinary research procedures to respond to the various issues of the scientific field. Marketing has also brought knowledge from several disciplines such as economics, psychology, biology, and medicine (Javor *et al.*, 2013). Neuroscience represents the excellent potential for marketing research. However, it should not be perceived as an attack on traditional consumer research but is a complementary element to further investigate specific consumer decision-making (Hubert and Kenning, 2008).

We consider consumer neuroscience a relatively young science, but psychophysiological techniques in consumer behavior research have been recorded in the sixties already. Measurement of consumer responses to marketing stimuli has been done by monitoring pupil dilation and electrodermal activity, followed by eye tracking and heart rate measurement (Wang and Minor, 2008). The term neuromarketing was first used in 2002 by Professor Ale Smidt. This concept is more closely related to the practical use of neuroscience knowledge for managerial purposes, while the same concept of consumer neuroscience is considered more suitable for use in the academic field (Berčík *et al.*, 2015).

Neuroscience methods offer to hope to solve one of the critical issues for many marketing scientists that is how reliably measure implied responses to marketing stimuli. Therefore, the area of marketing research has rapidly approved the adoption of neuroscience, and the evidence for this was the growing number of neuromarketing companies (Yoon *et al.*, 2012). The use of consumer neuroscience in marketing is extensive, and therefore this particular article deals with only one area – brand or logo.

Brands have gradually become a natural part of our lives. The brand of the company must address something to us and engage us emotionally. It should also be borne in mind that, for example, the design of the logo should last for several years, so it is not enough to appeal only to our consciousness but must also appeal to our subconsciousness, and this can be tested through the approaches and methods provided by consumer neuroscience (Mormann *et al.*, 2015).

The starting point for measuring brand value is primarily association, emotion, and motivation. These can be measured by using instruments that measure physiological responses and others measure changes in brain states. Changes in cerebral status in the memory association can be measured by functional magnetic resonance (fMRI) and electroencephalography (EEG). Emotional consumer responses to the brand are difficult to measure using traditional research methods, thus creating space for new measurement options that neuromarketing allows, such as affective priming, electromyography, and face expression analysis (Nagyová *et al.*, 2014b).

An example of the use of consumer neuroscience in connection with the logo is American company GAP. In 2010, the company experienced a decline in revenue, so it decided to change its logo. A new logo was drafted, which was denied by the public. That's why NeuroFocus Inc., the market leader in neuroscience expertise, took over the role. This company tested their new logo, and through EEG research and Eye-tracking, it confirmed that the new design did not encourage the perception of its subjects in a way that the new exciting logo would have. The effort of the company was to give consumers the impression that it was a stylish brand name, but the research did not even record the results. Of course, they also tested the original logo, which had an excellent ability to activate key brain centers, and based on these results, GAP uses this logo up to now (Dooley, 2010).

MATERIALS AND METHODS

Market vendors are able to track what consumers buy, but why it is so, it is harder to understand. This answer is the best provided by consumer neuroscience, using neuroscience tools and psychology. The primary objective of the contribution is to point to the use of consumer neuroscience in the study of consumer behavior through the selected product policy tool of the particular company Genaces Slovakia s.r.o. The subject of the research was the original logo of the company and the design of three new logo variants that were created using the online graphical tool on the website www.canva.com. 22 respondents (9 men and 13 women) were interviewed, who volunteered to participate in the research. The size of the sample is considered sufficient for this kind of research. Primary data collection was realized under laboratory conditions using the Eye Tracker and Face Reader.

The used eye-tracking method through fixed Eye Tracker by Gazepoint was mounted on a 22-inch diagonal LED monitor and was based on reflection of light from the retina to the camera – Bright pupil. This binocular system with a sampling frequency of 60 Hz has a 25 cm × 11 cm (horizontal × vertical) movement tolerance, a ± 15 cm motion depth range and accuracy of 0.5–1 degree viewing angle (Gazepoint, 2017). The initial phase of Eye Tracker testing was the individual calibration of each participant through a system wizard - 9 point calibration. After successful calibration, logos were displayed. The time for presentation of stimuli was calculated with respect to the size (area in cm²) of the presented visual stimulus. This time takes into account the fact that the time between fixations ranges from 1 to 6 seconds and during these stops the brain begins to process the received visual information (Matos, 2010). Because the subject of interest was the primary visual attention in the case of a one logo stimulus, the display time was set at 10 seconds and in the case of three small logos at 15 seconds. This time is also taken into account by many studies discussed “attention span” (Shank, 2017). First, a stimulus of all 3 logos was shown to each respondent. Subsequent the separated logos (A, B, C) were displayed in random order (ABC, BCA, CAB). Among individual stimuli was a 500 ms pause (black screen).

Data collected through Eye Tracker was statistically processed by Gazepoint Analysis 3.0 software. The software provided statistical indicators such as fixation points and heat maps, through which we can evaluate consumer behavior towards the logo designs. Fixation points show the sequence and position of views on static or dynamic media. The size of the circle indicates the length of the view, and the numbers in it show the order and average viewing time. This visualization should be used with fewer respondents in a shorter time interval (Berčík, 2015). Heat maps can be defined as two-dimensional graphical representations of data in which values of variables are displayed through colors. Heat maps are a convincing tool primarily for two reasons. The first reason is that the intuitive nature of the color scale associated with temperature minimizes the amount of learning and knowledge needed to understand them correctly. The second reason is that heat maps represent the data directly in the measured stimulus, so they are simply interpretable. Using heat maps, we can summarize a large amount of data that would be harder to interpret in numerical form (Bojko, 2009).

FaceReader 6.1, developed by Noldus Information Technology, was used to recognize emotions. This program can identify the six basic emotions (joy, sadness, anger, surprise, fear, and disgust or resistance) as well as a neutral state of face micro mimics (Noldus Information Technology, 2015). Data from FaceReader 6.1., we were interpreting by using valency. Through valency, it is possible to define the positive and negative character of emotions or some of the aspects of these emotions. Valency of emotions was argued as a key criterion for defining emotions and the primary dimension of measuring different subjective moods and emotions (Joffily and Coricelli, 2013).

RESULTS

The ever-growing number of competitors, modern technology, advertising blindness, are just a few determinants of the environment in which it is increasingly challenging for the brand to attract the attention of consumers. As a result, businesses are always looking for tools that can more effectively explain and interpret brand associations. Subconscious emotional processing and memory activation are critical drivers for decision making, so the ability of consumer neuroscience tools to capture these processes allows them to make a significant contribution to this area. Based on information from other researches carried out in this field, we decided to carry out our own study demonstrating the use of innovative research methods in practice on the example of a particular company, Genaces Slovakia, s.r.o. It is an online business center that understands the importance of the brand and its own logo. A properly and tailor-made designed logo is one of the pillars of creating a successful corporate identity. So to build strong corporate identity, the founders agreed to provide their logo, which we examined through the tools of consumer neuroscience.

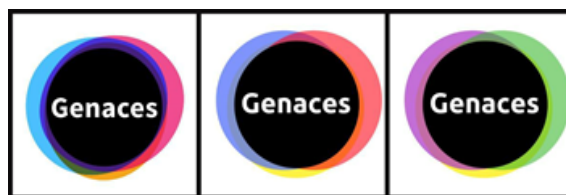
The subject of the research was the original logo of the company and our proposal of 3 new variants. The current logo is basically a combined logo. In the background, there are three color circles, each color representing one subject, Genaces as a business center, as a business partner and customer. A company's name appears in the center, white letters on a black background. The core values that this company defines are innovativeness, reliability, trust, openness and long-term customer relationships. Suggestions for new logo variants were based on color psychology, which evokes the association with the values

identified by the founders of the company, as well as the personal preferences of the founders. Three designs of new logo variants have been created, using the online graphical tool at www.canva.com. After creating the basic three designs, two options in other color combinations, as well as the original logo, were developed for each modification (see Fig. 1).

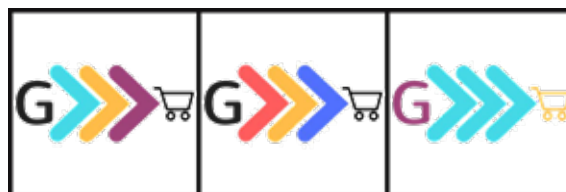
The first logo design is based on a similar concept to the original logo. We kept the idea of the three colors represented by individual subjects, but in another arrangement, the letter “G” from the name of the company was preserved, and the shopping cart pictogram was included. The second proposal represents the unification of the buying experience by using a circle with a yellow background showing the name of the company in different colors linked to the pictogram of the shopping cart. The third design was created by the name of the company on three different color backgrounds and the symbol of the yellow shopping cart on

the black background in the top right corner. To the original logo provided by the company, we created two other designs, but in different color combinations. We used a violet color because this color is characterized by innovation, creativity, and adult branding. The yellow color is an optimistic color that promotes communication, especially crucial for online business, and stimulates the nervous system, so it can very well capture the desired attention. Red evokes strong emotions, causes hunger, and is often used to address impulsive shoppers. Blue is often used in the business world because it gives the consumer a sense of confidence and trust in the brand. Orange creates a call to action, buy, sell, sign up the process. Green can relax one and is associated with nature and money (Gillett, 2014).

The research was carried out in the laboratory where the individual respondents came one after another. To the respondents, there were logotype designs played in particular order, with



Original logo



Draft No. 1



Draft No. 2



Draft No. 3

1: Colorful combinations of the original logo and 3 new logo designs

Source: Results of own research

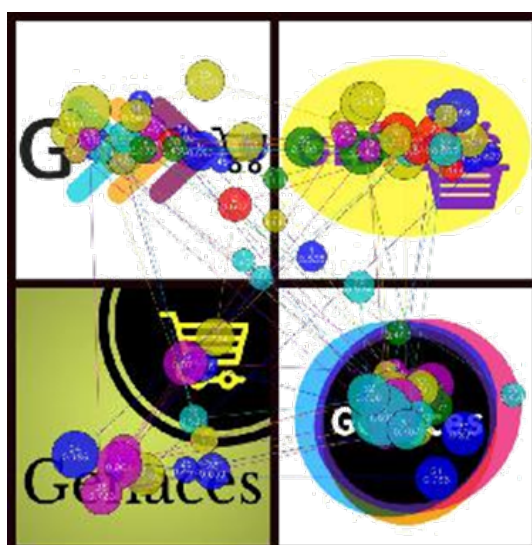
Eye Tracker and FaceReader 6.1 being used for the measurement. The first image, which was displayed to the respondent in a fifteen-second interval, displayed all the logos, i.e., the original logo and three new designs. The follow-up step, to the respondent it was shown four more images at ten-second intervals. Each picture showed one logo design that was shown in the first image, as well as two other color combinations for this logo. We proceeded the same with the original logo.

Fig. 2 shows the fixation points of male and female respondents. It is clear from the output that the views of men have focused on draft no. 1 and the original logo, then it was draft no. 2 with a yellow background and least of them were interested in design no. 3. Position views (rings) in case of proposal no. 1 shows that this logo was intrigued by its entire composition, while the original logo was mostly dominated by a white name on a black background. In the case of proposal no. 1, most of the rings concentrated on the three colors that represented the entities mentioned above as the founders hoped for. As of the original logo, the colors did not get any attention almost at all. The views of women were captured by the original logo, but as with male respondents, they have been attracted only by the name on a black background, not the colors themselves. We can characterize Draft No. 1 being able to capture the views of women for the most extended period, resulting from the size of individual rings. Interestingly, the pictogram of the shopping cart played an essential role in

this logo design. Draft no. 3 can also be evaluated from female respondents as a proposal that at least attracted their attention.

From Tab. I we see that every male respondent perceived each proposal. Draft no. 1 attracted attention after the shortest time, and it was 0.20 s, keeping the views at 3.31 s. A look back was gained by each proposal, except for proposal no. 2, only 8 male respondents from 9 were re-viewing this particular proposal. From Tab. I, we can also see that for female respondents, draft no.1 caught the views in the shortest time, and it was 1.03 s, and with no competition around draft no. 1 has held views for the longest time of 3.20 s. View back from each respondent was obtained only by proposal no. 1 and no. 2

Because the male respondents were most interested in Proposal No. 1 and the original logo, we will evaluate their subsequent testing in different color combinations (see Fig. 3). In case of proposal No. 1, we assess as the best the second color combination, which was able to catch a view for the longest time of 2.73 s, and also every one responded to this color combination by looking back. Fig. 3 also makes it clear that the original logo and the second color combination have gained the most views. We're evaluating as the best the second color combination because it grabbed a look of participants after the shortest time, and it's 0.67 s, and all of the respondents looked back at this color combination. Only 6 respondents returned to the original logo, but the viewing length was the longest – 3.38 s.



Male respondents



Female respondents

2: Fixed points for male and female respondents

Source: Results of own research

I: Numeric values of fixed points for male and female respondents

gender	number of respondents who perceive the draft		first view		the length of view		back view	
	M	F	M	F	M	F	M	F
draft no. 1	9/9	13/13	0.20s	1.03s	3.31s	3.20s	9/9	13/13
draft No. 2	9/9	13/13	0.74s	1.12s	2.68s	2.15s	8/9	13/13
draft No. 3	9/9	13/13	1.59s	3.00s	3.35s	2.20s	9/9	12/13
Original logo	9/9	12/13	1.98s	2.31s	1.98s	2.05s	9/9	12/13

Source: Results of own research

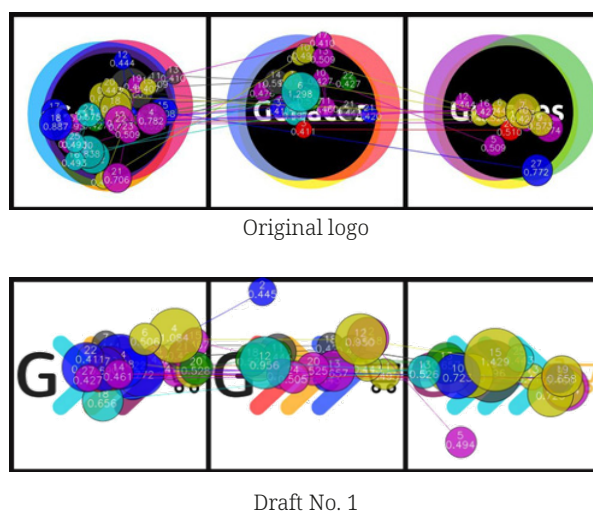
For female respondents, the best value was assigned to the second color combination of the first proposal, as well as that of male respondents. The time elapsed as respondents glanced at this variation was the shortest, with only 0.22 s, the longest lasting up to 2.41 s, and all respondents returned to this color combination. In the unconscious evaluation of the original logo and its color combinations, the fixation points were distributed almost evenly. The views were returned by the respondents to the first and second color combinations, the length of the views at first was 2.46 s and for the second in length of 2.30 s.

Heat maps are another statistical indicator that we've used to evaluate logo designs. These are two-dimensional graphical representations of data in which variables are displayed through colors and simplify the interpretation of a large amount of data. Heat maps may contain different types of data, such as visual attention, so we have chosen them as one of the statistical indicators in the evaluation of our research results. The heat

map outputs coincide with the fixation point outputs. In the Fig. 4 we can see that the original logo caught the eyes of both genders in the center where the name of the company is stated on a black background. The color scale displayed a yellow, orange, but also red, which indicates the intensity of the view within this area. Draft no. 1 is covered almost the whole by heat map, which means that the respondents perceived the whole logo, not just one part.

Heat maps of color combinations of design no. 1 shown in Fig. 5 express the preference of the first and second color combinations. Therefore we record there warmer colors. The heat maps of the original logo and its color combinations reveal that the preferred logo was not original, but it was the second color combination. In this color combination, the highest intensity of visual attention was observed as well.

In addition to monitoring visual attention, we also observed micro-emotions through the Microsoft Webcam – LifeCam Studio with the 1080p HD



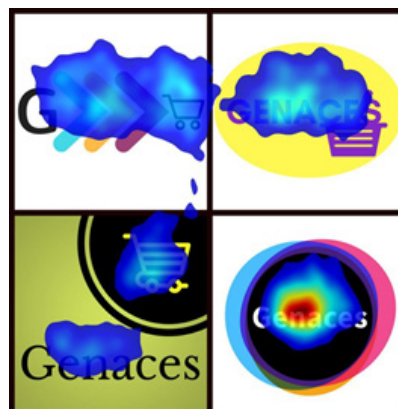
3: Fixed points for male respondents on draft no. 1 and the original logo

Source: Results of own research

Sensor, and data that describes the emotional status of the respondents we acquired through FaceReader 6.1. This program has provided us with a statistical indicator of emotional valence that points to the positive, neutral, or negative nature of emotions induced by the specific stimulus (Noldus Information Technology, 2015), in our case by exclusive logo designs. In Tab. II it shows the numbers of respondents in each emotional valency, at the beginning of the designed tracking and at the end. We watched the changes, caused by the suggestions, by gender. The results of male respondents are constant from the start of the observation to the end of the process of representation of the proposal. The most significant change was recorded within proposal no. 1, as the only one showed a positive valency in 4 respondents. Unlike male respondents, in the case of women, emotional valencies also changed during the observation of one proposal.

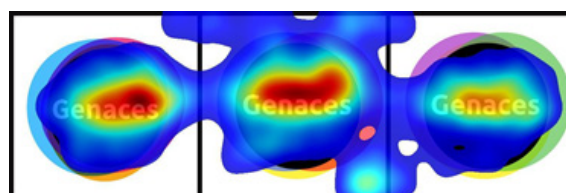
At the beginning of the consideration of each proposal, 5 respondents had a positive valence. The largest number of respondents with negative valence was induced by proposal no. 3.

Overall, based on the results of our research, the most positive we evaluate the proposal no. 1 and the original logo. Male respondents preferred draft no. 1, this proposal took their views fastest, kept their views for quite a long time, and more respondents had a positive emotional valence while watching this design compared to the original logo. With a more detailed look on Proposal No. 1, the second color combination appeared to be the most successful, because it took the longest view and each respondent looked back at this color combination. This is confirmed as well by heat maps. We rated the original logo as the second best proposal because it kept the views of male respondents for the longest time, and the most positive results in the color

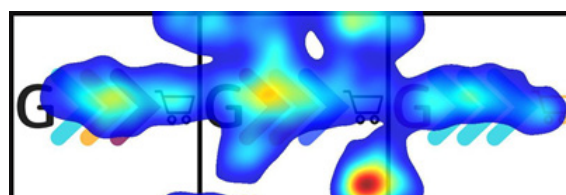


4: Heat maps

Source: Results of own research



Original logo



Draft No. 1

5: Heat maps of original logo and draft no. 1

Source: Results of own research

II: Valency counts for male and female respondents

gender	tracking time	positive		neutral		negative	
		M	F	M	F	M	F
Original	Start	3	5	1	0	5	8
logo	End	3	4	1	1	5	8
draft no. 1	Start	4	5	0	0	5	8
	End	4	4	0	2	5	7
draft no. 2	Start	3	5	0	3	6	5
	End	3	4	0	1	6	8
draft No. 3	Start	3	5	0	0	6	8
	End	3	3	0	1	6	9

Source: Results of own research

combinations were also reached by the second color combination that took the attention of participants in the shortest time and got the view back from each respondent. In the case of female respondents, the best results were for proposal no. 1. This proposal got the views the fastest, held them for the longest time and each respondent returned the look for this proposal. Of the total color combinations, the second color combination was the most successful, as was the case for male respondents. We evaluate the original logo from female respondents somewhat negatively, because it did not grasp their attention fast enough and not all respondents looked back at the logo. Overall, we rank the best logo for Genaces Slovakia s.r.o., as proposal no. 1 in the second color combination.

DISCUSSION

The expansion of horizons for a new field brings with it complex ethical discussions. Accordingly, there is a growing number of studies dealing with the ethical aspects of consumer neuroscience. Potential ethical dilemmas covered by these work include whether neuro-imaging technologies should be used to maximize profits, and also whether the results of neuromarketing research can be seen as a violation of individual consumer rights (Javor *et al.*, 2013). Many scientists claim that ads and marketing activities may be displayed for purposes other than information. They may have negative consequences, such as causing excessive shopping. As soon as a magic button appears, unethical companies will use existing information without a doubt to add dependence on their products and brands to the detriment of consumers'

physical and mental health (Hammou *et al.*, 2013). On the other hand, marketers pretend that if people consider non-marketing research to be unethical, it is as if they categorized the effort to sell something immoral. They are also aware of the complexity of the human mind and know that it can never be known into details and controlled less (Alonso Dos Santos, 2016). Nowadays, when someone becomes subject to such research, he/she signs a form of understanding the goal of the research and grants approval to use the images for research purposes. But there are still some critics who require the introduction of relevant laws and regulations to prevent privacy violations (Hammou *et al.*, 2013).

Nevertheless, we believe that consumer neuroscience has a future. It will gradually evolve, just like people and even brands (Morin, 2011). This area has gained a lot of enthusiasm over the years as it provides a better understanding of the target customers and their decision-making process. This information enables us to produce and offer better products and services. The decision-making process of consumers is much more complicated than some could ever think about. There is no magic purchase button. Each decision concerns different areas of the brain that are stimulated in different directions and by various factors (Hammou *et al.*, 2013). Given that it will evolve continuously, it will be necessary to develop publishing standards, to create training centers that will educate students and provide further training for faculties wishing to teach themselves in this field. Consumer science has the opportunity to solve exciting research questions now with new tools in the research toolkit (Yoon *et al.*, 2012).

CONCLUSION

For companies that are currently on the market, it's essential to involve consumers in designing and evaluating products and services, and that is not just asking for their opinion but gathering objective data from their subconscious when interacting with the product or service. The acquisition of this data was enabled by the whole set of tools offered by the new interdisciplinary science, called consumer neuroscience. A paper using selected tools researches the task of consumer behavior against the impact of the chosen product policy tool and that of a particular company's logo. As far as the identification of a specific company is concerned, it is much likely that the logo is among the first things consumers will think of or probably encounter rather than with the company itself. The new logo found for the selected company, however, is recommended before further testing, such as AB testing involving consumer neuroscience tools, to verify the validity of the research undertaken. Validation should also be done with a different location of the stimulus on the displayed area and conditions. Our logo designs were replayed to the respondents in one regular order, this fact could have influenced to a certain extent the suggestion seen by the respondents as the first one and the orientation of their views, so we suggest changing the display order of the design. By conducting this research and processing its results, we were aware of other factors that could have negatively affected the results and measures to deliver more accurate results. Testing of proposals should take place at the beginning of the week, in the middle and at the end of the week as well as the other day, because the moods of the respondents change, both during the week and during the day. Weather is another factor that can distort the results. We know well that weather can strongly affect the mood of respondents, so we suggest that testing should be done during rainy and sunny weather. We also recommend perfect laboratory conditions without interference, whether human, especially regarding noise, too high or low temperature or strong or weak lighting. Despite these constraints, we consider the contribution of this paper to education and the awareness of new research opportunities. With this statement, almost all research agencies claim that the Slovak manager is missing essential information about new possibilities, and therefore we hope that the company will become and set up a further great example of the use of consumer neuroscience for practice.

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