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ARTIFICIAL INTELLIGENCE AS A DRIVER OF ECONOMIC TRANSFORMATION IN THE VIDEO GAME INDUSTRY

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ШТУЧНИЙ ІНТЕЛЕКТ ЯК ЧИННИК ТРАНСФОРМАЦІЇ ЕКОНОМІКИ ІНДУСТРІЇ ВІДЕОІГОР

The article analyzes the impact and interaction of artificial intelligence technologies with the video game industry in the context of its economic transformation. The historical development of artificial intelligence usage in video games is examined, ranging from elementary gameplay algorithms to modern tools covering game development, marketing, and monetization processes. Based on statistical data, the growth of investments in artificial intelligence technologies by game companies is substantiated, as well as the increasing role of AI in the formation of competitive advantages. Analytical estimates of industry reports regarding the rapid growth of the AI gaming market at an annual rate of 36% and reaching a volume of up to USD 50 billion by 2033 are presented. The key role of artificial intelligence in the personalization of player and user experience is identified, particularly in audience segmentation and adaptation of monetization elements. The main areas of artificial intelligence application in game studios are analyzed, including visual content creation, level design, code generation, automated testing, and optimization of production processes. It is shown that the use of artificial intelligence in the gaming industry demonstrates a stable upward trend and represents an effective tool for both large companies and small studios. Examples of typical AI tools used in video game development are provided, along with survey results of game industry employees indicating the active integration of AI into daily workflows. Successful cases of artificial intelligence implementation based on the activities of NetEase and King are discussed. Particular attention is paid to the key challenges and risks associated with the growing role of artificial intelligence in the video game industry, including mass layoffs and negative perceptions of AI usage among segments of the conservative gaming audience. The obtained results may be applied in the practical activities of game studios when developing monetization strategies, optimizing production processes, making managerial decisions within the digital economy, and in the strategic planning of artificial intelligence tools for economic activities.

У статті проаналізовано вплив та взаємодію технологій штучного інтелекту з індустрією відеоігор у контексті її економічної трансформації. Розглянуто історичний розвиток використання штучного інтелекту у відеоіграх — від елементарних алгоритмів ігрового процесу до сучасних інструментів, що охоплюють розробку, маркетинг та монетизацію ігрових продуктів. На основі статистичних даних обґрунтовано зростання інвестицій у технології штучного інтелекту з боку ігрових компаній та підвищення їх ролі у формуванні конкурентних переваг. Показані оцінки аналітичних видань щодо швидкого зростання ринку AI в іграх на 36% річних і до 50 мільярдів доларів обсягу у 2033 році. Визначено ключову роль штучного інтелекту у персоналізації ігрового та користувацького досвіду гравців, зокрема у сегментації аудиторії та адаптації монетизаційних елементів. Проаналізовано основні напрями застосування штучного інтелекту в діяльності ігрових студій, зокрема для створення візуального контенту, левел-дизайну, написання програмного коду, автоматизованого тестування та оптимізації виробничих процесів. Показано, що використання штучного інтелекту в ігровій індустрії має стійку тенденцію до зростання та є ефективним інструментом як для великих компаній, так і для невеликих студій. Наведені приклади типових ШІ інструментів для відеоігрової розробки. Показані результати опитувань працівників ігрових студій, які свідчать про активну інтеграцію ШІ в робочі процеси. Наведено приклади успішного впровадження технологій штучного інтелекту на основі діяльності компаній NetEase та King. Окрему увагу приділено основним викликам і ризикам, пов'язаним зі зростанням ролі штучного інтелекту в індустрії відеоігор, зокрема масовим скороченням персоналу та негативному сприйняттю використання ШІ з боку частини консервативної ігрової аудиторії. Отримані результати можуть бути використані у практичній діяльності ігрових студій при формуванні стратегій монетизації, оптимізації виробничих процесів, прийнятті управлінських рішень у межах

цифрової економіки, а також у стратегічному плануванні впровадження інструментів штучного інтелекту в економічну діяльність компаній.

Keywords: *artificial intelligence, video game industry, economic market transformation, technological development, digital economy, experience economy, monetization.*

Ключові слова: *штучний інтелект, індустрія відеоігор, економічна трансформація ринку, розвиток технологій, цифрова економіка, економіка вражень, монетизація.*

Introduction. Over recent decades, the video game industry has become one of the dominant sectors of the global digital economy, outperforming traditional entertainment industries such as film, music, and publishing in terms of revenue generation. Forecasts indicate that the industry's annual revenue will exceed USD 258 billion by 2028 [1]. In addition, the video game sector demonstrates a high level of economic resilience, positioning it as an attractive and relatively stable investment domain for global companies [2].

One of the key factors behind this success lies in the widespread adoption of video games as a dominant leisure activity. By 2025, the global player base reached an estimated 3.3 billion individuals, representing nearly 40% of the world's population, with steady growth observed on an annual basis [3]. Beyond their economic significance, video games play an increasingly important role in shaping contemporary culture, particularly among younger social groups.

At the same time, a distinctive feature of the video game industry lies in its high level of innovativeness and its strong propensity for developing and testing new business models and approaches within the contemporary digital economy. Unlike traditional entertainment sectors, the video game industry combines a wide range of monetization models while continuously evolving existing product strategies, which explains the active presence of large companies associated with investment, high technologies, and economic development. Analytical reports by

international consulting organizations emphasize that the video game industry has become one of the key drivers behind the diffusion of games-as-a-service models, digital ecosystems, and data-driven management practices, which are subsequently adopted across other sectors of the digital economy [4].

The video game industry has historically been closely associated with technological innovation, contributing to the development of personal computers, gaming consoles, and mobile devices, while simultaneously shaping the digital habits of younger generations. The integration of artificial intelligence into video games can be traced back to the late 1970s, when early forms of computer-controlled opponents were introduced in single-player games. A widely cited example is *Pac-Man* (1980), in which non-player characters exhibited distinct behavioral patterns resembling basic personality traits. In subsequent decades, particularly during the 1990s and early 2000s, artificial intelligence techniques were increasingly employed to support more complex virtual environments and adaptive characters, as illustrated by games such as *The Sims* (2000) [5].

Despite the growing visual complexity and realism of contemporary three-dimensional video games, artificial intelligence within games has historically remained largely grounded in rule-based logic rather than self-learning systems. Industry analyses emphasize that even complex game environments are primarily driven by predefined algorithms such as pathfinding and conditional “if-then” decision rules, designed to ensure predictability, balance, and controlled player experience rather than autonomous learning or emergent behavior [5]. Consequently, for a prolonged period artificial intelligence in video games functioned mainly as a gameplay-supporting mechanism, rather than as an adaptive or self-developing form of intelligence.

Over the past fifteen years, however, the role of artificial intelligence in the video game industry has expanded significantly beyond in-game behavior modeling. AI-based methods have increasingly been applied to data mining, player behavior analysis, and augmented reality solutions, substantially extending the range of tools available to both developers and users [6]. This shift reflects a

broader transformation of artificial intelligence from a rule-based gameplay component into a core element of data-driven decision-making and operational efficiency within the video game industry.

According to market estimates, the global AI in gaming market is expected to grow from USD 3.3 billion in 2024 to USD 51.2 billion by 2033, with a compound annual growth rate of approximately 36%, which is nearly three times faster than the overall growth rate of the video game industry [7]. Figure 1 illustrates that the role of artificial intelligence in the video game industry is expanding across all major components of the value chain, including hardware, software, and services. In the hardware segment, AI contributes to code optimization, game engine performance, and server infrastructure. Within the software segment, AI is increasingly applied to game design, asset generation, and user interface development. At the service level, AI supports live operations, player analytics, and community management.

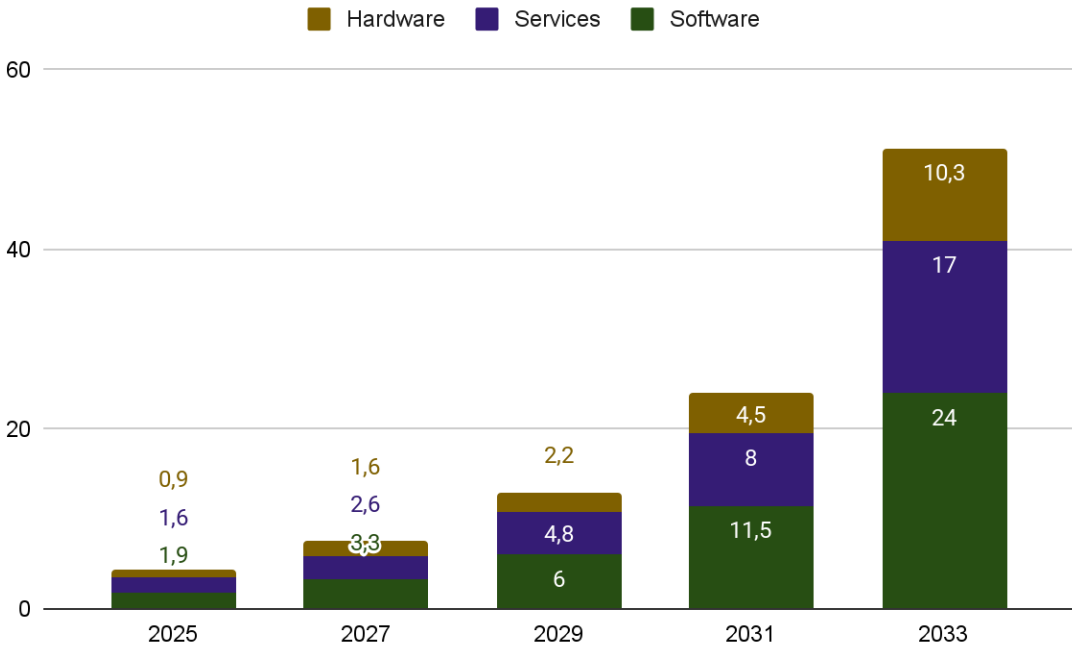


Fig. 1. Projected size of the AI in the video game industry, b\$, 2025–2033

Source: Systematized, generalized, and grouped by [7]

Aim and objectives. The aim of the article is to examine the economic implications of artificial intelligence adoption in the video game industry, with a focus on its impact on personalization, production processes, business model scalability, and associated economic risks.

The objectives of the article are to:

1. Analyze the role of artificial intelligence in transforming player experience personalization and engagement economics, including live operations practices.
2. Assess the impact of generative artificial intelligence tools on content creation processes and production efficiency in video game development.
3. Investigate the use of artificial intelligence as a tool for improving operational efficiency and scalability of video game business models, including adoption within development teams, management optimization, automation of user support, community moderation, and data-driven decision-making.
4. Identify key economic, ethical, and institutional risks and constraints associated with the application of artificial intelligence in the video game industry, and outline their implications for business model sustainability.

Results and discussion.

Transformation of player experience personalization. Across digital industries, users increasingly expect personalized experiences, which have become a key driver of engagement and value creation. In the video game industry, monetization is based on a complex combination of player acquisition, retention, and conversion strategies. Monetization models often evolve under the influence of new technologies or changing financial objectives, and artificial intelligence serves as an important tool for marketers, game designers, and monetization specialists.

Artificial intelligence enables companies to collect and analyze player data significantly faster than traditional approaches. Surveys, social media activity, online forum discussions, and in-game purchase histories can be processed efficiently using modern analytical technologies, allowing each player to be

represented through an individualized behavioral profile [8]. AI-driven algorithms help identify player interests, determine which offers or discounts should be presented, and recommend relevant content. As a result, AI automates the segmentation of in-game offers and supports the creation of personalized player experiences, in which purchase options are tailored to a wide range of behavioral and contextual factors.

This approach addresses several key business objectives. First, it enhances player experience personalization and increases conversion rates. Second, it improves operational efficiency and supports rapid growth, as successful games become easier to scale [9]. Consequently, both game development speed and decision-making processes are accelerated. The application of AI significantly shortens the analysis cycle for A/B tests, new feature launches, and monetization strategies, thereby streamlining developer workflows.

An illustrative example is the company King, the developer of Candy Crush Saga, which actively applies artificial intelligence technologies. AI is used to generate new game levels and personalized offers, and the company reports positive outcomes from this approach. At the same time, King emphasizes that artificial intelligence functions primarily as a decision-support tool, while expert knowledge in game design and monetization remains essential [10].

Impact of generative artificial intelligence on content creation and production efficiency. However, artificial intelligence influences not only monetization strategies but also content creation processes and production efficiency across the video game industry. Nowadays, AI is applied not only to simulate decision-making and in-game behaviors but also to automate repetitive and resource-intensive production tasks that traditionally require significant manual effort. Such automation reduces development time and operational costs while allowing human specialists to concentrate on creative and high-value activities that are less amenable to algorithmic replacement. AI can help companies to make games faster and bigger even if the team does not have a specific specialist [11].

Artificial intelligence opens several promising directions for application within game production, particularly in the generation of virtual worlds and game levels. By combining procedural techniques such as Perlin noise with diffusion models and AI-driven optimization systems, developers can create diverse and engaging environments more efficiently, significantly reducing production time and the workload of game designers and environment artists [12]. This approach is especially valuable for open-world games and titles featuring procedurally generated or randomized levels, where content variability plays a crucial role in player engagement.

In addition to environment generation, advances in image, audio, and text generation have encouraged companies to experiment with AI-assisted tools in visual art, character design, music composition, and voice generation. While these technologies do not fully replace human specialists, they increasingly support production pipelines by accelerating asset creation and reducing costs. Furthermore, AI is widely applied in game writing support, quality assurance, and automated testing processes, which can be performed faster and more consistently than manual testing [13]. Overall, the adoption of AI technologies contributes to lower production costs and shorter development cycles, particularly in large-scale AAA projects characterized by high budgets and long-term development timelines.

Artificial intelligence adoption and scalability of video game business models. In practice, this process is shaped not only by company-wide strategic initiatives but also by individual employee motivation to automate and streamline daily workflows. According to a Statista survey, only about one quarter of employees in game development companies report no interest in using AI tools for their professional activities or lack sufficient awareness of their application methods (Figure 2). At the same time, more than one third of employees already actively use various AI tools in their work-related tasks [14].

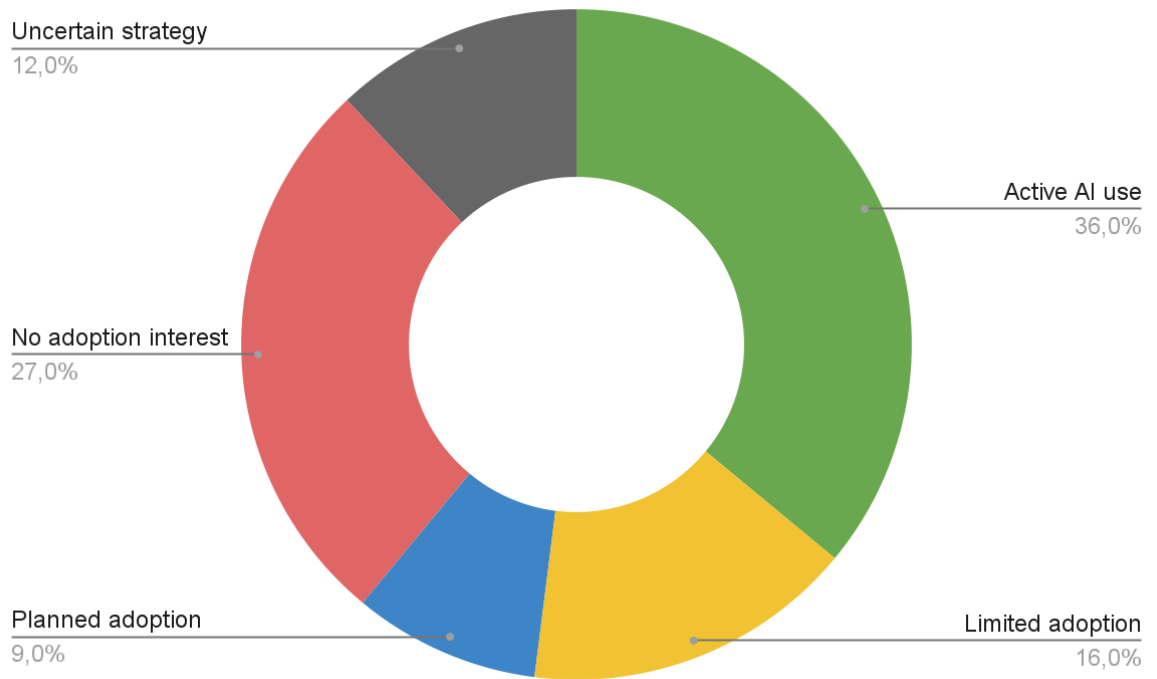


Fig. 2. Levels of Generative AI Adoption in Game Development Studios, 2025

Source: Systematized, generalized, and grouped by [14]

The case of NetEase illustrates that large-scale investment in generative artificial intelligence may be associated with both operational efficiency and strong commercial performance in the game industry. In 2023, the company reported total revenue of RMB 103.5 billion, with its game segment accounting for 79% of revenue and growing by 9.4% year-on-year, outperforming other business segments. Game-related R&D investment reached RMB 13.4 billion, yielding a return on investment of 24.2%, comparable to that of Tencent. AI-supported titles such as *Eggy Party* and *Ni Shuihan* demonstrated high user engagement, which the company attributes to the integration of generative AI technologies and the development of an AIGC+UGC ecosystem supporting sustained engagement and revenue growth [15].

Another important trend is that AI tools enable small studios to scale their operations and create distinctive gaming experiences even in the absence of large, highly specialized teams. Subscription-based pricing models of various AI tools,

such as ChatGPT, Midjourney, NVIDIA GameWorks AI, Unity ML-Agents Toolkit, IBM Watson for Game Analytics, and others. That provides developers with greater flexibility in planning operational costs and managing short-term staffing needs [16]. As a result, AI-driven tools lower entry barriers and support more adaptive and cost-efficient production strategies in game development.

Economic, ethical, and institutional risks of artificial intelligence adoption. However, despite its advantages, the application of artificial intelligence also entails several negative implications for the game industry. Three major challenges can be identified.

First, large-scale layoffs in game development companies. In 2023, approximately 10,000 employees were laid off in the game industry; in 2024, this figure increased to around 15,000, while in 2025 it declined to approximately 6,000. A significant share of these layoffs has been associated with large studios' initiatives to replace manual labor with AI-driven solutions and reduce workforce size in pursuit of financial optimization [17]. Such trends contribute to growing instability in the labor market and may, in the long term, result in a shortage of highly qualified specialists with relevant industry experience.

Second, negative perceptions among players and gaming communities. For many players, video games represent a core segment of the creative industries, and the use of AI technologies often provokes resistance, calls for boycotts, and increased support for developers who rely on traditional production methods. One notable example is the recent controversy surrounding the game *Clair Obscur: Expedition 33*, where the identification of AI-generated elements led to the withdrawal of awards at the Indie Game Awards [18]. Importantly, the actual use of AI in the game was limited; nevertheless, the case became symbolic for both organizers and fans, reflecting broader concerns about AI adoption in creative products.

Third, challenges related to quality control. Many games that actively rely on AI-generated content currently demonstrate relatively low production quality, largely because studios lack sufficient experience with these technologies and

cannot yet fully entrust core development processes to artificial intelligence [19]. This often results in negative player experiences and unfavorable feedback, as AI systems remain unable to independently generate consistently engaging gameplay. A related issue concerns AI-generated marketing materials, particularly promotional videos, which frequently provoke user dissatisfaction due to perceived low quality and lack of authenticity.

Although these challenges cannot be considered critical at present, they significantly influence community perceptions of AI in games and encourage both investors and developers to adopt a cautious approach to the use of artificial intelligence in game development, live operations, and marketing activities.

Conclusions. Historically, artificial intelligence appeared in video games in the 1970s in the form of simple rule-based algorithms governing the behavior of in-game objects. Over time, AI has evolved to participate in multiple stages of video game production, including development, marketing, and monetization. Today, artificial intelligence can be applied at virtually every stage of game creation to address a wide range of tasks. The adoption of AI technologies in the video game industry continues to grow at a rate of approximately 36%, and the global market size of AI in video games is projected to reach USD 51.2 billion by 2033.

At present, artificial intelligence exerts a substantial influence on video game monetization. Through the use of advanced AI-driven tools, developers are able to personalize player experiences and segment in-game offers and advertising strategies, thereby increasing conversion rates and encouraging long-term player engagement. As a result, modern players may encounter significantly different gameplay and user experiences depending on their playtime, behavioral patterns, and purchase history.

In addition, artificial intelligence is increasingly used to generate large volumes of game-related content, including source code, visual assets, video materials, voice acting, and other digital components. This capability enables companies to shorten development cycles, expand content output, and partially

substitute highly specialized labor with automated solutions, thereby transforming the production economics of the industry.

Industry surveys indicate that by 2025 a majority of game development studios already actively employ AI technologies in their workflows, with adoption rates continuing to rise. Artificial intelligence provides significant advantages for large studios such as NetEase and King in the development and scaling of both new and existing projects. At the same time, the relatively low cost and accessibility of AI tools contribute to a reduction in entry barriers for new and smaller companies, fostering increased competition and innovation within the industry.

Nevertheless, the widespread adoption of artificial intelligence also generates a number of challenges and risks. These include negative perceptions among more conservative player communities, declining content quality resulting from overly automated production pipelines, and a growing labor market crisis marked by large-scale layoffs. In the long term, such trends may adversely affect the training and availability of highly qualified specialists in the game industry.

Overall, artificial intelligence in the video game industry represents a promising investment direction and a powerful technological instrument with significant long-term potential. However, as with any creative industry, successful AI integration requires careful consideration of audience expectations and community sentiment, as increased automation does not necessarily lead to improved player experiences. A balanced and responsible approach to AI adoption remains essential for sustainable industry development.

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