The AI-Driven Transformative Potential of the Gaming Industry for Economy and Society

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Abstract

Computer game production has long transcended the entertainment industry to become a complex, high-tech, innovative, highly profitable field with transformative potential for other sectors. It synthesizes technical and humanities disciplines such as artificial intelligence (AI), virtual reality, behavioral psychology, cognitive science, design, agent-based modeling, scenario planning, Foresight, complex systems science, and others. The paper explores the prospects of expanding this interdisciplinary field through the application of more sophisticated technologies, including AI algorithms. Foresight methodology was used, including such tools as horizon scanning, analysis of scientific, technological, political, economic and value factors, assessment of effects and uncertainty, as well as expert surveys. The collected data set formed the basis for four scenarios for the industry in Malaysia over the next ten years. This study contributes to informing policy rationale for the use of AI for game development for various purposes, including strategic planning practices.

Keywords: gaming industry; artificial intelligence; game development; strategies; gamification; innovations in education; future modeling; computer games; business simulation games; educational games

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Introduction

While formally belonging to the entertainment industry, the computer games industry has reached a new level while undergoing a profound transformation. Today it is a high-tech and highly profitable sector that helps solve a wide range of serious problems. The ideas and developments emanating from this field continue to transform many areas of the economy and public life. Models of the metaverse and virtual currencies were born here, and great development potential remains through the integration of new technical and humanitarian areas, such as virtual reality, behavioral psychology, cognitive science, design, agent-based modeling, and scenario planning. Particularly significant transformation processes in this sector, as in many others, are associated with the further development of artificial intelligence (AI), the increasingly complex algorithms of which open up a wide range of new opportunities.

The leaders in the described processes include the USA, China, Great Britain, Japan, and some other countries in Europe and Asia. The Netherlands is a leader in the development of serious educational games related to the management of systems from local to global levels, in such areas as water resources (den Haan et al., 2020), infrastructure, transport (Duffhues et al., 2014), energy (Hettinga et al., 2020), and agriculture.[1] In Japan, gamification has become an integral part of annual nationwide exercises to prepare for rapid response to natural disasters[2].

The global volume of this industry is expected to reach $282.3 billion by the end of 2024, with the largest revenue coming from China ($94.49 billion). By 2027, its total turnover will increase to $363.2 billion (an annual increase of 8.76%), and the total number of users will be 1.472 billion people.[3]

Such dynamics stimulate the development of related areas, such as e-sports.[4] In 2023, the size of the global market in this area was estimated at $1.72 billion. It is predicted that this year its value will approach $2.06 billion, and by 2032 it will grow to $9.29 billion (average annual growth rate during 2024 –2032 will be 20.7%). Market growth is influenced by trends such as an increase in the frequency of live broadcasts of cyber tournaments, an increase in viewer interest, and increased investment in e-sports infrastructure. Universities view esports as a tool for developing specific professional skills in students, offering special educational programs.[5] The synthesis of virtual and physical reality along with artificial intelligence (AI) in computer games, every year expands the possibilities of enriching the gaming experience (Tang et al., 2020). Moving games to mobile platforms has made them accessible and convenient for more users.

The role of serious games aimed at developing professional skills in education, healthcare, and management is increasing. The effectiveness of educational games (to acquire new skills and behavioral patterns) is enhanced by the dynamic response of AI algorithms to user actions, which is expressed in the behavior of smart characters that adapt to the player's learning style and thinking (Tang et al., 2020; Fairclough et al., 2002; Shi et al., 2023; Waltham, Moodley, 2016). Advanced AI-based analytics improves the quality of assessment of the educational process. With the increasing use of AI in the development of different types of games, there are prospects for the development of expanded skills and competencies in many disciplines. Considering their real and potential effects, a deep analysis of the fundamentals of AI, an understanding of the development processes of the corresponding systems, and an assessment of the ethical aspects of their use are necessary.

In general, a vast amount of literature is devoted to the issues of game development as such and the areas of their application. Our scanning of international scientific databases revealed over 3,800 such publications over the past 10 years. However, only a small number of those works are devoted to the use of AI in this process.

Our article contributes to filling the corresponding gap. The main directions of using AI in the development of the gaming industry are considered in relation to the context of Malaysia, and four alternative development scenarios are proposed for the period until 2032.

Literature Review

The production of computer games began in the 1950s and over time this industry has grown into the most profitable segment of the wider global entertainment industry. The connection between AI and games can be traced back to the appearance of the first chess program. The quest to create AI

[1] https://agriculture.newholland.com/en-gb/europe/new-holland-world/farming-simulator, accessed 05.06.2024.

[2] https://www.gfdrr.org/sites/default/files/publication/learning-from-disaster-simulation-drills-japan-report.pdf, accessed 09.04.2024.

[3] https://www.statista.com/outlook/dmo/digital-media/video-games/worldwide, accessed 03.12.2024.

[4] https://www.fortunebusinessinsights.com/esports-market-106820, accessed 03.07.2024.

[5] For example, Syracuse University University, USA) announced a new course dedicated to eSports in 2023.

capable of winning strategy games against high-end players has spurred research, which in turn has led to significant advances in game design. AI technologies have revolutionized various aspects of game creation, from intelligent character generation and context-sensitive content to adaptive game mechanics and sophisticated analytics. Gaming companies see the benefits of AI, particularly in terms of opportunities to improve gaming experiences and save costs. Its application areas include, for example, improving visual effects, increasing their realism, dynamic content creation, balancing gameplay difficulty, and generating intelligent characters. Using AI in game design simplifies the development process, improves animation quality, and improves the efficiency of level design and content creation. The use of AI algorithms allows players to have a more immersive and dynamic gaming experience. AI-powered systems can adapt to the behavior of specific players, offer personalized challenges, and increase engagement. The emergence of virtual and augmented reality, other immersive technologies, and their adaptation to mobile platforms will radically transform this area and open up vast opportunities for both developers and users.[6] The role of games itself has expanded, going far beyond the scope of entertainment purposes - they perform various complex tasks, penetrating into the field of education, business, management, medicine, energy, and others.

In the study by (Bharathi et al., 2024), the authors explored opportunities to improve educational programs in a new context based on AI. In this regard, significant attention is paid to business simulation games, which are recognized by an increasing number of experts as an effective practice-oriented tool for interactive education. They are increasingly used by universities and companies to make decisions and develop strategies. Along with AI, adaptation to mobile platforms and cloud computing make a certain contribution to their improvement. An attractive, motivating atmosphere is created that enhances cognitive processes and improves the quality of information absorption due to the effect of complete immersion. Game-based learning creates opportunities to practice project management concepts in a simulated, safe environment, promoting active engagement, developing critical thinking, problem-solving, collaboration, and creativity skills (Jahan Tumpa et al., 2024).

The game approach is becoming widespread in STEM education (Gao et al., 2020). New research is revealing the pros and cons of integrating games into specific disciplinary contexts, thus contributing to a growing understanding of their potential for the educational field.

The Connection between Games and Cognitive Science and Strategic Thinking

The impact of various game genres on the cognitive functions of the brain, their contribution to the development of complex competencies, and the improvement of strategic thinking has been the subject of numerous studies (Ghasemi et al., 2024). Differences in cognitive abilities lead to individual differences in working memory functions, visual perception, and reaction speed. As a result, the variety of behavioral models that determine attitudes toward risk, uncertainty, and ambiguous, complex, and confusing situations is expanding (Frederick, 2005). New developments allow for the creation of increasingly advanced games aimed at increasing the productivity of strategic planning in business, the military sector, medicine, ecology, and other areas (Bellotti et al., 2014).

The synthesis of such subject areas as game theory, cognitive psychology, and systems thinking helps to reveal the nature of strategic thinking and identify effective tools for its development. Based on the differences in cognitive functions and the variety of behavioral patterns, developers face a difficult task - using AI to create gaming algorithms that adapt to the specifics of a particular user.

Business simulation games create an experimental reality where you can plan projects, implement them in roadmaps, and experience the consequences of mistakes, gaining valuable experience (Dantas et al., 2004). An engaging, immersive gaming environment helps reinforce the right or wrong steps taken (Sanzana et al., 2024), key entrepreneurial skills, communication, problem solving, resource management, and other competencies are developed (Shabbir, Pallares-Venegas, 2024).

Recent research suggests the integration of serious games into soft skill development programs. With their help, employees are trained in diverse communication styles (Sutil-Martín, Otamendi, 2021). A number of universities have created gamified virtual biology and chemistry laboratories, allowing students to practice dangerous experiments without risk (Sanzana et al., 2024). Educational games significantly improve problem-solving skills by identifying hazards early and taking preventive action (Solinska-Nowak et al., 2018). Based on the understanding that games should reflect complex real-world environments with emergent behavior,

[6] https://techcrunch.com/2015/10/31/the-history-of-gaming-an-evolving-community/, accessed 04.17.2024.

land use simulations have been developed (Bishop et al., 2009), energy policy (Dolin, Susskind, 1992) and water and climate change management are considered (Vervoort et al., 2022; Zhou, Mayer, 2017).

Business games synthesize the modeling of system dynamics and agent behavior (Alessi, Kopainsky, 2015; Le Page et al., 2012; Smajgl et al., 2015), dynamic interactions between elements of complex systems are displayed, which makes it possible to anticipate the effects of feedback and develop preventive measures (Alessi, Kopainsky, 2015). A special genre of games has emerged for proactive management (*anticipatory games)*, focused on the formation of a preferred future within the framework of scenario planning (Vervoort, Gupta, 2018).

They offer unique opportunities to create and experiment with new systems of governance, including the creation of rules and institutions, as well as the distribution of roles in dynamic contexts (Vervoort et al., 2022). For example, there are adaptations of popular SimCity and Minecraft games, which allow you to produce different development scenarios for cities of the future in a digital environment.[7] Various game theory heuristics are used as objects of political debate (Bekius et al., 2018).

Difficulties in Developing Computer Games and the Contribution of AI to Overcoming Them

Creating computer games requires a wide range of skills from different disciplines, particularly a combination of technological and artistic abilities (Hodgson, Briand, 2013). As gaming companies grow, the need for effective methods to manage the development process and its high-tech components increases (Kanode, Haddad, 2009). When creating complex software, problems often arise related to the violation of the planned deadlines for project implementation, primarily due to the initial underestimation of the expected time *costs* (in 65% of cases) (Petrillo et al., 2008). In the professional environment, the practice of constant rush jobs in the development of games and other software is widely discussed, and their reasons are analyzed (Dyer-Witheford, De Peuter, 2006; Peticca-Harris et al., 2015). The successful implementation of projects is also influenced by the quality of communication between members of an interdisciplinary team, the provision of which is particularly difficult. To develop complex educational games, in most cases it is necessary to select the appropriate tools, documentation, and algorithms for AI, animation creation, rendering, and learning analytics (Tamla et al., 2019).

In psychology, there are biofeedback mobile apps and serious games to help young people manage their anxiety and fears effectively, using AI to analyze user data and provide personalized feedback and recommendations (Almeqbaali et al., 2022). The AI can recognize the player's emotions and stress level and reduce psychological tension.[8]

Adaptive AI systems evaluate player behavior and adjust the game difficulty in real time according to the player's preparedness. The result is that the game remains fun without being overly difficult.[9] The "engines" that provide support for various game attributes are critical. For example, games serve as an "assistant coach" for people undergoing medical rehabilitation. They are created taking into account the individual needs of patients, creating a motivational environment to achieve the required results (Ambros-Antemate et al., 2021). In games like this, increasing the adaptability of the algorithms can radically affect the recovery results. Therefore, the difficult task is to provide their automatic correction and a convenient interface for manual configuration (Smeddinck, 2020). For this purpose, dynamic complexity adjustment approaches have been developed (Dynamic Difficulty Adjustment (DDA)), which increases player engagement by adapting the game's difficulty based on the player's performance. To automatically change the difficulty of the game depending on the level of the player, AI systems (for example, AlphaDDA) have been created, making the gameplay harmonious and attractive (Xue et al., 2017).

Research Methodology

To solve the problem (expanding the base of empirical data on the use of AI in game development), an exploratory study was carried out using Foresight methods, including horizon scanning, STEEPV analysis, and the development of scenarios for the next five to 10 years. The STEEPV method was used to analyze existing and potential problems and trends that could affect the economy and society as a whole. Six groups of factors were taken into account: social, technological, economic, en-

[7] http://www.edudemic.com/minecraftedu-and-simcityedu-blazing-trails-for-interdisciplinary-learning/, accessed 05.02.2024.

[8] https://safeinourworld.org/news/how-ai-and-biofeedback-are-helping-players-manage-stress-and-anxiety/#:~:text=By%20tracking%20the%20player's%20heart,symptoms%20of%20stress%20and%20anxiety, accessed 01.19.2024.

[9] https://www.gdgtme.com/features/ai-in-gaming-taking-video-games-to-the-next-level/, accessed 02.18.2024.

[10] https://tracxn.com/d/explore/gaming-startups-in-malaysia/__lrKvnVOpLT8CmWXvf1x5HSuJ4pbuDM-c7kHiPJ7NqMM/companies, accessed 03.09./2024.

vironmental, political, and value. In this way, a questionnaire was constructed and distributed to a target sample of game developers. Its structure is presented in Table 1. As of the first half of 2023, there were 86 game startups in Malaysia.[10]

Since exact data on the number of employees at each company was not available, we proceeded from a generalized conditional threshold - at least five specialists (general population of 430 people). After filtering it in accordance with the method described in (Krejcie, Morgan, 1970), the sample size was 205 respondents. Thirty-three questionnaires were completed (response rate - 16.1%) and analyzed using Microsoft Excel.

Secondary data was extracted from periodicals, online publications, and dissertations relevant to the research topic and was not limited to Malaysian ones. The collected unstructured information was filtered to extract meaningful information.

Table 1. **Structure of the Questionnaires**

Section	Items
A	Demographics of the respondents
B	The impact of drivers toward AI in gaming development
C	The uncertainty of drivers toward AI in gaming development

Source: auhtors.

Results

The accumulated array of information became the basis for assessing the effect and uncertainty, and then constructing scenarios. Subsequent analysis revealed two underlying factors that lead to the greatest impact and greatest uncertainty when using AI. The effect-uncertainty matrix presented in Figure 1 served as a framework for developing four alternative scenarios for the use of AI in the gaming industry over the next five to ten years. As a basis of relevant information, we used the results of the STEEPV analysis, which identified eight key factors reflected in Table. 2. The information collected is intended to enrich the evidence base for developing a holistic and informed approach to scientific and innovation policy in relation to the gaming industry.

The characteristics of the sample of respondents are presented in Table 3, and the average values of the assessment of answers to the questions are in Table 4. According to respondents, factors related to intellectual property rights for AI content produce the greatest effect, and the greatest uncertainty is caused by technical problems with AI algorithms. Therefore, intellectual property rules require further analysis and refinement to protect the rights of developers. The importance of this aspect in the gaming industry has been noted by a number of sources. Key legal issues have been identified, in particular, the need to protect against game cloning.[11] The fact that Malaysian engineers are most uncertain about technical problems with AI algorithms reflects their current level of knowledge in the field.

In Figure 2, the red circle highlights the factors responsible for the maximum magnitudes of effect and uncertainty, indicated by codes D5 "Gameplay and Immersion" and D6 "Technical Problems with AI Algorithms." They became the basis for the scenario analysis.

Scenarios for the Future Use of AI for Game Development

The scenario matrix is based on two factors that received maximum ratings from respondents: "Technical challenges of AI algorithms" and "Gameplay and immersion" (Figure 3).

Scenario 1 "Dynamic game environment". Recognized as the most preferred option, it combines the low level of technical problems with AI algorithms and a high degree of immersion in the gameplay as well as a high-quality gaming experience. In this scenario, AI is used by most game developers to create the most dynamic gaming environment possible. AI algorithms will take the gaming industry to a new level of development, expanding opportunities for user engagement. The use of AI is ushering in a new era with an unprecedented quality of gaming experience.[12] Increasing the complexity of character behavior, procedural content creation, and game balancing combine to create a game world that is both complex and interesting for users. AI-powered analytics allows developers to study player behavior to create games that automatically adapt to different gaming styles and preferences.

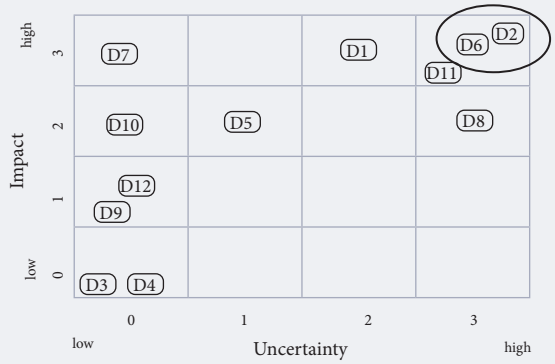
Scenario 2 "Long game development cycle." This scenario has both positive and negative aspects. The upside is that a long development cycle can

[11] https://www.qualityoracle.com/intellectual-property-rights-in-the-gaming-industry/#:~:text=Under%20IP%20protection%2C%20developers%20will,and%20sale%20of%20said%20games, accessed 04.18.2024.

[12] https://ilogos.biz/the-role-of-ai-in-game-development/#:~:text=Impact%20of%20AI%20in%20Gaming&text=This%20technological%20advancement%20has%20allowed,and%20challenging%20environment%20for%20players, accessed 05.05.2024.

[13] https://www.dualshockers.com/games-with-longest-development-times/#8-8-ultima-ix-ascension-five-years, accessed 02.14.2024.

Figure 1. **Impact-Uncertainty Matrix**



Source: auhtors.

Table 2. **Drivers Related to Merged Issues and Challenges**

1. Data Security and Privacy Concerns
• Data misuse or unauthorized access and theft • Lack of transparency and responsibility • Information withholding • Privacy challenges
2. Ethical Considerations and Responsibility
• Ethical concerns • Ethical frameworks • AI ethics • Responsibility for harmful content or biased algorithmic outputs • Mitigation of ethical risks • Ownership and control of affective models • Stereotypical portrayals of women • Encouragement of violent behavior • Safety and well-being of participants • Trustworthiness
3. Ownership and Intellectual Property of AI-Developed Content
• Attribution of authorship and copyright concerns • Patent protection and patentability • Challenges in ownership, transparency, and responsibility • Absence of comprehensive frameworks for ownership • Ownership issues, data security, and user privacy
4. AI-driven Gaming Innovation
• AI in game-based learning • AI integration into games • Revolutionize the gaming experience • Advanced AI models • AI-generated content • Shifting to utilizing neural networks
5. Gameplay Experience and Immersion
• Addictive tendencies • Enjoyable and immersive gameplay experience • Challenge for fair gameplay • AI-generated content for engaging and human-like gameplay • Automatic level generation • Addressing sequential decision-making challenges
6. Technical Hurdles of the AI Algorithms
• AI explanation • Limited tools • Technical hurdles or constraints • Uncertainty surrounding the opponent's decision • Black-box nature of games • Lack of transparency and predictability • Addressing sequential decision-making challenges
7. Competitive Game Innovation
• Competitive environment for players • Increasing player base • AI voice recognition and perspective plug-in • AI-generated engagement and human-like gameplay
8. Competitive Gaming Industry Environment
• Mounting competition among game developer • Rapid growth of online gaming
Source: auhtors.

ensure polished, polished games are created. Thus, the famous game "The Last Guardian" has been in development for eight years. Such a protracted process does not have one obvious reason; rather, it should be said that there are a number of interrelated problems. Among the factors that slowed down work were the departure of key studio employees, conflicts with the publisher (Sony), and other problems.[13] Despite this, "The Last Guardian" was successfully launched on the market and received mostly positive reviews. The disadvantages of a protracted development process include lost market opportunities or changed user preferences. What is considered innovative at the beginning of the cycle may lose relevance by the time it ends, and the risks of falling behind competitors' increase. Developers will have to invest more time and resources into the project with no guarantee of profit.[14] Thus, despite the complex technical problems of AI algorithms, this scenario also seems acceptable provided that players receive a quality gaming experience through deep immersion.

Scenario 3: "Dominance of technological complexity." Due to significant problems with AI algorithms and a low level of immersion in the gameplay, developers will have to pay excessive attention to technical aspects. This can lead to the loss of consumers who are interested not so much in technological innovation as in the attractiveness of the process. Over-reliance on technological complexity can result in losing the immersion and an engaging gaming experience that players have come to expect. The risks of losing such attributes that are responsible for interest in the game, such as an exciting plot, a detailed game world, and an intuitive interface, are increasing. Consequently, the likelihood of this scenario being realized may be low, since it depends on the balance between technological innovation and gameplay. However, the

Figure 2. **Impact-Uncertainty Analysis**

Source: auhtors.

[14] https://www.gamedeveloper.com/business/the-risks-of-long-term-game-development, accessed 05.07.2024.

Table 3. **Demographics of Respondents**

Category	Frequency	Share (%)
Gender		
Male	22	66.7
Female	11	33.3
Age		
18-24 years old	10	30.3
25-34 years old	11	33.3
35-44 years old	9	27.3
45 years old and above	3	9.1
Place of work		
Game development companies *	13	39.4
University **	2	6.1
Freelancing	10	30.3
Prefer not to say	8	24.2
Current job role		
Game designer	8	24.2
Game programmer	10	30.3
Producer	1	3. 0
Artist/animator	9	27.3
Writer / Storyteller	2	6.1
Tools Developer	3	9.1
Employment type		
Student	7	21.2
Full time employed	14	42.4
Part-time employed	6	18. 2
Self-employed	6	18. 2
Years of experience in game development		
Less than 1 year	5	15.2
1-3 years	14	42.4
4-6 years	5	15.2
7-10 years	5	15.2
More than 10 years	4	12.0
Size of the development team		
Individual developer	12	36. 4
Small team (2-10 people)	11	33.3
Medium team (11-50 people)	7	21.2
Large team (51+ people)	17	9. 1
Priority game platform focus		
PC	16	48.5
Console	2	6.1
Mobile	9	27.3
Virtual Reality	4	12.1
Augmented Reality	2	6.1
Familiarity with AI in gaming		
Very familiar	6	18.2
Somewhat familiar	19	57. 6
Not very familiar	5	15. 2
Not at all familiar	3	9.1
Integration of AI in current projects		
Actively integrating AI features	8	24.2
Considering integrating AI features	11	33.3
Not currently integrating AI features	8	24.2
No plans to integrate AI features	6	18.2

* Gameka, Knowles, Double 11, Dandelion Studio, Quurk, AC, HY Building, KPM, Alchymy Creative, Manson Games, Kayangan, PlayStation, Illuminative (each by a single representative).
** UOW Malaysia, Universiti Tunku Abdul Rahman (each by a single representative).

Source: compiled by the authors.

Table 4. **MEAN Score of Impact and Uncertainty Drivers**

Code	Drivers	Mean	
		Impact	Uncertainty
D1	Data security and privacy concerns	3.879	3.636
D2	Ethical consideration and responsibility	3.970	3.485
D3	Ownership and intellectual property of AI-developed content	4.000	3.455
D4	AI-driven gaming innovation.	3.970	3.727
D5	Gameplay experience and immersion	3.879	3.848
D6	Technical hurdles of AI algorithm	3.970	3.970
D7	Competitive game innovation	3.606	3.545
D8	Competitive gaming industry environment	3.485	3.576

Source: auhtors.

Figure 3. **Development of Four Alternative Scenario**

Source: auhtors.

passion for improving AI algorithms can upset this scenario.

Scenario 4: "Monotonous gameplay." In a gaming context, monotony means that players have to deal with a limited standard set of tasks, missions, or quests. If AI algorithms lack complexity and the ability to create game challenges, the process becomes predictable and repetitive. Characters controlled by the AI exhibit monotonous behavior with minimal differences in reactions or strategic decisions, resulting in a loss of interest in the game. This scenario could be the worst. If Malaysian game developers ignore solving the complex technological problems of AI algorithms, gameplay immersion will be low and the gaming experience will be substandard. Resistance to using AI for game development will increase given that the alleged improvements provided by AI are not apparent.

Conclusion

The gaming industry is considered a high-tech, innovative, and highly profitable sector with great potential for impact on the economy and society as a whole. These opportunities can be unlocked with the help of AI and other advanced technologies. It is of interest to assess the readiness of gaminedevelopers to implement more complex and adaptive AI algorithms.

For the first time in the Malaysian context, this article examines the prospects for the use of AI in this area. A comprehensive analysis of the factors determining them was carried out, combining a study of the literature and a survey of experts. Based on the two identified key drivers associated with the greatest impact and uncertainty, four alternative scenarios were developed. The "Dynamic Gaming Environment" scenario is considered the most preferable, since it is the combination of a lack of complexity with the implementation of AI algorithms with a focus on enriching the gaming experience of users that opens up the widest possible range of opportunities for the gaming industry.

Like any study, the analysis we present has its limitations. This is only the first attempt to provide an empirical basis for understanding the specific challenges and opportunities that the gaming industry may face as it implements AI technologies. Another limitation is the size and composition of the sample. Despite this, the collected data set turned out to be quite informative, which made it possible to draw conclusions about the research problem.

Several recommendations can be offered to overcome these limitations. First of all, in future research it would be advisable to expand the methodology and conduct in-depth interviews to better understand the relevant topics and other issues not covered in the literature. The presented research can serve as a starting point for assessing the dynamics of the future use of AI by game developers. In addition, scholars or policy-makers can use the results of this work to assess the impact of and uncertainty surrounding AI use in Malaysia. This will help enhance the positive effects of using such technologies for game development and mitigate the negative consequences. It is clear that, despite the widespread use of AI in game development noted in many studies, concerns about it remain. In general, games, especially those based on AI, impact the development of different areas and encourage the development of complex and valuable skills in users. There is a need to find the right balance between creating innovation and using it responsibly to ensure gaming is safe, inclusive, and beneficial for people of all ages.

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