



Artificial Intelligence as a Factor in Transforming Environmental Behavior and Consumer Purchasing Power in the Digital Economy

INESA MIKHNO*

Associate Professor of the Department of Business Analytics and Digital Economy.

*Corresponding Author

INESA MIKHNO

Associate Professor of the
Department of Business
Analytics and Digital
Economy.

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Abstract: This paper investigates the impact of artificial intelligence (AI) on consumer purchasing power and environmental behavior in the context of the digital economy. It examines how economic, technological, and socio-cultural factors interact with consumer stress levels, thereby influencing decisions regarding the purchase of environmentally oriented products. An optimization model of the consumer basket is proposed, which accounts for AI-driven personalized recommendations, budget constraints, individual preferences, and the psychological state of consumers. The model demonstrates that AI enhances the efficiency of product selection, mitigates the negative effects of stress, and promotes conscious consumption. Practical implementation of the model enables forecasting consumer behavior, forming optimal “green” baskets, and ensuring both economic and ecological efficiency in the digital economy. The findings highlight the role of AI as an integrator of economic, behavioral, and technological factors in shaping sustainable consumption strategies.

Keywords: Artificial intelligence; environmental behavior; consumer purchasing power; digital economy; sustainable development; natural resource use; ESG.

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Introduction

The digital economy is characterized by the deep integration of information and communication technologies into socio-economic processes, driving the transformation of consumption, production, and natural resource use patterns. One of the key drivers of these changes is artificial intelligence (AI), which is increasingly applied in resource management systems, digital consumption platforms, financial services, and environmental monitoring. Through the capabilities of processing large datasets and algorithmic personalization, AI significantly influences decision-making processes at the level of individual consumers and households.

In the context of sustainable development, the impact of AI on the environmental behavior of the population is of particular importance, as such behavior is determined by a combination of value orientations, socio-economic conditions, and institutional incentives. Digital tools based on AI algorithms create new channels for environmental communication, enhance the transparency of the ecological footprint of consumption, and promote the dissemination of environmentally oriented practices.

At the same time, the effectiveness of these tools largely depends on population income levels and consumer purchasing power.

The issue of purchasing power becomes especially relevant amid digital transformation, as environmentally sustainable goods and services often carry higher costs compared to traditional alternatives. This creates a tension between growing environmental awareness and the actual ability to engage in environmentally responsible behavior. In this context, AI can serve both as a tool for optimizing consumption and as a factor that potentially reinforces socio-economic differentiation.

Despite the growing interest of the scientific community in issues of digitalization and environmental sustainability, existing studies largely focus on individual aspects of AI application, without revealing the complex interconnection between population environmental behavior and purchasing power. The role of AI as a systemic factor simultaneously influencing ecological attitudes, economic capabilities, and consumer practices remains insufficiently explored.

Therefore, the aim of this study is to analyze the role of AI in transforming environmental behavior and consumer purchasing



power in the digital economy and to identify the key socio-economic factors determining the effectiveness of implementing digital environmental tools.

The aim of this study is to determine the role of artificial intelligence (AI) technologies in shaping the environmental behavior of the population and the dynamics of consumer purchasing power during the digital transformation of the economy.

Research indicates that AI has a significant impact on consumer behavior, particularly through personalization, recommendation systems, and automation of marketing communications (Alipour, P. Et al., 2025). For instance, a recent systematic review demonstrates that AI applications strongly influence consumer behavior and brand interactions, including autonomous purchasing models and the development of consumer–brand relationships (Cabrera, Á. A. Et al., 2023).

Another study highlights that personalization and behavioral forecasting are key areas of AI application in marketing. Machine learning algorithms enable a deeper understanding of customer behavior patterns and facilitate the provision of tailored services (Mariani, M. M. Et al., 2022).

These studies collectively confirm that algorithmic solutions are shaping new models of consumer interaction within digital environments, with important implications for the structure of consumer decision-making in the digital economy.

Main Body

Consumer purchasing power is one of the key factors determining the ability to engage in environmentally responsible behavior. In the digital economy, artificial intelligence (AI) plays a dual role in this process. On the one hand, algorithmic systems help optimize household expenditures by comparing prices, forecasting needs, and reducing irrational consumption. On the other hand, environmentally sustainable goods and services recommended by digital platforms often carry higher costs, limiting access for certain social groups.

Thus, the implementation of AI can both enhance the efficiency of household financial resource use and reinforce socio-economic differentiation. This effect is particularly pronounced when algorithmic recommendations are primarily targeted at higher-income consumers. Analysis shows that the environmental behavior of the population is shaped at the intersection of technological, economic, and social factors. AI acts as a systemic element of this interaction, influencing both the informational environment and the economic incentives of consumption. Personalized ecological recommendations can alter the structure of consumer demand; however, their impact is heterogeneous and largely depends on purchasing power.

Consequently, a paradoxical situation emerges in which increased availability of digital ecological tools does not always lead to a proportional rise in environmentally responsible behavior. This underscores the need to combine technological solutions with socio-economic policies aimed at improving access to sustainable consumption.

Alongside the positive effects of AI usage, potential risks exist, including the amplification of digital inequality, algorithmic biases, and reduced autonomy in consumer decision-making. In the sphere of environmental behavior, this may lead to the formation of an “ecological gap” between different social groups.

At the same time, with appropriate regulation and ethical AI application, it is possible to develop more inclusive models of sustainable consumption, aimed at enhancing both ecological efficiency and economic accessibility.

Based on the analysis of the main levers affecting consumer purchasing power, a systemic model of factors determining the economic capabilities of consumers in the digital economy has been proposed. This model integrates material factors (income, prices, financial instruments) as well as technological and behavioral aspects (digital literacy, algorithmic personalization, socio-cultural factors), while also accounting for stress levels, which indicate the intensity of constraints on consumer opportunities across different population groups.

1.Income and Employment Levels	1.Impact: A fundamental economic factor determining the actual ability to purchase goods and services.	1.Stress Level: High (low income significantly restricts access to eco-friendly products).
1.Price Dynamics and Inflation Processes	1.Impact: Price fluctuations and inflation reduce purchasing power, especially for high value-added products such as environmentally sustainable goods.	1.Stress Level: Medium to high.
1.Structure of Consumer Expenditures and Algorithmic Personalization	1.Impact: Personalized digital recommendations can both optimize spending and stimulate overconsumption.	1.Stress Level: Medium (depends on behavioral patterns and marketing algorithms).
1.Access to Digital Technologies and Digital Literacy	1.Impact: Determines the population’s ability to utilize platforms for price comparison and resource savings.	1.Stress Level: Medium to high (digital inequality limits economic efficiency).
1.Financial Instruments and “Green” Fintech	1.Impact: Loans, microfinancing, and green financial products expand resource access, though algorithmic restrictions may limit availability.	1.Stress Level: Medium.
1.Institutional and Regulatory Factors	1.Impact: Government policies, tax incentives, and subsidies shape access to environmentally sustainable products.	1.Stress Level: Low to medium (assuming effective policy implementation).
1.Behavioral and Socio-cultural Factors	1.Impact: Price perception, trust in digital recommendations, and ecological values modify economic constraints.	1.Stress Level: Low to medium (can partially compensate for limited income through value-based attitudes).

Fig. 1. Key Levers Influencing Consumer Purchasing Power

Figure 1 illustrates the comprehensive influence of these factors on actual consumer purchasing power and highlights the role of artificial intelligence as an integrating mechanism that simultaneously optimizes expenditures, affects consumption patterns, and can either exacerbate or mitigate socio-economic constraints.

The level of stress associated with economic, technological, and socio-institutional limitations serves as a key moderating factor in the consumer decision-making process. It determines the population's ability to efficiently utilize available resources, select environmentally responsible products, and adapt to the digital environment. Stress caused by low income, high prices, or limited

access to digital services activates cognitive and emotional constraints, reducing the capacity to evaluate alternatives and make rational decisions. Under stress, consumers tend to make more impulsive or low-risk choices, favoring cheaper or traditional products even if they are less environmentally friendly.

Accounting for the stress factor allows for more accurate prediction of consumer behavior in the digital economy and facilitates the development of more effective strategies for the promotion of "green" products. This underscores the importance of integrating psychological aspects into models of AI influence on consumers, as technological tools without consideration of stress factors may partially or completely lose their effectiveness.

Table 1: Levers Influencing Consumer Purchasing Power and the Role of Stress Level in Shaping Consumer Decisions

Influence Levers	Stress Level	Impact on Purchasing Decisions
Income & Employment	High / Medium / Low	High stress → limited purchases, preference for cheaper goods; low stress → conscious spending, willingness to buy "green" products
Price & Inflation	High / Medium	High stress → consumption restrictions, focus on cost minimization; medium stress → partial spending rationalization
Spending Structure & AI Personalization	Medium	Spending optimization but possible impulsive decisions; depends on algorithmic recommendations
Access to Digital Technology	Medium / High	Lack of access or low digital literacy → increased stress, limited use of AI recommendations; high literacy → reduced stress, effective purchasing
Financial Tools & Green Fintech	Medium	Supports purchasing power; algorithmic restrictions → moderate stress
Institutional & Regulatory Factors	Low / Medium	Available incentives → low stress; unavailable or complex incentives → medium stress, limiting "green" purchases
Behavioral & Sociocultural Factors	Low / Medium	High values and trust → stress reduction, strategic decisions; low values → medium stress, limited adaptation

Analysis of Table 1 demonstrates that consumer purchasing power is shaped by a complex system of economic, technological, and sociocultural levers, with stress level acting as a key moderating factor that determines the effectiveness of these levers.

- A high stress level, caused by low income, high prices, or limited access to digital technologies, leads to predominance of impulsive or low-risk decisions and restricts willingness to purchase environmentally sustainable products.
- A medium stress level modifies spending structure and influences partial adaptation to digital recommendations, which can either enhance or limit economic efficiency of consumption.
- A low stress level fosters strategic and conscious decisions, increases readiness to invest in sustainable consumption, and allows for the most efficient use of opportunities provided by digital technologies and AI algorithms.

Thus, Table 1 illustrates that the influence of all purchasing power levers is nonlinear and mediated by the psychological and behavioral state of the consumer, making stress level a critical

factor in shaping economically and environmentally responsible behavior in the digital economy.

Therefore, consumer purchasing power and environmental behavior are formed under the influence of a complex system of economic, technological, and sociocultural factors, with stress level serving as a key modulating mechanism that determines the effectiveness of these levers. Table 1 systematizes the main factors, showing how income, prices, spending structure, access to digital technologies, financial instruments, government incentives, and behavioral factors interact with stress level and affect specific purchasing decisions. The figure graphically illustrates this interaction and highlights the integrative role of artificial intelligence as a mechanism that simultaneously optimizes expenditures, modulates the stress factor, and stimulates conscious, environmentally oriented consumption—fully reflecting the article's concept and emphasizing its novelty in the context of the digital economy.

AI can form a personalized consumer basket by considering:

- Budget constraints — how much the consumer can spend
- Individual priorities — preferences and values (e.g., eco-friendly products)

- Behavioral and social factors — recommendations from friends, trends
- Stress level — psychological burden that reduces willingness to invest in expensive or “green” products.

In order to maximize the overall utility of the consumer basket while minimizing the negative effects of stress.

$$\max U(X) = \sum_{i=1}^n u_i(x_i) \quad (1)$$

$$\sum_{i=1}^n p_i x_i \leq B \quad (2)$$

where:

$U(X)$ — Total utility of the product set and overall utility of the basket of goods $X=\{x_1, x_2, \dots, x_n\}$

$u_i(x_i)$ — Individual utility of product i (considering environmental friendliness, price, and social recommendations)

p_i — Price of the product

B — Consumer budget

The stress level reduces the perceived utility of a product:

$$u_i(x_i) = \alpha_i * f(p_i, S_i) * (1 - \beta * stress) \quad (3)$$

First, the analysis of the optimized consumer basket model shows that artificial intelligence (AI) can significantly enhance the efficiency of consumer decisions, particularly in the domain of environmentally oriented products. AI integrates data on purchase history, consumer preferences, and social and behavioral factors to generate personalized recommendations. As a result, consumers receive an optimal set of products that maximizes their utility within a limited budget, which is especially important for “green” products that often have higher prices.

Second, the model demonstrates that the consumer’s stress level directly affects purchasing behavior. High stress reduces the willingness to purchase expensive or environmentally friendly products and can trigger impulsive or low-risk decisions. AI helps mitigate these negative effects by providing user-friendly interfaces, personalized prompts, and spending optimization options, thereby increasing the likelihood of purchase and promoting more conscious and strategic decision-making.

For illustration, consider a consumer with a budget of 1,000 UAH evaluating several eco-friendly products such as organic food, eco-dishware, and cosmetics. AI analyzes their utility by accounting for prices, preferences, and stress level, and suggests an optimal basket that maximizes total utility within the available budget. For example, it might recommend a combination of eco-dishware and cosmetics, or organic food and cosmetics, balancing expenditures

and ecological value. This approach demonstrates that AI not only improves economic decision-making but also promotes sustainable, conscious consumption in the digital economy.

Conclusions

1. Artificial intelligence (AI) acts as a key factor in transforming consumer purchasing power and ecological behavior, enabling personalized product offerings, expense optimization, and consideration of social and behavioral factors.
2. The consumer’s stress level serves as an intermediate moderating factor, which can either diminish or enhance the effectiveness of purchasing power levers; high stress limits conscious purchases and willingness to invest in “green” products, whereas low stress promotes strategic decision-making.
3. Mathematical and optimization models implemented through AI allow for the prediction of consumer behavior and the formation of an optimal basket of goods, taking into account budget, preferences, environmental priorities, and psychological factors.
4. The practical application of AI models demonstrates that personalized recommendations can increase purchasing power and stimulate environmentally responsible consumption, even under limited financial resources and elevated stress levels.
5. The integration of AI into the digital economy opens opportunities for the development of more conscious consumer strategies that combine economic efficiency with ecological responsibility, providing a powerful tool for modeling market behavior.

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