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Article

The impact of AI development on the development of marketing communications

Marketing i menedžment inovacij

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Reference: Nesterenko, Volodymyr/Olefirenko, Oleg (2023). The impact of AI development on the development of marketing communications. In: Marketing i menedžment inovacij 14 (1), S. 169 - 181.

https://armgpublishing.com/wp-content/uploads/2023/03/A676-2023-15_Nesterenko-et-al.pdf.
doi:10.21272/mmi.2023.1-015.

This Version is available at:

<http://hdl.handle.net/11159/15951>

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THE IMPACT OF AI DEVELOPMENT ON THE DEVELOPMENT OF MARKETING COMMUNICATIONS

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Type of manuscript: research paper

Abstract: *Advertising has always been and remains an important part of companies' operations. With the development of technology, its implementation and forms are constantly changing, allowing marketers to find new ways to influence consumers and promote products. One of these new forms, namely advertising created with the assistance of artificial intelligence, will be analyzed in the research. The research aims to assess the impact of technology on the development of marketing communications. The study applies ANNOVA techniques to achieve the paper's aims. A general review of the possibilities of using artificial intelligence to improve the marketing campaign and modern developments in artificial intelligence technologies that can (or will) be implemented in the marketing industry was conducted. Many options for realizing all the benefits provided by the technology, aside from the possibility of increasing the efficiency of advertising and collecting user data, were highlighted. The results of the ANOVA modeling allowed confirming the hypothesis about the existence of a statistically significant difference in the perception of the advertising video created by artificial intelligence, as opposed to videos created exclusively by humans. Additionally, there was a statistically significant difference in the perception of the video created by artificial intelligence with regards to the gender factor. The authors briefly reviewed real-life cases of artificial intelligence technologies used by some large companies and showed their efficiency indicators. The authors also surveyed a group of people about their impressions of several commercials, one of which was written by artificial intelligence and the others not. The research brings new knowledge to modern marketing theory and allows for a fresh look at the current principles of advertising campaigns and further development of technologies in this area.*

Keywords: marketing communication, artificial intelligence, advertising, values, trends, the transformation of social values.

JEL Classification: I29, J24, O15, M30, M31

Received: 2 June 2022

Accepted: 12 March 2023

Published: 31 March 2023

Funding: There is no funding for this research.

Publisher: Academic Research and Publishing UG

Cite as: Nesterenko, V., & Olefirenko, O. (2023). The impact of AI development on the development of marketing communications. *Marketing and Management of Innovations*, 1, 169-181. <https://doi.org/10.21272/mmi.2023.1-15>



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Introduction. Marketing is essential for the development of enterprises and strengthening their competitive position, as its tools are almost the only available way for a company to influence consumers (Oliveira & Luce, 2020; Jamil et al., 2022). The theory itself and approaches to marketing campaigns have changed a lot (from focusing on production aspects to social and ethical ones), due to the development of technology, changes in consumer preferences, etc. (Storbacka & Moser, 2020; Rangaswamy et al., 2020; Veckalne & Tambovceva, 2022). New trends and concepts are emerging (Morin, 2011; Rosokhata et al., 2021), the principles of using marketing tools are being redefined, and new ones are emerging (Thaichon et al., 2022; Letunovska et al., 2021). The development of new technologies has provoked the emergence of new marketing tools for promotion and advertising. (Letunovska et al., 2021).

In today's environment, the use of artificial intelligence (AI) to improve the effectiveness of advertising campaigns is becoming increasingly important Marr (2022). Many companies use artificial intelligence in one way or another, which allows them to significantly increase their marketing capabilities. There are already companies that provide such services and improve their own AI technologies. In addition, some applications are freely available and allow you to evaluate modern AI capabilities and use some of their developments in your work or education. As will be shown in the study below, the use of artificial intelligence in business operations does indeed improve key performance indicators and achieve better financial results.

In general, artificial intelligence refers to the ability of machines to copy functions that are mainly associated with humans, such as learning, analyzing information, drawing conclusions, making decisions, and others (Krenn et al., 2022). Companies use different variants of such applications, for example, for automated customer service, marketing process automation, automated sales, predictive analytics, etc. (Devang et al., 2019). Thus, it is important to analyze the effectiveness of such methods and the prospects for their application. In this research, the authors focus on how artificial intelligence can be applied in advertising and analyze existing cases and their metrics both in Ukraine and around the world.

The research aims to study:

- whether there is a statistically significant difference in the perception of commercials created by artificial intelligence as opposed to commercials created exclusively by humans;
- whether there is a statistical difference in the perception of the video created by artificial intelligence by men and women;
- whether there is a statistical difference in the perception of videos created by artificial intelligence and humans by men and women.

Finding opportunities for companies to use this technology to increase the efficiency of their activities, as well as forming objective conclusions about the results of the implementation of artificial intelligence technology. The main objects of the study are existing cases of using AI technology to improve their marketing capabilities. This work brings new knowledge to the theory of marketing, as well as complements information on the practical use of artificial intelligence, and the future implementation of this technology in the processes of life, which is the novelty of the work. All these conclusions are based on a survey of 124 respondents.

The research of this article is relevant, original and it mathematically verifies the hypotheses of the authors.

Literature Review. The authors used a significant scientific base in the research. It is worth highlighting the work of Devang et al. (2019), in which scientists, based on statistical calculations, describe the possibilities of using artificial intelligence by marketers. They also point out some existing problems related to the implementation of AI but do not provide practical methods for solving them. The possibilities of using artificial intelligence were also studied by Khrupovych and Borisova (2019), pointing out the possibilities of such implementation to facilitate the activities of marketers in social networks. In turn, Stebiuk and Kopeikina (2019) focused on existing and functioning tools for using AI in marketing activities, namely, on companies that provide such technologies and their Ukrainian counterparts. The study of the use of artificial intelligence in advertising was conducted by Buch and Thakkar (2021). The scholars outline that technology can be incorporated to advertising. It is worth noting that, although scientists mention the most common opportunities for implementing this technology, they do not describe them in full, which makes it relevant to further detail the use of AI in this area. Artificial intelligence is undoubtedly one of the newest technologies that are being actively developed and are often researched in the scientific community. Xu et al. (2021) find a large body of information on the use of artificial intelligence in various fields of life. Scientists are considering the possibilities of applying AI in history, physics, mathematics, geology, medicine, life sciences, chemistry, and the development of information technologies. As you can see, this list does not include any component of the economy, including marketing, which indicates a gap in the study of this topic in the global scientific literature. A detailed study of the use of AI in marketing can be found in the work of Haleem et al. (2022). It identifies 23 different opportunities for using artificial intelligence in marketing activities. For example, identifying the

target audience, analyzing input data more efficiently, improving customer service, and others (they are described in the Discussion section below). Although scientists write about the prospects of using AI in advertising, they seem to forget about the fact that this technology already can independently create scripts for commercials, create advertising texts, and generate images and videos used in advertising and marketing. Scientists mention only the ability of artificial intelligence to analyze large amounts of data and to more efficiently launch existing human-created programs, but ignore the possibilities described above. The same applies to the works of Buch and Thakkar (2021) and Yu (2021), who also assess the possibilities of using AI in marketing, but do not mention the possibility of creating video or audio ads on their own. In addition, there are very few studies that would draw any conclusions about the effectiveness of AI-generated ads and consumers' opinions about them.

The role of artificial intelligence in marketing activities was studied by Kumari (2021). The scientist provides an extensive list of possibilities for the application of this technology and justifies the benefits that can be achieved with the help of AI. Kumari notes that artificial intelligence is the future in this industry, and doing business and marketing without AI will become impossible. Huang and Rust (2020) also describe many opportunities for the use of AI in the formation of marketing strategies (segmentation, targeting, and positioning), research (data collection, market analysis, customer understanding), and campaigns (standardization, personalization, relationalization). Scientists emphasize that the ability of artificial intelligence to perform analysis that is inaccessible to human thinking is one of its most revolutionary capabilities, making its future use inevitable and its current use important for increasing the efficiency of companies.

Sama (2019) analyzed the impact of different types of media advertising on consumer behavior (through television, newspaper, magazine, and radio) in his study. The scientist comes to conclusions about the peculiarities of the impact of each type of advertising on consumers and their effectiveness: the most effective was television advertising, and the least effective was radio, which explains the difference in prices for advertising using these resources. (Jogi & Vashisth, 2021) wrote in more detail about online advertising, paying attention to the level of its effectiveness and consumer expectations. In general, many different publications on this topic can be found in the public domain, a literature review of which is provided in detail (Veiga & Diogo, 2022). However, they do not mention the use of artificial intelligence to create advertising. This is because there are not many studies in the literature on the effectiveness of AI-based advertising: most often, only theoretical benefits that such innovation can bring are described without analyzing statistical data. However, with the widespread use of this technology in marketing and other areas, the authors thought it was relevant to conduct a study on this topic.

One of the topics covered in this research is the concept of neuromarketing. Over time, it is become more and more popular: this is considered in their work by Vences et al. (2020), who describe neuromarketing as one of the leading opportunities to improve interaction and understanding between businesses and consumers (primarily in social networks). This topic is discussed more generally in the work of Bockova et al. (2021), as well as Sydorov and Petropavlovskaya (2021), who considered the theoretical and ethical aspects of this concept, respectively. Neuromarketing in terms of its interaction with artificial intelligence was studied by (Emic & Cabro, 2019; Mouammine & Azdimousa, 2019; Ziabina & Dzwigol-Barosz, 2022; Kuzior et al., 2022), pointing to a likely increase in the effectiveness of research in terms of consumers, their preferences, opinions, and emotions.

One of the most advanced areas in the marketing industry today is neuromarketing, a set of methods for studying human behavior based on the study of their behavior and behavioral reactions (Bockova et al., 2021). The concept is especially widespread through social media (Vences et al., 2020). Neuromarketing emerged due to the modern development of markets, which is unusual for classical and other theories. It would be logical to assume that consumers buy products that are the most profitable for them in terms of price/quality ratio. However, in today's realities, consumers are overloaded with information about products on the market, which makes it difficult to draw objective conclusions. Inefficiencies are being created in the market, which leads users to buy products that are not the most profitable for them, but those they hear about more often and trust more. Therefore, the price of goods and their quality are becoming less and less important, and companies are beginning to invest more time in researching new methods of promoting their products, which is why neuromarketing was created, trying to convey certain messages to their consumers (considering their preferences and «playing» on their emotions), which makes the products of such companies more competitive Sola (2013). This concept has both supporters (who consider neuromarketing a revolutionary discipline) and critics, who believe that it is nothing more than a means of deceiving consumers. Neuromarketing is indeed a new discipline that complements the existing marketing theory, but it also gives great power over user

behavior. According to scientists, in particular Sydorov and Petropavlovskaya (2021), companies that use it should not make any attempts to deceive consumers: in other words, the use of neuromarketing should be ethical. Given the very essence of neuromarketing, it can be concluded that the application of this concept can become much more effective given the further development and increasing use of artificial intelligence. With the ability of AI to analyze large amounts of data, marketers will be able to obtain more useful data about customer behavior and taste in terms of advertising, branding, and product evaluation, which will allow them to formulate better judgments and conclusions (Mouammime & Azdimousa, 2019). This interaction is mutually beneficial for the further development of marketing (Emic & Cabro, 2019). Shumilo (2022) studied artificial intelligence tools for managing the behavior of economic agents. The scientist provides a detailed description of the existing possibilities of using AI for the purposes that a company may need. Moreover, she provides links to these tools. Stebiuk and Kopeikina (2019) also assess the general possibilities of using artificial intelligence in the marketing industry, relying on the experience of several foreign companies operating in this area and their Ukrainian counterparts. In their turn, Khrupovych and Borisova (2019) describe in rather general terms the peculiarities of using AI in marketing research, however, focusing on the problems of analyzing large data sets.

Currently, the AI market is not very widespread, with only a few companies present in it. The first one worth mentioning is a neural network created by developers from Meta called Make-a-Video. It allows the creation of short videos based on a short description: famous works that can be found on their official website are «a confused grizzly bear in a math class», «a knight on horseback in the countryside» and others Make-a-Video (2022). The developers of this program Singer et al. (2022) explained in detail about their creation. The research describes in detail the peculiarities of reading text for transferring it as an image. In any case, AI must undergo a training and education process before the procedure itself. Developers continue to work on this technology and are going to increase its efficiency and open new possibilities for it. They are going to create the ability to form several scenes in a video sequence at once (currently, only one is available) and improve the accuracy of text reading. In general, this development has certain prospects for future use in the marketing sphere, but now it requires significant refinement and expansion of functionality. Google has a similar development called Imagen Video. This development is also capable of creating images and short (up to 5 seconds) videos but differs in its principles from Make-a-Video. Ho et al. (2022) described the model used and provided many examples of their work. They also point to significant opportunities for its further development and comprehensive use. This technology has both similar advantages and disadvantages to Make-a-Video, so at this stage of their development, it is difficult to conclude which one is more effective. However, there are now developments of completely different types. Thus, other American developers were able to create an AI, Soundify system capable of adding audio to video without sound. This technology was also described in the article by Lin et al. (2022). To achieve this result, the authors have created a database of more than 90 thousand high-quality sound effects that artificial intelligence can apply to a video sequence by analyzing objects that are sound sources (sound emitters) and the environment in which they are located. This technology can be successfully combined with the two technologies discussed above (Make-a-Video and Imagen Video), as it can add sounds to the video sequences created by them. However, at this stage, it needs to be improved by increasing the amount of audio data stored and improving the audio quality. Another company is OpenAI and ChatGPT, which is an artificial intelligence chatbot that can engage in a dialog on various topics, answer questions, and, importantly, generate unique text based on information on the Internet. This technology has become available for free use relatively recently, so it is not yet clear what purposes it can be used for. So far, the following can be identified: writing unique texts (including marketing texts), helping to find information to prepare for classes, providing psychotherapeutic assistance, etc. Currently, the developer company is developing very rapidly: it is estimated at \$29 billion, and its revenue in 2024 may increase to \$1 billion (Halytskyi, 2023). In 2022, Midjourney, a product specializing in processing human-written text for image processing, was actively launched. When entering text, AI generates four pictures, one of which a person can choose. Then Midjourney will generate variations of this picture until the person gets a satisfying option. DALL-E 2 also offers a similar feature, which also allows you to generate pictures based on the text you enter, or add certain elements to the pictures or photos you submit. It is worth noting that this technology can generate quite accurate images if you specify many variables in the text that it will rely on. In the future, it can be used to create unique pictures or drawings without the need for artists, which will increase the effectiveness of marketing campaigns. On the other hand, it can be a good source of inspiration for, for example, designers, because the pictures it sometimes generates are unique and inspire new ideas. The experience of IBM Watson Advertising is important. This company provides its partners with various services for developing digital marketing campaigns and automating interaction with people. Such technologies are

not as advanced as Make-a-Video, Imagen Video, or Soundify, but it has already been able to show successful results in cooperation with other companies. So, given the relevance of this area, the rapid pace of its spread, and the use of AI technologies, a study was conducted on the reaction of consumers to ads created by artificial intelligence and humans. It is worth noting that direct ad creation by artificial intelligence is rarely used today; in fact, there are only a few examples of such practices. Most often, AI can be used to improve the ability to create ads on specific platforms such as Facebook, Instagram, or Google, Yu (2021). Nevertheless, it is worth considering what examples of advertising created by artificial intelligence exist. The most famous of these is the use of AI technology to generate a commercial by Lexus Ibrahim (2018). IBM Watson Advertising has been training artificial intelligence based on advertising campaigns for the last 15 years, after which the AI wrote a script for a video directed by Kevin Macdonald Meedway (2018). The video itself is very unusual: it tells the story of the creation of the ES model and its departure for a crash test, which is watched by the developer. This use of artificial intelligence for an advertising campaign can be considered the most ambitious one ever made. Other examples of AI applications in advertising are more modest. A brief description of how different companies use this technology, and their effectiveness is shown in Table 1.

Table 1. Examples of AI applications in advertising by different companies and their effects

Company	Usage case	Effect
McDonald's	Encouraging consumers to visit their restaurants	Reduction of the price per visit by 168%
Best Western	Personalization of advertising with the help of AI from IBM Watson Advertising	Increased customer interaction time by 2.2 times Increase in website traffic with sales by 48.6%
CVS Pharmacy	Engaging consumers in regions with a high risk of influenza	Attracting 42 million visitors 644 million ad impressions Increase in the number of clicks on ads (CTR - click-through rate) by 120%
Walgreens	Identify potential customers based on weather conditions	379.98% increase in in-store traffic with native advertising
TruGreen	Create ads and optimize solutions based on collected user data	Increase the CTR level by 4 times Visitors stay on the site for 2 minutes longer

Sources: developed by the authors on the basis of (IBM Watson Advertising, 2021).

It should be noted that the authors used only the data on the use of AI directly or indirectly related to advertising (since AI has other uses). Although the options for using artificial intelligence described in Table 1 are not as extensive as in the case of the Lexus brand, even such a small increase in the effectiveness of advertising campaigns has sometimes led to a significant improvement in results.

Methodology and research methods. The study collected information online in September-December 2022 using the Google Forms platform to investigate the effectiveness of AI-generated advertising. It featured three one-minute videos of Lexus brand ads, one of which was created using artificial intelligence, and the other two were not, namely car commercials:

- 2018 Lexus ES Driven;
- 2022 Lexus NX;
- The Lexus RX (Lexus Official Website, 2022).

With this survey, the authors aimed to refute or confirm the following hypotheses:

H_1 : for this sample, there is a statistically significant difference in the perception of commercials created by artificial intelligence as opposed to commercials created exclusively by humans.

H_2 : there is a statistical difference in the perception of the video created by artificial intelligence by men and women

H_3 : there is a statistical difference in the perception of videos created by artificial intelligence and humans by men and women separately.

Respondents were asked to rate the videos from 1 to 5 (1 if they did not like the ad and 5 if they liked it a lot) and, if they wanted, to briefly describe the reason for their choice. The study used the *Likert* scale to evaluate the video, which is a measurement tool used in surveys to determine attitudes and opinions. The survey was anonymous: only their gender was asked from the respondents' private information. Thus, the survey was not burdensome and short, which made it possible to attract and interest a relatively large number of respondents. A total of 124 people were interviewed, including 65 women and 59 men. The sample was selected randomly, based on a publicly available survey; it is this random sample that can provide the most

reliable indicators of consumer opinions about the subject of the survey. Fisher (1966) Basic statistical methods were used to make the calculations that led to the conclusions, namely mean, median, mode, and standard deviation. Below, in Tables 2 and 3, we present the statistical base collected during the study.

Table 2. The set of respondents' estimates, based on which the study was conducted within the framework of the research

Mark	Number of women			Number of men		
	Lexus ES 2018	Lexus NX 2022	Lexus RX 2022	Lexus ES 2018	Lexus NX 2022	Lexus RX 2022
1	1	0	4	1	5	1
2	6	10	7	9	9	6
3	17	14	17	9	13	17
4	19	19	19	23	16	19
5	22	22	18	17	16	16
Total	65	65	65	59	59	59
Average number	3. 85	3. 82	3. 62	3. 78	3. 49	3. 73
Median	4	4	4	4	4	4
Mode	5	5	4	4	5	4

Note: * – first video (Lexus ES 2018); ** – second video (Lexus NX 2022); *** – third video (Lexus RX 2022); F – female, M – male. Sources: developed by the authors.

Table 3. The total set of respondents' estimates

Mark	Number of votes			Percentage of total		
	Lexus ES 2018* ¹	Lexus NX 2022 ²	Lexus RX 2022 ³	Lexus ES 2018*	Lexus NX 2022	Lexus RX 2022
1	2	5	5	1. 6	4. 0	4. 0
2	15	19	13	12. 1	15. 3	10. 5
3	26	27	34	21. 0	21. 8	27. 4
4	42	35	38	33. 9	28. 2	30. 6
5	39	38	34	31. 5	30. 6	27. 4
Total	124	124	124	100	100	100
Average number	3. 81	3. 66	3. 67	x	x	x
Median	4	4	4	x	x	x
Mode	4	5	4	x	x	x

Note: * – advertising created based on artificial intelligence; x – the cell is not filled in; Lexus ES, Lexus NX, Lexus RX – the names of the respective cars advertised in the video. Sources: developed by the authors.

Some coefficients were used to estimate the data obtained. The first of them is Cronbach's alpha (or Cronbaha's coefficient). It is most often calculated using the following formula:

$$\alpha = \frac{K}{K-1} \left(1 - \frac{\sum_{i=1}^K \sigma_{Y_i}^2}{\sigma_X^2} \right), \quad (1)$$

where α is Cronbach's alpha; K is the number of measured components (in this case, 3); σ_X^2 is the variance of the overall test result; $\sigma_{Y_i}^2$ is the variance of the component for the current sample.

Thus, in our study, Cronbach's alpha value was 0.05, which is a very low value (values of 0.5 and above are considered significant). This indicates a low level of internal consistency between studies. Such data can be interpreted as follows: although the commercials shown to the respondents were as close as possible (cars of the same brand were evaluated, and they were similar in their characteristics), viewers could evaluate different factors in each of them. For example, in some commercials, respondents paid more attention to the plot, while in others they focused on the dynamic development of events. Thus, this difference can be explained by both the characteristics of the people who were interviewed and the events in each video. In addition, the authors conducted Shapiro-Wilk normality tests. The formula for it is as follows:

$$W = \frac{(\sum_{t=2}^n a_t y_t)^2}{\sum_{t=1}^n (x_t - y_{avg})^2}, \quad (2)$$

where: W - the value of the Shapiro-Wilk coefficient; a_t - table coefficients; y_t - sample value; n - number of observations.

The calculation showed that the probability that the samples have a normal distribution is close to zero. Later, this statement was checked using the Kolmogorov-Smirnov test, which gave the same result. This allows us to state with confidence that the values obtained are not typical of a normal distribution. In addition, the Levene test was performed between the samples. It showed that the variance between the samples is homogeneous with sufficient probability, which indicates a uniform distribution of respondents' estimates in the samples. Since we have a normal distribution, we can then use a parametric test. For example, the Student's t -test. The Monte Carlo method is a statistical modeling technique used to evaluate the integrals of continuous functions. This can be done by generating random points in a given range, called «samples», and counting the ratio of the points under the function to the total number of points. The result of the method is an estimate of the integral of the function, which has high accuracy with an increase in the number of samples.

Principal Component Analysis (PCA) is a data visualization and analysis method used to find the most important components in a set of data. This allows you to reduce the dimensionality of the data while retaining the most important information. PCA works by finding orthogonal vectors that best describe the variation in the data. The first few vectors are called principal components and contain the largest proportion of the data variation. It was decided to conduct our survey among a random sample of respondents within Ukraine to draw conclusions based on how effective such advertising would be.

To find out whether H_1 is fully supported, it was decided to conduct an assessment using the Student's t -test (parametric test). To apply this criterion, the initial data must have a normal distribution. And they are since the authors conducted Shapiro-Wilk normality tests. Hence, the assessment uses the Student's t -test. To do this, the following formula was used to find t for the dependent samples:

$$t = \frac{Md}{\frac{s_d}{\sqrt{n}}}, \quad (3)$$

where t - Student's coefficient; Md - average difference of values; s_d - standard deviation of values; n - number of observations.

Results. In the research, the t values for the dependent samples (between 1 and 2 and 1 and 3 experiments) were as follows:

$$t_{1,2} = \frac{0,218}{\frac{1,788}{11,136}} = 1,356, \quad (4)$$

$$t_{1,3} = \frac{0,476}{\frac{1,5}{11,136}} = 3,53, \quad (5)$$

where $t_{1,2}$ – research for 1 and 2 videos (Lexus EX 2018 and Lexus NX 2022); $t_{1,3}$ – research for 1 and 3 videos (Lexus EX 2018 and Lexus RX 2022).

These results, with the condition α of = 0.05, indicate that when comparing the 1st and 2nd videos, the hypothesis is confirmed: respondents liked the video created by AI more than the human-made Lexus NX 2022. However, the same cannot be said for the Lexus RX 2022 video. There is a fairly high probability that the difference in ratings between the two is random. Nevertheless, in the author's opinion, even the data obtained is enough to draw a conclusion about the overall effectiveness of advertising created by artificial intelligence and confirm hypothesis H_1 . A t -test was also used to assess whether there was a statistical difference in the evaluation of the video created by men and women. The results are shown in Table 4.

Table 4. t-Test: Two-Sample Assuming Unequal Variances. Men and women

Indicators	Variable 1	Variable 2
Average	3.922	3.814
Variance	1.026	1.396
Observations	64	59
Hypothesized Average Difference	0	
df	115	
t Stat	0.544	
P(T<=t) one-tail	0.294	
t Critical one-tail	1.658	
P(T<=t) two-tail	0.588	
t Critical two-tail	1.981	

As a result, a value of m and w was obtained at 0.54; since it is within the critical range, hypothesis H_2 can be considered confirmed, and the statistical difference in the perception of the video between the articles is significant. Later, an analysis was conducted to determine whether there was a difference in the perception of the videos by men and women separately and in general using an ANOVA test. It showed that gender was only important in evaluating videos when watching videos created by AI (in this case, the p -value was very low, equal to zero). However, when viewing videos created by humans, the p -value is already 0.071 and 0.74 for Lexus NX and Lexus RX, respectively, which indicates that there is no influence of gender on the evaluation of these videos. The results are shown in Table 5. If an ANOVA test is conducted for all three videos at once, the p -value is 0.13, which also indicates a general lack of influence. Thus, H_3 can be considered rejected.

Table 5. Results of ANOVA tests

Indicators	SS	df	MS	F	P-value	F crit
ANOVA Lexus NX						
Between Groups	1.223	1	1.223	3.315	0.071	3.919
Within Groups	45.032	122	0.369			
Total	46.255	123				
ANOVA Lexus RX						
Between Groups	0.048	1	0.048	0.109	0.742	3.919
Within Groups	53.269	122	0.437			
Total	53.317	123				
ANOVA test for all three videos						
Between Groups	3.298	1	3.298	2.221	0.139	3.918
Within Groups	182.645	123	1.485			
Total	185.942	124				

Sources: developed by the author.

The results showed that among the three commercials, the best average score was given to the first commercial, i.e., the one created by artificial intelligence. At the same time, the amplitude of fluctuations between the average scores for the commercials is not high enough: 0.6 between the highest and lowest values. This distribution can be seen in more detail in Figure 1.

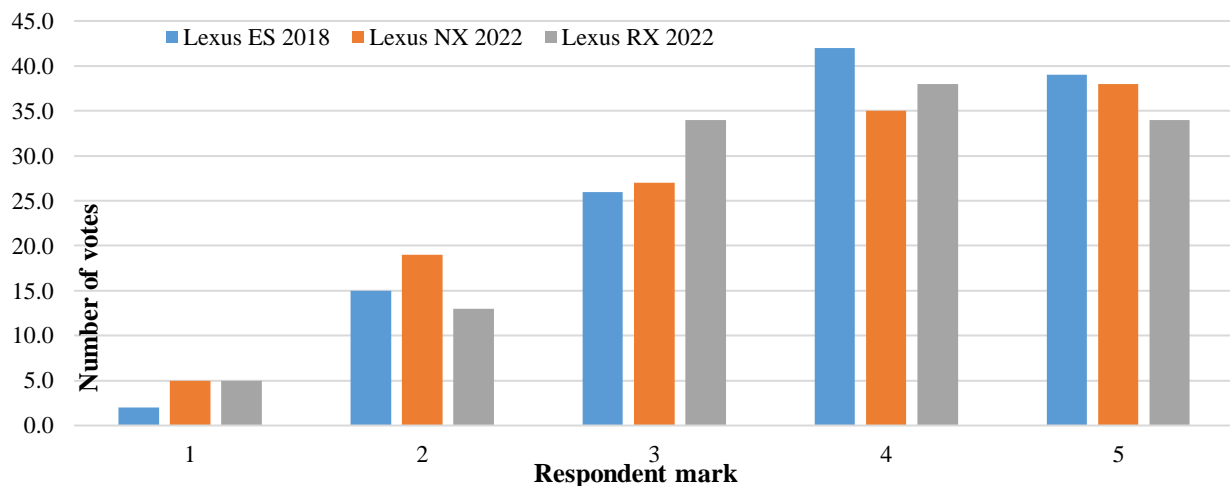


Figure 1. Distribution of user ratings of Lexus car ads

Sources: developed by the author.

Using the data presented in Figure 1, it is possible to see more clearly the distribution of ratings for Lexus ads. It can also be seen that the ratings for the Lexus ES ad are less dispersed and more centralized, as evidenced by the calculated standard deviation values (1.062, 1.19, and 1.094 for each ad, respectively). As Table 2 shows, both genders favored ads created with artificial intelligence. At the same time, women mostly gave higher scores for all commercials, while men gave lower scores. The average values of women's votes are higher than those of men. The trend can be seen in Figure 2.

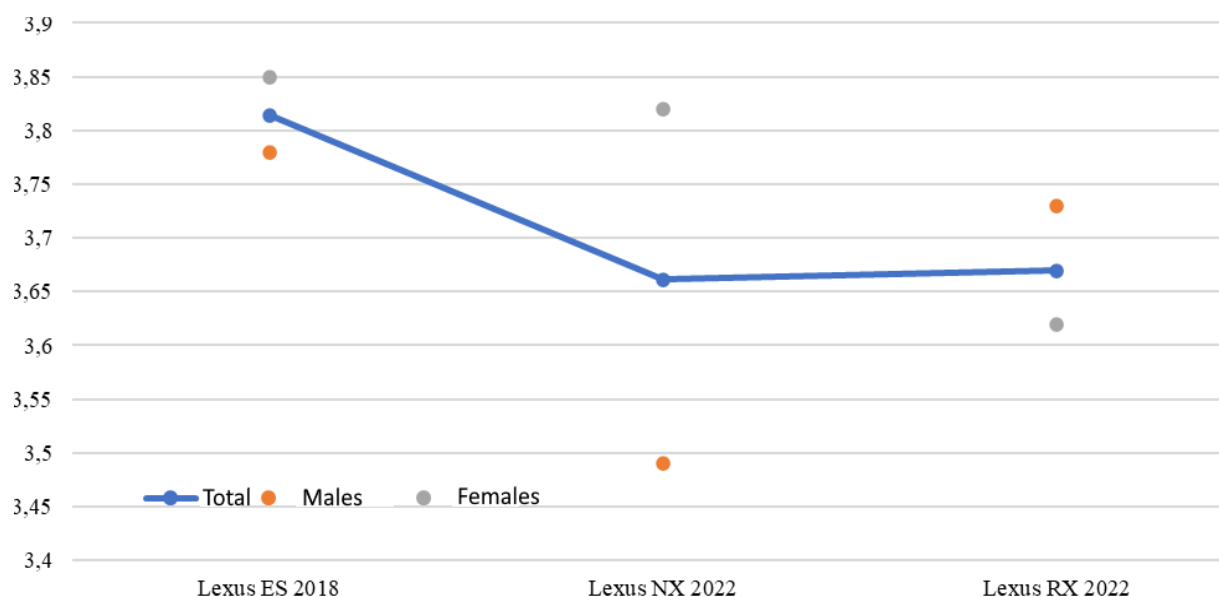


Figure 2. Distribution of average ratings for different types of advertising depending on the gender of respondents

Sources: developed by the author.

As you can see from Figure 2, women on average gave higher scores to the Lexus ES 2018 and Lexus NX 2022 videos, while men gave higher scores to the Lexus RX 2022 videos. Nevertheless, it is important to note that the higher average scores for the AI videos were among the female audience. Although the graph shows some differences in the evaluation of the commercials provided to the respondents, they are not that significant: by calculating Pearson's correlation, the authors tried to conclude the extent to which gender affects the consumer's reaction to watching an ad. Thus, for each video, they calculated the value of χ^2 , which each video is equal to 3.8, 6.02, and 1.7, respectively, which is less than the theoretical value of the indicator with the number of degrees of freedom equal to 4 and the significance level at 0.05 (under such conditions, the Pearson's criterion is equal to 9.5). This means that the respondent's gender does not affect his or her impression of the commercials selected in the study. Another Pearson's correlation coefficient also confirms these results: for the first video, it is approximately 0.17, for the second – 0.215, and the third – 0.117. Since the values are quite close to 0, this indicates a high level of independence of the variables.

As part of the research, it was also decided to calculate the value of the coefficient of agreement or concordance coefficient. Based on the survey of 124 experts, the coefficient was calculated at 0.057. This indicates a low level of consistency in the respondents' opinions, which is not surprising, since the respondents gave different ratings to different videos, ranging from 1 to 5. The coefficient of concordance for women separately is 0.091, and for men – 0.17. This may indicate that the separate opinions of women and men are more consistent with each other in terms of evaluating certain commercials and that the larger the sample, the less consistent the experts' opinions.

In addition, respondents had the opportunity to justify their choice of scores, pointing out the disadvantages or advantages of certain videos. To summarize the comments received, for the AI-based ads, attention was most often drawn to the plot, which was most liked by the control group (respondents liked the relationship between the car developer and his product), while some found it too intense. The situation is similar to the third video, but most respondents did not like the absurdity of the scenario. At the same time, the second video was most often given high scores because of its dynamism. Thus, it can be concluded that such moves can be considered successful in terms of the reaction of future consumers.

Thus, hypothesis H₁ formulated in the methodology can be considered confirmed: the average score of ads created by AI was significantly higher than the others. This indicates the prospects for the future development of this technology not only for AI control of certain processes (automatic communication with customers, analysis of advertising data, etc.) but also for creating full-fledged stories for commercials. As for hypothesis H₂, it was confirmed. This means that when evaluating the video created by AI, gender influenced the perception of advertising. At the same time, no such tendency was observed when viewing other ads, which is why H₃ was rejected. It can be assumed that this seeming contradiction is caused by the peculiarities of the AI-generated video that were not typical of the others, namely the high intensity of the plot.

The analysis conducted as part of the study showed that artificial intelligence technologies can and should be used to further shape advertising campaigns by businesses, as they increase their efficiency and make them more effective. This was demonstrated both in the survey of the control group and in the review of real cases of AI application by international companies such as McDonald's, Best Western, and others.

Discussion. Artificial Intelligence makes it possible to use the company's resources more efficiently, as it allows them to save on the implementation of marketing activities and reduce their cost. Above, the authors mentioned some new programs that allow using AI. It can be mention Midjourney and DELL-2, which allow the creation of pictures or drawings for future advertising campaigns, or ChatGPT by OpenAI, which can be used to write unique marketing texts. It is expected that there will be more and more such opportunities over time. It is worth noting that A. Halim, M. Jawaid, and M. A. Qadri are not the only scientists who have described the possibilities of using artificial intelligence in marketing. For example, Kumari (2021) describes several of the following positions that can be improved with the help of AI: sales forecasting, understanding consumers, creating their profiles, optimizing digital advertising campaigns, communicating with the audience in real-time, and automating marketing processes. Thus, the scientist speaks more personally about the role and possibilities of implementing this technology, but at the same time speaks about its importance and prospects for use in the future.

The role of artificial intelligence is also studied by Bruyn et al. (2020). They devote considerable attention to describing the possibilities and efficiency that can be achieved using artificial intelligence in marketing research, but also emphasize some other important factors. First, they write about the need to find opportunities for the most effective training of AI based on human experience and knowledge. In other words, it is important to process data from the outside with modern AI technologies for further use in various fields. Secondly, scientists point out the need to optimize the options for transferring knowledge from artificial intelligence to humans, which is best done through visualization. It has already been mentioned above that new AIs have made great progress in solving this issue: it is now possible to obtain data from such technologies in the form of photos, videos, and text. Indeed, in the modern era, the development of artificial intelligence is gaining momentum, although, as noted by Haenlein and Kaplan (2019), there have been cases in the past when, after the rapid development of AI, a «winter» came: initiatives were less active and investments in research and development decreased. We can only hope that this time, such implementation of the technology in various fields of activity will be more successful.

The study described a model of how the interaction between marketers and AI technologies is established Nurm (2019). As part of the study on possible future risks of using AI, the researchers describe the model of «using AI to automate personalized marketing». The process of interaction between a marketer and artificial intelligence consists of the following six components: planning, content, execution, data collection (from users), data management, and data analysis. The scientist notes that AI can play a leading role in all these processes, while human influence is required in only four of them: planning, content creation, execution, and data analysis. This creates an automated closed loop that simplifies the process of running marketing campaigns. This model is very similar to the one described above and describes well the process of interaction between a human performer (marketer) and artificial intelligence during the interaction.

As mentioned before, the authors were unable to find any publicly available studies that evaluated the effectiveness of ads created by humans and artificial intelligence based on empirical data. In this case, it is difficult for us to compare the results of our study, in which the video created by AI proved to be more receptive to most respondents than the one directed by a human. Nevertheless, we hope that in the future there will be more such studies, as well as cases of using the technology in practice.

Conclusions. Thus, the study showed that:

- there is a statistically significant difference in the perception of commercials created by artificial intelligence as opposed to commercials created exclusively by humans;
- there is a statistical difference in the perception of the video created by artificial intelligence by men and women;
- there is no statistical difference in the perception of videos created by artificial intelligence and humans separately by men and women.

The research also describes the main opportunities for using artificial intelligence in the field of marketing research. It was shown that there are already a lot of them, and this number will only increase over time, as more and more companies begin to use them and experiment with the results of their activities. In addition, the study surveyed a group of respondents about their assessment of several commercials, one of which was created by artificial intelligence. The data on the average number of points given to each of the ads suggests that AI-generated ads are more effective than conventional ones. In addition, based on real cases, it has been

shown that their marketing campaigns have increased in effectiveness. This suggests that the use of artificial intelligence technologies by companies, including Ukrainian ones, will allow them to achieve better results in their advertising campaigns. The study also evaluated the main developments in the field of artificial intelligence by various companies. It was shown that the only effective one is IBM Watson Advertising, which has already shown its effectiveness in cooperation with other companies. Other technologies in this area are more advanced but cannot yet fully prove themselves at this stage of development. Nevertheless, in the future, they can be used to create marketing advertising campaigns. A promising area for future research is the analysis of new opportunities for using artificial intelligence in the field of marketing activities of enterprises, for example, conducting AI dialogues with customers, managing online advertising, etc. In addition, it is still relevant to consider the development and application of AI technologies, as their use will improve the efficiency of companies in the domestic and global markets and increase their competitive advantages. Also, it would be relevant to conduct more global surveys on people's reactions and assessments of advertising fragments created by artificial intelligence.

Author Contributions: conceptualization, V. N.; methodology, O. O. and V. V.; software, O. O. and V. N.; validation, V. N.; formal analysis, V. N. and O. O.; investigation, V. N.; resources, O. O.; data curation, V. N.; writing-original draft preparation, O. O.; writing-review and editing, V. N.; visualization, O. O.; supervision, V. N.; project administration, O. O.; funding acquisition, V. N.

Conflicts of Interest: Authors declare no conflict of interest.

Data Availability Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

References

- Bockova, K., Skrabankova, J., & Hanak, M. (2021). Theory and Practice of Neuromarketing: Analyzing Human Behavior in Relation to Markets. *Emerging Science Journal*, 5 (1), 44-56. Retrieved from [\[Link\]](#)
- Bruyn, A. D., Viswanathan, V., Beh, Y. S., Brock, J. K.-U., & Wangenheim, F. V. (2020). Artificial Intelligence and Marketing: Pitfalls and Opportunities. *Journal of Interactive Marketing*, 1, 91-105 [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Buch, I., & Thakkar, M. (2021). *AI in Advertising*. Retrieved from [\[Link\]](#)
- Devang, V., China, S., Gunjan, T., & Krupa, R. (2019). Applications of Artificial Intelligence in Marketing. *Annals of Dunarea de Jos University of Galati Fascicle I Economics and Applied Informatics*, 25 (1), 28-36 [\[Google Scholar\]](#)
- Emic, A., & Cabro, S. B. E. (2019). Artificial Intelligence and Neuromarketing. *2nd International Scientific Conference on Digital Economy Diec 2019, Book of Proceedings*, 2, 1-13. Retrieved from [\[Link\]](#)
- Fisher, R. A. (1966). *The Design of Experiments*. Eighth Edition. Oliver and Boyd, Edinburgh. [\[Link\]](#)
- Haenlein, M., & Kaplan, A. (2019). A Brief History of Artificial Intelligence: On the Past, Present, and Future of Artificial Intelligence. *California Management Review*, 61 (4), 5-14. [\[Google Scholar\]](#)
- Haleem, A., Javaid, M., Qadri, M. A., Singh, R. P., & Suman, R. (2022). Artificial intelligence (AI) applications for marketing: A literature-based study. *International Journal of Intelligent Networks*. [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Halytskyi, S. (2023). *The owners of OpenAI (ChatGPT) estimate the business at \$29 billion. In two years, the turnover will reach \$1 billion*. Retrieved from [\[Link\]](#)
- Ho, J., Chan, W., Saharia, C., Whang, J., Gao, R., Gritsenko, A., ... & Salimans, T. (2022). Imagen video: High definition video generation with diffusion models. *arXiv preprint arXiv:2210.02303*. [\[Google Scholar\]](#)
- Huang, M. H., & Rust, R. T. (2021). A strategic framework for artificial intelligence in marketing. *Journal of the Academy of Marketing Science*, 49, 30-50. [\[Google Scholar\]](#)
- IBM. (2021). *11 AI advertising examples you should know about*. Retrieved from [\[Link\]](#)
- Ibriham, M. (2018). *Lexus launches ad scripted entirely using artificial intelligence*. Retrieved from [\[Link\]](#)
- Jamil, K., Dunnan, L., Gul, R. F., Shehzad, M. U., Gillani, S. H. M., & Awan, F. H. (2022). Role of social media marketing activities in influencing customer intentions: a perspective of a new emerging era. *Frontiers in Psychology*, 12, 6464. [\[Google Scholar\]](#)
- Jogi, S., & Vashisth, K. K. (2021). Effect of Online Advertisement on Consumer Buying Behaviour-A Review. *Conference: 2nd Yogananda International Conference- YICCISS*, 1, 1-10. Retrieved from [\[Link\]](#)
- Khrupovych, S. E., & Borisova, T. M. (2019). Use of Artificial Intelligence in Marketing Analysis of Unstructured Data. *Marketing and Digital Technologies*, 5 (1), 16-26. Retrieved from [\[Link\]](#)

- Krenn, M., Pollice, R., Guo, S. Y., Aldeghi, M., Cervera-Lierta, A., Friederich, P., Gomes, G. D. P., Hase, F., Jinich, A., Nigam, A. K., Yao, Z., & Aspuru-Guzik, A. (2022). On scientific understanding with artificial intelligence. *Nature Reviews Physics*, 4, 761–769. Retrieved from [\[Link\]](#)
- Kumari, P. (2021). *Role of Artificial Intelligence (AI) in Marketing*. Retrieved from [\[Link\]](#)
- Kuzior, A., Sira, M., & Brozek, P. (2022). Using Blockchain and Artificial Intelligence in Energy Management as a Tool to Achieve Energy Efficiency. *Virtual Economics*, 5(3), 69–90. [https://doi.org/10.34021/ve.2022.05.03\(4\)](https://doi.org/10.34021/ve.2022.05.03(4))
- Letunovska, N. E., Khomenko, L. M., & Lyulyov, O. V. (2021). *Marketing in the digital environment: a manual*. Sumy: Sumy State University, 259. Retrieved from [\[Link\]](#)
- Letunovska, N. Y., Liulov, O. V., Pimonenko, T. V., & Aleksandrov, V. T. (2021). *Environmental management and social marketing: A bibliometric analysis* (Doctoral dissertation). [\[Google Scholar\]](#)
- Lexus Official Website. (2022). Retrieved from [\[Link\]](#)
- Lin, D. C. E., Germanidis, A., Valenzuela, C., Shi, Y., & Martelaro, N. (2021). Soundify: Matching sound effects to video. *arXiv preprint arXiv:2112.09726*. Retrieved from [\[Link\]](#)
- Make-a-Video. (2022). Retrieved from [\[Link\]](#)
- Marr, B. (2022). Artificial Intelligence And The Future Of Marketing. FORBES. Retrieved from [\[Link\]](#)
- Meedway, R. (2018). *Lexus Europe Creates World's Most Intuitive Car Ad with IBM Watson*. Retrieved from [\[Link\]](#)
- Morin, C. (2011). Neuromarketing: The New Science of Consumer Behavior. *Society*, 48, 131–135. Retrieved from [\[Link\]](#)
- Mouammine, Y., & Azdimousa, H. (2019). Using Neuromarketing and AI to collect and analyse consumer's emotion: *Literature review and perspectives*. *International Journal of Business and Economic Strategy*, 12, 34-38. Retrieved from [\[Link\]](#)
- Nurm, K-M (2019). The possibilities and potential risks of using artificial. Intelligence in marketing. *Literature review*. Retrieved from [\[Link\]](#)
- Oliveira, D. M. D., & Luce, F. B. (2020). Is Marketing Department Important for Companies? *Revista Pensamento Contemporaneo em Administracao*, 14 (3), 120-131. Retrieved from [\[Link\]](#)
- Rangaswamy, A., Moch, N., Felten, C., Bruggen, G. V., Wieringa, J. E., & Wirtz, J. (2020). The Role of Marketing in Digital Business Platforms. *Journal of Interactive Marketing*, 51, 72-90. Retrieved from [\[Link\]](#)
- Rosokhata, A., Khomenko, L., Jasnikowski, A., & Dmytruk, K. (2021). Methodical Tools Research of Place Marketing Via Small and Medium Business Development. *Modern Economics*, 29(2021), 156-162. Retrieved from [\[Link\]](#)
- Sama, R. (2019). Impact of Media Advertisements on Consumer Behaviour. Retrieved from [\[Link\]](#)
- Shumilo, Y. M. (2022). Artificial Intelligence Tools for Managing the Behavior of Economic Agents in Marketing Activity. *The journal of V. N. Karazin Kharkiv National University*, 15, 60-66. [\[Google Scholar\]](#)
- Singer, U., Polyak, A., Hayes, T., Yin, X., An, J., Zhang, S., Hu, Q., Yang, H., Ashual, O., Gafni, O., Parikh, D., Gupta, S., & Taigman, Y. (2022). *Make-A-Video: Text-to-Video Generation without Text-Video Data*. Retrieved from [\[Link\]](#)
- Sola, H. M. (2013). Neuromarketing - Science and practice. *Journal of Targeting*, 1 (1), 25-34. Retrieved from [\[Link\]](#)
- Storbacka, K., & Moser, T. (2020). The changing role of marketing: transformed propositions, processes and partnerships. *AMS Review*, 10 (3), 299–310. Retrieved from [\[Link\]](#)
- Sydorov, A., & Petropavlovskaya, S. (2021). Ethics and Neuromarketing. *Problems of Systematic Approach in Economy*, 5 (85), 75-81. Retrieved from [\[Link\]](#)
- Thaichon, P., Quach, S., & Ngo, L. V. (2022). *Emerging Research Trends in Marketing: A Review of Australasian Marketing Journal*. Retrieved from [\[Link\]](#)
- Veckalne, R., & Tambovceva, T. (2022). The Role of Digital Transformation in Education in Promoting Sustainable Development. *Virtual Economics*, 5(4), 65–86. [https://doi.org/10.34021/ve.2022.05.04\(4\)](https://doi.org/10.34021/ve.2022.05.04(4))
- Veiga, P. M., & Diogo, J. (2022). Consumer Behavior: A Literature Review of the Early Research on the COVID-19 Outbreak. *International Journal of Marketing, Communication and New Media*, (11). [\[Google Scholar\]](#) [\[CrossRef\]](#)
- Vences, N. A., Diaz-Campo, J., & Rosales, D. F. G. (2020). *Neuromarketing as an Emotional Connection Tool Between Organizations and Audiences in Social Networks. A Theoretical Review*. Retrieved from [\[Link\]](#)
- Xu, Y., Liu, X., Cao, X., Huang, C., Liu, E., Qian, S., ... & Zhang, J. (2021). Artificial intelligence: A powerful paradigm for scientific research. *The Innovation*, 2(4), 100179. [\[Google Scholar\]](#) [\[CrossRef\]](#)

Yu, Y. (2021). The Role and Influence of Artificial Intelligence on Advertising Industry. *Advances in Social Science, Education and Humanities Research*, 631, 190-194. Retrieved from [\[Link\]](#)

Ziabina, Y., & Dzwigol-Barosz, M. (2022). A Country's Green Brand and the Social Responsibility of Business. *Virtual Economics*, 5(3), 31–49. [https://doi.org/10.34021/ve.2022.05.03\(2\)](https://doi.org/10.34021/ve.2022.05.03(2))

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Вплив розвитку Штучного Інтелекту на розвиток маркетингових комунікацій.

Маркетингова комунікація була і залишається важливою складовою діяльності компаній. З розвитком технологій, її прояви та форми постійно змінюються, що дозволяє маркетологам знаходити нові способи впливу на споживачів та просування продукції. У даній роботі розглянуто одну з нових форм, а саме рекламу, створену за сприянням штучного інтелекту. Метою дослідження є оцінювання впливу технологій на розвиток маркетингових комунікацій. Для досягнення поставленої мети у статті використано ANOVA моделювання. Авторами систематизовано можливості використання штучного інтелекту та його вплив на ефективність маркетингової кампанії. Авторами розглянуто реальні кейси використання технологій штучного інтелекту великими компаніями, проаналізовано ключові індикатори їх ефективності. Вихідну базу дослідження сформовано основі результатів опитування респондентів з метою визначення їх вражень від декількох рекламних роликів, один із яких був написаний штучним інтелектом, а інші – ні. Результати ANOVA моделювання дозволили підтвердити гіпотезу про існування статистично значимої різниці в сприйнятті рекламного ролика, створеного штучним інтелектом, на відміну від роликів, створених виключно людьми. А також наявність статистичної різниці в сприйнятті ролика створеного штучним інтелектом у розрізі гендерного фактору. Результати дослідження доповнюють наявні напрацювання у сфері маркетингу, а також дає змогу по-новому поглянути на сучасні принципи проведення рекламних кампаній, подальший розвиток технологій у даній сфері. Також в роботі описано основні можливості використання штучного інтелекту у сфері маркетингових досліджень. Було визначено, що все більше компаній починають використовувати штучний інтелект та експериментувати з його результатами. Крім того, наявні тенденції стрімкого розвитку новітніх технологій та їх лавиноподібне проникнення в усі сфери життя обумовлює відповідної реакції ринкового середовища. З огляду на це, компанії повинні адаптуватись до нових викликів та адаптувати свої рекламні кампанії з урахуванням новітніх тенденцій ринку з метою збереження своєї конкурентоспроможності.

Ключові слова: маркетингова комунікація, штучний інтелект, реклама, цінності, тренди, трансформація суспільних цінностей.