

Original Article

Smart data in healthcare marketing: linking digital transformation to patient behavior and branding

Mohammad Farid Ashouri ¹ , Mehrdad Tarassoli ^{2*} 

¹ Department of Business Administration, Marketing Major, University of Tehran, Kish International Campus, Tehran, Iran.

² Department of Business Administration, Finance Major, CT.C., Islamic Azad University, Tehran, Iran.

* **Corresponding author and reprints: Mehrdad Tarassoli**, Master of Business Administration, Department of Business Administration, Finance Major, CT.C., Islamic Azad University, Tehran, Iran.

Email: Tarassoli95@gmail.com

Received: 17 Jun 2025

Accepted: 15 Jul 2025

Published: 28 Jul 2025

Abstract

Background: This study aimed to identify the key factors Influencing the application of smart technologies to improve patient communication, increase satisfaction, and strengthen brand image within the healthcare system

Methods: This study employed a mixed-methods approach (qualitative–quantitative). In the qualitative phase, semi-structured interviews were conducted with 15 key informants, including hospital managers, digital health marketers, and AI/data specialists. Participants were selected through purposive. Thematic analysis was carried out using Braun and Clarke’s six-step framework. Coding was performed manually, and themes were validated through member checking and peer review. In the quantitative phase, data were collected using a structured questionnaire developed based on the themes identified in the qualitative stage. Path analysis and correlation tests were used to examine the relationships among variables. 200 participants were selected among hospital managers, health marketing specialists, and data analysts working in digital health settings.. Data analysis was conducted using SPSS version 23 and SmartPLS version 3.

Results: Most experts validating the qualitative phase were male (62.5%), aged 30–40 (69%), held a master’s degree (77.5%), and had 5–10 years of experience (73%). Thematic analysis identified customer data analysis and content personalization as key AI-driven components in health marketing. Quantitative findings showed significant positive relationships between AI, advanced marketing, behavioral change, and branding strategies. Path analysis confirmed all hypotheses, with AI indirectly influencing branding via marketing and behavioral shifts. The model showed strong fit (GOF = 0.62) and acceptable reliability and validity.

Conclusion: Integrating AI technologies into healthcare marketing not only improves patient experience but also enhances the branding position of healthcare organizations in competitive environments.

Keywords: Artificial Intelligence; Marketing of Health Services; Patient Acceptance of Health Care; Routinely Collected Health Data.

Cite this article as: Ashouri MF, Tarassoli M. Smart data in healthcare marketing: linking digital transformation to patient behavior and branding. *Soc Determinants Health*. 2025;11(1):1-10. DOI: <http://dx.doi.org/10.22037/sdh.v11i1.48719>

Introduction

Digital transformation and artificial intelligence, as key transformative forces, play currently a vital role in

redefining the performance of organizations, especially in the field of marketing and branding. Using smart data

and advanced artificial intelligence algorithms has enabled brands to gain a deeper understanding of consumer behavior and design their strategies based on accurate analytics and data-driven predictions (1). These developments have become especially pronounced in digital platforms and online marketplaces, where fast and evidence-based decision-making is crucial for the survival and success of brands (2). Meeting the growing need of consumers for a personalized and unique experience is one of the most important challenges facing brands in this field. Today's customers expect brands to tailor not only products and services but also their interactions based on their individual needs. This goal will not be achieved without using behavioral data and machine learning algorithms. Brands must react quickly and flexibly to rapid changes in the market and consumer behavior and continuously update their branding strategies (3).

Despite the growing body of research on digital marketing and AI applications, there remains a notable gap in understanding how AI and digital transformation jointly influence consumer behaviour and branding outcomes in a structured, model-based approach. Previous studies have often addressed these dimensions separately or lacked empirical validation within the healthcare sector or similarly complex service environments. Moreover, the mediating role of advanced marketing practices in translating AI capabilities into effective branding strategies has received limited scholarly attention (4).

This study aims to address these gaps by examining how AI and digital transformation contribute to the development of advanced marketing approaches, the modification of consumer behaviour, and the enhancement of branding strategies—particularly through the use of smart data. In doing so, it seeks to provide both theoretical insights and practical implications for brand managers and health service organizations. The

strategic application of AI can foster customer loyalty and create a distinctive, interactive experience that strengthens the brand–customer relationship, moving beyond conventional promotional tactics toward genuine engagement based on identified needs (5, 6).

Methods

Research environment and population

This study employed a mixed-methods design combining qualitative and quantitative approaches. In the qualitative phase, the research population included subject-matter experts and scientific documents related to digital transformation, artificial intelligence in marketing, and consumer behaviour. Data were collected through semi-structured interviews with 15 experts, including academic researchers, digital marketing consultants, and AI specialists. Snowball sampling was applied, starting with a few key informants, who then recommended other relevant experts. The process continued until theoretical saturation was reached—when no new themes emerged from the data. This method was chosen due to the specialized nature of the topic and the limited accessibility to highly experienced informants.

In the quantitative phase, the population consisted of managers, marketing and branding specialists, and data analysts working in Iranian companies involved in digital marketing and artificial intelligence. Sampling was conducted using a stratified random sampling method to ensure representation across different sectors and roles. The sample size ($n=200$) was determined using the Cochran formula, and participants were selected through random convenience sampling within the identified strata.

Data Collection Method

In the qualitative stage, data were collected by reviewing documents, scientific articles, research reports, and related theses. The

information collection tool in this section was scientific note-taking and content analysis of texts. Data were analyzed using a systematic review approach and content analysis to identify influential components in the fields of digital transformation, artificial intelligence, consumer behavior, and branding strategies. In the quantitative section, a researcher-made questionnaire was designed and used to measure and validate the results of the qualitative stage.

Statistical Analysis

Quantitative data were analyzed using SPSS-23 and SmartPLS-3 software. Analysis methods included path analysis to examine causal relationships between variables and correlation testing to examine the intensity and direction of the relationship between the components of digital transformation, artificial intelligence, consumer behavior, and branding strategies.

Results

The results revealed that the majority of the experts participating in the study for

sensitivity analysis and validating the findings of the qualitative section (content analysis) in the field of the impact of digital transformation and artificial intelligence on advanced marketing, consumer behavior, and branding strategies, were between 30-40 years old (69%), had a master's degree (77.5%), had an employment history between 5 and 10 years (73%), and were mostly male (62.5%). Additionally, 80 percent of them had direct expertise in areas related to digital marketing, artificial intelligence, data analytics, and branding Table 1.

The results revealed that digital transformation and AI capabilities had a significant impact on the formation of advanced marketing, and these changes led to changes in consumer behavior and improved branding strategies. The data analysis indicated that the integration of AI into marketing processes led to the development of advanced tools, increased accuracy in decision-making, and personalized customer experience.

Table 1. Examining the personal characteristics of experts in the field of advanced marketing, digital transformation, and branding strategies

Variable	Category	frequency	Valid percentage
Age (years)	below 30 years old	10	5
	30-40 years old	138	69
	Over 40 years old	52	26
	Total	200	100
Experience in Advanced Marketing / Digital Transformation	below 5 years old	20	10
	5-10 years old	146	73
	Over 10 years old	34	17
	total	200	100
Gender	Female	75	37.5
	Male	125	62.5
	Total	200	100
Education	Bachelor's Degree	36	18
	Master's Degree	155	77.5
	PhD	9	4.5
	Total	200	100
Specialization Type	Digital Marketing, Branding, and Data Analytics	160	80
	New Technologies (Artificial Intelligence and Data-Driven)	40	20
	Total	200	100

Two key capabilities were identified in the digital transformation and AI dimension:

- Customer data analysis: Brands could analyze customer behavior and needs with more accuracy using machine learning algorithms and make decisions based on them.
- Content personalization: The use of AI in the production of personalized content increased the attractiveness of marketing messages and increased user engagement rates.
- In the advanced marketing dimension, the model structure is designed based on the advanced use of AI for personalization, behavior analysis, and increased engagement. Businesses using this model could go beyond traditional advertising and create a deeper and more effective experience for customers.

In the dimension of changing consumer behavior (customer interaction), the direct impact of the use of new technologies was observed:

- Predicting consumer behavior through advanced analytics enabled brands to take proactive measures to meet the needs.
- Increasing customer interaction and participation in the digital space was significantly enhanced with chatbots, personalized messages, and interactive user experiences.
- Engaging with the brand through purposeful and personalized interactions increased consumer attention and trust.

Considerable results were also obtained in the dimension of branding strategies (marketing and brand outcomes):

• Sales growth was identified as one of the direct outcomes of using new technologies.

• Increased customer satisfaction and loyalty resulted from a positive customer experience and accurately meeting their needs.

• Marketing strategies were improved as a result of a deeper understanding of the audience and real-time feedback.

Accordingly, Figure 1 illustrates the most important factors affecting digital transformation and AI on advanced marketing, consumer behavior, and branding, based on the content analysis of the studies, as follows:

Digital transformation and AI (AI capabilities)

1. Customer data analysis
2. Content personalization

Advanced marketing (entire model structure)

1. (Advanced use of AI for personalization, behavior analysis, and increased engagement)

Consumer behavior change (customer interaction)

1. Consumer behavior prediction
2. Increased engagement and participation
3. Brand engagement

Branding strategies (marketing and brand outcomes)

1. Sales growth
2. Increased customer satisfaction and loyalty
3. Improved marketing strategies



Figure 1. Conceptual model of digital transformation and artificial intelligence in advanced marketing and its impact on changing consumer behavior and branding strategies using smart data

A correlation test was used to evaluate the relationship (correlation) between research variables.

Its results are given in the matrix in Table 2:

Table 2. Correlation matrix between research variables

Statistical Index of Variables	Artificial Intelligence and Digital Transformation	Advanced Marketing	Consumer Behavior Change	Branding Strategies
Artificial Intelligence and Digital Transformation	-			
Advanced Marketing	**0.47	-		
Consumer Behavior Change	**0.33	**0.32	-	
Branding Strategies	**0.41	**0.39	**0.31	-

** symbol represents a significance level of less than 0.01 and indicates the existence of a positive and significant correlation between the research variables. In other words, a direct, positive, and statistically significant relationship was observed between the variables of artificial intelligence and digital transformation, advanced marketing, changing consumer behavior, and branding strategies.

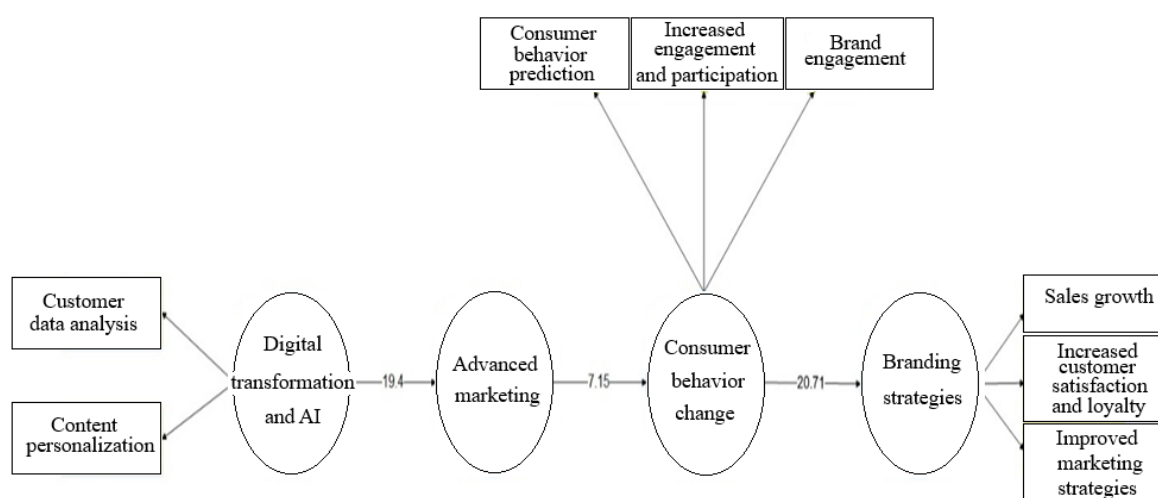


Figure 2. Path analysis diagram of the conceptual model of the research in the form of significant numbers

The t-statistic or t-value was used to examine the significance of the relationship between the variables Figure 2.

The results of the factor loadings confirm the model's validity of the model.

Table 3 presents the path coefficients along with the t-values for the research. As seen,

the tested paths shown in Table 3 are accepted.

As seen in Table 3, all relationships between variables were significant and positive. AI and digital transformation had a positive and significant impact on advanced marketing. Advanced marketing also significantly changed consumer behavior,

Table 3. Path coefficients and t-values for the research hypotheses

Path	Path Coefficients	T-value	Result
Artificial Intelligence and Digital Transformation ⇒ Advanced Marketing	0.68	19.04	Accepted
Advanced Marketing ⇒ Consumer Behavior Change	0.49	7.15	Accepted
Consumer Behavior Change ⇒ Branding Strategies	0.71	20.71	Accepted

Table 4. Reliability coefficients, R2, AVE, and coefficient of determination of the research variables

Constructs	Cronbach's alpha	Composite reliability	AVE	R ²
Artificial Intelligence and Digital Transformation	0.72	0.81	0.58	—
Advanced Marketing	0.81	0.87	0.62	0.68
Consumer Behavior Change	0.78	0.84	0.60	0.49
Branding Strategies	0.85	0.89	0.66	0.71

and ultimately, consumer behavior change significantly affected branding strategies. These results confirm the research hypotheses and indicate that the impact of AI capabilities and digital transformation is indirectly transferred to branding strategies through mediating variables. Table 4 below shows the reliability coefficients of the average variance extracted, and the coefficients of determination of the research variables.

The results in Table 5 showed that all hypotheses were confirmed.

$$Gof = \sqrt{\text{communalities} \times R^2} = 0.6205$$

As the overall goodness of fit (GOF) index is higher than 0.36, it can be concluded that the research model has a good fit. Additionally, all path coefficients are significant, the explained variance is at an acceptable level, and the internal consistency of the constructs is evaluated as more than 0.05. Thus, the structural model of the research is evaluated as statistically strong and reliable.

Table 5. Commonality Table

Dimensions	Commonalities	R2
Artificial Intelligence and Digital Transformation	0.58	—
Advanced Marketing	0.62	0.68
Consumer Behavior Change	0.60	0.49
Branding Strategies	0.66	0.71
Mean	0.615	0.626

Discussion

The results revealed that digital transformation, particularly the use of artificial intelligence (AI), significantly enhanced the effectiveness and precision of advanced marketing processes. The integration of big data analytics, machine learning, and intelligent algorithms enabled a deeper understanding of customer preferences and facilitated personalised communication and engagement. This contributed to increased consumer interaction, participation, and emotional connection with brands, which ultimately improved branding strategies, customer satisfaction, loyalty, and sales performance.

However, the findings also showed variations in the strength of relationships among variables. For instance, while AI

had a strong and significant impact on advanced marketing ($\beta = 0.68$, $t = 19.04$), its direct correlation with consumer behaviour change was moderate ($r = 0.32$). This suggests that AI alone may not be sufficient to influence consumer behaviour without being mediated through structured marketing practices. Similarly, the relationship between advanced marketing and branding strategies, though significant, showed a lower path coefficient ($\beta = 0.49$) compared to other relationships, implying that branding outcomes depend on multiple additional factors beyond the scope of this model.

Moreover, no statistically significant direct path was observed between AI and branding strategies, highlighting that the impact of technological capabilities on branding is indirect and contingent upon the

quality of marketing interventions and consumer engagement. These findings highlight the importance of contextual and organizational readiness in leveraging AI for branding purposes and suggest that technology adoption alone does not guarantee behavioral or branding success (6).

Overall, while the model demonstrated good fit and statistical strength, these nuances underscore the need for a more cautious and context-sensitive approach in interpreting the transformative potential of digital technologies in marketing (7).

In addition to the significant path coefficients (e.g., $\beta = 0.68$ for the effect of AI on advanced marketing), the structural model demonstrated strong explanatory power and acceptable predictive relevance. The coefficient of determination (R^2) for branding strategies reached 0.71, indicating that 71% of the variance in branding outcomes could be explained by the model's variables. Similarly, the R^2 values for advanced marketing (0.68) and consumer behaviour change (0.49) suggest a robust level of explained variance, confirming the model's adequacy in representing real-world dynamics.

The average variance extracted (AVE) for all constructs exceeded the minimum threshold of 0.5, supporting convergent validity. Moreover, the model's predictive relevance, measured by the Stone–Geisser Q^2 index, was satisfactory, indicating that the model possesses substantial predictive power for the endogenous constructs. The Standardized Root Mean Square Residual (SRMR) value was below the cut-off threshold of 0.08, confirming the overall goodness of fit of the model. Additionally, the Goodness-of-Fit (GOF) index was calculated as 0.62, which, based on, indicates a strong model fit for PLS-SEM.

These findings collectively demonstrate the statistical strength, reliability, and practical relevance of the proposed model in capturing the complex relationships

between AI, digital transformation, marketing strategy, and consumer behavior.

Additionally, the results revealed that advanced marketing, beyond merely using technology tools, creates a new structure for customer interaction. The use of machine learning algorithms and chatbots has allowed companies to interact with customers in real time and take a proactive step in responding to needs by predicting their behavior (8). These changes led to a transformation in consumer behavior; from greater participation in the digital space to purposeful interactions with the brand. These developments have led to more efficient branding strategies, increased customer loyalty and satisfaction, and ultimately sales growth (9).

Given the results of the conceptual model of the study, it can be stated that the precise and intelligent implementation of digital capabilities and artificial intelligence has paved the way for marketing transformation and brand promotion. These results can be a guide for decision-makers and marketing managers in developing new technology-based strategies. The results confirm that digital transformation, and especially the use of artificial intelligence, plays a key role in redefining the relationship between consumers and brands. These results are in line with those of previous studies as they have shown that new technologies, especially machine learning algorithms and big data analytics, can make consumer behavior more predictable and controllable (10). In other words, artificial intelligence has improved consumer experience and increased brand engagement by personalizing the customer experience, providing intelligent recommendations, and facilitating two-way relationships.

Advanced marketing has not only served as a tool for implementing digital technologies but has also emerged as an important mediator between technology and the consumer. This result is also in line with the perspectives of the theory of planned behavior (11, 12) and the technology

acceptance model (TAM), as both emphasize the role of perceived effectiveness, ease of use, and personal experience in changing individual behavior.

The results also revealed that consumer behavior change is not only affected by technological factors, but also by the interaction between brand recognition, proposed values, and trust formed through AI-based data, playing a vital role in guiding consumer preferences. This result is in with recent studies that referred to the role of digital trust in brand success (13, 14).

The results also revealed that brands that used AI capabilities to improve the customer decision-making process have performed better in creating customer loyalty and improving brand image, indicating that AI is emerging as a strategic marketing partner, not just as a support tool. Based on these results, it is essential that marketing managers, in addition to traditional skills, have a deep understanding of the applications of new technologies, especially AI to maximize the emerging opportunities. Generally, the results indicate that the use of AI in marketing improved the efficiency and accuracy of consumer behavior analysis and led to the formation of a personalized and meaningful experience for the customer. This digital transformation has led to a transformation in consumer decision-making patterns and the way they interact with brands, requiring marketers to move beyond traditional methods to intelligent and analytics-driven tools. Thus, AI has emerged not only as a technological innovation but also as a strategic factor in redefining brand-consumer relationships (15, 18).

Conclusion

The present study investigated the role of digital transformation and AI capabilities in promoting advanced marketing, changing consumer behavior, and formulating branding strategies. The results of statistical analyses and structural modeling showed

that AI plays a key role in improving marketing performance by facilitating data processing, analyzing customer behavior, and providing personalized services. These capabilities improved customer interactions and user experience and paved the way for the formation of more effective and competitive branding strategies in the digital space by affecting consumer behavior.

Results also showed that advanced marketing, as a key mediator, is considered a bridge between AI and changing consumer behavior. It finally leads to improved brand image, increased customer loyalty, and sustainable growth of the organization. Thus, it is recommended that organizations and brands pursue the path of digital transformation as a strategic competitive advantage by investing purposefully in digital infrastructure, developing analytical algorithms, and using artificial intelligence. This approach can increase productivity and lead to better alignment between market needs and organizational goals.

Recommendations

To utilize artificial intelligence in marketing, it is recommended that organizations and brands invest effectively in creating data-driven infrastructures, including data analysis systems, smart dashboards, and customer behavior prediction tools. Using smart technologies such as chatbots, recommender systems, and content personalization based on behavioral and psychological data can significantly improve the customer experience. Using advanced customer journey models supported by artificial intelligence is recommended for planning personalized marketing campaigns. It is recommended that policymakers in the technology and marketing industry sectors provide the necessary legal, ethical, and infrastructural frameworks for the development of artificial intelligence in digital marketing and develop standards for the protection of personal data and privacy.

It is also recommended to provide specialized training courses for managers, experts, and marketing activists to increase their capabilities in data analysis and recognition of new technologies.

Author's contribution

Mohammad Farid Ashouri and Mehrdad Tarassoli developed the study concept and design. Mohammad Farid Ashouri and Mehrdad Tarassoli acquired the data. Mohammad Farid Ashouri and Mehrdad Tarassoli analyzed and interpreted the data, and wrote the first draft of the manuscript. All authors contributed to the intellectual content, manuscript editing and read and approved the final manuscript.

Informed consent

Questionnaires were filled with the participants' satisfaction and written consent was obtained from the participants in this study.

Funding/financial support

There is no funding.

Conflict of interest

The authors declare that they have no conflict of interests.

References

- 1- Nwabekee US, Abdul-Azeez OY, Agu EE, Ignatius T. Digital transformation in marketing strategies: The role of data analytics and CRM tools. *International Journal of Frontline Research in Science and Technology*. 2024;3(2):55-72. <https://doi.org/10.56355/ijfrst.2024.3.2.0047>
- 2- Hue TT, Hung TH. Impact of artificial intelligence on branding: a bibliometric review and future research directions. *Humanities and Social Sciences Communications*. 2025;12(1):1-11. <https://doi.org/10.1057/s41599-025-04488-6>
- 3- Swan EL, Peltier JW, Dahl AJ. Artificial intelligence in healthcare: the value co-creation process and influence of other digital health transformations. *Journal of Research in Interactive Marketing*. 2024;18(1):109-126. <https://doi.org/10.1108/JRIM-09-2022-0293>
- 4- Figueiredo N, Ferreira BM, Abrantes JL, Martinez LF. The Role of Digital Marketing in Online Shopping: A Bibliometric Analysis for Decoding Consumer Behavior. *Journal of Theoretical and Applied Electronic Commerce Research*. 2025;20(1):25. <https://doi.org/10.3390/jtaer20010025>
- 5- Gomes S, Lopes JM, Trancoso T. Customer experience in digital transformation: the influence of intelligent chatbots toward a sustainable market. *International Journal of Innovation Science*;2025. <https://doi.org/10.1108/IJIS-06-2024-0148>
- 6- Zaman Fashami R, Haghighinasab M, Seyyedamiri N, Ahadi P. Designing a digital content marketing framework to engage consumers with brands on social Media: A bibliometric review. *Journal of Business Management*. 2022;14(4):573-601. <https://doi.org/10.22059/jibm.2022.338386.4308>
- 7- Chaffey D, Ellis-Chadwick F. *Digital marketing. Digital Marketing (7th ed.)*. Pearson Education;2024. <https://hisp.html.ch/course/view.php?id=525>
- 8- Kumar V, Dixit A, Javalgi RG, Dass M, Dass M. Digital transformation of business-to-business marketing: Framework and research agenda. *Journal of Business and Industrial Marketing*. 2016;31(8):1151-1160.
- 9- Saljoughi RS, Hassani S. Challenges of metaverse technology for the tourism industry. *Social Determinants of Health*. 2025;11(1):1-9. <https://doi.org/10.22037/sdh.v11i1.47138>
- 10- Dada SA, Adekola AD. Leveraging digital marketing for health behavior change: A model for engaging patients through pharmacies. *International Journal of Science and Technology Research Archive*. 2024;7(2): 50-59. <https://doi.org/10.53771/ijstra.2024.7.2.0063>
- 11- Huang MH, Rust RT. A strategic framework for artificial intelligence in marketing. *Journal of the academy of marketing science*. 2021;49(1):30-50. <https://doi.org/10.1007/s11747-020-00749-9>
- 12- Khatri M. How digital marketing along with artificial intelligence is transforming consumer behaviour. *International Journal for Research in Applied Science and Engineering Technology*. 2021;9(VII):523-527. <https://www.ijraset.com/best-journal/how-digital-marketing-with-artificial-intelligence-transforming-consumer-behaviour>
- 13- Kitsios F, Kamariotou M. Artificial intelligence and business strategy towards digital transformation: A research agenda. *Sustainability*. 2021;13(4):2025. <https://doi.org/10.3390/su13042025>

- 14- Shynkarenko R. Using big data and AI to predict consumer behaviour in e-commerce. Scientific notes of Lviv University of Business and Law. 2025;20(44):115-127.
<https://nzlubp.org.ua/index.php/journal/article/view/1549>
- 15- Vidrih M, Mayahi S. Generative AI-driven storytelling: A new era for marketing. arXiv preprint arXiv;2023.
<https://doi.org/10.48550/arXiv.2309.09048>
- 16- Davenport TH, Ronanki R. Artificial intelligence for the real world. Harvard business review. 2018;96(1):108-116.
<https://hbr.org/2018/01/artificial-intelligence-for-the-real-world>
- 17- Wedel M, Kannan PK. Marketing analytics for data-rich environments. Journal of marketing. 2016;80(6):97-121.
<https://doi.org/10.1509/jm.15.0413>
- 18- Ali Mohamad T, Bastone A, Bernhard F, Schiavone F. How artificial intelligence impacts the competitive position of healthcare organizations. Journal of Organizational Change Management. 2023;36(8):49-70. <https://doi.org/10.1108/JOCM-03-2023-0057>