"A New Golden Era" or "Slap Comps": How Non-Profit Driven Indie Game Developers Perceive the Emerging Role of Generative AI in Game Development

Ruchi Panchanadikar
rapanch@clemson.edu
Clemson University
Clemson, South Carolina, USA

Guo Freeman
guof@clemson.edu
Clemson University
Clemson, South Carolina, USA

Lingyuan Li*
Kelsea Schulenberg*
lingyuanli9936@gmail.com
kelseas@clemson.edu
Clemson University
Clemson, South Carolina, USA

Yang Hu
yhu3@clemson.edu
Clemson University
Clemson, South Carolina, USA

ABSTRACT

While the boom in generative AI technologies continues to transform modern creative work, it also introduces new and urgent risks. We endeavor to unpack these complicated phenomena by focusing on how non-profit driven indie game developers perceive the opportunities and challenges of using generative AI for their creative practices. Based on qualitative analysis of 1,540 posts and comments from online forums dedicated to this creative community, we provide early empirical evidence of the potential for generative AI to shape the trajectory of creative technology communities such as non-profit driven indie game developers. These insights may inform future research regarding AI's impacts on the nature of creative work and the growth of creative workforces in technology, which may also help design future AI technologies to support rather than harm these creative communities.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in collaborative and social computing**.

KEYWORDS

Generative AI, Creativity, Game Development, Indie Game Development

ACM Reference Format:
Ruchi Panchanadikar, Guo Freeman, Lingyuan Li, Kelsea Schulenberg, and Yang Hu. 2024. "A New Golden Era" or "Slap Comps": How Non-Profit Driven Indie Game Developers Perceive the Emerging Role of Generative AI in Game Development. In *Extended Abstracts of the CHI Conference on Human Factors in Computing Systems (CHI EA '24), May 11–16, 2024, Honolulu, HI, USA.* ACM, New York, NY, USA, 7 pages. https://doi.org/10.1145/3613905.3650845

*Both authors contributed equally to this research.

CHI EA '24, May 11–16, 2024, Honolulu, HI, USA

ACM ISBN 979-8-4007-0331-7/24/05
https://doi.org/10.1145/3613905.3650845

1 INTRODUCTION

In recent years, there has been a growing trend of using AI systems for creative work (e.g., *generative AI*) rather than just producing decisions or descriptions as how they have been used in traditional workplaces [25]. For example, an emerging body of HCI research has explored how generative AI systems, such as ChatGPT [26] and Midjourney [24], can be used to produce new creative content, including images, texts, music, and videos that are similar to what humans could create [25]. These powerful technological advances continue to highlight the new approaches and opportunities of using AI to support a broader spectrum of work practices and workforces . Yet, they also introduce new and urgent issues and risks regarding technology and creative work that require further investigation. For example, one such concern is the potential for generative AI to replace the human creative workforce [36].

As our first endeavor to unpack these complicated phenomena surrounding generative AI and creative work, we report our preliminary findings of how **non-profit driven independent (indie) game developers** perceive both opportunities and challenges of emerging generative AI technologies for their creative practices. We specifically chose non-profit driven indie game development as our research context because this community (1) differs from traditional creative workforces that have been extensively studied in HCI research on generative AI and creativity (e.g., artists or novelists); and (2) may face more frequent and severe challenges brought about by emerging generative AI technologies due to their special focus on the creative, cultural and artistic values of games over the pursuit of economic benefits [7–9, 11, 14, 15, 28, 31] (see more in **Section 2**).

Indeed, the origin of indie games can be traced back to at least the 1980s and is rooted in "a struggle to find alternative modalities to make, play, and distribute video games" [31]. In this sense, indie game developers are not employed by or affiliated with tech giants, large gaming companies, or publishers and thus represent an alternative game production model compared to the traditional mainstream gaming industry. This alternative model is now a crucial part of the global game industry and has gained popularity and commercial success since 2008 [14, 31]. However, the indie game development community is also highly diverse, as people often engage in indie game development for various reasons. Among

them, non-profit driven indie game developers are a subset of indie game developers whose technological practices constitute an important alternative to the traditional game production model by advocating a more participatory and democratic form of game development through collaborative efforts [7, 8, 28]. These developers tend to form much smaller teams with various levels of skills and experiences and work on smaller-scale projects than large tripe-A companies or more profit-driven indie studios [7–11, 14, 15, 28, 31]. They also believe that the indie culture should not merely focus on making profits or selling games in different channels, but should also reflect various non-profit driven artistic and cultural values [7–11, 14, 15, 28, 31]. Therefore, these developers are well known for actively leveraging online forums for collaboration, collective learning, social support, and knowledge sharing to build a sense of community [7–11, 14, 15, 28, 31].

We thus explore the following research question in this work: ***RQ: How do non-profit driven indie game developers perceive both opportunities and challenges of emerging generative AI technologies for their creative practices?*** In doing so, we conducted a qualitative analysis [3] of 1,540 online posts and comments from subreddits and Facebook groups for non-profit indie game developers regarding their understandings, perceptions, and reflections of generative AI's new role in indie game development. As generative AI is dramatically transforming traditional creative work practices, our preliminary research contributes towards addressing critical but understudied concerns for HCI research at the intersection of AI technology, innovation, and the future of creative work. We provide one of the first empirical pieces of evidence about how emerging new technology like generative AI has the potential to actively shape the future trajectory of creative technology communities such as non-profit driven indie game development. These insights may inform future research on better understanding how generative AI may affect the nature of creative work and the potential impacts on the growth of new creative workforces in the technology sphere. This may also help design future AI technologies to support rather than harm these creative communities.

2 RELATED WORKS

Artificial Intelligence (AI) has become the core driver of innovation in emerging technologies [19] and is increasingly used support workplaces across a variety of sectors, ranging from healthcare [2] and manufacturing [5] to education [35]. In particular, recent advances in AI have demonstrated increasing potential for moving beyond just producing decisions or descriptions towards assisting and augmenting creative work across domains including art, writing, music, and design (e.g., *generative AI*) [6]. For example, generative AI systems like DALL-E 2, Google Imagen, and Jasper enable casual users to produce AI-generated creative content like images, text, and music with ease [25]. Other advanced generative AI systems have also been designed and developed for creating compelling narratives via visual storytelling [16, 40] and creative writing [12, 13] . As such, there is growing interest in leveraging generative AI to support creative practices and workflows, which presents new opportunities as well as potential risks and challenges that urgently require further investigation.

Indie game development is one such creative community that is facing unprecedented tensions as various AI-powered game development tools and systems have been introduced. On the one hand, emerging generative AI tools may help indie game developers automate the creation of assets, mechanics and other game elements, allowing them to focus their efforts on high-level creative direction rather than grunt work [4]. On the other hand, the extensive use of generative AI could potentially erode indie game developers' foundational skills and sense of achievement [29]. Such AI systems may also introduce intellectual dilemmas concerning originality and the jeopardizing of game developers' intellectual property rights [20].

Therefore, in this work, we focus on the emerging new role of generative AI in indie game development, especially in non-profit driven indie game development, for two reasons. First, non-profit driven indie game development appears to significantly differ from the mainstream gaming industry or more profit-driven indie game studios, which often consist of expert game developers and focus on sophisticated, profitable software products (e.g., triple-A level games) by focusing instead on the creative, cultural and artistic values of games over the pursuit of economic benefits [7–9, 11, 14, 15, 28, 31]. This subset of non-profit driven indie game developers thus shows the potential to foster a more open and participatory game production model and often depends on a broad community of developers of various levels, experiences, and skills [7, 28, 32, 37]. In this sense, this community differs from traditional creative workforces that have been extensively studied (e.g., artists or novelists) in HCI research on generative AI and creativity because it offers alternative production and distribution structures in the tech economy and fosters new forms of funding, power structures, and work atmospheres in creative work [7–9, 11, 11, 14, 21, 28, 31, 38].

Second, compared to the mainstream gaming industry or game studios with more financial resources, non-profit driven indie game developers' strong focus on non-profit driven artistic and cultural values in game development may also make them face more and more severe challenges brought about by emerging generative AI technologies. For example, the introduction of AI-powered game development tools (e.g., Unity AI [34]) may be considered a potential risk to replace many indie game developers' creative practices and careers. Additionally, Steam, one of the primary platforms to publish and distribute indie games, announced that games with AI-generated content will not be allowed on the platform [30]. This thus leads to tensions and confusion surrounding how and to what degree generative AI can be used to support rather than harm indie game development. Indeed, prior HCI research has highlighted that non-profit driven indie game developers are already facing several challenges regarding *labor* (tensions in both team-based labor and individual labor), *capital* (the lack of various resources, especially **financial** resources, to sustain their technological practices), and *production* (barriers to innovating the traditional game production model) in their creative practices [9, 11, 17, 21, 31, 33]. How, if at all, generative AI technologies both further magnify these already identified challenges for non-profit driven indie game developers and provide potential novel opportunities to help mitigate these challenges thus becomes important considerations for HCI researchers to better understanding AI's new role in shaping future creative work.

3 METHODS

Data Collection. Considering non-profit driven indie developers' active engagement in online discussion and collaboration [7–11, 14, 15, 28, 31], in this study, we used online threads, including posts and comments that discuss the intersection of non-profit driven indie game development and AI as our data source. More specifically, we collected such data from Reddit and Facebook groups due to their significant number of members, popularity, and impact within the non-profit driven indie game development community. We especially selected two subreddits that are most popular among non-profit indie game developers, r/gamedevs with 1.3 million members and r/indiegames with 183 thousand members. We also joined several popular Facebook groups for indie game developers, such as Indie Game Devs with 61,271 members and Indie Game Developers IGD with 141 thousands members. All of these platforms allow members to ask questions about all possible avenues of indie game development, including marketing, creating art, and coding, which provides us with a unique space to understand the impacts of AI on multiple aspects of non-profit driven indie game developers' creative process.

To collect data, we used keyword searches (e.g., "AI," "Generative AI," and "AI art") on these online communities to collect non-profit driven indie game developers' self-reports regarding their various perceptions of AI's new role in their creative practices. We then reviewed the retrieved online posts and comments comprehensively and filtered out conversations that were not about generative AI (e.g., a post about how to program an AI NPC in their game) or not relevant to non-profit driven indie game developers (e.g., a for-profit indie studio's post about how to leverage AI to make money). As a result, a total of 1,540 posts and comments were used for further analysis. Our collected posts and comments ranged from August 2022 to November 2023. We believe that this is an appropriate timeframe for conversations surrounding generative AI's role in non-profit driven indie game development because most of the popular generative AI models were released during this time. For example, Midjourney was released in July 2022 [24], DALLE-2 in September 2022 [27], and ChatGPT in November 2022 [26]. Additionally, despite using public Facebook and Reddit data, we removed any possibly identifiable information from the dataset (e.g., usernames and location) to protect the developers' privacy.

Data Analysis. We then adopted the thematic analysis approach [3] to conduct an in-depth inductive qualitative analysis of the collected data. As we focus on non-profit driven indie game developers' own perceptions of using generative AI in their creative practices, a qualitative approach is appropriate for this study because qualitative methodologies are well-suited for investigating questions about "how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences" [23]. Rather than emphasizing inter-rater reliability and quantitative measures, our analysis aimed to identify recurring concepts and categories of interest; establish relationships, connections, and comparisons among them; and organize them into more complex groups and broader categories [22]. Our data analysis followed the following steps: (1) the first author closely read through the collected data line by line to identify pieces of information that were relevant to the research question and to acquire a sense of the overall picture regarding non-profit indie game developers' various perceptions of generative AI in their creative practices; (2) the first author assigned preliminary codes to identified pieces of information, combined codes, eliminated redundant codes, and categorized codes into thematic topics related to the research question (i.e., opportunities and challenges of emerging generative AI technologies for non-profit driven indie game development); For example, the quote *"AI smells. It is quite easy to understand it is done by a computer, and people immediately devalue anything using AI as cheap and low quality"* was coded as "copyright issues," "negative perception of AI," and "challenge," and then combined into the broader theme of "generative AI causes potential copyright concerns." (3) four authors continued to discuss, integrate, refine themes and subthemes, and name the final set of themes [3]; and (4) all authors discussed selecting the most compelling quotes as examples and created a narrative structure where all findings flowed naturally and coherently [3].

4 FINDINGS

Overall, our data shows that the non-profit driven indie game community indeed has adopted various generative AI technologies in their creative practices. For example, these developers posted about using tools like ChatGPT and GitHub Copilot for coding tasks to streamline their development process. Some even mentioned using ChatGPT for crafting the storyline of their game and conceptualizing game ideas. Others described using generative AI to create artworks for their games, such as using DALL-E-2 and Midjourney to generate character design, create the gaming environments, and produce concept art and game design prototypes. Additionally, AI voice generators have also been used to create characters' voices and game narration. These diverse applications thus underscore the multifaceted role generative AI has begun to play in the non-profit driven indie game development community. This emerging trend further highlights the importance of exploring how these developers perceive the use of these AI technologies in their creative practices as an interwoven blend of novel opportunities and urgent challenges (**RQ**). In addressing this research question, our findings have revealed three ways generative AI could simultaneously provide opportunities and limitations to non-profit driven indie developers' game development practices.

4.1 Generative AI Supports More Focused and Cost-Effective Game Creation but Poses Career Growth Challenges for Small-Scale Non-Profit Driven Indie Teams

Many non-profit driven indie developers note that a significant opportunity of integrating various generative AI technologies in their creative practices is to **empower small non-profit driven indie teams to streamline their development processes, resulting in more focused and cost-effective game creation.** This shift is seen as a game-changer because it has the potential to enable small, non-profit driven indie studios to compete with their larger counterparts, who traditionally possess greater financial, technological, and human resources for advanced game development.

Indeed, many non-profit driven indie developers highlight how generative AI can offer the capability to automate mundane and

repetitive tasks that would otherwise consume significant manual effort. As one developer envisions, *"Maybe AI will be able to help us with every kind of work, that we think it's exhausting or tedious someday. We will make AI work for us, and we do the fun parts of the work."* In this sense, using generative AI to streamline the development process may not only make game development efficient but *"fun."* Others also add that leveraging generative AI technologies significantly accelerates their game production while simultaneously reducing the financial burden, which is considered a main challenge for non-profit driven indie developers as shown in prior works [8, 9, 11, 14, 31]. One post states, *"It's just faster and cheaper. You can't compete if you're not cutting down production costs."* Another post also elaborates that for small non-profit indie teams who are unable to hire more people to do the work, generative AI can be a very helpful tool: *"AI art is incredible for a small team or a solo dev like me, who would never have the time nor the money to hire a concept artist. It lets us realize our vision more closely."*

In this sense, the diminished financial burden associated with the use of generative AI technologies seems to provide these non-profit driven indie developers with the freedom to explore and experiment with different game genres and game concepts, rather than solely focusing on profit-driven considerations. One post describes this perspective, *"It is my vision and hope that AI will bring back the golden age of gaming, where it was about fun, not profit, about creating great games. Because money will be much less of a factor to compete than before AI."* Some others even envision that leveraging generative AI would greatly facilitate the growth of the non-profit driven indie community in the broader games production landscape, *"Indy studios will use AI to make better, more fun games. And if this indeed happens, it'll be the start of a new golden era."* For them, since using generative AI would reduce production costs and alleviate non-profit indie developers' financial pressures, they might be more encouraged and motivated to engage in more innovative and experimental endeavors in game development rather than consistently worrying about paying for their electric and internet bills.

On the flip side, incorporating generative AI in indie game development may **pose career growth challenges for non-profit driven indie developers.** As highlighted in this paper, non-profit driven indie game developers seek to pursue the artistic and cultural values of game development rather than focusing on financial revenues. However, using AI in their game development practices, especially for creating artistic assets for games, may diminish the necessity to employ humans for such tasks, particularly when the outcomes produced by AI are deemed satisfactory. One post explains this issue, *"AI art is disproportionately affecting smaller artists for sure. An artist who used to get by making commissions of people's characters for D&D portraits might find themselves losing a lot of work to basic AI tools."* Others even expressed concerns about the future employability and career trajectory of non-profit driven indie game developers in the broader gaming industry, *"In the future, some companies/studios won't hire concept artists anymore because they basically have AI to do that stuff for them."* In this sense, the prevailing sentiment is that the growing role of generative AI may inevitably harm non-profit driven indie developers' job opportunities, particularly for those engaging in commission-based artistic work. As a result, generative AI may reshape the dynamics of employment and workforce in the larger gaming context.

4.2 Generative AI Facilitates Idea and Content Generation but Also Results in Creative Dilemmas for Non-Profit Indie Game Developers

For small non-profit driven indie teams who focus on the creative and cultural aspects of games and less on the monetization side of game development, generative AI can be particularly beneficial by **facilitating idea and content generation to jumpstart their game development.** For example, one post mentions how using generative AI could expedite their game development with intelligent templates, *"AI tools will mainly help you with workflows that are now just manual monkey work that is hard to automate via 'classical' means."* Another post adds, *"AI saved me a ton of time on making my own concept to model from, its tutored me in better use of code and unity, and it helps me write simple scripts saving me a ton of time, it can be helpful as a starting point for narrative design and marketing assets, it can point out mistakes and recommend corrections."* In this sense, using generative AI as a "jumpstart" can save non-profit driven indie game developers tremendous time and effort at the preparation stage, which allows them to immediately engage in game development practices.

This benefit seems to be especially valuable to non-profit driven indie developers who already have certain artistic skills. As expressed by one developer, *"The AI for the normal user is a nice gadget/tool to create some nice pictures; AI used by someone with at least a little bit of artistic knowledge/skill or image editing skills can without question create professional results."* For these developers, generative AI plays an important role in not only jumpstarting their creative practices but also amplifying their artistic visions and skills, which significantly improves the quality of their final products. Therefore, many developers envision a future where generative AI can be used in a broad spectrum of tasks to further foreground non-profit driven indie game development's strong focus on artistic and cultural values, such as: *"One scenario I see is a graphics designer creating a design vision of a game, feeding the AI, and then letting the AI create most of the content based on the combination of its learned, generalized data and the custom data the designer fed it."* This paints a more optimistic image where the rising of generative AI could further empower rather than marginalize non-profit driven indie game developers.

Conversely, others express concerns about this seemingly positive vision. In particular, they highlight that a prevalent issue is that using generative AI for non-profit driven indie game development will lead to **creative dilemmas due to AI's inability to maintain consistency in idea generation**, a crucial aspect when crafting the art or story for a game. One post explains such a concern, *"I can't generate solid variations that replace specifically the parts I want iterations off with the kinds of adaptations I need."* Similarly, another developer characterizes the iterations produced by generative AI as *"slap comps,"* which is merely a rudimentary visualization of ideas that may not align with the desired level of detail or concreteness of an actual game as an artistic product. A game artist further elaborates on this issue, *"Without artists, you'd be lacking a proper art bible. The art bible for each game clearly defines the rules for a video game's art direction, encompassing laws for lighting and color, notes about motion, and specifications for rendering materials. Without*

an appropriate art bible, the style of your game will be all over the place." Taken together, the challenge seems to lie in generative AI's incapacity to comprehend how various artistic elements in a game can interconnect and lead to a coherent story in a meaningful way. This thus severely impedes AI's ability to maintain consistency of the developed game at the cognitive, emotional, and intellectual levels, rendering its actual benefits to the non-profit driven indie game development community's artistic endeavors questionable.

4.3 Generative AI Makes Non-Profit Driven Indie Game Development More Open and Accessible to All but Causes Potential Copyright Concerns

Non-profit driven indie games are often created by developers who possess varied levels of skill sets. Sometimes, their proficiency in certain tasks, such as coding or art creation, may not be sufficient enough to create their desired products, which may discourage them from further engaging in game development. In this case, generative AI provides valuable opportunities to **make non-profit driven indie game development more open and accessible to all by bridging the gap between developer skills and game development requirements.** One developer summarizes, *"With AI becoming ever more potent, we will see this gap closing to an extent. Its practically a very powerful force multiplier. As a first step, it will probably make every role in development more effective."* For these developers, generative AI seems to demonstrate the potential to open up the indie game development process even more to everyone who is interested in making games. Even if such AI tools are not used in the actual creation process, developers still believe that their existence may motivate more people to participate in non-profit driven indie game development. One post explains, *"I use the ai to unblock me on lots of tasks...coding to creative. It's not going to do it for you but a good chance it will give you some motivation."* In this sense, generative AI would not replace game developers because *"it's not going to do it for you."* Instead, such tools may motivate people to engage in non-profit driven indie game development by significantly simplifying and opening up the development process.

However, one major pitfall of using generative AI in creative practices like non-profit driven indie game development is that AI-generated content cannot be copyrighted according to the stance of the United States Government [1]. This limitation stems from the requirement for a human author to register a copyright, leaving content produced by AI models devoid of legal protection. Even when substantial alterations are made to AI-generated content, potential copyright infringement issues can still arise if the material is based on copyrighted sources. Therefore, developers consider the **potential copyright concerns as a major challenge in leveraging generative AI to further open up non-profit driven indie game development.** As highlighted by a commentator, *"Even if both you and the AI are massaging these images into some final form, they're still derivative of protected IP. It won't pass the fair use 'sniff test' of being able to stand on its own without the sourced material propping it up or being exempt due to typical fair use provisions."* Developers also warn that the absence of copyright protection for AI-generated content opens the door to potential misuse, as non-profit driven indie game developers may find their artwork used without consent. A commentator illustrates this concern, *"If you have an AI-generated banner/cover/main character art, for example, you may not be able to stop someone from copying it and using it for themselves."* As non-profit driven indie game developers are already facing several challenges regarding labor, capital, and production in their creative practices [9, 11, 17, 21, 31, 33], these new risks seem to make them even more vulnerable.

As a result, some developers express strong reservations against widely using generative AI in non-profit driven indie game development. One post describes this sentiment, *"AI smells. It is quite easy to understand it is done by a computer, and people immediately devalue anything using AI as cheap and low quality."* The reluctance is not solely due to aesthetic considerations but also based on solid ethical concerns. Another post points out, *"As far as the community is concerned, the use of AI-generated images in a video game can potentially result in a review bombing, as there is a lot of hostility towards the use of AI image generation due to potential ethical concerns."* In this sense, how generative AI can be used in an ethical and fair way to further support, rather than suppress, non-profit driven indie game developer's creative and artistic endeavors would require more future work and careful considerations.

5 DISCUSSION AND FUTURE WORK

As a unique creative community, non-profit driven indie game developers often view their games as a form of artistic and cultural expression and a reflection of their craftsmanship, which sets them apart from the mainstream gaming companies and larger game studios that are often profit-driven [7–9, 11, 14, 15, 28, 31]. Furthermore, they stand apart from the broader creative community by embracing alternative production and distribution methods within the tech economy, which fosters innovative approaches to funding, power dynamics, and work environments [21, 38]. This uniqueness also creates a distinctive space where the booming generative AI can serve as both a valuable ally and a potential threat. Our preliminary findings thus have highlighted several ways for non-profit driven indie game developers to perceive the emerging role of generative AI in their creative practices.

Indeed, our findings show that one significant role that generative AI plays is acting as a bridge to overcome skill gaps within non-profit driven indie teams. Due to the often small size of such teams, these developers may excel in certain areas of the game development process, such as storytelling or gameplay mechanics, while facing technical challenges or knowledge gaps in areas like coding or art creation [10]. In this sense, generative AI tools become instrumental in filling these gaps by jumpstarting and assisting tasks that may require specialized expertise. These AI tools also prove invaluable in automating mundane and time-consuming tasks. This thus allows non-profit driven indie developers to focus their energies on the more creative and critical aspects of game design, which are key values to the non-profit driven indie community [7–9, 11, 14, 15, 28, 31]. By reducing time investment, financial costs, and knowledge barriers to enter game development, the use of generative AI seems to potentially empower non-profit driven indie game developers to create more polished and higher quality products to reflect their artistic and cultural values, which may further

open up and democratize the game development and production process to all.

Despite these promising opportunities, our findings have also demonstrated how developers express concerns about generative AI potentially hindering the personal touch and artistic expression that define the very nature of non-profit driven indie games. There is an urgent need to establish a delicate balance between utilizing generative AI as a helpful tool to enhance creativity and avoiding over-reliance, which could lead to a loss of the unique, human touch that distinguishes non-profit driven indie games from mainstream titles [18, 39]. Compounding this concern is the complexities regarding using generative AI in creative works emerging in the legal and ethical domains. For example, our findings have highlighted the absence of copyright protection for AI content may leave non-profit driven indie game developers without ownership rights and become even more vulnerable to potential unauthorized use and monetization by others. The perception of generative AI as a replacement for human roles in the creative process further exacerbates the situation and leads to strong resistance to widely adopting generative AI in the game development community in hopes of protecting the future trajectory and sustainability of non-profit driven indie game development.

Taken together, our study thus leads to important new research questions regarding further unpacking the sociotechnical, ethical, and community challenges associated with using generative AI to facilitate creative work like non-profit indie game development. We plan to continue upon this current study by interviewing non-profit driven indie game developers and conducting larger-scale survey studies to (1) investigate how they may strategically use generative AI in various aspects of the game development process to amplify the opportunities and mitigate the challenges associated with generative AI for creative work, and (2) understand their own recommendations for better designing AI tools to support rather than harm their creative practices. In doing so, we hope that we will contribute to painting a more holistic image of how the interplay between creativity and generative AI may shape the future trajectory of creative technology communities such as game development.

ACKNOWLEDGMENTS

We thank the anonymous Reddit posters for sharing their experiences of generative AI in non-profit driven indie game development. We also thank the anonymous reviewers for their valuable suggestions that help us improve this paper.

REFERENCES

[1] 2023. Generative Artificial Intelligence and Copyright Law. https://crsreports.congress.gov/product/pdf/LSB/LSB10922/1
[2] Claus Bossen and Kathleen H Pine. 2023. Batman and Robin in Healthcare Knowledge Work: Human-AI Collaboration by Clinical Documentation Integrity Specialists. *ACM Transactions on Computer-Human Interaction* 30, 2 (2023), 1–29.
[3] Virginia Braun and Victoria Clarke. 2012. *Thematic analysis.* American Psychological Association.
[4] Aleena Chia. 2022. The artist and the automaton in digital game production. *Convergence* 28, 2 (2022), 389–412.
[5] Rupa Dash, Mark McMurtrey, Carl Rebman, and Upendra K Kar. 2019. Application of artificial intelligence in automation of supply chain management. *Journal of Strategic Innovation and Sustainability* 14, 3 (2019), 43–53.
[6] Juqing Deng and Xiaofen Chen. 2021. Research on artificial intelligence interaction in computer-aided arts and crafts. *Mobile Information Systems* 2021 (2021), 1–14.
[7] Stephanie J Fisher and Alison Harvey. 2013. Intervention for inclusivity: Gender politics and indie game development. *Loading...* 7, 11 (2013).
[8] Guo Freeman, Jeffrey Bardzell, Shaowen Bardzell, and Nathan McNeese. 2020. Mitigating Exploitation: Indie Game Developers' Reconfigurations of Labor in Technology. *Proceedings of the ACM on Human-Computer Interaction* 4, CSCW1 (2020), 1–23.
[9] Guo Freeman, Lingyuan Li, Nathan Mcneese, and Kelsea Schulenberg. 2023. Understanding and Mitigating Challenges for Non-Profit Driven Indie Game Development to Innovate Game Production. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. 1–16.
[10] Guo Freeman, Nathan McNeese, Jeffrey Bardzell, and Shaowen Bardzell. 2020. " Pro-Amateur"-Driven Technological Innovation: Participation and Challenges in Indie Game Development. *Proceedings of the ACM on Human-Computer Interaction* 4, GROUP (2020), 1–22.
[11] Maria B Garda and Paweł Grabarczyk. 2016. Is every indie game independent? Towards the concept of independent game. *Game Studies* 16, 1 (2016).
[12] Katy Ilonka Gero, Tao Long, and Lydia B Chilton. 2023. Social dynamics of AI support in creative writing. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. 1–15.
[13] Maliheh Ghajargar, Jeffrey Bardzell, and Love Lagerkvist. 2022. A redhead walks into a bar: experiences of writing fiction with artificial intelligence. In *Proceedings of the 25th international academic MindTrek conference*. 230–241.
[14] Pawel Grabarczyk. 2016. Is every indie game independent? Towards the concept of independent game. *Game Studies* 16, 1 (2016).
[15] Orlando Guevara-Villalobos. 2015. Independent gamework and identity: Problems and subjective nuances.. In *DiGRA Conference*.
[16] Brett A Halperin and Stephanie M Lukin. 2023. Envisioning Narrative Intelligence: A Creative Visual Storytelling Anthology. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. 1–21.
[17] Brendan Keogh. 2021. 1. Hobbyist Game Making Between Self-Exploitation and Self-Emancipation. *Game Production Studies* (2021), 29.
[18] Hye-Kyung Lee. 2022. Rethinking creativity: creative industries, AI and everyday creativity. *Media, Culture & Society* 44, 3 (2022), 601–612.
[19] Yang Lu. 2019. Artificial intelligence: a survey on evolution, models, applications and future trends. *Journal of Management Analytics* 6, 1 (2019), 1–29.
[20] Lingjuan Lyu. 2023. A pathway towards responsible AI generated content. In *Proceedings of the Thirty-Second International Joint Conference on Artificial Intelligence*. 7033–7038.
[21] Chase Bowen Martin and Mark Deuze. 2009. The independent production of culture: A digital games case study. *Games and culture* 4, 3 (2009), 276–295.
[22] Nora McDonald, Sarita Schoenebeck, and Andrea Forte. 2019. Reliability and inter-rater reliability in qualitative research: Norms and guidelines for CSCW and HCI practice. *Proceedings of the ACM on human-computer interaction* 3, CSCW (2019), 1–23.
[23] Sharan B Merriam and Elizabeth J Tisdell. 2015. *Qualitative research: A guide to design and implementation.* John Wiley & Sons.
[24] Midjourney. 2022. Midjourney. https://www.midjourney.com
[25] Michael Muller, Lydia B Chilton, Anna Kantosalo, Charles Patrick Martin, and Greg Walsh. 2022. GenAICHI: generative AI and HCI. In *CHI conference on human factors in computing systems extended abstracts*. 1–7.
[26] OpenAI. 2022. ChatGPT. https://openai.com/blog/chatgpt
[27] OpenAI. 2022. DALL-E 2. https://openai.com/dall-e-2
[28] Felan Parker, Jennifer R Whitson, and Bart Simon. 2018. Megabooth: The cultural intermediation of indie games. *new media & society* 20, 5 (2018), 1953–1972.
[29] Sida Peng, Eirini Kalliamvakou, Peter Cihon, and Mert Demirer. 2023. The impact of ai on developer productivity: Evidence from github copilot. *arXiv preprint arXiv:2302.06590* (2023).
[30] Lucas Ropek. 2023. Valve All But Bans Steam Games From Using AI-Generated Content. https://gizmodo.com/valve-bans-ai-generated-content-from-steam-games-1850601741
[31] Paolo Ruffino. 2020. *Independent Videogames: Cultures, Networks, Techniques and Politics.* Routledge.
[32] Bart Simon. 2013. Indie Eh? Some Kind of Game Studies. *Loading...* 7, 11 (2013).
[33] Olli Sotamaa and Jan Svelch. 2021. *Game production studies.* Amsterdam University Press.
[34] Unity. 2023. Unity AI. https://create.unity.com/ai-beta
[35] Maarten Van Mechelen, Rachel Charlotte Smith, Marie-Monique Schaper, Mariana Tamashiro, Karl-Emil Bilstrup, Mille Lunding, Marianne Graves Petersen, and Ole Sejer Iversen. 2023. Emerging technologies in K–12 education: A future HCI research agenda. *ACM Transactions on Computer-Human Interaction* 30, 3 (2023), 1–40.
[36] Vice. 2022. Can AI-Generated Art Replace Creative Humans? https://www.vice.com/en/article/epzkwm/artificial-intelligence-art-creatives-ai
[37] Emma Westecott. 2013. Independent game development as craft. *Loading… The Journal of the Canadian Game Studies Association* 7, 11 (2013), 78–91.
[38] Jennifer R Whitson, Bart Simon, and Felan Parker. 2021. The Missing Producer: Rethinking indie cultural production in terms of entrepreneurship, relational

labour, and sustainability. *European Journal of Cultural Studies* 24, 2 (2021), 606–627.

[39] Zhuohao Wu, Danwen Ji, Kaiwen Yu, Xianxu Zeng, Dingming Wu, and Mohammad Shidujaman. 2021. AI creativity and the human-AI co-creation model. In *Human-Computer Interaction. Theory, Methods and Tools: Thematic Area, HCI 2021, Held as Part of the 23rd HCI International Conference, HCII 2021, Virtual Event, July 24–29, 2021, Proceedings, Part I 23*. Springer, 171–190.

[40] Chao Zhang, Cheng Yao, Jiayi Wu, Weijia Lin, Lijuan Liu, Ge Yan, and Fangtian Ying. 2022. StoryDrawer: A Child–AI Collaborative Drawing System to Support Children's Creative Visual Storytelling. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems*. 1–15.