CHAPTER 10

New Research Methods in Organization Development: Eye Tracking (Case Study)

Bartłomiej Kabaja

Cracow University of Economics, Poland; ORCID 0000-0002-4155-2966

Summary. In the economic environment of today, businesses need to constantly develop, seek new opportunities and cutting-edge solutions. Organization development inevitably means introducing innovative products and adapting them to the ever-changing expectations of consumers. This chapter focuses on the eye tracking method and presents an example of its application to improve the communicative function of food product packaging. The study sample comprised 60 individuals. The eye tracking method consists in measuring and analyzing the eye movements of consumers during their contact with an examined object; in this study – these were various items of food packaging. Numerous empirical studies have shown that human eyesight tends to focus on elements that attract people's attention and interest. Eye tracking is a highly objective research method, and the progressive miniaturization of devices makes it less and less invasive. The conducted research made it possible to determine what difficulties consumers most often encounter when using the product and its packaging. The study has shown that the most important information from the perspective of consumer safety continues to appear on food packaging in hardly visible and oftentimes barely legible manner. Such situation can cause distress and discomfort to consumers, thus making them seek other, better-labeled products and, as a result, leading to the outflow of customers from the brand.

Keywords: organization development, eye tracking, packaging, marketing communication, marketing 4.0

1. Introduction

1.1. Organization development

In the time of rapid social, cultural and environmental changes, it seems that the need for continuous adaptation and adjustment of the organization to its environment has become more relevant than ever before in history. Therefore, the flexibility and foresight of managers are now particularly important in adapting to new tasks and defining business strategies.

Increasing competition invariably stimulates the systemic creation of innovations and their implementation in various areas of the organization. When operating in the market, businesses must be dynamic, use the latest technologies and manufacture goods that meet the expectations of the most demanding customers. What is particularly crucial, is the introduction of innovative marketing solutions and new tools of company communication with the market, arising from the fourth industrial revolution. These new techniques, tools and business practices have already been termed digital marketing or marketing 4.0 (Kotler et al., 2017).

In order to fully benefit from the possibilities of the newest technologies and gain or maintain an advantage over the competition, it is also vital to consider the role and importance of the product itself in the marketing strategy. Digital marketing and marketing automation give a unique opportunity for the businesses to become even more closely connected with their customers. They help understand their expectations and provide personalized experiences. The development of information technologies makes it possible to transfer processes such as customer acquisition and sales to the virtual world. Therefore, online and offline reality will coexist to achieve a personalized approach to the customer, which becomes a new distinguishing feature on the market (Chen, 2015). Through social media, the opinions of current customers become subject to modification in the virtual world under the influence of other people, especially those participating in consumer processes as well. The essence of marketing 4.0 will be to recognize the complementary roles of traditional and digital marketing in building consumer engagement and advocacy. Some of the best communication techniques and marketing tools in the era of Industry 4.0 are (Kotler et al., 2017):

- content marketing;
- multichannel marketing;
- social media marketing;
- gamification;
- mobile applications.

In such a way, customers are now not only a source of information about their own preferences or expectations, but they have become active co-creators, building a company's value that translates into competitive advantage on the global market (Łaszkiewicz, 2014).

Eye tracking is another particularly interesting method that gives an opportunity to develop and improve solutions consistent with the assumptions of the Industry 4.0. It can support the advancement of marketing and management, as well as IT and engineering, which form the basis of the fourth industrial revolution.

The aim of this chapter is to present the results of the study carried out using the eye tracking method, with the primary focus on possible ways of improving the availability of information on food product packaging.

1.2. Eye tracking method

Sight is the most important of senses. For the vast majority of people, it is the main source of information about the surrounding world. It is estimated that 90% of the information processed by the brain is visual content (Felder & Spurlin, 2005). Eye tracking is based on analysing the eye movement activity of the subjects during their contact with the objects

tested (Kabaja, 2018). There are two basic types of these movements: saccades and fixations (Duchowski, 2003).

Visual activity and eye movements accompany people in cognitive acts not only related to sight but also: hearing and skin sensation. Therefore, eye behavior testing in various situations can provide a lot of important data about information processing while performing mental tasks (Szymusiak, 2012). The most commonly used methods of obtaining the oculomotor signal are as follows: electrical (electro-oculography), photoelectric (reflective oculography), magnetic (test coil method), and visual (video-oculography) (Jaśkowski, 2004).

The presented methods differ in the way the oculomotor signal is obtained, while its interpretation – regardless of the method – is very similar. The calculation of the point at which the examined person looks depends on the position of both eyes. To this point, three-dimensional coordinates $\{x_g, y_g, z_g\}$ can be assigned. Each test is preceded by calibration of the eyes of the examined person with a device detecting motion. By recording the eye position change and its analysis, as well as by making the appropriate calculations, the coordinates of the point at which a person is looking can be determined. Figure 1 presents the scheme and geometries of oculomotor signal acquisition.

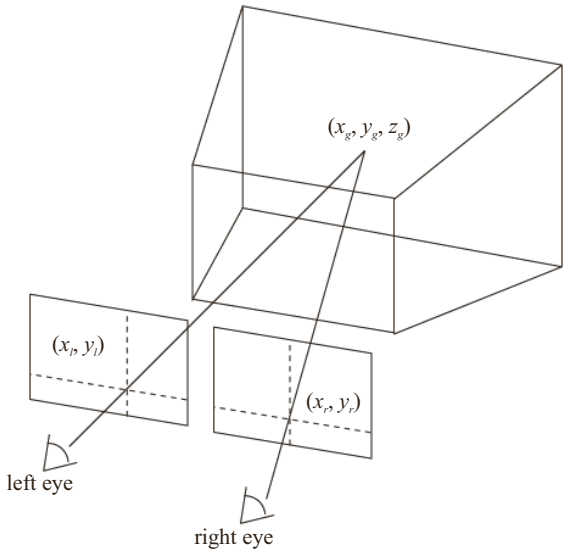


Fig. 1. Scheme and geometries of oculomotor signal acquisition

Source: own elaboration based on (Duchowski, 2003)

Different types of stimuli used during experiments in simulated or real environments (workstation, place of purchase) evoke specific internal states associated with cognitive and emotional processing in the examined person. Consequently, this leads to the possibility of recording, analysing and inferencing about the person's response to the environment as the subject of the experiment. Most often, to describe the impact of stimuli on the human senses, the following model is used: "Stimulus – Organism – Reaction" (S-O-R) (Woodworth, 1929). Eye tracking makes it possible to measure user interactions with the environment studied.

Such research is highly objective because it primarily focuses on actual behaviours of the subjects, not the states or opinions they declare. The possibility to track how the environment or the object studied are perceived helps provide specific guidelines concerning the behaviour and interactions that were detected during the experiment.

The size of the research group in the eye tracking study depends, similarly to the other research methods, on the purpose of the study. According to Nielsen and Pernice (2010), using a sample of 30 people in studies based on heat map analysis is sufficient. In turn, A. Bojko (2013) claims that already a 7-person group can make it possible to seek and obtain adequate information in the studied scenarios. However, in summative research plans, the sample size should be larger, so that the results can be subjected to statistical analysis, providing inferences about the entire population. In such cases, approximately 100 respondents should be examined (Mościchowska & Rogoś-Turek, 2015).

Eye tracking tests give the opportunity to recognize attention-absorbing elements, their observation time, observer's eye movement path, attention transfer order, as well as possible returns and revisions of the observed areas. Based on the collected data, such as e.g.: the number and length of fixations, the time until the first fixation, the number of visits and their duration, in-depth statistical and mathematical description of the obtained results can be provided.

2. Case study

2.1. Materials and methods

The material used for the research comprised 6 packages of dietary supplements generally available on the market. All of them had similar purposes and belonged to the group of products supporting immunity. According to research, such supplements are the most favourite and frequently purchased ones by consumers on the Polish market (Kabaja, 2018). The names of products and their general characteristics are presented in Table 1.

Table 1. Dietary supplements selected to eye tracking tests concerning product labelling

Product name	Package size	Product form
Propolis Plus	100 pcs	pills
Propollen	60 pcs	pills
Propolis Plus Mikstura	20 ml	drops
Propolis Forte	30 pcs	pills
API Gardin	16 pcs	lozenges
Propolis Forte (with 10% ethanolic extract)	20 ml	drops

The selection of research subjects was purposeful. As many as 60 respondents took part in the study, representing equal gender distribution. The detailed structure of the studied population is shown in Table 2. The study was conducted with the use of a Tobii X2-30 device (reflection oculography), compatible with Tobii Studio version 3.2 software, which was coupled with an Asus K95VJ portable computer (18.4-inch screen diagonal, 1920 × 1080 resolution).

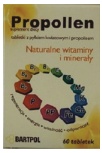
Table 2. Population structure of the respondents taking part in eye tracking test

Independent variables	**Segment**	**Study population *n* = 60**	
		n	**(%)**
Gender	female	30	50.0
	male	30	50.0
Age [years]	up to 19	10	16.6
	20–29	10	16.6
	30–39	10	16.6
	40–49	10	16.6
	50–59	10	16.6
	60 and over	10	16.6

2.2. Results and discussion

In the first part of the study, all packages of the products tested were presented to the subjects and they were then asked to choose one of them. The results obtained are presented in Table 3. Most respondents (40%) selected the packaging of Propolis Plus. The average time to indicate this packaging was less than 13 seconds. The fastest decisions were made by the subjects that selected the packaging of Gardin API – it took them only 9 seconds. Most of the fixations were directed towards the packaging of API Gardin and Propollen, and the fewest of them on the packaging of Propolis Forte. Most of the subjects did not pay attention to this product. As many as 10 of them (17%) completely ignored that packaging and did not set any eye fixations on it. The packaging that attracted the most attention was of API Gardin. On average, after only 0.45 seconds, the subjects tested fixed their eyes on this product. Analysing the number and time of all fixations, the packaging the subjects looked at most were: API Gardin, Propollen, Propolis Plus – which received most indications. To obtain a more detailed analysis, the heat maps were elaborated. They are shown in Figure 2 and depict the places on the packaging on which subjects fixed their eyes for the longest time.

Table 3. Eye tracking test results

Indicator	Main field of view of the packages tested					
		* 				* 
Number of subjects (n = 60)	13 (22%)	4 (7%)	9 (15%)	9 (15%)	24 (40%)	1 (2%)
Average time to indicate the selected packaging (s)	10.87	8.92	17.57	14.57	12.53	14.64
The average number of fixations on a given packaging	2.1	3.28	3.43	2.85	2.85	1.41
Number of subjects with no fixations on a given packaging	4 /60 person (7%)	2/60 person (3%)	5/60 person (8%)	5/60 person (8%)	4/60 person (7%)	10 /60 person (16%)
Average time to first fixation on a given packaging (s)	2.41 (3/6)	0.45 (1/6)	1.31 (2/6)	2.80 (4/6)	3.79 (5/6)	4.54 (6/6)
The total time of all fixations registered on a given packaging (s)	123.86	133.16	151.40	104.26	143.74	64.28
The sum of fixations on a given packaging	343 (17%)	411 (20%)	409 (20%)	279 (14%)	396 (20%)	184 (9%)

* For editing purposes, the photos of packages were rotated by 90 degrees. During study they were presented in normal position

Fig. 2. Heat map of product packaging

In oculomotor studies, it is assumed that the sight is directed to those elements of the visual scene that are thought of and are important for the viewer, so eye movement parameters are interpreted as indicators of cognitive processes (Francuz, 2010). The fixation time was therefore mapped on individual packaging elements with specific colours according to the map legend. The map shows that the test subjects most often acquainted themselves with the packaging by reading the product name. For each packaging, the places on the labels where the product names are given coincide with the heat map indications. Additionally, in the case of Propollen and Propolis Plus packaging, the respondents focused their attention on graphic design as well. On the other hand, in the case of Propolis Forte and Api Gardin, the subjects also carefully read the product descriptions. The key to choosing Propolis Plus could be the inscription "supports immunity" under the product name and a large number of pills in the package – 100 pcs. The heat map clearly shows that among all the markings referring to the contents of the packaging, the respondents paid the most attention to the name of the Propolis Plus product. In the next stage, the labels of the tested supplements were more carefully analysed, focusing on the availability of information on the packaging and the transparency of the graphic design. The study scenario consisted in asking the subjects to find particular markings or pieces of information on the packaging. After finding the required information, the subjects were to click on it with a computer mouse to confirm the completion of the task. The information the subjects were to look for was important for the correct use of the product and its safety. Selected test results are presented below. When testing the API Gardin packaging, it was observed that consumers had a problem finding the "recommended daily intake" marking. As many as 40% of subjects were unable to find this information. In order to analyse this case, a heat map of tested packaging was prepared, including the registration of those respondents who did not correctly follow the scenario instructions. The map is presented in Figure 3.

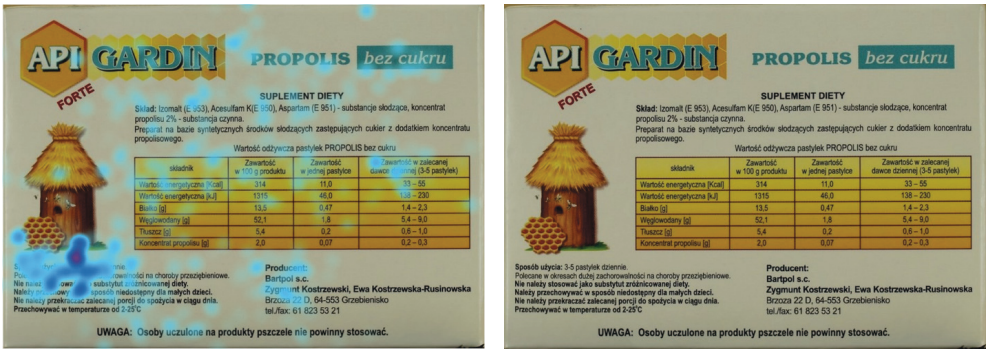


Fig. 3. Heat map recorded during tests
on availability of information API Gardin packaging

Source: (Kabaja, 2018)

Figure 4 presents the differences in the time taken by subjects to notice and indicate information in accordance with the study scenario. It turns out that the marking containing a warning not to exceed the recommended daily intake was particularly difficult to find.

In the case of Propollen packaging, it took an average of over 18 seconds to find and indicate the information, which significantly differs from the search time of other markings on the tested packaging.

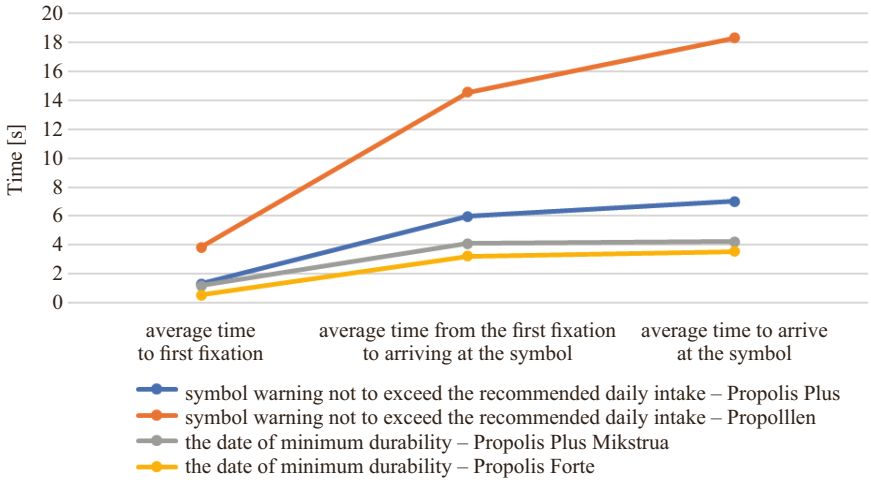


Fig. 4. Time taken by subjects to notice and indicate information

The eye paths registered during the study confirm the difficulty of the subjects tested in finding the marking which warns consumers not to exceed the recommended daily intake of the product. The registered eye fixations of two selected subjects, whose time to arrive at the symbol was in the fourth quartile of this feature (Tab. 4), are presented below. Difficulties in finding the marking are confirmed by a large number of fixations in the analysed area and a long time taken by the subjects to complete the task. As can be seen in Table 4, the subjects focused their attention on the place where the information actually was on the label, but for some reason they did not indicate it. This was most probably due to low readability of the text (font).

To sum up the research part, it should be stated that eye tracking is an innovative research tool with great potential and possibilities. The first part of the conducted tests made it possible to compare different product packaging and indicate which of them meets with the greatest interest as well as to analyse these choices from the perspective of eye movement activity. Such tests can be easily performed in enterprises to compare packaging, e.g., with competitive products. As a result of such study, it can be determined how the packaging will attract customers in the environment of competing products. The analysis of heat maps allows to detect which elements of packaging and their graphic design attract the most attention of consumers. In addition, during the product preparation phase, companies can perform various eye tracking tests to maximize the promotional value of the packaging.

In the second part of the study, each packaging was thoroughly assessed for its visibility and readability of markings. The aim was to detect such packaging elements that may potentially cause problems for consumers. The analysis focused on the information on packaging that is difficult to find and become familiar with, thus raising serious difficulties for product

users. By carrying out such type of tests, companies can optimize the appearance and design of the packaging to achieve higher level of consumer satisfaction. Manufacturers can modify the appearance and design of the packaging to obtain appropriate endpoints related to consumer satisfaction. Undertaking such activities is in line with the assumptions of Industry 4.0, namely social product development and its personalization. The use of eye tracking in the field of packaging makes it possible to understand the preferences of future customers and to introduce modifications accordingly.

Table 4. Eye tracking of selected subjects during evaluation of Propollen packaging

Characteristics of the subjects and their eye movement activity		
Age	above 60	40–49
Gender	male	male
Number of fixations	108	109
Duration of all fixations	46.52 s	38.59 s

3. Conclusions

In conclusion, it should be stated that eye tracking undoubtedly belongs to technologies that are gradually becoming more important for organization development. Eye tracking will support many areas of the organization, especially marketing and the development of consumer products. Thanks to its application in research, it will be possible to better adapt products and services to customer requirements and to support promotional activities.

The eye tracking method can contribute to the improvement of the following aspects of organization development: human-machine cooperation, workplace and workstation conditions, usability of computer program interfaces, broadly understood communication, social product development or product profiling. Another advantage of eye tracking is the possibility of presenting the test results in diverse and visually attractive graphical forms (heat maps, eye tracks). Further development of eye tracking technology can contribute to the development of remote

eye controlling techniques for devices or computer programs. Certainly, along with technological progress, the capabilities of eye tracking devices will be improved. The expected directions of further advancements are as follows: the miniaturization of the devices, a reduction of the invasiveness of the test, an increase in the accuracy of eye parameters reading, wireless operation, the analysis of the results in real time or extended battery life. An ongoing development of eye tracking technology is confirmed by numerous patents. Among the weaknesses of eye tracking technology are the cost of devices, the need for analysis by qualified staff, and the difficulty and arduousness of analyzing the source data.

Acknowledgements

The publication was financed by the Ministry of Science and Higher Education granted to the Department of Commodity Science Cracow University of Economics, for Research for Young Scientists and PhD Students.

References

Bojko A., 2013. *Eye Tracking the User Experience: A Practical Guide to Research*. Rosenfeld Media.

Chen S., 2015. *Multichannel Marketing: A generalized framework, and the antecendents and consequence of its implementation* [doctoral thesis]. Politecnico Di Milano, March, 2015; https://www.politesi.polimi.it/bitstream/10589/102815/1/2015_03_PhD_Chen.pdf [31.01.2020].

Duchowski A., 2003. *Eye tracking methodology: Theory and Practice*. Springer.

Felder R.M., Spurlin J., 2005. *Applications, reliability and validity of the index of learning styles*. "International Journal of Engineering Education", vol. 21(1), pp. 103–112.

Francuz P., 2010. *Ruchy gałek ocznych podczas wykonywania zadań wyobrażeniowych*. [In:] P. Francuz (red.), *Na ścieżkach neuronauki*, Katolicki Uniwersytet Lubelski, Lublin, pp. 47–106.

Jaśkowski P., 2004, *Zarys psychofizjologii*. Wyższa Szkoła Finansów i Zarządzania, Warszawa.

Kabaja B., 2018. *Kryteria oceny znakowania opakowań jednostkowych suplementów diety*. "Monografie: Prace Doktorskie", no. 31, Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie, Kraków.

Kotler P., Kartajaya H., Setiawan I., 2017. *Marketing 4.0. Era cyfrowa*. Wydawnictwo MT Biznes, Warszawa.

Łaszkiewicz A., 2014. *Wolontariat konsumencki w dobie mediów społecznościowych*. "Marketing i Rynek", no. 8, pp. 1123–1128.

Mościchowska I., Rogoś-Turek B., 2015. *Badania jako podstawa projektowania User Experience*. Wydawnictwo Naukowe PWN, Warszawa.

Nielsen J., Pernice K., 2010. *Eyetracking Web Usability*. Nielsen Norman Group, New Riders, Berkeley, CA, USA.

Szymusiak H., 2012. *Neurobiologiczne techniki stosowane w biznesie*. Wydawnictwo Uniwersytetu Ekonomicznego w Poznaniu, Poznań.

Woodworth R.S., 1929. *Psychology: study of mental life*. Holt, New York.