My Teammate is an AI: Evaluating Generative AI in Game Asset Creation through a Post-GameJam Study

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ABSTRACT

This study explores the integration of generative AI into game development, focusing on its use during a university-led game jam involving undergraduate students. The research investigates whether generative AI holds significance for the future of game creation - highlighting its potential or otherwise to transform asset production, team dynamics, and creative workflows. It examines how AI-driven tools such as ChatGPT and DALL-E impacted the development process, enabling hybrid roles and streamlining production tasks that involve repetitive visual patterns or templated interface elements. However, limitations emerged, including asset reliability, quality, and creative customisation challenges. Finding what this means for the broader industry while emphasising the importance of refining AI tools to balance efficiency with artistic integrity. A significant number of participants (46%) reported notable learning gains, reflecting improved technical skills and a deeper understanding of AI's role in creative processes. These results point to broader questions for future policy, including intellectual property, ethical data use, and inclusive development - although such issues were not explicitly raised by participants during the study. This research offers insights for advancing AI-human collaboration models to support sustainable, innovative, and culturally diverse game production.

Keywords

generative AI, game development, creative automation, asset creation

INTRODUCTION

The games industry has reached a critical juncture marked by technological innovation, economic instability, and shifting cultural narratives. On the one hand, game development is increasingly shaped by advanced technologies such as generative Artificial Intelligence (AI), which automates creative processes that were traditionally the domain of human artists and designers. Conversely, the industry

faces systemic challenges, including precarious employment conditions, market consolidation, and the rising costs of AAA game production by mid-sized and major publishers (Nieborg and Poell, 2018). This reflects the broader socio-economic dynamics within digital creative industries, suggesting that game development is not just a technical process but also a cultural and economic one. The recent introduction of AI-driven asset generation raises questions about creative agency, labour displacement, and artistic authenticity (Anantrasirichai and Bull, 2022).

This study investigates the integration of generative AI, particularly for producing visual and audio assets, into game development workflows during a yearly university-led game jam involving undergraduate students at the University of [ANONYMOUS] in the 2023-24 academic year. This was the first time generative AI tools were used for asset creation during the game jam, replacing traditional graphic design students as team members. By examining the game jam students' experiences, the study explores how AI-driven tools impact game development in terms of creativity, team dynamics, and production efficiency. It further situates these findings within the broader discourse on automation in creative industries, where AI is often positioned as both a tool with the potential to enhance productivity and as a disruptive force that may redefine traditional roles in creative projects, fuelling possible labour displacement and the erosion of creative agency (Epstein et al. 2023).

LITERATURE REVIEW

The current state of the games industry reflects a convergence of technological, economic, and cultural shifts that challenge traditional models of game development. This technological evolution introduces opportunities and challenges, raising critical questions about creativity, team dynamics, and production efficiency. While AI offers promising potential to streamline game development by automating repetitive tasks, it simultaneously disrupts established creative roles, prompting concerns about labour displacement and diminished artistic agency. The literature review explores these dual perspectives by examining key themes such as technological innovation, generative AI applications, labour dynamics, and cultural representation, providing a comprehensive context for understanding how AI-driven tools influence modern game development.

Games at the Crossroads: A Historical and Cultural Perspective

Technological advancements, particularly in AI, are reshaping game development processes. AI-driven tools are being explored to automate creative tasks traditionally performed by human artists and designers, such as asset generation and narrative design (Robertson and Young 2021). While these innovations are hypothesized to improve efficiency and reduce production costs, their impact in real-world industry settings remains contested. Notably, some recent AI-generated content in commercial games has been met with negative reception from players, underscoring the need for further empirical validation of their effectiveness in professional contexts (Yin-Poole, 2024). Integrating AI into creative workflows necessitates a re-evaluation of the roles and skills required in game development, prompting discussions about the balance between technological innovation and the preservation of human creativity (Qiu, 2023).

Moreover, the industry's focus on high-budget, blockbuster titles has led to a homogenisation of game content, potentially stifling creativity and diversity. Former

PlayStation executive Shawn Layden has criticised this trend, suggesting that emphasising big-budget games could harm the industry's long-term health (The Scottish Sun 2024). This techno-cultural shift reflects broader socio-economic dynamics within digital creative industries, where technological innovation intersects with artistic production, influencing both the creation and consumption of video games.

Defining Generative AI in Game Development

Generative AI refers to algorithms capable of producing new content, such as images, music, or text, by learning patterns from existing data (Feuerriegel et al., 2024). In game development, generative AI includes techniques like Procedural Content Generation (PCG), where algorithms autonomously create game elements, including levels, assets and narratives (Mao et al. 2024). This level of automation enables the generation of expansive and diverse game content, primarily enhancing gameplay variability and replayability.

Historically, PCG has been instrumental in game development, enabling the creation of complex game worlds that adapt to player interactions, thereby increasing replayability and personalisation (Bontrager and Togelius 2020). Traditional PCG methods have employed rule-based systems and stochastic processes to generate content such as terrains, maps, and quests. In this regard, the advent of advanced generative AI models, particularly Large Language Models (LLMs), has significantly expanded the capabilities of PCG. Its integration into asset creation reshapes modern game development, offering potential solutions for assisting in the crafting of game characters, 3D models, environments, textures and soundtracks (Weng et al. 2024).

Generative Adversarial Networks (GANs) have emerged as powerful tools for synthesising lifelike images and characters, enabling developers to generate diverse art assets with minimal manual input (Shamsolmoali et al. 2020). Modern online tools allow developers to create custom game visuals by inputting descriptive prompts, streamlining the creative process while supporting unique artistic styles (Ko et al., 2022). This capability might empower smaller teams with limited resources to produce high-quality content. Environment and world-building have also benefited from AI-powered algorithms. Procedural terrain generation powered by AI enables the creation of expansive game worlds with detailed environments. AI algorithms can dynamically generate forests, mountains, and cities that adapt to gameplay scenarios, enhancing immersion (Rose & Bakaoukas 2016). AI has similarly transformed audio and music composition through adaptive soundtracks that respond to in-game events, dynamically adjusting intensity and tone based on gameplay (Fernando et al. 2024). This real-time musical adaptation heightens emotional engagement and enhances storytelling in interactive experiences.

Beyond asset creation, LLMs can also generate coherent and contextually relevant narratives, dialogues, and even game rules, offering a more dynamic and immersive player experience (Buongiorno et al. 2024). For instance, recent research demonstrates the potential of LLMs to simultaneously generate game rules and levels, indicating a substantial advancement in procedural generation techniques (Sun et al., 2023). Moreover, AI can also automate the level design process by generating game stages by learning from existing level data and producing balanced, engaging layouts (Irfan et al. 2019). This reduces development time and ensures that games can continuously introduce new content, keeping players engaged in long-term play

sessions. Such processes facilitate scalable development through automation, reducing production time and costs (Begemann and Hutson 2024). This scalability is particularly beneficial in developing expansive game worlds that require many unique elements. By leveraging generative AI, developers can efficiently produce varied content, enhancing the richness and depth of the gaming experience.

Emerging Debates on AI within Game Development

The growing presence of AI in game development has intensified debates around its dual role as both a productivity enhancer and a disruptive force that reshapes traditional creative practices. On the one hand, AI-driven tools streamline game development by automating asset generation, narrative design, and environmental creation, reducing production time and costs (Robertson and Young 2021). On the other hand, these tools raise critical concerns about labour displacement, the redefinition of creative roles, and the potential erosion of artistic agency (Gruetzemacher et al., 2020). As AI reshapes workflows, it forces a reconsideration of essential industry practices, including authorship, team collaboration, and the creative decision-making process (Qiu, 2023). This evolving dynamic calls for examining the opportunities and challenges AI presents in game development.

The relationship between AI and creativity represents a dynamic and contentious discussion area in game development (Doshi and Hauser, 2024). AI has the potential to act as a collaborator in creative processes, providing inspiration, accelerating production, and handling repetitive tasks (Anantrasirichai and Bull, 2020). Generative AI can produce concept art based on prompts, offering visual suggestions that help artists refine their ideas. Similarly, LLMs can assist in brainstorming narratives or generating dialogues, thus streamlining early design phases (Sweetser 2024). These tools can support human capabilities, potentially allowing creators to focus on higher-order creative tasks such as refining artistic direction or crafting complex gameplay mechanics. While AI offers tools that enhance creative workflows and foster new possibilities, it raises significant concerns about the lack of emotional depth and cultural nuance. AI systems rely on training datasets derived from existing human-created works, which can lead to outputs that merely imitate rather than innovate. For example, AI-generated characters or environments may lack the personal, emotive touch that resonates with audiences, resulting in generic or soulless creations. Moreover, over-reliance on AI can potentially homogenise creative outputs. By basing its decisions on historical data patterns, AI risks reinforcing existing artistic norms rather than encouraging innovation. This could lead to a saturation of derivative content that stifles originality in industries like game development (Mi et al., 2023).

The increasing use of AI in creative industries also disrupts traditional notions of authorship and labour. Creators have voiced concerns over using their work to train AI models without proper consent or compensation, effectively appropriating their intellectual property (IP) (Anantrasirichai and Bull 2020). Furthermore, AI's ability to automate creative tasks raises fears about job displacement in fields like graphic design, animation, and game writing (Gruetzemacher et al., 2020). As AI takes over aspects of production, it risks marginalising the human contributors who instil art with cultural and emotional significance. In this regard, AI's dependence on existing data can reinforce harmful stereotypes and cultural biases (Tubadji et al., 2021). For example, generative AI systems trained on datasets with limited diversity may produce content perpetuating underrepresentation or misrepresentation of

marginalised groups (Shuford 2024). This exacerbates issues of cultural exclusivity in game design, where narratives and assets often reflect dominant perspectives rather than fostering inclusivity (Dwi and Hidayatullah, 2024).

Recent industry-facing research by Vimpari et al. (2023) highlights both the promise and complexity of adopting generative AI in professional game development. Their findings confirm that text-to-image generation (TTIG) has entered mainstream industry workflows, especially in pre-production phases such as ideation and prototyping. While professionals recognise potential benefits; including empowering small studios and enhancing creative freedom, concerns remain regarding job loss, artistic agency, ethical compromise, and the erosion of meaning in creative work. Above all, the authors argue that the field remains in flux, with too little long-term evidence to guide responsible decisions. Their call for democratic, collaborative, and sustainable approaches to AI use echoes the broader discourse on AI's cultural and ethical impact, reinforcing the urgency of critically examining how such tools are integrated into both educational and industry contexts.

METHODOLOGY

Integrating generative AI into creative workflows reshapes traditional processes across industries, including game development. This study seeks to understand how generative AI tools impact game development's collaborative and creative dynamics, particularly during a high-pressure, time-constrained environment like a game jam. By focusing on university students' experiences, the research aims to capture both the opportunities and challenges associated with adopting AI in asset generation. The methodology outlined below provides a comprehensive framework for addressing these questions.

Research Questions and Objectives

The primary research question guiding this study is: How does generative AI influence the game development process during a game jam context? To explore this, the study addresses three specific objectives: (1) assessing the perceived creative potential of AI-generated assets compared to human-designed ones, (2) evaluating the effect of AI on team communication and role distribution, and (3) examining the perceived learning outcomes associated with the adoption of AI tools. These objectives aim to provide a holistic understanding of how generative AI reshapes game development's creative and collaborative dimensions, offering insights into its future potential within the industry.

Research Design

This study employs a mixed-methods research design, integrating both qualitative and quantitative approaches to provide a holistic understanding of the impact of generative AI on game development processes during a game jam. A mixed-methods approach ensures the study captures measurable outcomes and nuanced insights (Bryman 2006). Quantitative data were collected through a post-game jam survey, which included Likert-scale and multiple-choice questions to assess students' perceptions of generative AI tools regarding ease of use, reliability, and effectiveness. Simultaneously, qualitative data were gathered through open-ended survey questions that allowed participants to elaborate on their experiences, challenges, and suggestions. This dual approach provides a more comprehensive understanding of the

phenomenon by integrating numerical patterns with personal narratives (Östlund et al. 2011).

The survey instrument was carefully designed to align with the research objectives, covering topics such as the quality and customisability of AI-generated assets, task completion efficiency, and AI's overall impact on creativity and collaboration. Closed-ended questions facilitated statistical analysis, while open-ended questions encouraged students to share specific examples and reflections. This combination ensures a balanced data collection that captures general trends and individual experiences. The survey was distributed to participants immediately after the game jam to provide responses based on fresh recollections of their experiences, thereby enhancing the reliability of the data collected.

Participants

The participants in this study were second and third-year undergraduate students enrolled in an Artificial Intelligence programme at the University of [ANONYMOUS]. These students participated in a university-led game jam as part of their coursework, providing a controlled environment for the study. The game jam is an annual event designed to simulate real-world game development scenarios, with students required to create fully functional games within a limited timeframe. For the first time, participants were encouraged to use generative AI tools for asset creation, replacing the traditional inclusion of graphic design students from another Faculty in their teams. This created a non-standard jam configuration where teams lacked dedicated visual artists, requiring computer science students to take on both technical and visual design responsibilities. This unique setup provided a valuable opportunity to explore the integration of AI into collaborative and creative processes. All game jam participants were invited to participate in the study, resulting in a convenience sample of 37 students. This sampling approach ensured that the data reflected a broad range of experiences within the game jam, accounting for varying prior exposure to generative AI and game development. It is important to note that the unusual team composition - without the typical presence of graphic design students, likely amplified the reliance on AI tools and influenced how participants perceived their usefulness. This limitation should be considered when generalizing results to more conventional game jam or studio environments.

Data Collection and Tools

The data collection process was designed to align with the study's mixed-methods approach, ensuring a robust examination of participants' experiences with generative AI during the game jam. The primary tool for data collection was a structured post-game jam survey that included closed-ended and open-ended questions (Rice et al., 2014).

The survey instrument comprised 19 questions to capture participants' perceptions and experiences. Closed-ended questions employed Likert scales to measure variables such as (i) familiarity with generative AI before the game jam; (ii) ease of use, reliability, and quality of AI-generated assets compared to human-created ones; (iii) efficiency in task completion and impact on creativity; (iv) team communication and role clarity in the absence of graphic design students. Open-ended questions complemented these metrics, inviting participants to elaborate on the strengths and weaknesses of AI tools, describe specific challenges they faced, and suggest

improvements. This combination of question types provided quantitative data for statistical analysis and qualitative insights into participants' experiences.

Ethical considerations were integral to the research design. Before participation, students were informed about the purpose of the study and their right to withdraw at any point without penalty. Informed consent was obtained electronically to ensure voluntary participation. All survey responses were anonymised to protect participants' privacy, and no identifying information was collected. Additionally, the study adhered to the University's ethical guidelines, ensuring that data were securely stored and used solely for research purposes.

Data Analysis

This study employed a mixed-methods analytical framework that integrated quantitative and qualitative analyses to interpret the data collected. This approach ensured a comprehensive understanding of the impact of generative AI on game development during the game jam. The quantitative data from closed-ended survey questions were analysed using descriptive and inferential statistical methods (Sutanapong and Louangrath 2015). The qualitative data from open-ended survey questions were analysed using thematic analysis to identify recurring themes and patterns (Braun and Clarke 2012). Responses were coded manually and categorised into key themes, such as the advantages of generative AI, challenges in implementation, and its impact on team communication. This approach allowed for a deeper exploration of participants' experiences and insights that could not be captured through quantitative measures alone. The thematic analysis also highlighted nuances in students' perceptions of how generative AI influenced their creative workflows and collaborative processes. Integrating quantitative and qualitative findings provided a richer understanding of the data. Quantitative trends were cross-referenced with qualitative insights to validate the results and offer a more holistic interpretation. For example, statistical findings about the perceived reliability of AI tools were contextualised with students' detailed reflections on specific challenges they encountered. This triangulation of data ensured that the analysis was rigorous and comprehensive (Flick 2018).

RESULTS

The following section presents the findings from the post-game jam survey with 37 respondents, highlighting key themes related to participants' experiences with generative AI tools. The analysis focuses on seven key areas: Demographics & Prior Experience, Use & Evaluation of Generative AI Tools, Asset Quality and Effectiveness, Team Communication & Role Definition, Creativity & Customisation, Advantages & Challenges and the overall Learning Experience. These categories provide a comprehensive view of how generative AI influenced game development processes during the game jam, offering insights into its potential and limitations.

Demographics & Prior Experience

The resulting survey data revealed a diverse range of experience levels in game development. Most respondents were at the beginner level, comprising 43.2% of the total sample, followed by the intermediate level at 29.7%. Overall, 27.1% had no prior experience in game development. This distribution suggests that the game jam predominantly attracted newcomers and upcoming talent to the game development

field. Regarding previous game jam experience, most participants (73%) indicated no prior game jam participation, while only 27% had previously participated in such events. The combination of predominantly beginner-level developers and first-time game jam participants is particularly relevant when considering the introduction of generative AI tools, as it represents an opportunity to understand the perception of such a cohort on how these technologies can support and enable less experienced developers in creating games.

Use & Evaluation of Generative AI Tools

Before the game jam, participants reported varying familiarity with generative AI. The majority (40.5%) were moderately familiar with the technology, followed by 27% who were very familiar. Only 2.7% (1 participant) had no prior familiarity, while 21.6% were slightly familiar, and 8.1% were extremely familiar. The average familiarity rating was 3.16 out of 5, indicating moderate prior exposure to the technology.

The analysis reveals that the generative AI tools used during the game jam include Bing AI and DALL-E (64.9%), followed by ChatGPT (51.4%). Some participants used Procedural Generation (5.4%) or other tools (5.4%). Additionally, 32.4% of respondents used multiple tools during the game jam. Regarding ease of use during the game jam, participants were evenly split between finding the tools "somewhat easy" and "neutral" (32.4% each). The remaining participants were distributed between finding the tools "somewhat difficult" (18.9%), "very difficult" (8.1%), and "very easy" (8.1%). The average ease of use rating was 3.14 out of 5, suggesting a moderate level of accessibility.

However, reliability emerged as a significant concern. Most participants (45.9%) found the AI tools "somewhat unreliable," while 21.6% rated them as "very unreliable." Only 27% found them moderately reliable, and a mere 5.4% (2 participants) considered them very reliable. The average reliability rating was 2.16 out of 5, indicating substantial concerns about the consistency and dependability of the generative AI tools used.

Asset Quality & Effectiveness

Participants were asked to compare the quality of AI-generated assets to human-designed ones. The majority (48.6%) rated AI-generated assets as "slightly worse," while 18.9% found them "slightly better." A smaller portion (13.5%) rated them "about the same" or "much worse," and only 5.4% considered them "much better." These results suggest that while AI-generated assets were perceived as useful in this context, they were generally perceived as slightly inferior to those created by humans, particularly regarding quality and refinement.

Participants frequently mentioned background images and main menu designs when asked about particularly effective AI-generated assets. These assets were praised for their ability to save time and provide visually appealing results, making them valuable for rapid prototyping and enhancing the visual appeal of projects. These assets' simplicity and static nature likely contributed to their effectiveness, as they require less precision and consistency than more complex elements. On the other hand, character sprites and sprite sheets were commonly identified as ineffective. Participants noted inconsistencies, unnatural designs, and a lack of coherence in the generated assets. These challenges highlight the limitations of current AI tools in

handling complex, detailed, or animated assets, which require a higher level of precision and contextual understanding to meet user expectations. It is worth noting that participants in this study were not trained graphic artists but students from a computer science background. Their perception of poor asset quality suggests that untrained users could readily identify visual flaws, thereby implying that professional designers or art directors might find these deficiencies even more problematic.

Participants suggested several enhancements to improve the effectiveness of generative AI tools. These included providing more variety in outputs, better resources for crafting queries, and addressing the tools' inability to capture the broader context of games. These suggestions emphasize the importance of advanced AI capabilities and user-friendly features to better reflect the developers' creative and technical demands.

Team Communication & Role Definition

Based on the survey responses on team communication and role definition during the game jam, participants reported strong effectiveness despite the absence of dedicated graphic artists. A significant portion of respondents (45.9%) indicated "very effective" communication regarding graphic asset production, while an additional 37.8% reported "somewhat effective" communication, suggesting that most participants maintained good collaborative dynamics. Similarly, role clarity remained robust, with 48.6% of participants reporting "very clear" roles and 32.4% indicating "somewhat clear" roles without graphic artists. Only a small percentage (5.4%) experienced unclear role definitions. In comparison, 13.5% remained neutral, demonstrating that most participants successfully adapted their workflow and responsibilities to accommodate the graphics production process, likely through AI tools and cross-functional collaboration.

Creativity & Customisation

Using generative AI during the game jam had a mixed impact on participants' creative processes. While 27.0% of respondents reported that it "somewhat enhanced creativity", 13.5% found it "significantly enhanced creativity," and 37.8% felt it had a neutral effect, indicating no impact on their creativity. On the other hand, 18.9% thought it "somewhat hindered creativity," and 2.7% reported it "significantly hindered creativity." These results suggest that while generative AI can be a valuable tool for some, its impact on creativity varies depending on individual workflows and expectations. Customising AI-generated assets was also challenging, with 37.8% finding them "moderately customisable" and 32.4% rating them as "slightly customisable." Only 13.5% found the assets "very customisable," while 16.2% felt they were "not customisable at all," highlighting a need for more flexible and adaptable AI tools.

Advantages & Challenges

Participants identified several advantages of generative AI for asset creation, with common themes including time savings and assistance in visualising game concepts. For example, some respondents noted that AI helped create a vision for their game or provided quick solutions user interface (UI) and menu designs, which saved resources. However, challenges were also evident, particularly in the absence of human graphic artists. Many participants expressed frustration with the limited availability of high-

quality, customisable assets, especially for complex elements like sprite sheets and animations. Others mentioned feeling constrained by lacking human expertise, which could have provided more tailored and cohesive designs. These insights stress the dual nature of generative AI as both a time-saving tool and a source of creative limitations.

Learning Experience

The learning experience with generative AI was generally positive, with 37.8% of participants stating they "learned quite a bit" and 8.1% reporting they "learned a great deal." However, 27.0% felt neutral about their learning, and 16.2% indicated they "learned a few things," while 10.8% reported learning very little. Despite these mixed experiences, the likelihood of future use remains high, with 27.0% of respondents "very likely" to use generative AI in future projects and 29.7% "somewhat likely." Only 10.8% were unlikely to use it again, suggesting that most participants see potential in the technology, even if it requires further refinement to meet their needs.

DISCUSSION

This section critically examines the study's findings, linking them to broader industry debates on integrating generative AI in game development. It addresses how AI-driven tools influenced creativity, team dynamics, and production efficiency during the game jam. While AI facilitated asset creation and streamlined specific processes, its use also raised concerns about reliability, creative authenticity, and evolving team roles. The discussion contextualises these findings within the broader discourse on automation in creative industries, emphasising AI's dual role as both an enabler of productivity and a disruptive force. Key issues such as labour redefinition, skill adaptation, and future adoption are explored, highlighting AI's challenges and opportunities in reshaping the future of game development. While ethical concerns such as IP and bias were not central themes raised by participants, they remain critical issues for industry-wide discussions and were therefore addressed in this paper from a theoretical and policy perspective.

Research Objectives and Key Findings

The primary research question guiding this study was: How does generative AI influence the game development process during a game jam context? To explore this, three objectives were examined: (1) assessing the perceived creative potential of AI-generated assets compared to human-designed ones, (2) evaluating the effect of AI on team communication and role distribution, and (3) examining learning outcomes associated with adopting AI tools.

The study's findings revealed a complex dynamic between the promises and limitations of generative AI in game development. On the one hand, AI facilitated faster asset creation and allowed teams to work independently of traditional graphic designers, fostering productivity and innovation. Conversely, participants frequently reported challenges related to the reliability, quality, and customisation of AI-generated assets. Team roles evolved to accommodate AI-driven workflows, suggesting a redefinition of creative responsibilities. Despite technical limitations, participants expressed optimism about AI's potential, mirroring broader experimentation with automation in game development, though its large-scale impact remains debated.

In this regard, integrating generative AI into game development is reshaping creative workflows, even in an event such as a game jam with mostly beginners in the field, offering both opportunities and constraints. Survey results highlighted that while AI tools accelerated asset creation, their impact on creativity was mixed. Participants reported that generative AI helped streamline production elements perceived as repetitive, which often involve layout repetition or standard visual components rather than bespoke illustration, thus allowing developers to focus on game mechanics and storytelling. This suggests a possible role for AI as a creative collaborator that supports, rather than replaces, human imagination.

However, concerns about asset quality persisted. Most participants rated AI-generated assets as "slightly worse" than those created by human designers. Specific criticisms included inconsistent styles, awkward character designs, and limited contextual understanding. These findings are particularly significant considering that participants were not trained art professionals. Their ability to detect quality shortcomings reinforces concerns about the current readiness of generative AI tools for professional-level asset creation. For instance, while AI performed well in generating static visual elements, such as backgrounds, it struggled with dynamic, interactive components like character sprites and animations. This suggests that generative AI is better suited for supplementing human artistry than acting as a standalone creative force. In this sense, the tension between automation and creative control emerged as a central theme. Although AI tools facilitated rapid prototyping, participants expressed frustration with the limited ability to customise generated content. This constraint hindered artistic expression and emphasised the current technical limitations of generative AI. Additionally, the reliance on pre-trained datasets risks producing repetitive or culturally biased outputs, further complicating its creative potential.

The introduction of generative AI tools during the game jam has also significantly reshaped team dynamics and redefined creative roles. Without dedicated graphic designers, participants adapted using AI-powered online tools to create assets, enabling team members to assume hybrid roles blending creative and technical tasks. This adaptability led to high reported team communication effectiveness and clear role definitions, suggesting that AI-driven workflows encouraged collaborative flexibility. However, challenges emerged due to the learning curve of prompt crafting and refining AI-generated outputs. Without specialised graphic design expertise, some teams struggled with asset quality and creative consistency, reinforcing the notion that AI cannot entirely replace human artists. The process required developers to become "creative technologists," balancing technical and artistic responsibilities while managing AI's limitations.

AI also fostered dynamic discussions about artistic direction, asset feasibility, and project scope, encouraging ongoing team communication. This demonstrates that while AI-enabled workflows expand creative possibilities, they demand well-defined team structures, strong communication practices, and openness to learning new tools. Ultimately, the findings suggest that generative AI can successfully augment team dynamics when integrated thoughtfully, reshaping roles while preserving the need for human oversight and specialised design skills.

Overall, the game jam experience revealed mixed learning outcomes among participants, reflecting both the opportunities and challenges of integrating

generative AI into game development. Many respondents (45.9%) reported substantial learning gains, citing improved technical proficiency and a deeper understanding of AI-driven creative processes. This suggests that hands-on exposure to AI tools fosters experiential learning, particularly for students with limited prior experience. However, some participants expressed frustration with the steep learning curve associated with prompt crafting and asset refinement. Students had to rely on trial and error, which occasionally hampered their creative workflow. However, despite technical challenges, most participants were willing to adopt AI tools in future projects. This optimism likely stems from their recognition of AI's potential to accelerate repetitive tasks and assist with early-stage prototyping. Yet, participants also stressed the importance of further technical refinement and increased customisation options.

Broader Industry Implications

Integrating generative AI into game development has far-reaching implications that extend beyond individual projects, reshaping labour dynamics, redefining creative roles, and prompting significant cultural and ethical considerations. Although the study did not directly explore ethical concerns through participant feedback, these issues, particularly around fairness, data use, and cultural representation, are central to the wider discourse on AI integration and are discussed here to provide contextual relevance. This reflects a growing trend where creatives and technical responsibilities increasingly overlap (Epstein et al., 2023). However, this shift raises critical concerns about labour displacement. As AI automates tasks traditionally performed by artists and designers, specialised creative roles risk being devalued or reduced to secondary functions (Gruetzemacher et al., 2020). Rather than replacing these roles, industry practices must emphasise human-AI collaboration, leveraging AI for repetitive tasks while preserving the unique artistic input only humans can provide (Anantrasirichai and Bull, 2022).

Adopting generative AI also demands significant changes in industry training and education. Developers may need to acquire AI-specific skills such as crafting precise prompts, refining generated content, and managing data-driven design pipelines (Qiu, 2023). This evolving skill set may call for reimagining aspects of game design curricula, where AI literacy becomes as essential as programming and artistic proficiency (Robertson and Young 2021). Game development programmes should integrate AI-powered design processes into their syllabi, ensuring students are equipped to navigate a rapidly changing industry landscape. Balancing technical training with nurturing creative and conceptual thinking will be essential to producing well-rounded industry professionals capable of collaborating with AI while maintaining human-centred design values (Buongiorno et al., 2024). This perspective is consistent with Vimpari et al. (2023), who call for a rethinking of creative pipelines in both industry and education. Their study notes that as TTIG becomes a standard part of artists' toolkits, educators must adapt by fostering not only technical skills but also ethical literacy, empathy, and a critical understanding of human-machine co-creativity. They emphasize that while creative AI offers exciting possibilities, its widespread adoption also demands reflection on well-being, meaning-making, and the long-term sustainability of artistic professions.

Cultural representation and ethical responsibility remain pressing concerns in the use of AI-generated assets. Generative AI systems often reflect the biases in the datasets they are trained on, potentially perpetuating stereotypes or excluding marginalised

groups (Shuford, 2024). During the game jam, participants reported limited customisation options and inconsistent artistic coherence, illustrating how AI-generated assets can fall short of capturing cultural nuance and diversity. Addressing these issues requires embedding inclusivity into AI development practices through more diverse training datasets, transparent algorithms, and ethical design frameworks (Tubadji et al., 2021). Moreover, involving diverse creative teams in the development process can ensure that AI-generated content aligns with authentic cultural representation, fostering more inclusive and globally resonant game narratives (Dwi and Hidayatullah, 2024).

As AI tools generate assets based on vast datasets, questions of intellectual property, authorship, and ownership become increasingly complex (Kazimi and Thalwal, 2024). Industry-wide policies must define the legal status of AI-generated works, ensuring creators receive appropriate recognition and compensation when their work is used as training data (Çebi et al., 2023). Transparent licensing agreements and ethical data-sourcing practices can help mitigate these concerns. The games industry must adopt a balanced approach that blends AI-driven productivity with human creative agency. Policymakers, educators, and developers must collaborate to establish ethical standards, regulatory frameworks, and best practices that guide AI integration while preserving artistic innovation, cultural representation, and labour protections (Mi et al., 2023). This balance will determine whether generative AI is a tool for meaningful creative expansion or a source of disruptive change.

CONCLUSION

This paper explored how generative AI may influence game development workflows, drawing on data collected during a university-led game jam. The findings provided insights into three key areas: the creative potential of AI-generated assets, the impact of AI on team communication and role distribution, and the learning outcomes associated with adopting generative AI tools. While participants acknowledged AI's capacity to support hybrid roles and streamline certain tasks, challenges such as limited asset quality, reliability, and customisation underscored the technology's current limitations. The results demonstrated that AI tools could facilitate cross-functional collaboration in the absence of graphic design expertise. However, concerns around creative authenticity and shifting team roles reflected the nuanced interplay between human creativity and automated processes - an area that warrants further investigation. Participants also reported notable learning gains, suggesting the educational potential of generative AI in fostering technical and collaborative competencies among novice developers.

This study was conducted in an educational setting involving undergraduate students participating in a university-organised game jam. All participants were enrolled in an Artificial Intelligence programme, and several knew the researchers in their capacity as instructors. These factors may have introduced response biases and limit the generalisability of the findings to commercial game development environments. Additionally, the small sample size (n=37) and absence of professional artists within teams constrain the extent to which conclusions about asset quality or team dynamics can be extended to industry practice. Nevertheless, the study offers valuable insights into early-stage perceptions and challenges of generative AI in collaborative game creation.

In this context, the findings from this study suggest that generative AI may contribute to reshaping game development practices, particularly in educational and prototyping contexts. While the study did not explicitly investigate ethical concerns, it raises important questions about the frameworks required to ensure future AI adoption aligns with inclusive and responsible development. Addressing issues related to intellectual property, cultural representation, and labour dynamics will be essential for aligning AI-driven innovation with human-centred values. Policymakers and industry leaders must consider guidelines that balance the efficiency of automation with the irreplaceable depth of human artistry. Future research should further examine AI-human collaboration models, particularly in relation to customisability, creative control, and long-term sustainability. By refining technical capabilities and fostering inclusive practices, the games industry may be able to harness generative AI in ways that promote innovation while preserving the creative agency of its human contributors.

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