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THE POSSIBILITIES OF USING ARTIFICIAL INTELLIGENCE IN ADVERTISING: THEORY AND PRACTICE

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Purpose: The overall aim of the presented paper was to identify the main areas of application of artificial intelligence in advertising activities.
Design/methodology/approach: In order to realise the objectives of this paper, it was decided to use two research methods: bibliometric analysis and a multiple case study. First, a quantitative analysis of the resources of the Scopus and Web of Science databases was carried out, which was used to isolate the main research areas concerning the application of artificial intelligence in advertising. Next, examples of advertisements from the business world that use artificial intelligence were searched for and assigned to each research area. In the final phase, the case studies were related to the results of a qualitative analysis of the literature exported during bibliometric research.
Findings: With capabilities such as analysing, automating, creating and optimising, AI systems can have a variety of applications in advertising. In particular, they are used to monitor trends, targeting, behavioural prediction, personalisation, creation, audience interaction and engagement.
Research limitations/implications: The article contains a preliminary study. In the future it is planned to conduct additional quantitative and qualitative research.
Practical implications: The conclusions of the study can serve to better understand the relevance of artificial intelligence for the advertising industry and the practical possibilities of its use. The results of the study can be used both in market practice and as inspiration for further research in this area.
Originality/value: The article demonstrates the specificity of artificial intelligence in relation to promotion. The research uses examples from business practice.
Keywords: Artificial Intelligence, Advertising, Marketing Communication, Personalisation, Targeting.
Category of the paper: Technical paper, Conceptual paper.

Introduction

Artificial intelligence (AI) can be defined as a multidisciplinary technology that, through the use of data, algorithms and computing power, can efficiently process information, simulating various aspects of human intelligence (Lu, 2024). Because of their ability to process huge data sets, such systems are particularly useful in industries where analysing large amounts of information is important. They are primarily driving the further development of this type of technology (Zhang, Li, 2021). Moreover, state-of-the-art systems that use deep learning mechanisms not only have the abilities of traditional data analysis (Janiesch, Zschech, Heinrich, 2021; Taye, 2023), but are also capable of discovering relationships and objects in raw data, as well as creating new functionalities (Garnerelo, Shanahan, 2019; Nasution, Sitompul, Nababan, 2020). To this end, neural network algorithms build predictive models around complex problems involving natural language processing, computer vision, or content generation (Xie, Zhang, Bai, 2017; Bisong, 2019).

In a rapidly changing digital environment, not only are technologies developing, but the way marketing communication is conducted with consumers is also transforming (Bajak, Spendel, 2022). One of the forms of promotion that experiences the most changes in content, message media and mode of distribution is advertising. This is a result of the fact that it has become necessary to constantly generate content that is not only visually appealing, but also appropriately personalised. However, it is in this area that artificial intelligence can prove particularly helpful. Because its capabilities can be used to create new experiences and deliver value to the consumer (Mondal, Das, Vrana, 2023).

The main objective of the presented paper was to identify the primary areas of application of artificial intelligence in advertising activities. In order to realise the aims of this paper, combining a theoretical approach with business practice, it was decided to use two research methods, bibliometric analysis and a multiple case study. First, a quantitative analysis of the resources of the Scopus and Web of Science databases was carried out, which was used to isolate the main research areas concerning the application of artificial intelligence in advertising. Next, examples of advertisements from the business world that use artificial intelligence were searched for and assigned to each research area. In the final phase, the case studies were related to the results of a qualitative analysis of the literature exported during bibliometric analysis. On this basis, specific areas of use of artificial intelligence in advertising were identified.

Aim and research methods used

The overarching aim of the presented paper was to identify the main areas of application of artificial intelligence in advertising activities. In order to realise the objectives of this paper, combining a theoretical approach with business practice, it was decided to use two research methods, bibliometric analysis and a multiple case study. The research conducted was based on the following research questions:

- What are the general trends related to the growth of scientific publications on advertising-related publications in which the theme of artificial intelligence appears?
- What research sub-areas can be identified in the literature on the use of artificial intelligence in advertising?
- How can artificial intelligence be used in advertising?

The research was carried out in two stages. Firstly, a bibliometric analysis involving quantitative analysis of publications from the Scopus and Web of Science databases was carried out. For this purpose, papers were exported in which the keyword 'advertising' appears (as a single word or as part of a sequence) and at the same time their topic (title, keywords and abstract) includes the phrase 'artificial intelligence'. The main tasks of bibliometrics include exploring the content of databases, conducting trend analysis, as well as identifying main research streams and the links that exist between them (Ejdys, 206; Olczyk, 2016; Theus, 2016). The bibliometric research identified general trends in the literature for advertising-related publications in which the theme of artificial intelligence appears. The links between keywords in these publications were also examined and the content of the articles extracted as part of the analysis conducted was analysed in detail. All data for the ongoing research was exported on 05.05.2024, using Scopus (2024) and Web of Science (2024) resources. Visualisation of keyword links was carried out using VosViewer (2024) software.

The remainder of the research focuses on practical examples of the use of artificial intelligence in advertising using the multiple case study method. This is a qualitative method, which assumes the creation of a detailed and multifaceted description of the studied phenomenon. In doing so, it simultaneously refers to the nature of a given scientific discipline (Grzegorczyk, 2015), as well as economic practice (Manchak, Sanak-Kosmowska, 2018). When analysing processes and their context, both secondary and primary empirical material is used (Matejun, 2012; Rashid et al., 2019). The studied examples of the application of artificial intelligence in advertising were selected in a purposive manner, guided by the following criteria:

- the possibility of disseminating the applied solutions in advertising practice,
- innovativeness of the use of artificial intelligence,

They were then classified according to the research areas extracted from the bibliometric analysis.

The final stage of the research was to relate the discussed case studies to the results of the qualitative analysis of the literature exported during the bibliometric research. On this basis, specific areas of use of artificial intelligence in advertising were identified.

Artificial intelligence in advertising publications

The Scopus database classified a total of 467 papers in which the keyword 'advertising' appears and at the same time their topic (title, keywords and abstract) includes the phrase 'artificial intelligence'. In contrast, only 90 such publications were identified in the Web of Science database. Preliminary thematic analysis indicates that the vast majority of publications in the Scopus database are in the area of 'Computer Science' (70.45%), while, for example, only 13.7% of documents are in the area of Business, Management and Accounting. On the other hand, in the Web of Science database, publications are mainly related to the areas of Business (27.78%) and Computer Science Information Systems (18.89%). For the purpose of further consideration, it was decided to develop a quantitative summary of publications available in the Scopus and Web of Science databases on advertising, which are also thematically related to artificial intelligence (Table 1).

Table 1.
Summary of publications related to advertising in which the theme of artificial intelligence appears, available in the Scopus and Web of Science databases

Data	**keyword "advertising" + topic (title, keywords and abstract) "artificial intelligence"**	
	Scopus	**Web of Science**
Number of publications	467	90
Number of citations	8912	934
Average citations	19,08	10,38
h-index	38	13
Year of oldest publication	1995	1996
Main subject areas	Computer Science (329); Mathematics (96); Engineering (82); Business, Management and Accounting (64)	Business (25); Computer Science Information Systems (17); Communication (14); Computer Science Artificial Intelligence (13)
Authors with the highest number of publications	Tang, P. (4); Chapelle, O. (3); Chen, Y. (3); Geng, T. (3); Jin, O. (3); Nair, H.S. (3); Parkes, D.C. (3); Plangger, K. (3); Sands, S. (3); Shen, W. (3); Wu, F. (3); Xu, J. (3); Zheng, Z. (3)	Plangger, K. (3); De Las Heras-Pedrosa, C. (2); Kietzmann, J. (2); Peláez, J.I. (2); Sands, S. (2); Sánchez-Núñez, P. (2)

Cont. table 1.

Publications with the highest number of citations	Bonnefon, J.-F., Shariff, A., Rahwan, I., 2016 (903); Mcmahan, H.B. et al., 2013 (681); Zhou, G. et al, 2019 (655); Juan, Y. et al., 2016 (575); He, X. et al., 2014 (458)	Lambrecht, A., Tucker, C., 2019 (242); Kim, J.W., 2001 (105); Lee, N.T., 2018 (80); Chandra, S. et al., 2022 (71); Dao, T.H.; Jeong, S.R., Ahn, H., 2012 (65)
Research institutions with the highest number of affiliations	Shanghai Jiao Tong University (10); Tsinghua University (10); Google LLC (9); Alibaba Group Holding Limited (8)	Ministry Of Education Science Of Ukraine (5); University Of London (5); Swinburne University Of Technology (4)
Journals with the highest number of publications	Lecture Notes In Computer Science Including Subseries Lecture Notes In Artificial Intelligence And Lecture Notes In Bioinformatics (43); ACM International Conference Proceeding Series (13); Ijcai International Joint Conference On Artificial Intelligence (10); Ceur Workshop Proceedings (8)	IEEE Access (3); Journal Of Business Research (3); Revista Latina De Comunicacion Social (3)

Source: Own study.

The earliest publications on the use of artificial intelligence in advertising come from the 1990s. In the Scopus database, it is an article on the automatic creation of advertisements based on similarity measures and case adaptation (Zhuang, Pan, 1995). In comparison, in the Web of Science database, the oldest publication is on advertising ideas developed using algorithmic procedures to systematically generate ideas and creative solutions to problems (Goldenberg, Solomon, Mazurski, 1996). In the following years, single papers on the topic of the present considerations appeared. Their systematic growth has only been evident since 2008/2009, which is probably linked to the increasingly dynamic development of the internet and social media. However, at present, due to the growing interest in artificial intelligence tools, such as ChatGPT, Midjourney, or Character.AI, an increasingly dynamic emergence of publications related to the use of artificial intelligence in advertising can be expected.

Artificial intelligence in advertising - research sub-areas

The next stage of the bibliometric research was to create a map of keyword associations and to identify the main thematic areas related to the use of artificial intelligence in advertising. Due to the higher number of publications in Scopus, as well as their higher citation and h-index, it was decided to use the resources of this database for further analysis. Using the VosViewer software, the co-occurrence of keywords in the studied papers was examined. This resulted in a total of 3119 indexed keywords. From these, keywords that were repeated at least 12 times were extracted, thus obtaining a linkage map consisting of 47 elements (Figure 1).

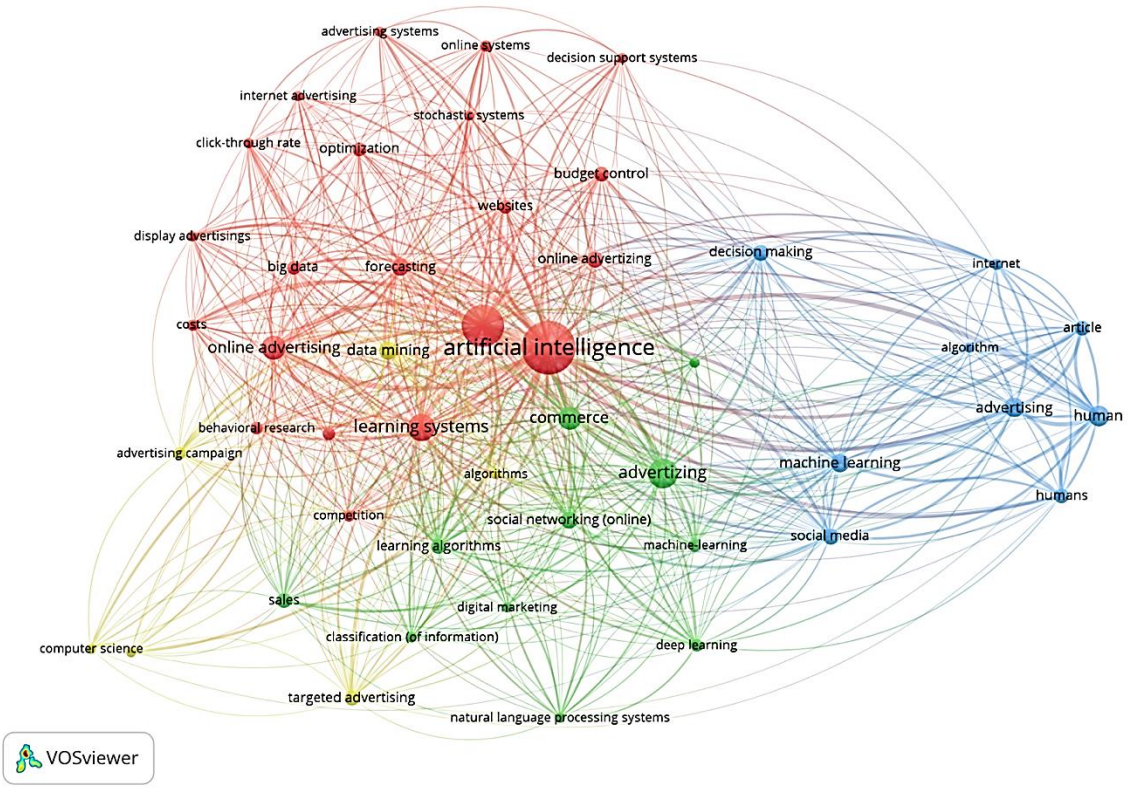

Figure 1. Map of keyword associations in advertising-related publications in which the theme of artificial intelligence appears.

Source: own research.

The keywords depicted on the cluster map fall into 4 thematic clusters:

- red cluster - 21 elements - primarily related to the topic of advertising in the real and virtual world, its effectiveness and optimisation, within the cluster is the most popular keyword 'artificial intelligence', which was used 310 times, as well as the second most popular keyword, 'marketing', occurring 195 times,
- green cluster - 19 elements - focused on retail and e-commerce, as well as tools supporting online sales, with the keyword "advertizing" occurring the most times, appearing 95 times,
- blue cluster - 9 elements - mainly related to consumer behaviour, in particular purchase decisions and opportunities to influence this process, where the most frequent keyword was "human", appearing 46 times,
- yellow cluster - 6 elements - related to targeting advertising based on available data, the most frequent phrase was 'data mining', occurring 36 times.

The clusters identified in the bibliometric analysis carried out delineate the main research sub-areas for AI-supported advertising (Table 2). They can be seen as further research directions for the issue of the use of ChatGPT in different management areas.

Table 2.
Main research sub-areas for the topic of artificial intelligence in advertising

Research sub-area	Examples of issues	Most popular keywords	Examples of references
Online and offline advertising (red cluster)	internet advertising, optimisation, big data, effectiveness of advertising	artificial intelligence (310); marketing (195); learning systems (81); online advertising (67); forecasting (35)	Jones, 2018; Sánchez-Núñez et al., 2020; Smith, 2020; Shameem et al., 2023
(e-)commerce (green cluster)	online sales, commercial activities, social networks, deep learning	advertizing (95); commerce (59), social networking (online), learning algorithms (27), sales (26),	Zhang, Zhong, 2011; Abou Ali, Abbass, Farid, 2020; Daase et al., 2023, Ramu, Yeruva, 2023
Online consumer behaviour (blue cluster)	consumer behaviour, machine learning, social media, purchase decisions, ethics	human (46); advertising (45), machine learning (38), social media (30), decision making (29)	Ding et al., 2015; Caroll et al., 2023; Kim, Park, 2024; Shultz, Koch, Olbrich, 2024
Targeting of advertising (yellow cluster)	data mining and algorithms in advertising targeting	data mining (36); targeted advertising (27); advertising campaign (18); algorithms (14)	Diapouli et al., 2017; Aguilar, Garcia, 2018, Laux et al., 2022, Braca, Dondio, 2023

Source: own study.

It is worth noting that the isolated clusters largely overlap. This is due to the multi-dimensionality of artificial intelligence technology and the variety of its applications in promotional activities. Often, AI systems perform several different functions simultaneously and have applications beyond advertising. They can also be applied at various stages of promotional activities. The individual clusters were used in the following part of the study to purposively select examples of advertisements using AI.

Overview of selected advertising activities supported by artificial intelligence

The study analysed eight carefully selected examples of the use of artificial intelligence in advertising (Table 3), which were divided according to the research areas identified as a result of mapping the results of the bibliometric analysis.

Table 3.
Overview of case studies

Number of the Project	Name	Characteristics of the advertisement	Use of artificial intelligence
Online and offline advertising			
1.	**HalfPrice Club: Only emotions are real**	Advertising posters containing images generated by artificial intelligence, accompanied by the comment: "Only the emotion of joining the club is real in this image, we thank the artificial intelligence for the rest".	Generation of the graphics that were used in the advertising.
2.	**Coca-Cola 3000**	As part of the promotion of the new Coca-Cola Zero flavour, which was created with the help of artificial intelligence, qr codes were placed on the cans. These took the scanner to the Creations Hub, where, using his or her own smartphone, it was possible to take a picture of the environment and see what the world of the future would look like, thanks to an AI-generated futuristic vision, and then share the design, which became an advertisement for other consumers.	Superimposing fictional elements onto an image of the real world using the lens of the consumer's mobile device.
(e-)commerce			
3.	**esize.me**	Using data from a foot scanner covering the structure of the foot and its walking and running behaviour to create tailored shopping recommendations and advertisements, ideally tailored to the consumer's individual physical parameters, as well as their behaviour and aesthetic preferences.	Analysing the consumer's physical and behavioural parameters and recommending matching products based on them.
4.	**Nike by You**	A promotional campaign encouraging people to personalise their own shoes using a wizard using artificial intelligence. The campaign showcased examples of footwear created using the wizard and the tool's capabilities, and customers were invited to design their dream shoes themselves.	Creating attractive and tailored recommendations and inviting customers to co-create the brand and allow them to create products themselves.
Online consumer behaviour			
4.	**Mazda CX-5 Commercial**	Mazda's advertising campaign used interaction activities during a voice-over ad to engage listeners. Hypothetical customers were given the opportunity to answer a question by voice in one of the streaming applications. The customer was able to see the new car model and the specially dedicated price promotion, as opposed to those who did not agree. They, in turn, were referred to the new model's portfolio and dedicated information page.	Creating engagement with audio listeners in a direct dialogue with the brand, providing information about the product, building a relationship with the buyer.
5.	**The North Face**	The brand's use of AI tools results in an interaction between the customer and artificial intelligence (natural speech interface) focusing on advertising outerwear that best matches the needs of the individual customer. After learning the preferences and behaviour of a hypothetical customer, the system is able to identify products with a high probability of fitting the customer, thus supporting the purchase decision process.	The ability to converse and interact with customer data, analysing the data and detecting trends, enabling support for the customer at every step of the purchase path.

Cont. table 3.

Targeting of advertising			
7.	**Netflix**	Netflix uses artificial intelligence to create individualised film recommendations for users. In doing so, it relies on descriptive and behavioural data, as well as the viewer's past activities. Not only the suggested content, but also the thumbnails promoting the video are personalised.	Personalisation of recommendations and user experience.
8.	**Starbucks Deep Brew**	With the help of artificial intelligence, Starbucks performs predictive analytics on its customers using information about past purchases, demographics, or the user's location. Based on this, it adapts the notifications and advertisements displayed to the user in the app. As a result, they may appear, for example, when a consumer approaches a Starbucks coffee shop.	Displaying advertisements in line with predicted consumer behaviour, tailored to the consumer's preferences.

Source: own study on the basis of: (CCC Group; Coca-Cola; eobuwie; Nike; Instreamatic, AI Expert, Litslink, Sturbucks company).

Based on the case studies, it can be seen that the developments in the scientific literature related to artificial intelligence in advertising coincide with trends in business. The creation of experiences for the consumer, the personalisation of relationships, as well as the prediction of behaviour, seem to be particularly relevant in this context.

Summary

Artificial intelligence finds multiple applications in advertising. It can be used, for example, in planning and creating advertising (Gao et al., 2023), targeting (Choi, Lim, 2020), distributing the message (Aguilar, Garcia, 2018), as well as monitoring effects and improving the creative (Miralles-Pechuán, Ponce, Martínez-Villaseñor, 2018). This is mainly made possible by the ability of artificial intelligence to analyse data (Ahmed, Das, Smola, 2014; Sharakhina et al., 2023), automate processes (Diwanji, Lee, Cortese, 2022), create content (Molares-Cardoso, Badenes-Plá, Maiz-Bar, 2024), and optimise processes (Wen, Lin, Guo, 2022). In practice, these functionalities provide multifaceted opportunities for the use of such systems in promotional activities. Based on the literature analysis and case studies, the main areas for the use of artificial intelligence in advertising were identified (Figure 2).

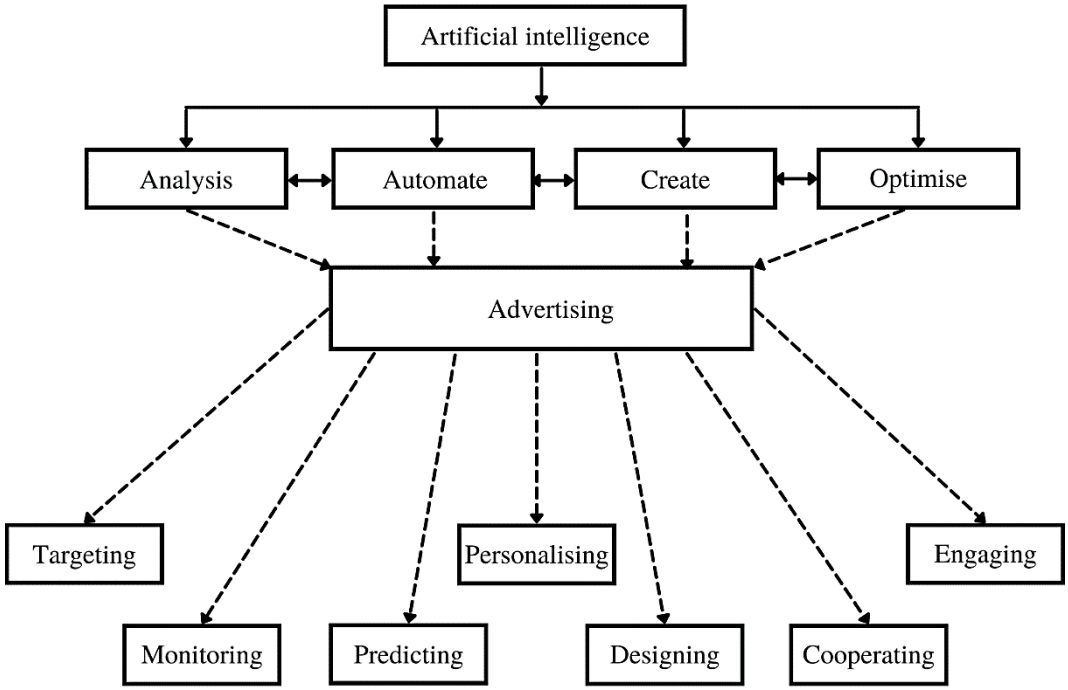

Figure 2. Areas of application of artificial intelligence in advertising.

Source: own study.

Thoughtful use of artificial intelligence can significantly increase the impact and precision of marketing activities. Such systems enable the analysis of large data sets, which allows not only the study of advertising effectiveness, but also the accurate monitoring of market trends and consumer behaviour. On the basis of these analyses, precise targeting is possible - the identification of specific groups for advertisements, taking into account various demographic and behavioural factors. In addition, the data enables prediction, i.e. forecasting future consumer behaviour, allowing advertising creations to be better matched to the context. Personalisation of promotional content includes not only tailoring to the situation, but also adapting it to the individual preferences and needs of the audience. In the ad creation process, on the other hand, artificial intelligence algorithms support the generation of attractive and personalised material such as text, images and videos. The ability to create and automate interaction can be used to cooperate with consumers, who thus become co-creators of promotional materials and brand products. In turn, engaging the viewer in both the creative process and the overall interaction with the brand is key to building a long-term relationship and, ultimately, loyalty and advocacy. Systems used by companies can focus on single areas of AI use or combine them by taking a comprehensive approach to advertising activities.

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