THE IMPACT OF ARTIFICIAL INTELLIGENCE ON FOOD CONSUMPTION BEHAVIOR IN E-COMMERCE

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Abstract

Artificial intelligence (AI) has rapidly emerged as a transformative force across multiple sectors, with digital marketing being a prominent beneficiary. As AI technologies continue to advance, their potential to reshape the digital marketing landscape is becoming increasingly apparent, leading to profound implications for businesses and their digital communication strategies. AI in Consumer Behavior Analysis: AI algorithms can analyze vast amounts of data from various sources to understand consumer behavior patterns. This allows marketers to create more targeted and personalized campaigns, ensuring that the right message reaches the right audience at the right time. AI-powered tools can automate repetitive tasks such as email marketing, social media posting, and even customer service through catboats. This not only saves time but also ensures consistency and efficiency in marketing efforts. By using predictive analytics, AI can forecast future trends and consumer behaviors, allowing businesses to adjust their strategies proactively. This can lead to more effective marketing campaigns and better allocation of resources. AI can generate and optimize content for various platforms, ensuring that it is engaging and relevant to the target audience. Tools like natural language processing and machine learning can help create high-quality content that resonates with consumers.

Key words: Artificial intelligence, AI, Digital marketing, E-commerce, Food industry

This paper is structured in three parts. Thus, in the first part, the review of the specialized literature relevant to the research carried out is presented, focusing on the use of AI in the field of commerce. In the second section, the methodology used to conduct the research is detailed, stating the purpose and objectives. The third part reflects the research results, which show the main purposes of AI mobile applications in e-commerce.

Artificial intelligence personalizes and improves the shopping experience for users, while for merchants, it is a means of increasing sales and improving customer relations. It has become an essential component of how many consumers interact with digital platforms. Artificial intelligence has emerged as a technology that can differentiate between two competing firms in e-commerce environments (Bawack R.E., 2022), a decisive factor for the success of a company using e-commerce in front of the competition.

By using AI (artificial intelligence), a company can improve customer experience, optimize business processes and make more informed decisions, which can provide a competitive advantage over other firms in the same field.

MATERIAL AND METHOD

Artificial intelligence enables the collection, analysis and interpretation of a vast amount of data in real time, thus facilitating informed decision-making. As an entrepreneur or manager, using AI systems can help anticipate demand for products or services, assess risks and opportunities, and identify emerging trends in the market segment.

In Romania, the e-commerce market made its presence felt starting in 2000 and began to really develop with Romania's entry into the European Union, when infrastructure investments began through access to European funds.

RESULTS AND DISCUSSIONS

In the period 2015-2023, Romania's population registered a slight decrease, from 19.8 million to 19.0 million inhabitants. In contrast, the number of internet users has increased significantly, from 11 million in 2015 to 14 million in 2023. This increase in internet users is also reflected in the internet usage rate, which has increased from 56% in 2015 to 82% in 2023.

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These data indicate a substantial increase in the accessibility and use of the internet among the population. The application of AI in the food industry has been growing for years due to various reasons such as food sorting, classification and prediction of the parameters, quality control, and food safety. (Mavani, *et al*, 2022).

The total value of electronic commerce (e-tail) increased from €1.4 billion in 2015 to €6.5 billion in 2023. This growth reflects the rapid expansion of the e-commerce market in Romania. The average value of online purchases per day increased from €3.8 million in 2015 to €17.8 million in 2023, indicating a higher frequency and value of online transactions. Also, the average number of transactions per day increased from 8.2 million in 2015 to 11.5 million in 2023 (Micu A. *et al*, 2020).

Table 1

Electronic commerce issues

Electronic commerce issues	2015	2016	2017	2018	2019	2020	2021	2022	2023
Romania's population (millions of people)	19.8	19.7	19.6	19.5	19.4	19.3	19.2	19.1	19.0
Internet users (millions of people)	11	11.2	11.2	11.7	12.0	12.5	13.0	13.5	14.0
Internet penetration rate (%)	56	58	58	70	72	75	78	80	82
Smartphone penetration	31.6	38.8	46	52.5	58	63	68	72	75
Orders placed online from mobile devices (%)	25-30	35-40	45	54	60	65	70	75	78
The value of online shopping (e-tail) (billion €)	1.4	1.8	2.8	3.5	4.2	5.0	5.8	6.3	6.5
Average value of online shopping / day (million €)	3.8	4.9	7.6	9.8	11.5	13.7	15.9	17.3	17.8
Average number of transactions / days	8.2	8.4	8.7	9	9.5	10	10.5	11	11.5
Online payment by card (million €)	514	745	980	1300	1600	1900	2200	2500	2800

Source: Data processed by authors based on reports available on www.gpec.ro and www.statista.com

The presence of artificial intelligence has intensified competition in the field of e-commerce, prompting companies to adopt this technology to stay at the top of customer preferences. A deep understanding of artificial intelligence offers a significant advantage to the e-commerce industry, as it enables a more detailed knowledge of consumer behavior. Through a clear analysis of buying behavior, companies can develop optimal strategies that align their goals with customer needs and preferences.

Eating behavior is influenced by various neural pathways and psychological factors. In the field of AI and consumer behavior, it is essential that companies find a balance between harnessing the capabilities of AI and ensuring transparency and ethical use of data. Building trust with consumers through clear communication about the benefits and limitations of AI is critical to driving acceptance and adoption.

Based on a comprehensive study of the scientific literature on the impact of artificial intelligence in food trade, the authors conducted a quantitative research to demonstrate the nature of the link between this impact and consumer perceptions of artificial intelligence (Purcărea T., 2020).

There are numerous benefits that derive from the use of artificial intelligence in e-commerce (*figure 1*). These include:

Improving the customer experience: Artificial intelligence can personalize the shopping experience for each individual customer. By analyzing browsing behavior and purchase history, AI can recommend relevant products and personalized offers, leading to increased customer satisfaction and loyalty.

Predictive market analysis: AI can analyze sales data and market trends to predict future demand. This helps companies manage their inventory more efficiently, plan marketing campaigns and make informed decisions about new product launches.

Facilitation of decision-making: By using machine learning algorithms, AI can provide valuable insights and detailed analysis that help managers make faster and more accurate decisions. For example, AI can identify growth opportunities or flag potential risks.

Streamlining the sales process: AI can automate many of the repetitive tasks in the sales process, such as managing orders, updating inventory and processing payments. This allows sales teams to focus on more strategic activities and improve operational efficiency.

Automation and optimization of the data transcription process: AI can automate the data collection and analysis process, thereby reducing human error and saving time. For example, speech recognition and natural language processing technologies can quickly and accurately transform phone conversations or text messages into structured data.

Therefore, for a leading agriculture in Romania, the integration of AI in agricultural operations represents a transformative leap in the exploitation of the latest technologies that can provide invaluable support to farmers, in addition to innovative crop protection solutions and advanced hybrids. Technology facilitates decision-making processes that exceed human capabilities in terms of speed, accuracy, analysis and multitasking (Cheong Y.S., 2021).
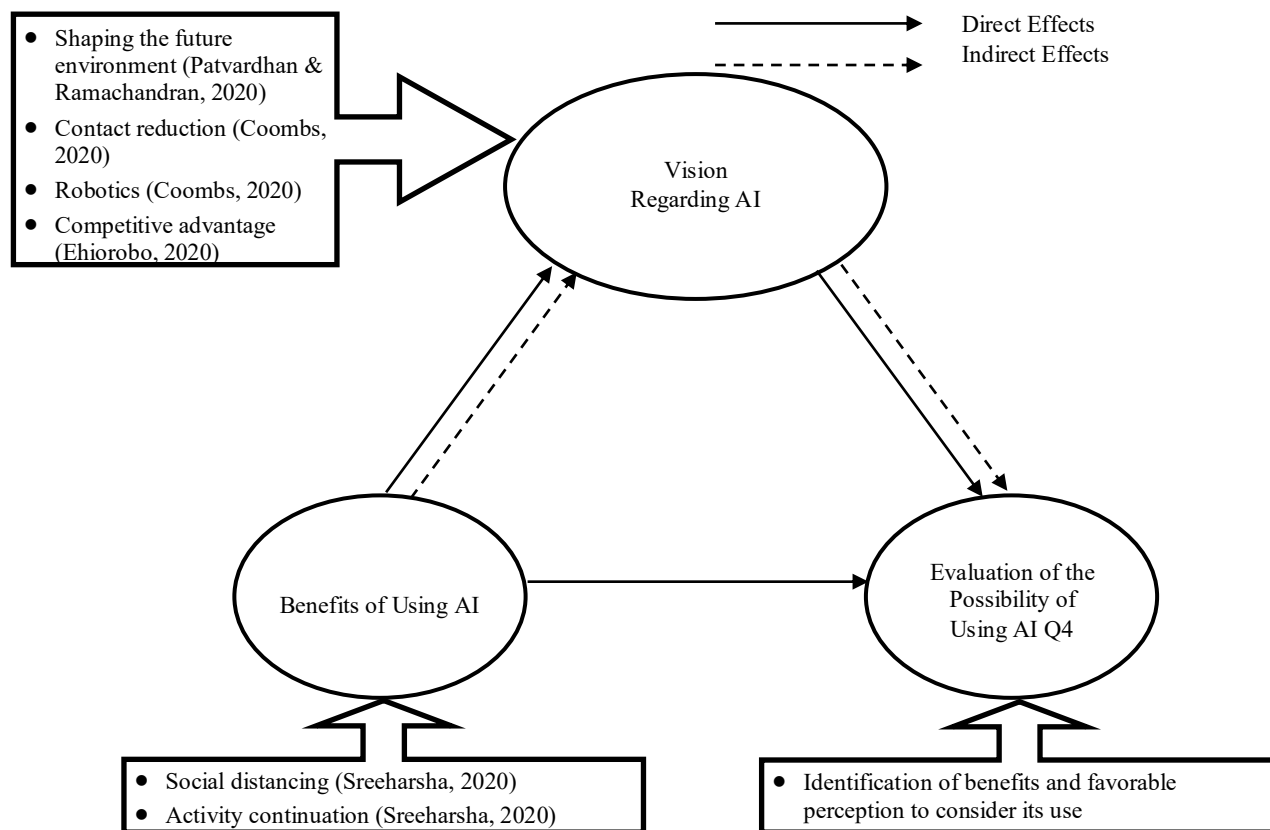

Figure 1 **Conceptual model and hypotheses to be tested with SmartPLS 3**

Artificial intelligence has become a predictive tool in the optimization of online stores, transforming the buying experience of users and improving the efficiency of merchant operations. From personalizing the shopping experience to managing online payments and transaction security, AI is deeply influencing every aspect of e-commerce.

Based on the results obtained from the administered questionnaire, the majority of respondents are male (52%), while 47% of participants are female. The age distribution analysis shows that 28% of respondents are aged between 25 and 34 years, representing the largest age category. The next age group, 35-44 years old, includes 21% of participants. Respondents aged between 45 and 54 years constitute 18% of the total, while those aged between 55 and 64 years represent 10% of the group. The age group over 65 years has a percentage of 5%.

This demographic distribution provides insight into the diversity of the studied group and allows for a detailed analysis of trends and preferences among different age and gender categories.

The analysis of respondents' monthly incomes shows that those with incomes between 2500 and 5000 lei represent the largest share, at 34%. Next are respondents with monthly incomes between 5000 and 7000 lei, which constitute 29% of the total.

This income distribution provides a valuable perspective on the economic situation of the participants and can contribute to a deeper understanding of their behavior and preferences.

Regarding the question in the survey about the frequency of purchasing food products online,

the answers were distributed as follows: 50% of respondents indicated that they occasionally purchase food products online, 18% of respondents make these purchases weekly, 13% never buy food products online, 11% purchase monthly and 8% of respondents make these purchases daily. These results suggest a predominantly occasional behavior in the purchase of food products online among respondents.

Additionally, there is a significant diversification in purchase frequency, reflecting various consumption habits in the digital environment.

From the survey, we identified the main reasons why consumers choose to purchase food products online:

- **Convenience**: 48.4% of respondents mentioned convenience as the main reason for preferring online shopping. This method allows them to avoid crowds and shop from the comfort of their own home.
- **Time savings:** A major factor for 62.1% of participants is time savings. Online shopping is quick and efficient, eliminating the need for frequent trips to the supermarket.
- **Wide variety of products:** 37.9% of respondents appreciate the greater diversity of products available online compared to physical stores. This gives them the option to choose from a wide range of products.
- **Better prices:** 27.4% of participants highlighted better prices as a determining factor in their decision to buy online. Promotions and discounts are more frequent in the online environment.
- **Personalized recommendations:** 23.2% of respondents indicated that personalized recommendations, based on purchase history and individual preferences, are a significant reason for choosing online shopping.

From the survey administered, we obtained the following results: 39.4% of respondents are not familiar with the use of artificial intelligence (AI) in e-commerce, while 60.6% of respondents are familiar with this concept.

These results highlight a clear need for additional education and information in the field of AI for e-commerce. On one hand, the majorities of respondents (60.6%) recognizes and understand the potential of AI in this sector, suggesting that AI-based technologies have already started to make their presence felt in e-commerce. On the other hand, a significant percentage (39.4%) is not yet familiar with these technologies, indicating a potential barrier to the widespread adoption of AI in e-commerce.

From the survey, we observed the following results regarding the influence of AI:

- **Moderately:** 32% of participants believe that artificial intelligence moderately improves their online experience. They appreciate that AI brings benefits in navigating and using digital platforms.
- **Significantly:** 26% of respondents think that AI significantly influences their online experience, making it more efficient and enjoyable.
- **Very significantly:** 18% of participants appreciate that AI greatly improves their online experience, highlighting the clear advantages of using AI-based technologies.
- **Slightly:** 14% of respondents consider that AI only slightly improves their online experience, being less convinced of its benefits.
- **Not at all:** 10% of participants do not feel any improvement in their online experience due to AI, suggesting either insufficient interaction with AI technologies or that they do not find them useful.

These data underscore the diversity of perceptions regarding the impact of artificial intelligence on users' online experience. They reflect both the enthusiasm and reservations about adopting and using AI in everyday life.

Following the survey of 100 respondents, it was found that 78.8% of respondents answered affirmatively, indicating that they had observed personalized food product recommendations on the e-commerce platforms they used. This significant majority suggests that personalization technologies are widely implemented and recognized by users. On the other hand, 21.2% of respondents answered negatively, indicating that either they had not encountered these recommendations, or they were not sufficiently noticeable to be observed.

According to the survey data, 36.5% of respondents consider the recommendations useful, 31.3% find them neutral, 17.7% appreciate them as very useful and 8.3% consider them useless. These results highlight the diverse perceptions of users regarding personalized recommendations offered on e-commerce platforms. The majority of respondents (36.5%) find these recommendations useful, indicating a recognition of the added value that personalization can bring to the purchasing process. Meanwhile, a significant percentage of users (31.3%) have a neutral opinion, suggesting that while they are not disappointed with the recommendations, they also do not consider them essential to their shopping experience.

On the other hand, 17.7% of respondents consider the recommendations very useful, highlighting a segment of users who benefit

significantly from these technologies. However, there is also a minority of 8.3% who do not find these recommendations useful, suggesting that there is room for improvement in terms of the relevance and precision of these recommendations.

According to the data obtained from question 11: "To what extent do personalized recommendations influence your purchasing decisions?" conducted using the Likert scale; option 3, having a neutral value, was the most chosen by respondents, with 36% of them selecting this option. In the scale, 1 represents "not at all" and 5 "very much".

These results indicate that, while personalized recommendations have an influence on purchasing decisions, this influence is moderate for the majority of respondents. Option 3, chosen by 36% of participants, suggests that recommendations are perceived as useful and relevant, but not decisive in the purchasing process. These findings underscore the importance of improving personalization algorithms to offer more precise and tailored recommendations to consumers' individual needs. Improving these aspects could increase the positive influence of recommendations on purchasing behavior. (*Ziakis, C., 2023*).

According to the data obtained from question 12 related to concerns about the privacy of personal data when using e-commerce platforms that use artificial intelligence, 50.5% of respondents are not at all concerned about the privacy of their personal data when using these. In contrast, 49.5% of respondents are very concerned about this aspect.

These results reflect an almost equal division in users' perceptions of the security and privacy of personal data on e-commerce platforms that use AI. The half that is not concerned suggests significant confidence in the data protection measures implemented by these platforms. On the other hand, almost half of respondents express considerable concern, highlighting the need to improve transparency and education regarding data privacy and security policies.

In conclusion, these results underscore the importance of continuing efforts to protect users' personal data and effectively communicate implemented security measures. Increasing transparency and educating users about privacy policies could help reduce concerns and strengthen trust in e-commerce platforms that use AI.

According to the data obtained from question 13 of the survey, 72.7% of respondents answered affirmatively, indicating that they had observed personalized recommendations based on their purchase history. At the same time, 15.2% of respondents are not sure and 12.1% answered negatively, suggesting that they had not observed such recommendations.

These results indicate a high prevalence of implementation and recognition of personalization technologies based on purchase history in e-commerce platforms. The majority of respondents who answered affirmatively suggest that these personalized recommendations are a significant aspect of their shopping experience. On the other hand, the relatively small percentage of respondents who are unsure or who had not observed these recommendations indicates that there is still room for improvement in the visibility and relevance of these technologies.

According to the survey data, out of a total of 100 respondents, 61.2% are influenced by reviews from other consumers. Promotions and discounts have a similar impact, influencing 61.2% of respondents. Personalized recommendations influence 36.7% of participants, while new launches and products have an influence percentage of 31.6%.

These results highlight that consumer reviews and promotions are the most important factors influencing consumers' purchasing decisions when it comes to online food products. Personalized recommendations and new products, although important, have a lesser impact compared to the first two aspects mentioned.

In conclusion, e-commerce platforms should place special emphasis on user reviews and offering attractive promotions to maximize their influence on consumer purchasing behavior. At the same time, improving personalized recommendation systems and promoting new launches can contribute to a more complete and satisfying shopping experience.

The data collected from the last question of the survey, applied to 100 respondents, highlights their perceptions of using artificial intelligence in e-commerce. Participants had to choose numerical responses, from "strongly agree" to "strongly disagree", to express their agreement with various statements.

For the statement "AI-based personalized recommendations influence my purchasing decisions", 33% of respondents selected "agree", while only 4% selected "strongly disagree". These results suggest that personalized recommendations have a significant impact on the purchasing decisions of an important part of users, though there is also a segment that does not consider these recommendations relevant.

Regarding the statement "Chatbots and virtual assistants improve my online shopping experience," 29% of respondents answered

"neutral," indicating a neutral perception of these technologies. Additionally, 9% of respondents selected "strongly disagree." However, 34% of respondents agreed with this statement, highlighting relatively strong support for the role of chatbots and virtual assistants in improving the shopping experience.

The last statement, "I am concerned about the privacy of my personal data used by AI," showed that most respondents (27%) selected "strongly agree," demonstrating considerable concern for the privacy of personal data. In contrast, 10% of respondents selected "strongly disagree," indicating a lack of concern in this regard.

These results suggest that, although there is significant support for the use of artificial intelligence in e-commerce, privacy concerns are predominant. To enhance trust and acceptance of AI in e-commerce, it is essential to address these concerns by ensuring appropriate transparency and protection of users' personal data.

CONCLUSIONS

In conclusion, artificial intelligence (AI) provides a crucial competitive advantage in e-commerce, personalizing and enhancing the shopping experience for users and contributing to increased sales and optimized merchant-client relationships. Companies that adopt AI manage to optimize their operations and make more informed decisions, significantly differentiating themselves from the competition.

Applications and platforms such as Truda, DataFeedWatch, Channable, Feedonomics, Productsup, Shopify, BigCommerce, PrestaShop, Magento and WooCommerce offer advanced solutions for managing and optimizing product data, improving operational efficiency and marketing campaign performance.

The study highlights that AI personalizes the shopping experience and facilitates decision-making, allowing entrepreneurs to anticipate demand, assess risks and identify emerging trends. The questionnaire reveals that most consumers prefer online shopping due to convenience, time savings, diversity of available products, better prices and personalized recommendations. These consumer behaviors are influenced by demographic and economic factors.

Transparency and ethics in the use of AI algorithms are crucial for building consumer trust. Companies must clearly communicate the benefits and limitations of AI, ensuring responsible data use and strengthening trust in digital platforms.

The survey data shows the diversity of perceptions related to AI in e-commerce. The majority of respondents are familiar with AI use, and perceptions of its influence vary: 32% consider that AI moderately improves the online experience, 18% believe that AI has a very significant impact, while 10% do not observe any improvement. Additionally, most of the 100 respondents have noticed personalized recommendations and an insignificant number are concerned about personal data privacy.

Consumer reviews and promotions are the main factors influencing purchasing decisions, mentioned by more than half of the respondents. These conclusions underscore the need to optimize AI technologies and educate consumers to maximize benefits and ensure responsible data use.

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