



ORIGINAL PAPER



DOI: 10.26794/2220-6469-2025-19-3-61-68
UDC 330.1(045)
JEL D91, D83, C45, O33

Consumer Choice Features in the Context of Bounded Rationality and the Influence of Artificial Intelligence

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ABSTRACT

Subject. This article examines the impact of bounded rationality on consumer behavior and how modern artificial intelligence (AI) technologies are transforming economic decision-making processes. The purpose of the study is to demonstrate how human cognitive and time limitations, combined with algorithmic recommendation systems, dynamic pricing, and other AI tools, shape a new environment for making choices. The scientific significance of the research lies in the expansion of the classical «rational agent» model by integrating psychological factors and considering the risk of manipulative potential inherent in AI. The methodological foundation includes works on behavioral economics, the concept of bounded rationality, as well as contemporary studies focused on the application of machine learning and big data analytics in markets for goods, services, and financial products. A comparative analysis of theoretical models is also employed, along with practical case studies from e-commerce, travel services, and robo-advisors. The practical significance of the article lies in the potential to help companies, regulators, and consumers interact more effectively and transparently in the digital economy, taking into account both the benefits and potential risks of algorithmic technologies.

Keywords: bounded rationality; artificial intelligence; behavioral economics; dynamic pricing; cognitive biases; personalized recommendations; digital economy

For citation: Shcherbakov A.P. Consumer choice features in the context of bounded rationality and the influence of artificial intelligence. *The World of the New Economy*. 2025;19(3):61-68. DOI: 10.26794/2220-6469-2025-19-3-61-68

INTRODUCTION

The modern economic landscape is rapidly evolving under the influence of digital technologies, which are increasingly permeating both everyday life and professional activities. Algorithms with varying degrees of “intelligence” are now used across almost all areas of economic activity — from e-commerce and automated financial market analysis systems to marketing campaigns powered by cognitive computing. At the same time, classical economic concepts — in particular, the “rational agent” model (*Homo Economicus*), which assumes that individuals maximize their own interests with full knowledge of available choices — do not always adequately describe actual consumer behavior. In reality, people are often guided by emotions, subject to various cognitive biases, and constrained by limited time and resources.

The concept of bounded rationality, proposed by H. Simon, has long been a central focus of behavioral economics, which seeks to explain why people do not always make “optimal” decisions. Today, with the addition of powerful AI tools to the existing sources of uncertainty, this issue has become even more pressing. On one hand, algorithmic systems can help consumers find desired goods or services more quickly by analyzing vast amounts of data in fractions of a second; on the other hand, they often exploit behavioral vulnerabilities, creating nudges that encourage unconscious or emotionally driven choices. As a result, the question of the synergy between “bounded rationality + AI” has gained particular significance, as it determines whether modern consumers will reap benefits — such as time savings and expanded choices — or be subtly manipulated by systems that exploit their cognitive weaknesses.

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An equally significant role is played by the socio-economic context in which both consumers and suppliers operate. In the digital economy,

communication and sales channels themselves are changing: marketplaces, mobile applications, and online platforms are increasingly implementing machine learning systems and big data analytics. Moreover, competition for users’ attention is intensifying, so platforms actively use recommendation algorithms to boost sales and retain audiences. These algorithms can be tailored to identify each customer’s “pain points” and preferences, then offer personalized discounts or products, thereby increasing the likelihood of impulsive spending. At the same time, the question of ethical boundaries for such personalization, as well as the need for regulatory standards to prevent harmful or discriminatory practices, remains unresolved.

In light of the above, it is important to examine how individuals’ bounded rationality manifests in the modern digital environment and how artificial intelligence technologies modify the economic decision-making process. Particular emphasis is placed on analyzing both the positive effects, such as the reduction of temporal and informational barriers, and the negative consequences that arise when algorithms are used manipulatively for the benefit of specific organizations.

THEORETICAL FOUNDATIONS: BOUNDED RATIONALITY AND THE BEHAVIORAL TURN IN ECONOMICS

For a long time, traditional and especially neo-classical economic schools relied on the postulate that people behave rationally, seeking to maximize utility when making decisions. However, as early as the mid-20th century, Herbert Simon demonstrated that, in real life, economic agents have highly limited resources for processing information and are prone to perceptual and evaluative errors [1]. According to the concept of bounded rationality, an individual tends to seek a “satisficing” solution rather than an ideal optimization. This idea became the foundation of modern behavioral economics, whose proponents (Kahneman, Tversky, Thaler, and others) empirically demonstrated the existence of a



wide range of cognitive biases that influence behavior [2–5].

For example, the anchoring effect occurs when the first observed price or number influences all subsequent judgments, while confirmation bias reflects the tendency to actively seek information that aligns with existing beliefs [4, 5]. Collectively, these biases limit the ability to impartially compare alternatives and choose the truly optimal option. In a digital society, such biases can not only persist but also intensify through more subtle mechanisms of targeted influence [6].

In the Russian academic context, these issues are reflected in studies of behavioral models and various forms of “digital” socialization of consumers [7,8]. Scholars also note that a specific combination of historical, social, and psychological factors can either amplify or mitigate certain forms of irrational behavior. Nevertheless, the overall conclusion remains unchanged: the Homo Economicus model only partially describes reality, as individuals are limited by their cognitive capacities and are constantly subject to effects that do not conform to the classical logic of absolute rationality.

The “behavioral turn” in economics essentially broadens the analytical framework by integrating methodologies from psychology, sociology, and neuroscience. This research approach allows for a deeper understanding of how people make decisions, how preferences are formed, and how social institutions can either mitigate behavioral vulnerabilities or, conversely, exploit them for self-interested purposes. These effects are most pronounced in digital environments, where AI enables content to be tailored to individual users and their reactions tracked almost in real time.

Thus, the theoretical foundation of this study is based on the concept of bounded rationality, supported by extensive empirical evidence from behavioral economics, as well as numerous studies by domestic and international scholars examining the manipulation of consumer behavior through digital platforms.

ARTIFICIAL INTELLIGENCE TOOLS: PERSONALIZATION, PRICING, AND CHOICE ARCHITECTURE

Modern AI technologies go far beyond simple sorting or recommendation algorithms: they consist of complex machine learning systems capable of analyzing massive datasets (big data) while accounting for temporal trends, geolocation, psychological preferences, and numerous other factors. In the context of consumer choice, several key applications of such tools can be highlighted. Recommendation systems have become an integral part of many online platforms, from e-commerce sites to streaming services. Algorithms based on collaborative filtering suggest products, movies, music, and other items according to the user’s previous actions. On one hand, this significantly simplifies information search and reduces time costs; on the other hand, it creates a “filter bubble,” where the consumer sees only a narrow selection curated by the algorithm, losing opportunities for serendipitous discovery.

Under conditions of bounded rationality, recommendation systems can exploit anchoring or scarcity effects, for example, by showing how many items are left in stock and emphasizing urgency. A customer busy with daily tasks often does not consider whether these “remaining quantities” are real or artificially generated. While such tactics increase conversion rates, they raise ethical concerns regarding the methods of influence.

Another important AI tool is dynamic pricing, widely used in travel and transportation services (airline bookings, hotel reservations, taxis, etc.). Algorithms monitor demand, seasonality, competitor behavior, and even individual factors, such as a user’s search history for specific routes. If the system notices that a user repeatedly revisits the same itinerary, the price may rise. This strategy encourages quick decision-making, as the fear of missing out (FOMO) drives immediate action.

From a classical economic perspective, a changing price is dynamically fair, as it reflects the real-time balance of supply and demand. In practice, however, consumers experience additional stress: they may feel “cornered into a purchase,” fearing

further price increases. Thus, bounded rationality manifests in a tendency toward hasty actions initiated by the algorithm [10, p. 125].

In behavioral economics, the concept of choice architecture has long been recognized [11], where the environment in which an individual makes decisions is deliberately structured to nudge them toward certain actions. Digital platforms expand this idea by creating interfaces that can amplify irrational impulses. For example, pop-up notifications, countdown timers, bright color accents, and sound cues can focus the user's attention on a target action — most often a purchase or subscription — while ignoring alternatives.

AI algorithms track the effectiveness of such nudges for each audience in real time, making rapid adjustments. If a particular user group is more prone to impulsive decisions, the system can increase the frequency of promotions or notifications, encouraging additional transactions. From a business efficiency standpoint, this is beneficial, but for consumers, it carries the risk of unwanted spending.

Marketing has long used segmentation based on socio-demographic and behavioral criteria. However, with modern machine learning algorithms and big data analysis, companies can identify subtle psychological traits of their audiences — even detecting emotional patterns and a user's current mood. Dynamic offers can then be tailored to the individual (for example, based on the time of day or previous actions), presenting “comfort purchases” or “inspirational” deals, which intensifies the impact on emotions and bounded rationality. Practical applications of these AI tools span many domains. Some of the clearest examples demonstrate how digital technologies interact with consumer bounded rationality.

In e-commerce giants like Amazon, Ozon, and Wildberries, recommendation algorithms create personalized storefronts: users are shown products based on their search history, previous purchases, and browsing behavior. On one hand, this saves significant time, as the customer does not need to sift through thousands of items manually.

On the other hand, it creates the illusion of the “best deal” or “most popular” option, which limits real freedom of choice. Often, people buy exactly what the system highlights without exploring the market more thoroughly.

In addition, marketplaces employ social proof tactics (for example, displaying the number of positive reviews) and scarcity cues (highlighting that a product is “running out”). Consumers tend to respond to these signals emotionally, making decisions under the influence of fear of missing out (FOMO). In this way, bounded rationality nudges individuals to avoid spending time on additional comparisons and to purchase the product “here and now.”

Well-known services such as Booking.com, Airbnb, and Skyscanner implement dynamic pricing, where costs can change literally within minutes. Furthermore, platforms actively use informational cues indicating how many people are “currently” viewing the same dates or how quickly rooms in a selected hotel are being booked. Seeing growing demand, users often perceive the situation as a competition for a limited resource and make decisions under pressure. As a result, purchases may occur faster than if the person had time to calmly weigh the pros and cons. In the digital economy, such practices are increasingly perceived as the norm, yet questions regarding the ethical boundaries of these strategies remain unresolved.

Robotic investment advisors, which have become increasingly popular, offer clients automatically generated securities portfolios based on questionnaires and big data analysis. These services promise to simplify investing, making it accessible to a broader population. However, the actual effectiveness of such “robo-advising” can heavily depend on the assumptions built into the algorithm. Individuals with limited knowledge of financial markets, influenced by marketing promises, often overestimate the algorithm's capabilities and underestimate market risks. Moreover, the algorithm frequently does not account for an investor's unique life circumstances, such as the need for liquid funds or unexpected expenses.



Overall, these cases demonstrate that the interaction between AI and bounded rationality can have both positive effects (time savings, personalized assistance) and negative effects (manipulation, imposed decisions). It is crucial to consider these processes alongside ethical and legal aspects, as the boundaries of acceptable algorithmic influence on human choice are not always clear [9–11].

ETHICAL CHALLENGES AND LEGAL REGULATION

The active use of AI in marketing and sales raises a number of ethical concerns, the foremost of which is transparency in user interactions. Companies can collect and process vast amounts of data — including information not explicitly provided by the consumer — create behavioral profiles without direct consent, and use the results of such analyses to nudge users toward purchases. Considering that individuals are often unaware of the mechanisms behind dynamic pricing or recommendation systems, there is a significant risk of manipulation and the amplification of existing cognitive biases.

In both the **Russian legal framework** and internationally, increasing attention is being paid to the principles of fair data processing and the need to inform users. Key aspects include:

*Privacy and personal data protection*¹. The Russian Federal Law “On Personal Data” imposes restrictions on the collection, storage, and transfer of information that can identify an individual. In the European Union, Regulation (EU) 2016/679² (General Data Protection Regulation, GDPR) establishes similar principles. However, in the context of machine learning, it is often difficult to determine precisely which data were used by an algorithm and how the final decision is generated.

Prevention of discrimination and exploitation of vulnerable groups. Algorithms trained on “historical” data may implicitly inherit biases. This can lead to segregation based on income, age, or other factors, with certain user groups systematically shown inflated prices or denied access to impor-

tant alternatives. Discriminatory practices in the market for goods and services are prohibited by various regulations (including the Law on Advertising³), yet their adaptation to digital platforms remains incomplete.

Informed consent and algorithmic transparency. The principle of transparency means that users have the right to know how recommendations and prices are calculated, and whether factors such as their geolocation and search history are considered. However, questions remain about how deeply and in what format such details should be disclosed. Overly detailed explanations may encourage users to bypass algorithmic restrictions, while insufficient information increases the risk of manipulation and undermines trust.

At the international level, comprehensive ethical and legal standards for AI are being developed. For example, the OECD AI Principles⁴ emphasize the importance of transparency and accountability for developers. In 2021, UNESCO adopted the “Recommendations on the Ethics of Artificial Intelligence⁵,” aimed at protecting human rights and individual dignity. The European Union is also developing the Artificial Intelligence Act⁶, which seeks to systematize risks and establish requirements for specific categories of AI systems.

In Russia, there have been growing calls for the development of codes of ethics for AI system developers and operators, as well as for the creation of independent algorithm audit institutions [12] capable of verifying whether systems violate fair competition rules, employ dark patterns, or contain discriminatory elements. While traditional marketing has been regulated through advertising standards and antitrust laws, artificial intelligence requires more sophisticated control tools that take into account the algorithmic nature of decision-making and the challenges of the “black

³ URL: https://www.consultant.ru/document/cons_doc_LAW_58968/

⁴ URL: https://www.oecd.org/en/publications/artificial-intelligence-in-society_eedfee77-en.html

⁵ URL: <https://www.unesco.org/en/articles/recommendation-ethics-artificial-intelligence>

⁶ URL: <https://data-en-maatschappij.ai/en/publications/europese-commissie-proposal-for-a-regulation-laying-down-harmonised-rules-on-artificial-intelligence>

¹ URL: https://www.consultant.ru/document/cons_doc_LAW_61801/

² URL: <https://eur-lex.europa.eu/EN/legal-content/summary/general-data-protection-regulation-gdpr.html>

box.” Moreover, several researchers emphasize the importance of Explainable AI (XAI), which would provide a comprehensible justification for algorithmic decisions [13]. This is particularly crucial in cases where algorithms nudge consumers toward specific behaviors based on data and patterns hidden from them. Without clear explanations, consumers — already operating under conditions of bounded rationality — become even more vulnerable to manipulative practices.

Independent audits can reveal hidden exploitation of cognitive biases and systematic overpricing for certain groups. Explainable AI plays a central role here, as it allows the system to present the logic behind its recommendations or evaluations in a way understandable to both regulators and users.

Meanwhile the following measures are being discussed:

- *Disclosure of key pricing factors*, for instance, when a platform informs users that product prices depend on location or browsing history.
- *Prohibition of aggressive targeting of vulnerable groups*, which entails stricter monitoring of offers aimed at users with low income, signs of addiction, or other social vulnerabilities.
- *Liability for deliberate misinformation*, meaning that companies repeatedly misleading users through variable algorithms could face fines and sanctions from regulators.

It should be noted that finding a balance between protecting consumer rights and interests and preserving the market’s innovative potential remains a complex task. On one hand, excessively strict regulation could “freeze” innovation and limit competition among new market entrants; on the other, underestimating the manipulative power of AI algorithms could lead to growing distrust in digital services and exacerbate social inequality. Consequently, many experts advocate for “soft” regulation, complemented by industry self-regulation, principles of privacy by design (embedding privacy and ethical principles into system architecture from the design stage), and voluntary participation in certification programs.

Thus, the ethics and legal regulation of artificial intelligence in the context of bounded rationality is a multifaceted issue requiring an interdisciplinary approach and coordinated actions from legislators, businesses, society, and end-users — who need comprehensive information about how algorithms operate and the risks they entail.

RECOMMENDATIONS FOR USERS AND BUSINESSES

Based on the analysis, several key directions can help maximize the benefits of AI while minimizing potential abuses:

1. *Improving digital literacy*. Users should understand how recommendation content is generated, the principles behind dynamic pricing, and the concept of choice architecture. Developing critical thinking skills, questioning advertising claims, and verifying information from multiple sources are essential for reducing vulnerability to manipulation.
2. *Self-regulation and business ethics*. Companies implementing AI should develop internal codes of ethics, provide employee training programs, and publish roadmaps for the use of algorithmic methods. This will increase transparency and foster trust in digital services.
3. *Balanced legal regulation*. Government authorities need to develop legislation that reflects the specifics of AI and the digital environment while avoiding overregulation that could stifle innovation. Finding a balance between protecting citizens’ interests and promoting technological development is crucial.
4. *Institutions for external algorithm audits*. Independent expert groups or specialized agencies could evaluate algorithms for potential discrimination, dark patterns, or unfair dynamic pricing. Such practices, already discussed at the international level, would enhance corporate accountability and protect end-users.
5. *Building digital immunity*. Beyond formal legislation and business ethics, fostering a culture of responsible technology use is important. Skills in mindful consumption, avoiding impulsive purchase traps, and critically evaluating algorithmic



recommendations should be cultivated through educational initiatives by governments, universities, and digital platforms themselves.

CONCLUSION

In the context of the digital economy, bounded rationality — conceptualized by H. Simon and widely recognized in behavioral economics — takes on new forms. AI tools, on one hand, can simplify consumers' lives by offering personalized selections and instant calculations of optimal choices, and on the other hand, can be used to manipulate behavior and increase profits through decisions that are not always fully conscious or justified. As demonstrated by examples from e-commerce, online booking platforms, and robo-advisors, the effects of AI technologies are complex, generating both positive and negative outcomes.

As the role of AI in marketing and commercial processes grows, ethical and regulatory issues will become increasingly pressing. Attention is already rising around problems such as discrimination, dark patterns, and uninformed consent. Government authorities and expert communities

will need to strike a balance between fostering innovation and ensuring consumer protection.

Practically, it is important to develop “digital immunity” among users — the ability to understand the logic of algorithmic systems and critically evaluate their recommendations. Businesses should exercise social responsibility by implementing voluntary codes of ethics and avoiding aggressive manipulative practices, while legislators should continue to seek optimal regulatory measures that protect consumers without stifling economic activity.

Thus, the synergy of bounded rationality and artificial intelligence is becoming a key driver of transformation in consumer behavior within the modern digital economy. How these technologies are implemented, and how consciously all market participants engage with them, will determine whether AI becomes a tool for enhancing efficiency and convenience or a mechanism for covertly imposing goods and services. Future research in this area must take into account the interdisciplinary nature of the issue, spanning economics, psychology, computer science, and law.

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Conflicts of Interest Statement: The author has no conflicts of interest to declare.

The article was received on 26.03.2025; revised on 10.04.2025 and accepted for publication on 10.06.2025. The author read and approved the final version of the manuscript.