GenAI is accelerating the evolution of the gaming industry

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To observe that the world of gaming has seen rapid change is obvious and an understatement. To a gamer in 2015, the games available today are unimaginably rich and visually spectacular – but the gamer of the future will look back on today's games with derision. Generative artificial intelligence (GenAI) is set to transform the richness of the gamer experience and disrupt the game development industry. Development tasks that have historically been costly and time consuming will be handed over to AI. Human experts will play a critical role, but will concentrate on the most valuable tasks, overseeing the GenAI output rather than creating it themselves. This will not only transform the economics and timing of game development but opens up new possibilities in terms of visual and audio fidelity, dynamic generation of scenarios, as well as characters whose behaviour and speech are not scripted and predefined, but responsive and interactive.

So, what are the emerging developments that show the way to this bright future, and how do gaming companies need to react?

For developers, the exponential increase in the fidelity and complexity of games is becoming a challenge, as the time, staff and budget requirements to create AAA experiences is skyrocketing. GenAI has potential to help alleviate the burden by supplementing game development professionals in their creation and validation tasks. Down the line, both large studios and indies will need to resort to some sort of GenAI-based tools to remain visible in an increasingly competitive industry.

For players, the type of natural interaction that has been made possible by ChatGPT-like large language models (LLMs) will come to be expected from in-game experiences, such as discussion with non-player characters (NPCs) or unscripted interactions, and gamers will increasingly look for procedurally generated experiences or gamer-created content which bring novelty to each play-through.

In this article, we detail how some of the latest innovations are already drafting the path to these new paradigms for the gaming industry.

GenAI will disrupt game development

Game development is lengthy, complex and costly,[1] and involves highly specialised lines of work: creative, computer science/programming, quality assurance (QA) etc. All of these functions will change as GenAI tools cause a re-engineering of the system:

[1] Development of an independent game can cost anywhere from USD10 000 to USD1 million; AAA game development can cost upwards of USD250 million.

- **Programming**: GenAI excels at generating code from a set of simple instructions, or optimising existing code for debugging or for performance tweaking. One of the first practical and commercial uses of GenAI was Microsoft's GitHub Copilot,[2] which is now reportedly used by 1 million paying GitHub users.[3]

- **Asset creation**: new generative models can create graphical (2D, video and 3D) assets than can then be used inside level-creation tools or 3D engines, such as Unity or Unreal Engine. Nvidia's AI Toybox and Toggle3D[4] are good examples of what is becoming possible.

- **Level creation**: further into the future, it is likely that GenAI tools will make their way into game-making tools in a way that allows semi-automatic level generation, based on a set of text instructions, design rules and gameplay indications.

- **Storytelling/scenario/concept art**: GenAI tools provide a rich source of ideas during brainstorming sessions, at early stages of the game creation, or to flesh out early scenario/design ideas.

- **Sound design**: GenAI tools can generate music or sound based on textual prompts, which can help quickly define the soundscape of a game or generate completely new sounds for imaginary creatures or vehicles, for instance. Meta's opensource AudioCraft[5] model is a good example of how GenAI can help sketch out ideas.

- **Quality assurance**: the QA process generally involves the creation of a variety of test scenarios to uncover (and then remove) bugs. GenAI has potential to support the design of test scenarios but also to play the scenario in a more human-like way (by adding unscripted variations). Some companies, like Virtuoso,[6] are already adding GenAI-based tools to their testing/QA environments.

- **Localisation**: 'localising' a game means translating all in-game assets from the game's native language and context into other languages, for international distribution. GenAI is proving adept at translation and can help translate games more efficiently and across a wider range of locales/languages.

GenAI can improve the efficiency and productivity of the various specialists involved in game creation, but all these tools require stringent human supervision, either for designing and feeding data/prompts (the creative part) or for checking and implementing the outputs of the models (the production part).

GenAI will create new experiences for players

GenAI tools bring new experiences, in-game, to players and increase the realism and interactivity of virtual experiences:

- **'Intelligent' NPC**: NPCs are characters in a game that the player interacts with, but which are handled by the computer. GenAI will transform these flat interactions into something much more natural, responsive and

2 Github (2024).*The world's most widely adopted AI developer tool*.

3 ZDNET (2023). *Microsoft has over a million paying Github Copilot users: CEO Nadella.*

4 Toggle3D (2023). *Generate PBR Material With AI.*

5 Meta (2023). *Introducing AudioCraft: A Generative AI Tool For Audio and Music.*

6 Virtuosos (2024). *Unlock the Best of Both Human and AI Worlds with AI-Powered Test Automation.*

immersive, as NPCs' dialogues become powered by LLMs. Some companies have already launched products or proofs of concept, such as Inworld AI.[7]

- **Procedural worlds**: there are already a variety of games that use procedurally generated worlds to create a novel experience at each run-through of the game, such as No Man's Sky[8] or Minecraft Dungeons.[9] GenAI can amplify the diversity and realism of these in-game universes.

- **User-generated content (and moderation)**: many games not only focus on the 'playing' but also the 'creating' of experiences that are then shared between players (potentially generating revenue). GenAI, as it does for professional game creators, can help gamer communities create more compelling in-game experiences. It also has potential to help with moderation of user-created content. Roblox has already launched its Assistant[10] chatbot, which helps users to design, and generate revenue from, experiences.

- **Graphics upscaling/frame interpolation**: as is already done by graphics card drivers and some games, GenAI has the potential to assist the graphics rendering pipeline by increasing resolution and/or framerate through ML-based extra- and interpolation. As an example, Nvidia's latest version of its real-time AI-based graphics interpolation/enhancement tool (DLSS[11]) is now capable of generating additional frames (interpolation).

- **Character/clothing animation**: GenAI models can also help with the animation/deformation of characters in the game, especially for complex elements, to convincingly reproduce the movement of muscles, hair or clothes. Unreal Engine is already providing its ML Deformer framework to solve some of these challenges.[12]

Eventually the processes and economy of game development will be transformed, but the immediate impact will be in the gradual amplification of the capabilities of the existing system: enhancing the productivity and diversity of human roles in game creation, and enriching the experience of gamers.

The gaming industry will need to integrate new AI-powered experiences that users will come to expect, but there will also be other significant business challenges. Copyright issues around AI-generated content have yet to be resolved; AI will restructure the competitivity of game development studios (as more and more content is being co-produced by GenAI, which can lead to cost savings or reduce time to delivery); user safety will be an increasingly significant concern (GenAI-created content will have to be carefully moderated).

About us

AI is a game-changing technology. It carries the opportunity to disrupt the gaming industry, easing game development and providing new experiences to gamers, but it also carries substantial risk (inefficiencies, compliance, content moderation) when applied incorrectly or without a thorough understanding of its limitations. At Analysys Mason, we can draw on our deep sector expertise and technological understanding to

7 inworld (2024). *The leading AI engine for games.*

8 Minecraft (2024). *NO MAN'S SKY.*

9 Minecraft (2024). *Minecraft Dungeons.*

10 Hub Creation (2024). *Assistant.*

11 Nvidia (2024). *NVIDIA DLSS.*

12 Epic Games (2024). *Using the Machine Learning Deformer.*

help our clients navigate both the opportunities and risks associated with emerging technologies such as AI. For further information, please contact Sylvain Loizeau, Principal.