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Game Artists and Generative AI

– Utilizing generative AI in a creative, thoughtful, and skill-enhancing way.

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Master’s Thesis | Abstract

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The swift advancement of generative AI introduces uncertainties about its long-term effects on artistic expression and professional growth. This thesis explores the integration of visual generative AI into the work of game artists and other creatives. It aims to analyze the turbulent state of visual generative AI and its benefits, limitations and risks regarding creativity, skill development and its impact on game artists.

This study follows the constant comparative method from grounded theory to analyze the data gathered from both primary and secondary data sources. Primary data includes interviews with five professional game artists working in smaller game studios who have experiences with generative AI. The secondary data consists of comments and findings from industry experts working for larger companies and their perspectives on generative AI.

Findings highlight that domain expertise, creative control and critical thinking play a role in the effective use of generative AI tools. While these tools can enhance efficiency and ideation, over-reliance may impede skill development and creativity. The results are compiled into recommendations that provide insight into the meaningful and creative integration of generative AI into artistic workflows.

Keywords:

Generative AI, game artist, creativity, creative control, grounded theory

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Peliartistit ja Generatiivinen tekoäly

- Tekoälyn hyödyntäminen luovalla, järkevällä ja taitoja kehittävällä tavalla.

Generatiivisen tekoälyn nopea kehittyminen herättää huolia sen pitkäaikaisista vaikutuksista taiteelliseen ilmaisuun ja ammatilliseen kasvuun. Opinnäytetyössä tarkastellaan visuaalisen generatiivisen tekoälyn integrointia pelitaiteilijoiden ja muiden luovien ammattilaisten työnkuvaan. Työssä analysoitiin generatiivisen tekoälyn hyötyjä, haittoja ja riskejä luovuuteen, taitojen kehittämiseen ja sen vaikutusta peliartisteihin.

Tutkimuksessa käytettiin ankkuroidun teorian jatkuvan vertailun menetelmää ensi- ja toissijaisten aineistojen analysointiin. Ensisijainen aineisto koostuu pienissä yrityksissä työskentelevien viiden peliartistin haastatteluista. Kaikilla oli entuudestaan kokemusta generatiivisen tekoälyn käytöstä. Toissijaiset aineistot sisältävät isoille pelialan yrityksille työskentelevien ammattilaisten kommentteja ja löydöksiä generatiivisen tekoälyn vaikutuksista.

Tulokset korostavat, että alakohtainen asiantuntemus, luova ohjaaminen ja kriittinen ajattelu ovat keskeisiä piirteitä generatiivisen tekoälyn tehokkaassa hyödyntämisessä. Lisäksi nämä työkalut voivat parantaa tehokkuutta ja ideointia, mutta liiallinen riippuvuus voi heikentää taitojen kehittymistä ja luovuutta. Tulokset ovat lopuksi koottu suosituksiksi, jotka tarjoavat näkemyksiä generatiivisen tekoälyn järkevästä ja luovasta integroinnista artistiseen työhön.

Asiasanat:

Generatiivinen tekoäly, GenAI, peliartisti, luovuus, luova ohjaaminen, grounded theory

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List of abbreviations (or) symbols

AI	Artificial intelligence
CCM	Constant Comparative Method
GenAI	Generative Artificial Intelligence
IP-Adapter	Image prompt adapter
LLM	Large Language Model
LoRA	Low-rank adaptation

1 Introduction

Generative Artificial Intelligence (GenAI) has been transforming the creative industry by introducing cost-effective shortcuts for artists during recent years. GenAI models are more and more frequently being used to generate outputs such as image, text, 3D, video and audio [1] with the training data they have been given. Human controlled interfaces are used to turn text prompts and other data into artistic outputs. Some reports suggest that AI-adoption has improved productivity and enhanced the quality of work [2], while others present GenAI use-cases for game development pipelines [3]. This rapid integration of GenAI brings uncertainty about its long-term impact on creativity, artistic learning, and the evolving role of artists in the field [4], [5], [6]. There exists a distinct possibility that GenAI can cause some artistic skills to become more emphasized and place others at the risk of being automated [7].

Researchers raise the potential of GenAI to enhance ideation [8], creativity, innovation and efficiency [9], [10]. On the other hand, there are concerns regarding the originality [7], diversity [11] and risk of design fixation [12] in AI-generated content. Often these studies rely on participants with limited GenAI knowledge and sometimes limited professional artist experience, such as students. However, to fully understand how these domains interlink, both areas require substantial expertise. While research explores the potential, challenges and risks, little focus is given to understanding the meaningful integration of these technologies into existing content creation workflows.

The aim of this thesis is to research and develop recommendations for the thoughtful integration of GenAI tools into the work of game artists and other creatives. The intention is to stimulate creativity, critical thinking and fundamental skill acquisition to ensure meaningful and innovative use of GenAI tools into content creation workflows. To ensure practicality and usefulness of the results, this thesis identifies factors and recommends mitigations that may affect this integration. To achieve this, expert interviews are conducted with game artists who have experience with generative AI tools, and these are

compared against available secondary sources. Given the complexity of multiple domains, this thesis takes a broader approach to identify key categories. The scope is limited to understanding the focus of game artists' skill development, the current state of visual generative AI, and how to maintain creativity and innovation with these tools. This thesis aims to answer: (a) What skills, fundamental knowledge and qualities are needed from game artists who use GenAI; and (b) Which steps, when using GenAI for visual creation continue to require creative human input and guidance?

The remainder of this thesis is divided into five chapters. Chapter 2 reviews essential theoretical framework aspects for game artist skills and creativity, as well as the building blocks of visual generative AI and its control practices. Chapter 3 outlines the methodology used in this thesis, followed by Chapter 4 that discusses and links the interview findings to existing secondary sources. Chapter 5 provides the contributions of this thesis in the form of recommendations. Chapter 6 concludes the thesis by discussing the research questions and limitations of this study.

2 Theoretical framework

Game artists are creative professionals who craft visually pleasing aesthetics that are often one of the key factors influencing in purchasing decisions of games [13] and purchasing of additional content such as in-game cosmetics [14], making their effort usually the first and longest lasting impression a game makes on the playing audience. The work of a game artist includes both artistic and technical skills to create different digital art assets during the game development. They collaborate closely with programmers, designers and other team members to create immersive, interactive experiences. [15]. Game artists can specialize in various 2D and 3D roles, such as concept-, environmental-, asset-, character-, marketing-, and user interface artists, as well as animators and illustrators [16].

In consideration of current visual GenAI advancements, this thesis focuses primarily on the areas where GenAI has been popular and where the interviewed artists have experienced, namely image generation and 2D art [17]. GenAI tools can enhance efficiency in areas such as iteration, exploration [9] and visual memory [18], making GenAI tools useful for early visual development phases such as idea generation [8] and concepting.

Concept art or the conceptualization stage is emphasized as the foundational step for 3D game art workflows [19], [20], [21]. Usually, in larger productions, concept artists begin generating ideas for various elements of the game. They collaborate with art directors and game designers by creating sketches and concept art, which help explore and establish the visual direction during the conceptualization [15]. Developing original ideas, researching current trends and making sure the design fits the overall theme are all critical aspects in well planned concept art [19]. Digital art objects are purposefully crafted to deliver a message, requiring attention to the details and the narrative of the asset [22]. Thus, creating the ideas, concept art and sometimes the first iterations of the final assets happen during the concepting stage.

Following the concepting phase, artists create characters, environments, props, and other assets based on refined and approved concept art and reference images, concentrating on their expertise to ensure quality and optimization for the game engine [15]. However, a closer look is needed at how concept and reference images fit into the bigger picture. Figure 1 presents the 3D modeling process gathered from three companies related to game development [19], [20], [21]. It shows the variety of tasks which are needed to create digital game art assets for 3D workflows. In smaller studios artists often adopt multiple roles as versatility becomes important to meet the diverse demands.

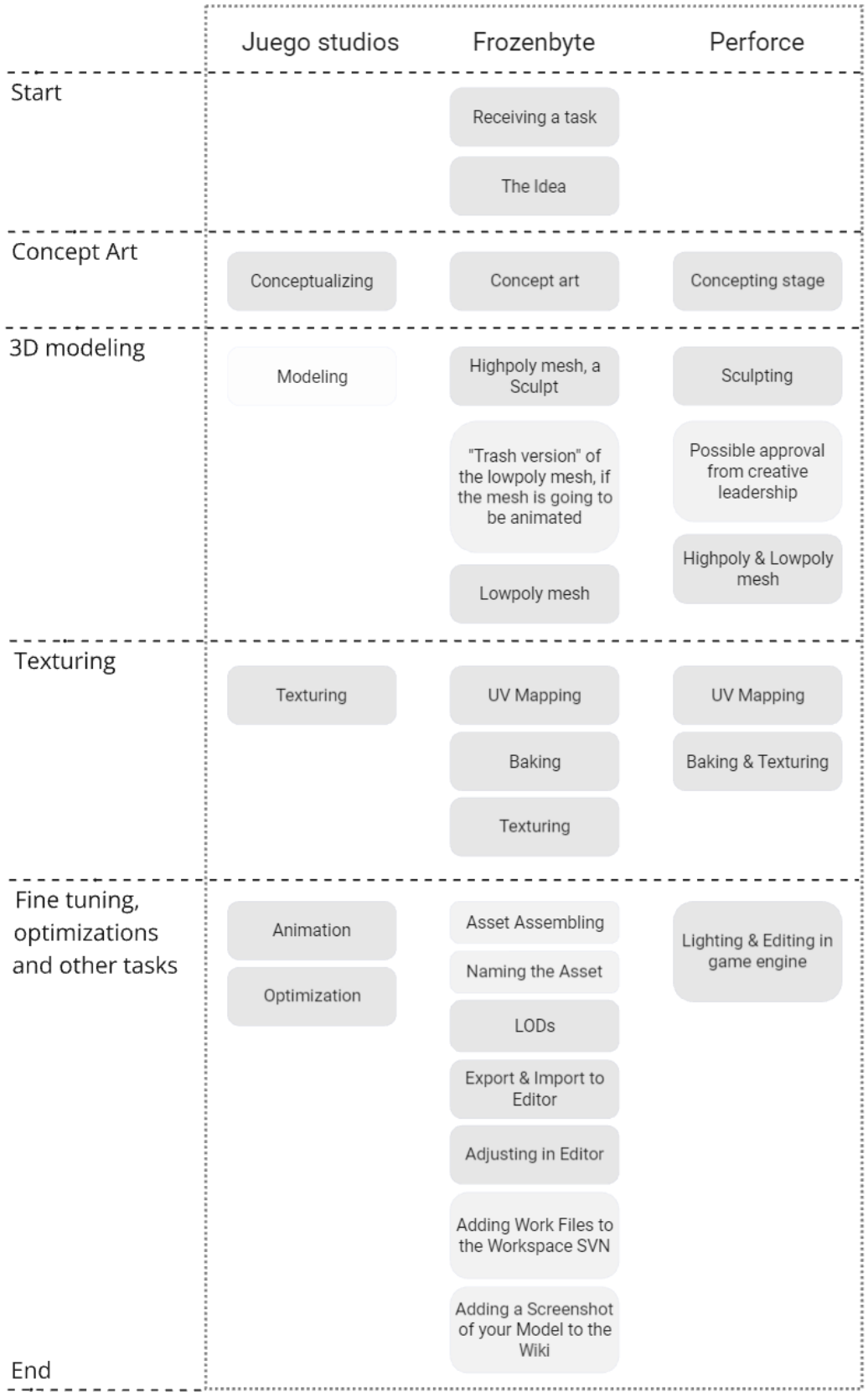

Figure 1. 3D game asset workflow.

To successfully navigate these complex and demanding tasks, artists require essential creative-, soft- and technical skills, which include proficiency in digital art creation and its related tools, as well as the ability to visualize appealing environments and characters [23]. With skills in interactive and visual storytelling artists can deliver authentic stories. However, a solid understanding of technical and game engine related skills, such as optimization, setting up materials and lighting, and general software proficiency with the game engine is required [20]. Teamwork and good communication skills play a significant role, along with highly sought after skills such as imagination, innovation and creativity [16], [23]. Moreover, given this amalgamation of skills and continuous change from technological advancements, versatility and adaptability become increasingly important. Considering the iterative nature of the creative process [24], it is essential to examine creativity.

2.1 Creativity for game artists

Creativity has been a widely researched topic since modern creativity research began in the 1950's [25]. Two requirements for creativity, originality and effectiveness are often pointed out. Originality, also often called novelty, refers to something that is novel, unique or unusual, while effectiveness is considered useful and somehow appropriate for the context [26].

Kampylis and Valtonen [27] studied 42 definitions of creativity and found that the majority of those follow these four key points: (a) Creativity is a key ability of individual(s); (b) Creativity presumes an intentional activity (process); (c) The creative process occurs in a specific context (environment); (d) The creative process entails the generation of product(s) (tangible or intangible). Creative product(s) must be novel (original, unconventional) and appropriate (valuable, useful) to some extent, at least for the creative individual(s).

Walia [28] further examined these components through existing research on creativity. Considering different scholarly perspectives, creativity was defined to be an act of creating something new. Moreover, this is referring to the ability of

the human mind to produce new images using imagination. Past knowledge and memory lay a strong foundation for this activity, but the “new” originates from the creator’s mind Walia explains. With value attached to unique and new things that are useful for an audience or the creator themself, there exists intrinsic motivation to act. Walia [28] and Sawyer [25] agree that pursuing creativity in a familiar setting is common as expertise is one of the key elements for creative results and that creativity can sometimes take a long time to take the form of creations.

These points emphasize the necessity of developing creative skills and highlight that the artist or group behind the creation needs to intentionally pursue towards a goal or product with certain qualities. This intentionality is important whether using GenAI tools or not.

According to Boden [29] there are three ways in which creativity can occur. Combinational creativity involves creation by making associations between different ideas that have not been previously combined. Exploratory creativity takes place within a defined conceptual space, such as an artistic style or a cultural practice like cuisine. It focuses on uncovering the possibilities and boundaries of this space while adhering to its rules. In contrast, transformational creativity seeks to change the conceptual space or framework itself, enabling the generation of ideas that were previously impossible within the original space.

Although artists have different creative processes, a look at Sawyer’s [25] eight stages of the creative process can help to understand the general steps for creativity. Creativity begins with identifying and defining a worthwhile problem, which increases the chances of finding an innovative solution. This is followed by gathering relevant knowledge and remaining open to unexpected, seemingly unrelated information. Allowing time for incubation enables the unconscious mind to process and connect ideas in surprising ways. Generating a variety of ideas, both consciously and unconsciously, and merging them in novel combinations is then needed. After which selecting the best ideas using relevant criteria ensures focus on the most promising solutions. Finally, creative

ideas evolve and take shape as they are expressed through materials and representations.

These eight stages of the creative process [25] correlate well with a game artist's workflow, which includes formulating an idea, collecting references, sketching variations and settling on final designs through iterations. They also reflect the importance of prior domain knowledge, divergent thinking, problem solving and well-developed creative skills, while opening up possibilities to add GenAI into the workflow, for example to gather knowledge and generate ideas. Sawyer [25] highlights that creativity emerges from sustained effort and the combination many smaller ideas, which adds value to explore GenAI tools further.

2.2 Components of visual generative AI models

To understand what Generative AI is, a brief inspection of its building blocks and the visual guidance methods that shape its outputs are required. These methods, such as prompts, image references [1] and other control mechanisms [30], play a crucial role in ensuring meaningful results.

Artificial intelligence (AI) was introduced in science fiction in the 1950's [31] and it remained a hot topic until 1974 while computer performance was on rise. As challenges surfaced and innovations halted, a period of stagnation, also known as the "AI Winter" followed [31]. Machine learning emerged during the 1980's and deep learning in 2010's [32]. During the last 2 to 3 years, we have seen new Hype Cycles® for AI, highlighting technologies such as Generative AI and prompt engineering [33].

Artificial intelligence (AI) is a branch of technology that aims to simulate how humans comprehend, solve problems, and make decisions [32]. AI wishes to mimic human creativity. While AI software can do similar tasks to humans, such as generating images, videos, text, speech, analyse data and solve complex problems [32], it remains debatable whether AI can truly create something new and memorable [34]. Notwithstanding, AI is currently undergoing impressive

advancements in its learning capabilities, continuously eroding the line between creating something new and reorganizing things that existed before.

Machine learning (ML) is a subfield of AI in computer science [35]. It focuses on building algorithms that take a collection of information, usually called datasets, to learn mathematical relationships in the given data to build a statistical model. This model is then expected to solve a practical problem. Neural networks (NN) are a popular choice of machine learning algorithms [35]. They consist of layers of nodes, which mimic the neurons in our brains. Neural networks consist of an input layer, a hidden layer and an output layer [32], [35]. Deep learning occurs through neural networks with two or more hidden layers [35]. These deep learning neural networks can reach structures with hundreds of thousands of layers [32].

Recently we have been introduced to various deep generative AI models that provide high quality images and audio synthesis. These include Generative adversarial networks (GANs), autoregressive models, flows, variational autoencoders (VAEs) and Diffusion models [36]. To understand how some recent and popular generative AI models, generate images, the last two AI models are of interest.

Variational autoencoders (VAEs) has two parts, encoder and decoder [37]. And in the case of image generation, the encoder maps the image into discretized latent space (an optimized representation of data) and the decoder converts it back into pixel space. VAE is part of the larger category, autoencoders [38].

In the paper Denoising Diffusion Probabilistic Models, Ho et al. [36] presents a way to train and generate images using diffusion models. They present that during the process, gaussian noise is added to images until they are no longer recognizable, this is called forward diffusion. Then it learns to reverse this process by removing the noise, this is called reverse diffusion. This process, however, has turned out to be somewhat inefficient.

Latent diffusion models (LDM) were presented by Rombach et al. [39] to achieve significant efficiency in training and sampling over diffusion models.

The model uses VAE to take input data to latent space and with the diffusion process it learns to generate latent representations of the image-text pairs it is given. The sampling process is in low-dimensional latent space and is much more efficient than in a high-dimensional image space. Then, when generating images, conditioning such as text and images are mapped to latent space using an encoder and introduced in the reverse diffusion process. Finally, the latent space representation will be converted back to pixel space to form the final image.

Rombach et al. [39] also highlights inpainting in their LDM paper. This process fills masked areas with new content relative to the original image, often used to remove unwanted details [40]. Extending the image in a similar fashion is called outpainting. Both include elements of image-to-image conditioning that uses the original image to fill in the spaces and they can be combined with text conditioning [41]. But with such a continuously adapting technology landscape, a need for new control methods has surfaced.

Adapting these models to perform slightly different tasks can be done through various methods. Fine-tuning is the process of training or tailoring an existing machine learning model in the context of content creation, often to support a style, composition, or unique subject matters [42]. However this process is expensive and time consuming [43].

Therefore, more efficient alternatives have been developed. ControlNet was introduced by Zhang et al. [30] and it is a neural network structure that adds task-specific conditional control for these text-to-image based diffusion models. ControlNet’s are trained by introducing conditioning images to teach the AI model for each condition and similar images can then be used to transfer information to the generated output [30]. ControlNet can be trained for user sketches, human poses, depth and normal maps, colours, styles and various edge, line and semantic segmentation maps [44].

Another recent control method, image prompt adapter (IP-adapter) is a lightweight ‘plug-n-play' alternative to fine-tuning and has good adherence to

different reference images once been trained. It can export features of an image to newly generated outputs [45].

Low-Rank Adaptation (LoRA) on the other hand is a lightweight fine-tuning technique that was introduced by Hu et al. [43]. It adds small numbers of parameters and creates relatively small files that can be used for task specific generations together with the AI model it was trained for [46]. To better understand what these types of control methods can do, Multi-LoRA composition offer examples where objects, background and characters are combined into cohesive images (Figure 2).

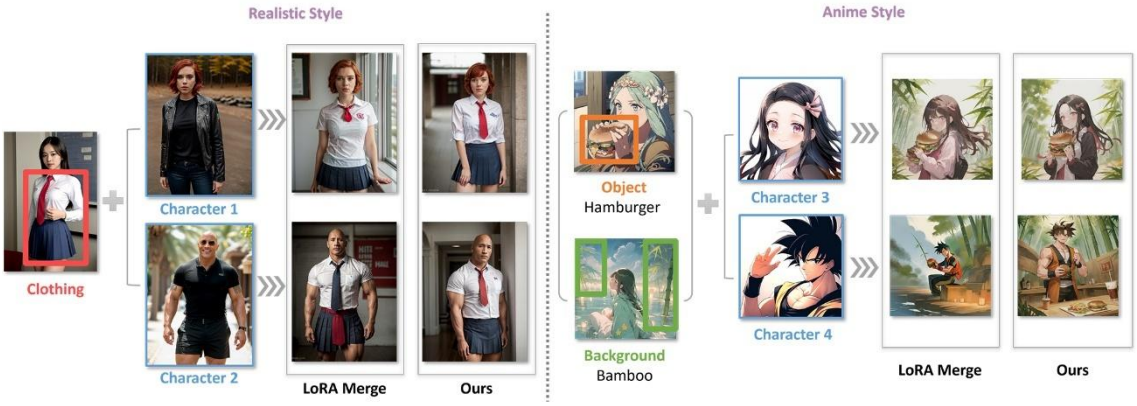

Figure 2. Multi-LoRA Composition for Image Generation [47].

At its core, AI leverages complex neural networks to analyse vast datasets of artistic styles, techniques, and patterns, enabling it to generate aesthetic content for various purposes. However, AI systems cannot act independently. AI systems require human artists to prompt them along the process of creating the desired artifacts.

2.3 Prompting and visual generative AI tools

Prompting is defined as the process of giving conditioning such as text, images and sound to an GenAI model to control the generation [1]. Methods to structure or use prompts in a way that has been found effective are known as prompting

techniques [1]. Prompt engineering, on the other hand, refers to iterating the prompt towards desired results often involving various prompting techniques [1].

Such iterative work often starts with a simple construct for a prompt which is changed until the desired direction is achieved. This can include adding keywords that affect the overall quality, or define the artistic style, color, lighting, camera angle, composition, as well as providing information for material, texture, atmosphere, cultural, historical and other important factors the artists want to combine [48], [49]. Additionally negative prompting can be used to control the things we do not want to see in the image [1].

Generative AI models sometimes require extensive prompt engineering to achieve good outputs when relying on text and might not provide enough control on composition and other appearances [50]. To accompany prompting, various conditioning methods (image-to-image, ControlNet, LoRA, IP-Adapter and others) have been invented. Using these conditioning methods and the generative AI models themselves, applications and other user interfaces have been built to offer user-friendly solutions. Midjourney™, for example uses the Discord® group chat platform or their website as the user interface where you can control the creation process [51]. Stable Diffusion™, on the other hand, is an open-source GenAI model created by Stability AI™ [52] and has been widely experimented with by the community, resulting in various custom versions of the model [53] and user interfaces such as ComfyUI™ and Invoke™ to accommodate user needs [54]. Bigger companies such as Adobe® are also bringing GenAI models to their suite of applications [55]. In addition to visual GenAI, large language models (LLM) such as ChatGPT™ enable artists to generate ideas in text format, offering additional methods for experimentation and information discovery [56].

3 Author’s background and AI usage

The author has experience in the game development field in various graphics related roles between the years 2013-2025, this includes studies in game development, co-founding a game development startup, work in a small game studio with well-known IP and finally as project specialist in his current, evolving role in the research group, Futuristic Interactive Technologies of Turku University of Applied Sciences. These roles have included various artistic tasks in 2D, 3D and game design for mobile, desktop and XR -platforms as well as project management and work with students.

Earlier AI tools which could generate merely acceptable landscapes from artists’ brushstrokes gave minor insight into the possibilities that AI could bring to visual work. However, the excitement came when diffusion based generative AI tools first became familiar in May 2022 after a co-worker shared an article on Disco Diffusion [59]. Shortly after, experiments began with the beta version of Midjourney™ and later, once released, with Stable Diffusion™. This fueled the interest towards Generative AI. The author has been a keen hobbyist and workflow explorer in generative AI since these inception years.

During this thesis, AI tools were utilized according to the school directives. ChatGPT™ was used for translation, data formatting, grammar checking, and in the essence of this topic, for ideation generation. However, it has not been used to directly create text or as a source in any part of the thesis. All the outputs, such as translations, have been human checked as well. Other AI-assisting tools used or experienced during this work include Whisper™, Photoshop®, Midjourney™, ComfyUI™, Invoke™, Leonardo.AI™ and Microsoft Word®.

4 Methodology

This study collected qualitative data from both primary and secondary sources. The primary data originated from interviews with industry specialists in the field of digital graphics, who work in small-scale studios. The secondary data used in this research was extracted from existing academic literature and statements made by highly regarded experts in digital content creation working medium to large studios. To answer the research questions, the researcher applied a grounded theory approach [57] through the Constant Comparison Method [58].

RQ1: What skills, fundamental knowledge or qualities are needed from game artists who use GenAI?

RQ2: Which steps, when using GenAI for visual creation require creative human input and guidance?

4.1 Constant Comparative Method

The Constant Comparative Method (CCM) for qualitative analysis was introduced by Barney G. Glaser [58] to systematically analyze qualitative data from sensitive social issues. This type of analysis allows the researcher to combine any kind of qualitative data such interviews, observations and analysis of different media and information to finally construct a theory. The method can be divided into four stages.

Comparing incidents applicable to each category

The researcher initiates the CCM by coding a first qualitative data source into different categories. Subsequent data points are then coded, while being compared to previous data. This starts to create theoretical properties of the categories.

Integrating categories and their properties

This coding and comparing data-to-data starts to change into data to category comparison instead at some point. This ultimately leads to better understanding of the categories and their properties. Thus, data coded earlier might be seen in a different light later when new information is discovered.

Delimiting the theory

As the theory takes shape, various delimitations start to occur, and modifications decrease. Categories can be combined or removed, and they become more focused and selective when taking in coded data. And finally, the aim is to attain theoretical saturation for those categories the researcher wishes to highlight for their scope. Other data collections can also be added to further drive the saturation of the categories.

Writing the theory

At the end there will be a variety of different notes, coded data and theory. These shall provide the main themes for discussion after the analysis. The gathered data is then usually used as evidence to support the conclusions the author theorizes on. Qualitative analysts usually only present enough material to support comprehension, thus it might not be enough data to evaluate all suggestions.

4.2 Research structure

To define the research questions, academic literature and other sources along with the author's knowledge in this field was considered. Next, forming the set of interview questions for these semi-structured interviews was done. Using CCM during the interview phase, the researcher created a categorized theory

for the discussions and findings chapter. Additional secondary data was analyzed to support the findings and improve the grounded theory. Later, recommendations were summarized from this discussion to present actionable steps for game artists that are considering generative AI use. This research structure can be seen in figure 3.

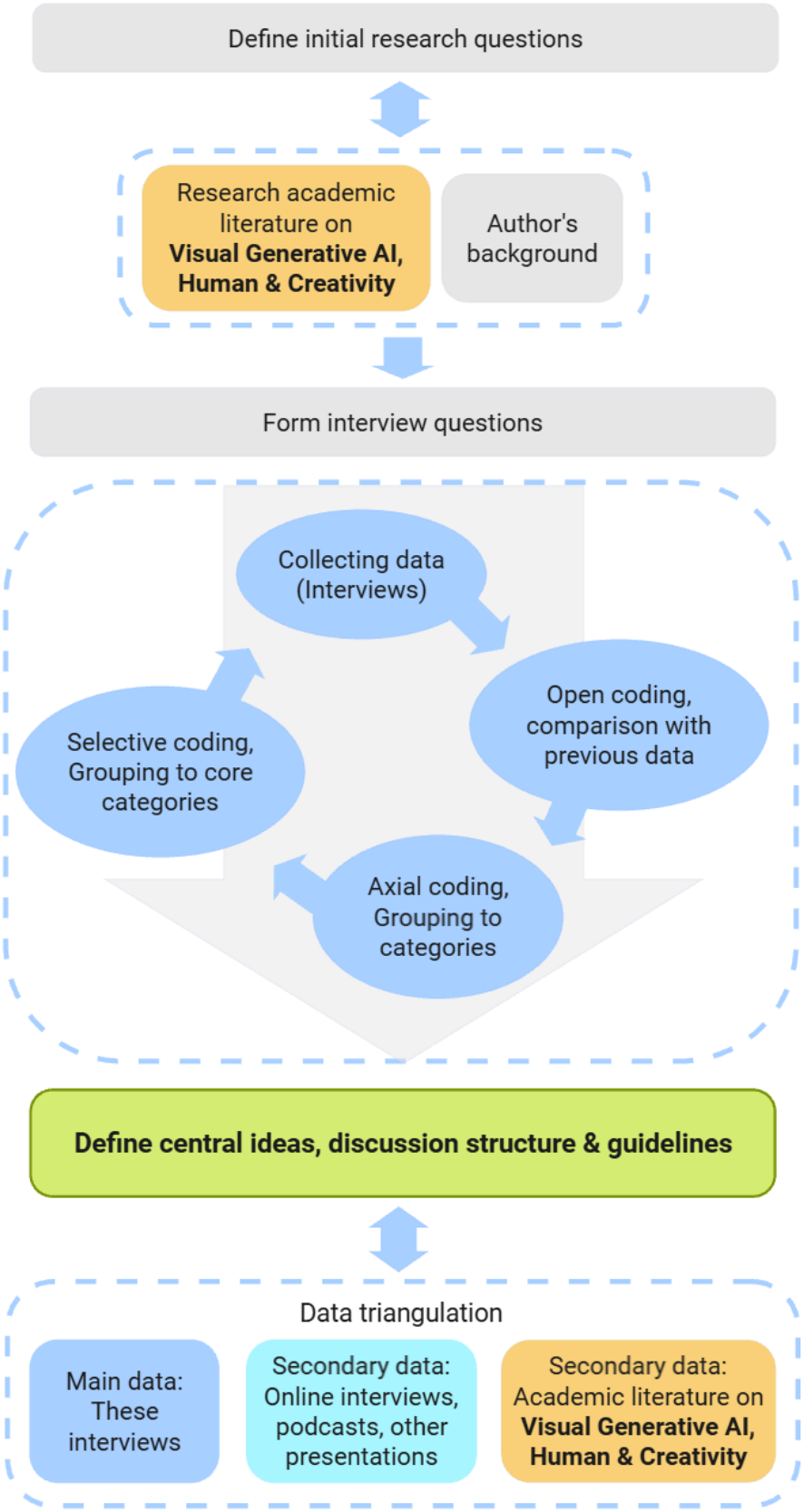

Figure 3. Research structure

4.3 Data collection

The data collection for this study came in three steps. First, a review of academic literature was done to assess the current state of research. Relevant references throughout the process were added to a reference collection and were later utilized during the writing. Secondly, interviews were conducted and recorded, serving as the primary data for this study. Finally, during the research process, secondary data sources were identified and recognized as additional valuable insight and support for the findings of this study.

4.3.1 Academic literature

Academic literature was researched using keywords such as “Generative AI, GenAI, Artificial Intelligence, Creativity, Creative, Artist, Visual, Human”. A collection of relevant academic writing, including journal articles, conference papers and preprints was compiled. During the thesis work around 70 academic publications were investigated, and 39 were included in this thesis. Researching these helped to create a better understanding of the direction for constructing the interview questions and setting limitations on participants.

4.3.2 Interviews

The interviews were limited to people who are working in game development companies as artists and had experiences in using generative AI tools for visual purposes. All the interviewees were working in small-sized companies at the time. Interviews were conducted either face-to-face or through an online meeting. The interview recording lengths varied from 34 to 86 minutes, the average being around 65 minutes. Five game artists were interviewed from June to August 2024. Relevant work experience (digital art or game development related) for the participants varied between four and twenty years.

The interviews were semi-structured to ensure topical conversations that provided accurate insight into GenAI usage for visual purposes. As information became familiar during the interviews, the researcher took a grounded theory approach and allowed the questions to evolve to facilitate in-depth discovery throughout the interview process. The resulting interview schedule is given in Appendix 1.

The focus of the interview questions was to excavate concepts that are more focused on the game artists, their workflows and understanding of the new generative AI tools.

The interviews were recorded and conducted in Finnish and English (one interviewee was non-Finnish). The interview recordings were first transcribed with OpenAI's™ automatic speech recognition system, Whisper™ [60]. A locally installed version was used with the AI model version 'Large', to get initial transcriptions. ChatGPT™ was then utilized to format the text for clarity. Finally, the audio recordings and text were manually compared to check and fix possible errors.

Analyzing and coding started with the first interview as soon as it was completed. The interview answers were collected into an excel file and the first iteration of thoughts and open coding was included next to each question-and-answer pairing. After the first three interviews the categories started to take form, and a mind mapping tool Miro™ was used to visually structure the categories. The first iteration of categories and core categories were created and grouped. The first interviews were coded again in a new excel file with updated categories and the remaining interviews were coded directly into the same file. All text was kept in its original language (Finnish or English) during the collation and analysis processes. The quotes that are presented in the discussions chapter were processed similarly. Samples of the coding can be seen in figure 4.

145		**Enabling**	"We wanted to do it in, I think, two weeks or something like that, so it wasn't possible because, well, at least for me because I'm the only artist at the company, so this was the only solution. It was to start to use AI."
146			"mä koen siinä mielessä olevani onnekas koska mä en kauheasti osaa digitaalista piirtämistä mikä on just se missä AI on loistava tällä hetkellä"
147			"varsinkin just noissa asiakasprojekteissa, mitkä välttämättä, missä ei haeta sitä mun omaa tyyliä ja minkä kanssa mä oon taitava ja kyvykäs, niin sitten se ohjaa helposti ja sitten pystyy suoraan kontekstissa näkemään, miten vaikka just ne muodot ja värit kuuluisi toimimaan, yhdessä siihen kyseiseen tyyliin, mitä haetaan sen kanssa."
148			"sanotaan et jos on semmosii tiimiläisii, ketkä ei osaa välttämät piirtää tai näin, niin ne se tuo niinku äänen tai niinku mahdollisuuden heille enemmän näyttää siitä, mitä haluu."
215		**Creativity**	"...if you use these tools... An example is that the Concept artists are creating awesome art because now they have more possibilities to expand their creativity."
216			"Mä nääkisin ehkä sen niinku semmosena työkaluna siinä välissä. Totta kai se nopeuttaa ja mä en nää sitä sellasena, niinku et muilta kopioidaan asioita toiselta, vaan se, et sä saat variaatioita. Tai jotain kahden tyyppisiä tyylisuuntia yhdistettyä ja niitä.. niinku, et se luo enemmän semmosta luovaa flowta, mitä sä et oo ehkä pystyny ajattelemaan. "
217			"Sitä keksimistä ja innovointia ei voi täysin ulkoistaa vielä, noille generatiivisille. "
276		**Avoid replication**	"for example in mobile games companies...use a lot of images that clearly represent particular characters...I think in the future this kind of copies. It will be bigger
277			"Suurin osa noista, missä on niinku selvää.. et selvästi on niinku jonkun.. artistin työ on tullu sielt koneesta läpi. Niin siin on myös haettu sen artistin tyylillä. Niinku ihan tietoisesti sitä lopputulosta."
278			" ...et jos otetaan jonkun taiteilijan tyyli, ja sit aletaan niinku kopioimaan sitä, niin mun mielestä se ei oo kauheen niinku cool."

Figure 4. Coding samples from a few categories

The emerging categories were re-analyzed during this process to form the initial ideas and core categories in Miro™ (Figure 5).

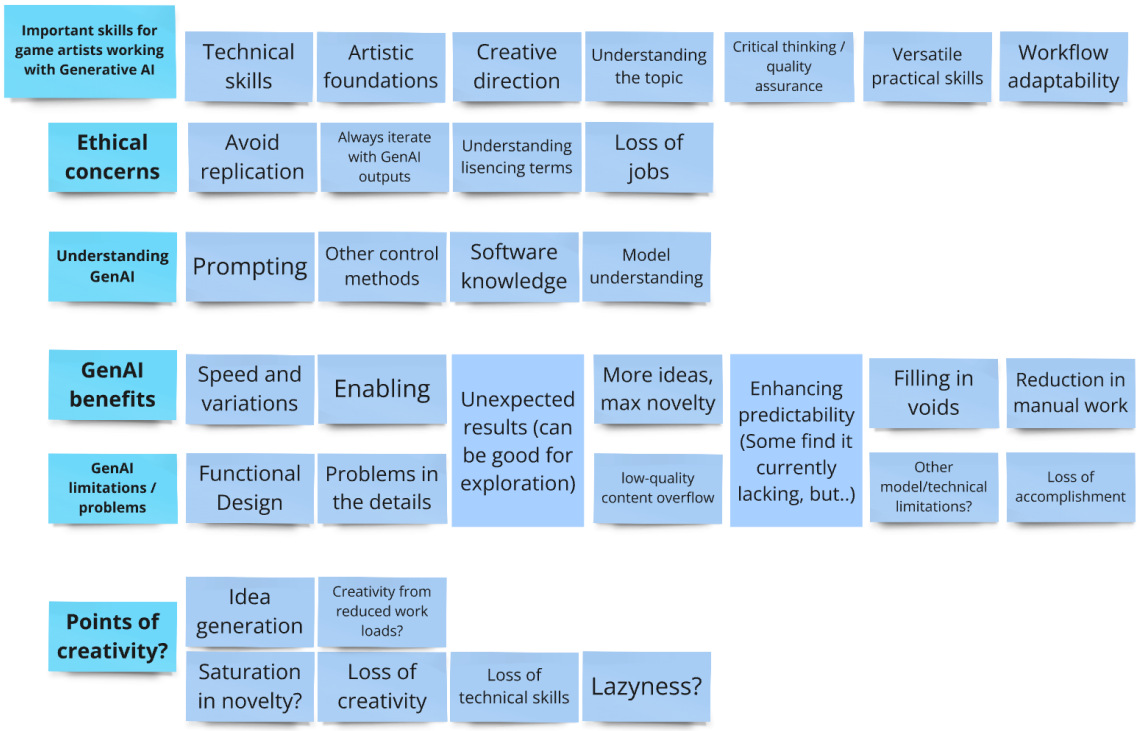

Figure 5. Initial categories before final iteration.

The codes and categories continued to change as the analysis progressed. Later, some minor revisions to the structure were included to help shape the theories that emerged. Better naming, combining categories and other fixes resulted in a more comprehensible networked overview.

4.3.3 Secondary Data

The aim of using secondary data was to further reflect on and triangulate the interview data which is limited in sample size. Some awareness of larger studios' ways of handling new technologies materialized from the secondary data, although the focus remained on the game artist's work and GenAI. The highlighted sources and experts are well known in their respective fields and all entries include generative AI in creative or game development fields as the topics, thus being relevant to the primary interviews.

Two of the secondary data sources include interviews from Jussi Kemppainen [61] and Tommy Thompson [62] in online video format. These sources were gathered during the time of conducting the interviews and were noted down as they provided more to the topic from experts that work with bigger studios. They were conducted by the host, Gabriele Romagnoli in his "XR AI Spotlight" podcast series.

Jussi Kemppainen is a technical game artist and industry veteran that has worked for AAA-studios. He has ventured into developing Echoes of Somewhere, a game where the aim was to utilize generative AI in its development [63]. This interview of approximately 53 minutes provides thoughts from a game artist's point of view, who has more experience in generative AI tools than the artists from the primary interviews [61].

Tommy Thompson is a consultant for big game studios in game AI, and he shares his thoughts on the impact of AI on game development. This interview of approximately 50 minutes provides insight into future developments of AI in this field and how big companies are being cautious in this situation [62].

The next secondary data source is the talk “Unraveling Project AVA” from the Game Developers Conference® [3]. The presenters Lionel Wood (Studio Art Director at Electric Square®) and Stephen Peacock (Head of Games AI at Keywords Studios®) explain and share their results from Project AVA. The project’s aim was to build a “shippable” game using GenAI tools. Their research considered most of the game development process to provide meaningful results for visual creatives in the game development field while also keeping legal concerns in mind.

The final secondary interview data source is from Feng Zhu, a concept artist, who started his work in the 90’s and since founded FZD School of Design. In his episode of the YouTube® series Design Cinema, he discusses the possibilities and limitations of generative AI [64]. Zhu also explains the types of skills that he sees important for concept artists in entertainment design and what type of problems GenAI cannot solve.

While Whiteside et al. [65] discuss outdated or missing data, approval to use data, weaknesses in data collection methods, and insufficient fit in data as concerns in using secondary data, the researcher persisted with secondary sources as support for the primary interview data. The secondary data was a good fit as it provided more perspectives from similar and, in some topics, more advanced experts. However, as these secondary sources did not follow the same interview schedule, not all data was comparable. Nevertheless, they provided valuable overall support to the primary findings. The data was relevant to the interviews and given that the coded and analyzed videos are public, the rest of these concerns can be eliminated.

5 Findings and discussion

This chapter combines the findings from the five categories that emerged from the interviews: (a) technical and artistic foundation for game artists; (b) using current GenAI models and their limitations; (c) benefits of GenAI in current landscape; (d) risks, harms and considerations in GenAI use; (e) keeping the creative control (Table 1). The analysis goes through these topics from a holistic viewpoint that considers the artists, their current skills and views on building foundational knowledge, the new types of generative AI tools and methods of working as well as the limitations introduced by these technologies. The research continues to highlight the positives made possible through these new types of Human-GenAI workflows. After which the researcher will unpack the possible risks to consider in moving forward and finally highlight some standards for innovation and creativity that could be followed. After this chapter, the main findings will be summarized into recommendations that can serve as a starting point for future work.

Table 1. Core categories and subcategories.

Core categories	Subcategories
1. Technical and artistic foundation for game artists	Technical skills
	Versatile practical skills
	Artistic foundations
2. Using current GenAI models and their limitations a) Working with GenAI tools	Prompting
	Other control methods
	Advanced control methods
	AI tool & software knowledge
	AI model knowledge

Table 1. (continue)

b) More on limitations	Unexpected results
	Enhancing predictability (control)
	Problems with the details
	Functional design
	Understanding licensing
	Quickly progressing landscape
3. Benefits of GenAI in current landscape	Enabling artists
	Efficiency improvements in manual work
	New assistant type interactions
	Idea generation & exploration
4. Risks, harms and considerations in GenAI use	Loss in skill versatility
	Loss of motivation & laziness
	Loss of accomplishment
	Loss of jobs
	Saturation in novelty
	Low-quality content overflow
5. Keeping the creative control	Understanding the topic
	Quality assurance
	Avoiding replication
	Creative direction
	Critical thinking
	Creativity
	Creativity from reduced workloads

5.1 Technical and artistic foundation for game artists

First, we will discuss the findings that relate to basic, foundational and practical skills that artists should still develop to build a stable footing in game artistry. This includes the artists' views of what skills they value for the coming age of generative AI.

Without proper technical skills and basic core skills, one might struggle with strange issues and things looking weird explains artist 1 while using UV-mapping as an example. This is an important step in the texturing process of 3D modeling. Artist 3 also points out in similar fashion that they don’t see generative AI doing proper 3D mesh topology for the animations pipeline quite yet and that there will still be holes and steps in the bigger process where humans must fix things, and where basic knowledge is paramount for technical work. Know-how in multiple applications also seemed like a norm during all the interviews as can be seen from artist 2's casual mentions on starting a project.

> "I might jump straight into Photoshop, or Illustrator®, or whatever it is, or Blender, whatever the task requires." - Artist 2

This need for versatile practical skills is also highlighted by the other artists as all of them use both 3D and 2D skills in their work. But also, other skills such as knowledge in game engines to implement their graphics as they wish, some mentioning level design, user-interfaces, video editing, concepting and even coding. Working in smaller game studios automatically pushes the artists to obtain a wide range of tasks which stack up the skill variety over the years as many of them explain.

> "In a small company like this, you often have to wear different hats. So, it's like being an artist, a technical artist, and doing a bit of level design—whatever is needed at the time, let's say. You fill in where there isn't enough staff." - Artist 3

> “Mostly, I work on user interface design and graphics for games, both 2D and 3D. Sometimes I also do video editing and video content. Additionally, I handle web design, and occasionally, I even have to get involved in coding." - Artist 2

Artist 4 explains that learning from whatever they are doing is important and solving the problems themselves gives good skills for the future. Artist 1 goes

on to state that they will first take the long road for making advanced animation system for their personal 3D modeling work and learning the ins and outs, before seeking out automation and other means to shorten the workflow. Beginners need suitable guidance and self-discipline to obtain important bits of knowledge and skill acquisition. The interviewed artists believe in developing their own skills and see that by having proficiency in technical details they can automate and use new tools in greater ways.

Being able to extract or highlight ideal features from images, whether generated or not, can be considered technical, but the Individual's artistic foundation plays a large role too. Participants agreed that artistic skills such as color theory, compositions, shapes and forms, as well as light and shadows are something game artists, even in 3D will benefit from. Having a coherent and professional visual design language enables the message to come out more clearly explains artist 2. Additionally, there is a need to have our eyes trained and capable of spotting the problems, do paint overs and fix the outputs that GenAI models generate for us.

> "You need to have the eyes trained... you need to be capable of seeing that it is coherent." - Artist 4

Artist 2 put it well by saying that "for beginner artists, a generated output looks like a finished artwork." Which implies the lack of artistic exposure in people new to the field.

Similar messages come from other seasoned industry veterans as well. The quality of generative AI outputs in 2D is good, but an ability to curate and adapt is still needed [3]. Wood continues to mention that they did put up early iterations of generated user interface (UI) together by photobashing, a method where pieces from many images are put together to form something bigger. But they went back to old methods to finalize the game's UI as the layouts became more complicated. AI was able to help, mostly in reference gathering, but having the skills to create UI was necessary in the end [3].

The 3D game artist's role is demanding, and a comprehensive understanding of tools, techniques and other practices increases the chances to improve and adapt to the workflows. Domain expertise is needed for automation and to improve the workflows. Similarly, project AVA notes that professional expertise is needed to get good GenAI outputs [3].

> "...when there's a boring, tedious task or step. Then you think, do I really have to do this manually myself, or you realize, wait a minute, I could get some help to speed this up. But it requires taking that tedious step enough time to finally realize this." - Artist 1

Feng Zhu, a seasoned concept artist and teacher also highlights the need to upgrade our skills and points out certain styles of illustrations where GenAI can take the lead over concept artists [64]. Zhu continues to explain that when Photoshop® came around, it also created big changes as traditional methods were much slower. The same thing happened with digital sculpting and 3D tools. 3D representations can easily solve perspective problems that exist with 2D art. Nevertheless, such tools did not replace artist skillfulness but rather caused artists to apply their existing skills in a reinvented workflow that incorporates a more efficient set of tools. Generative AI will be another tool that we have to adapt to, so we don’t get left behind Zhu explains [64].

In summary versatile practical skills with game development tools are still needed and they can help to include generative AI tools for existing workflows. This combined with an ‘artistic eye’ enables game artists to use and adapt these outputs in meaningful ways.

5.2 Using GenAI models and their limitations

This part will discuss current generative AI use and knowledge from interviewed artists. It aims to expand on topics that are relevant for getting good results with the current set of GenAI tools available to artists.

Table 2. Generative AI tools that the interviewed artists had used.

Tool	Users	Key features
AudioGen	1	Audio GenAI, web UI
ChatGPT™	5	LLM, chat-based web UI
DALL-E® (OpenAI™ or Bing®)	4	Image GenAI, web UI, free usage trough Bing® and works from ChatGPT™ as well
GAN Breeder	1	GAN based image generator, older technology
Gemini	1	LLM, chat-based web UI
Ideogram™	1	Image GenAI, web UI, Text generation ability
Leonardo.AI™	1	Image GenAI, web UI, prompt presets/templates and other
Luma™	1	3D/mesh GenAI, web UI
Midjourney™	5	Image GenAI, web UI and Discord® UI
Photoshop® Generative fill	4	Image GenAI, easy accessibility and use
Stable Diffusion™ (& ControlNets)	2	Image GenAI, different UI's, local installation, open source

This table contains the tools that artists mentioned when discussing their use of generative AI tools in alphabetic order. Most of these being visual generative tools, but the use of ChatGPT™ was widely mentioned too.

5.2.1 Working with GenAI tools

Prompting lies at the base for creating images using recent Generative AI models [1]. When interacting with text-to-image methods, artists see that being familiar with writing textual prompts has a positive impact on outputs.

> "Only in the last couple of months have I really started to get the hang of using prompts. At first, it was just about giving it a sentence like 'make me this,' but now I've gained a better understanding and looked into them more." - Artist 5

> "When creating a prompt, you need to be creative, but if you're not a good prompt engineer, not experienced, and you provide too little detail, then it becomes really hit-or-miss. Still, it can sometimes produce good results for you." - Artist 1

Understanding how the AI tool and the model works and how basic prompting works are essential requirements for using these tools, but the results can widely differ based on advanced knowledge and the control methods as artist 4 points out.

> "If you're using Stable Diffusion™™, you have two options: first, you need to know basic knowledge like where to put the prompt text, the negative prompt text, the resolution of the image, and the button to generate the image. This is basic for any generative AI, like in Midjourney™. Then there is advanced knowledge that you need to know to get more control over these images. For example, if you want perfect characters with five fingers or some specific hairstyle, you need to know more things like the correct order of the words and need to know about extras like ControlNet and how to use it and why you need to use these kinds of extra tools." - Artist 4

Interviewees did comment, however, that this type of work isn't an artist's work even if the prompt was skillfully written and that it could be considered being more like coding in certain ways (Artists 2 & 5). This is further highlighted by Artist 3's comment, that automating the textual prompt generation itself could easily be used to generate a thousand images. Other sources also discuss the iterative process on how to add keywords to prompts to affect the quality of your generative outputs [66]. These comments point out that prompt engineering does require less artistic means to create outputs, same as what 'prompt engineering' term itself suggests. Project AVA findings highlighted that time and adaptability were required to become better in prompt engineering [3].

Other control methods such as image-to-image, negative prompting and other settings for the generation came up too. These are default features built into the base GenAI models, such as Stable Diffusion™ and Midjourney™.

Using an image as a base can be used to instruct the GenAI model to create images with similar feel, style and overall structure to the original image (Artist's

1 & 2). Another option is to extend the original image or to fill some parts within the image. Prompting can be combined with other features to give more control.

> "But with something like image-to-image, you can really guide the overall features a lot, and then the stylization comes entirely from the machine." - Artist 2

“Stylization” in the quote refers to prompt templates that Leonardo.AI™, a website implementation for visual generative models has on their tools. Ultimately these are just text input that is added to the user's prompt instructions to aid the generation. These may add better image quality for newcomers who might not be familiar with prompting practices. Prompt templates may also increase efficiency to quickly enhance results by adding keywords. Testing by the developers has naturally been done as well to get prompt keywords that work together. Kemppainen also explains that the initial experience is very important and getting good results fast can affect if a GenAI tool is enrolled in his personal pipeline or not [61].

On the other hand, one may become stuck in the stylization the AI provides. This can drive outputs in a certain direction, making it hard to control. But studios may find custom GenAI models to be desirable if they can quickly provide rendering in correct style or save time in getting to a certain stage in the process.

Photoshop’s® generative fill was one of the most used Generative AI tools among the artists. This might be due to Adobe Photoshop® being an easily accessible industry standard tool. From the limited description on their website, Generative fill most likely uses inpainting and outpainting features, but might include a more advanced setup under the hood. Figure 6 shows an example of this, where the image has been first extended and then strawberries have been added.

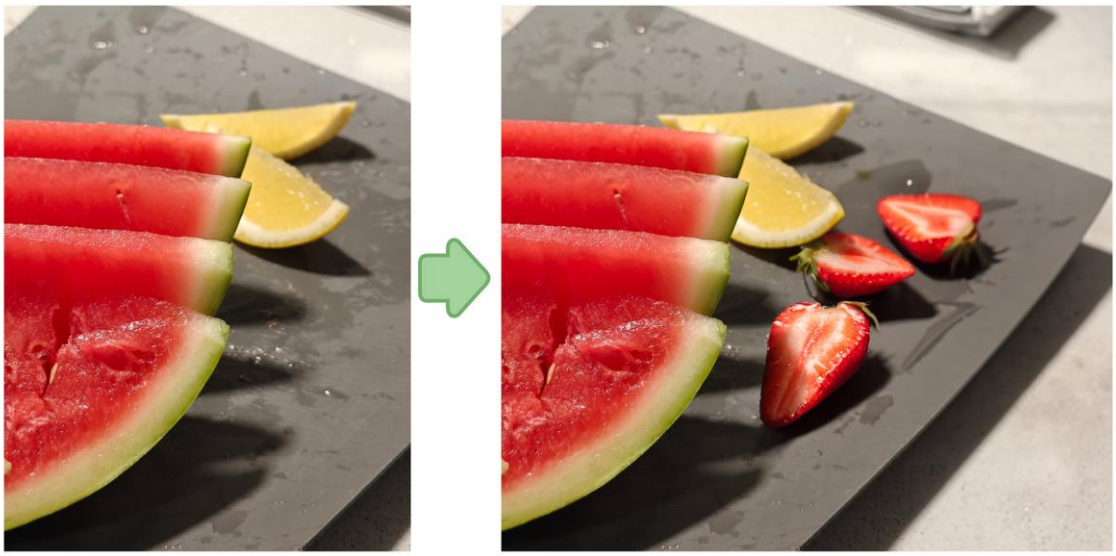

Figure 6. Photoshop® generative fill example.

Photoshop® was an application where generated images were usually further processed by the interviewed artists and with more traditional methods.

> "...just for some background elements. Or if you need to adjust the aspect ratio a bit, add a little more on the sides or something like that..." - Artist 2's use on generative fill.
>
> "...and then use Photoshop's generative AI to clean up anything." - Artist 4
>
> "... in Photoshop, like layers, color saturations, brightness, all of these things, it's really, really important to use in images generated by AI" - Artist 4

Extensive use of advanced control methods such as ControlNet were identified in few of the artists. These additional AI models that are introduced to the generation pipeline can take various data from images to control the outputs in meaningful ways. These can be for example human poses, edge data, scribble & line drawings or images containing data maps such as depth, normal and segmentation to differentiate areas for the generation [30]. The use of LoRA and IP-Adapter were not specifically identified from the interviews, but these technologies are likely to be familiar to those with more expertise on the topic.

Those that were versed in these methods also thought that just purely text-to-image prompting wasn't enough or in such a big role anymore for some of the use cases they had been exploring.

> “It's pretty hard to get a certain kind of result with just prompts.” - Artist 3

> "If you want to get an image with a certain perspective, it's easy to render that depth out in Blender®. So, you use that as a base” – Artist 3

> "I draw the clean sketch with the basic colors, no shadows.. in Photoshop®", "So the 2D character is made by me", "You don't need to write any kind of prompt, because it's enough with the model you are using." - Artist 4

It is important to note that tools such as Midjourney™ and Ideogram™ have introduced new tools after these interviews where users can work on a canvas and utilize these advanced features with more ease. These allow users to specify prompts in separate areas using inpainting and outpainting and use existing images as a control layer for generating variations. They show promise and they have gained a lot of interest online. By making these tools more accessible and easier to use, we can expect more control from users in the future. As with technical skills, AI tool and software knowledge is essential when implementing these tools to artist workflows.

The interviewed artists noted that there is a need to choose the correct GenAI model and use the correct way to interact with it. These models can change the style by themself, even without the need for a prompt as mentioned earlier. Custom AI models from the GenAI community have seen popularity on sites such as civitai.com, but ethical uncertainties for company use exist with these AI models [53].

> "With Stable Diffusion™, you can use models trained for specific results. If you want a more stylized result, you need to find a model trained for that." - Artist 4

Artists that were not too familiar with some advanced features also saw clear opportunities in these while using Midjourney™ or Leonardo.AI™ models.

> "There's a learning curve with those... Even in Midjourney™, there are so many different styles nowadays... And at some point, the more you use it, the more you understand the nuances. And then you learn to switch earlier to the right version of the tool." - Artist 2

It can be said that AI model knowledge is an important factor in getting good outputs. Not just selecting the correct AI model but also knowing what type of results can be expected and how to control these AI models, whether it's

prompting or some other control methods. Deeper knowledge of AI model architecture felt lacking for most artists, which is understandable as it is quite a complex technical aspect in all this.

> “I know the surface level of this, but I have a really poor understanding of what's happening underneath." - Artist 3

Training new GenAI models is done by feeding the machine images together with text descriptions and as a result the AI model should form the ability to generate similar images. This way it is one of the biggest factors in setting a style. And training your own GenAI model to support a certain style is quite advanced if we think about a single artist's role. But for companies or pipelines with large throughputs of visuals this might be beneficial as mentioned before.

A problem-solving mindset combined with good understanding of these tools can help to navigate the landscape as seen with the next example workflow from Project AVA. The problem they had was to keep the painterly style consistent for project assets. While a generated character worked well, abstract icons and objects posed a challenge.

The following steps as seen in Figure 7 were done with Midjourney™.

1. Generate outputs until you find a fitting image.
2. Paint selections and use inpainting to add more features (added camera lens).
3. Extend the image or do other edits (changed background)
4. Use remix or variation features with prompt additions such as “Joaquin Sorolla’s style, brush strokes, stylized” to introduce style. [1]
5. Upscale the image (used creative upscale)

[1] The artists name ”Joaquin Sorolla” as style could be used as copyright expires 70 years after one’s death [3]

Figure 7. Adding style with Midjourney™ using workflow from Project AVA.

The Project AVA presentation showcased this workflow, which presents some methods to overcome limitations with these technologies.

Getting unexpected results from generative AI was highlighted by all artists in some way. Some positive aspects of this will be discussed later under the idea generation, but all artists had something negative to say about getting unexpected results. One common problem was that when re-generating an image to fix a problem, it would either not fix the problem or that the style wasn't kept consistent. This exploration often ended up wasting time and leaving artists unsatisfied.

> "I noticed that it's easier to get an image I'm satisfied with and then take it out and edit it myself in Photoshop®. And then you can make it exactly how you want, rather than asking through prompting to remove something from it." - Artist 1

> "...at some point, I've generated hundreds of images from a single one, trying to fix some specific thing with it. And then I just lose my patience. You could have spent that time just throwing it onto the tablet and drawing that part yourself to look exactly how you want it." - Artist 2

> "...at least for me, it feels difficult to keep the style consistent all the time. So, when you change the prompt a little or ask for a shield icon instead of a sword icon, the style might change slightly each time." - Artist 5

Wood [3] explains that the parts in the prompt that define the style were sometimes fighting against them, thus they only included the style in the final parts after having first generated the object and fixed the problems. With a workaround such as this, it makes sense to state that generative AI can assist in creating game ready 2D assets “if you really work with it” and that visual style is possible to keep consistent.

But Wood also points out that artists must compromise when settling on a style that works with the AI model and sometimes a lot of time can go into finding good prompts [3]. This “artistic compromise” as they word it, is quite important overall, since current GenAI models work in certain ways and have these constraints. Kemppainen [61] chose this approach in his project as well, settling on a theme that Midjourney™ was able to support at the time and where there was the least friction when generating outputs.

The limitation and the opportunity to use generative AI as much as possible has certainly given some motivation for the team behind Project AVA and Kemppainen. But is this motivation something the interviewed artists lacked?

Many of the interviewed artists found it hard to keep the style consistent and to further edit images using the GenAI tools. However, the interviews gave the impression that these struggles may point to early phases in one’s journey into any tool where challenges still exist in finding proper use cases. The dawn of the generative AI landscape and the individual's insufficient skill level are somewhat linked together in this case. The hurdle of overcoming this step is crucial and as AVA results present, the key is to understand the tools [3]. It is possible to enhance predictability by knowing the limitations of the GenAI models and being familiar with the practices as one of the artists points out.

> "...especially characters, because you can create a skeleton and use it to give more data to Stable Diffusion™™ to create the character. This way, you can get consistency with the same character in different poses, which is difficult in Midjourney™™" - Artists 4 discusses the use of ControlNet's

In summary, predictability and control in generated outputs can be further improved with good knowledge in generative AI tools, control practices such as prompting and advanced control methods, as well as understanding what type of outputs a model can give. Artistic compromise to work with the model strengths may be needed and insufficient knowledge and skill level can affect the opinion of what is possible.

5.2.2 More on the limitations

Other than artistic compromise, there were some additional problematic areas that came up from interviews. Functional design, problems with the details and in some way, licensing are things to consider when integrating these tools.

These first two problems are tied to the AI model limitations as well. Based on the interviews and secondary sources as well as how AI model training is done, the GenAI models do not know what is beneath the surface of a certain machine or building, or how different historic periods differ and how the world around us functions.

One of the biggest reasons why GenAI models have struggled with fingers and other repeating patterns is because they are usually accompanied by more of the same pattern. And differentiating the correct amount has been hard as these GenAI models try to put pixels next to other pixels that work well together based on the training data.

> "I've seen many posters, or some ads where they generate the images that have mistakes like extra fingers or it’s an alien” - Artist 4

> "...some buttons are in odd places when you take a closer look at a shirt or something like that. And they need to be adjusted, these kinds of little details." - Artist 2

Creating functional designs or environments with the problem of repeating detail and other design problems can be seen everywhere, from missing character backstories to impossible environments. Zhu, a long-time concept artist, also discusses that these GenAI systems cannot currently match exterior to interior

design or do multi-layer design where the environment serves a purpose to some bigger idea [64].

> “it's a bit tricky to get it to generate, for instance, rooms and locations on the spaceship that make sense in relation to how people live and operate there. This larger-scale functionality within that environment is something AI cannot really understand.“ - Artist 2

> “Right now, you can't rely on these systems for that at all, and that easily becomes a problem... You end up with a mess where the architecture isn't consistent, the fashion isn't consistent. These kinds of things, and they especially don’t match the era in which the story takes place." - Artist 2

To further demonstrate this problem figure 8 below was generated using Leonardo.AI™ platform with the prompt: “kitchen in a submarine, top-down isometric view, ultra detailed illustration”. Problems like the missing door, too many sinks, cooking plates in the corner, window placements and pots that can fall from the turbulent sea movement are clear examples of this limitation.

Figure 8. Problems with details and functional design.

Generating a normal home kitchen on the other hand was much easier, but those always followed certain traits and similar compositions that kept appearing. These follow the training data and prompts adherence to text pairs, so it does not come as a surprise. Using generative AI to create functional

environments on its own is not possible if they do not exist in the training data. Even in cases where function can be seen in the generated outputs, it comes from the original images in training data. These problems could be seen from many of the interviews, but only a few of the more experienced artists pointed out these directly.

> "And then you get this kind of mess where there's no coherent architecture, no consistent style. These kinds of things, and especially they don't match the era in which the story takes place." -Artist 2

While some reveal comprehension through comments such as this:

> "I've noticed that it's easier to get an image I'm satisfied with, take it out, and edit it myself in Photoshop®. That way, I can make it exactly how I want it, rather than asking through prompts to remove something from the image." -Artists 1

Special requests such as generating the long nose of Pinocchio on a character can also prove to be problematic.

> "So, if the nose had to be different—if it had to be long, like Pinocchio's nose, for example—it should look realistic. But that's hard to do because there aren't any references for that." - Artist 3

To demonstrate this problem, figure 9 was generated with the prompt: “Portrait of a female with long pinocchio nose” from Leonardo.AI™. As we can see, something that does not exist in the training data is hard to create with just prompting and purely using generative AI. Zhu made this comment as well, when describing the idea to generate something before it has existed, like transformer robots [64]. For concept design, human artists are needed to map out these functionalities that AI cannot solve. Kemppainen [61] agrees that generative AI would not be usable if we want to create something exactly to our wishes. As we know, GenAI models do not know causality, they learn correlations in their training data [50].

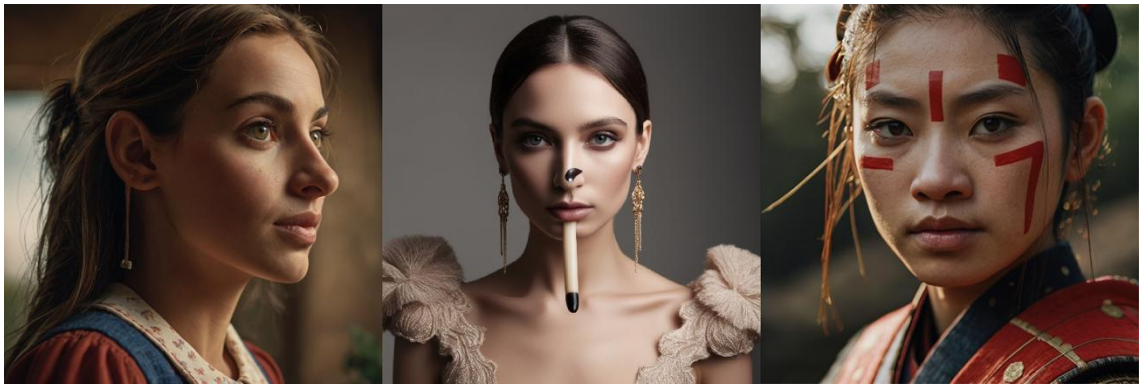

Figure 9. Generated portraits that should have Pinocchio style nose.

Licensing and terms of use conditions are to be considered too. Wood [3] together with their legal team had spent time seeing what considerations there are. Questions such as “who owns the generated content” or “do you relinquish ownership of art that is used to controlling the generation process” are important for larger studios when considering use [3]. Artists 1 and 3 also note that reading the small print is important, but as of now terms and conditions for generative AI remain confusing.

While we have discussed the limitations in the last parts and as seen in some cases, solutions and workarounds start to emerge. This quickly progressing landscape brings challenges and opportunities as the processes evolve and become better understood.

As recently as 2023, artists needed considerably more compromise when working with generative AI models explains Kemppainen [61]. At the time making sci-fi was possible, but nowadays it's much better at making other scenarios. The same can be said for many of the tools and features that have been released during the past year. Project AVA team formed a sort of tool assessment and evaluation pipeline for themselves as they waded through more than 400 GenAI tools or services they had listed for code, graphics, sound, design and narrative [3]. Wood continues to say that cutting down this list was relatively easy as many had dead websites, non-working applications, no pricing information available or bad/non-existent terms and conditions and other poor company practices. There is a constant influx of new tools, and

attempting to keep up with the rapid release rates of the tools could, in itself, lead to weariness.

> “I have to admit that I've kind of lost track in the past month of what's new, because things are changing so fast." -Artist 3

> "These days, you start wishing that the tools could stay the same for a while, without constantly having new things to learn” -Artist 5 on the tools used in game development

Kemppainen [61] also notes that if the application gives satisfactory results right away, it can be enrolled as part of the pipeline.

The quickly progressing landscape adds a few important notions to the interview data. The artists from this interview show varied knowledge in these generative AI tools, some not having knowledge in advanced control methods. Initial stages prompted extraordinary interests from artists and other users worldwide, as the Midjourney™ Discord® server saw huge growth to become the most popular Discord® server by a huge margin [67]. One of the artists explained that after the initial excitement the usage of GenAI tools started to dwindle a bit. But they still mention usage later in the interview with work tasks, which indicates just a slight usage normalization towards the era before GenAI. The 2024 Hype Cycle® for Emerging Technologies in figure 10 presents this phenomenon.

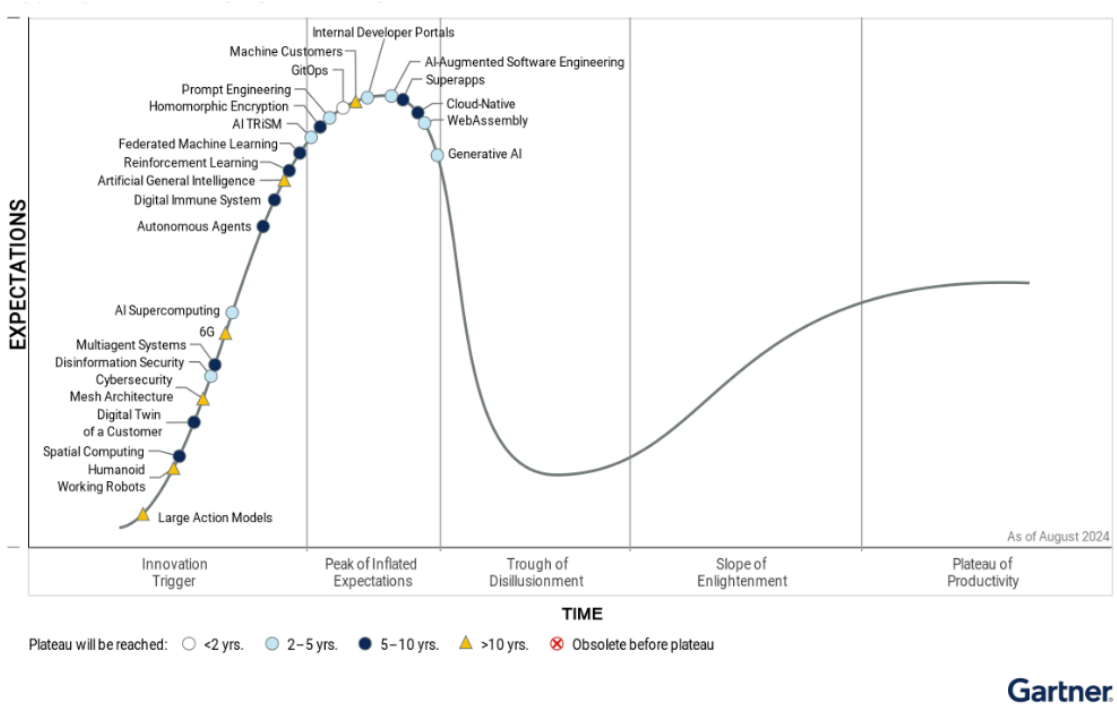

Figure 10. Generative AI is progressing on the curve [33].

Nevertheless, some weariness can be noticed for early adopters. This can lead to having a mindset of “I’ve already seen what these tools can do,” which may result in missing the advancements when those come. However, artists might be waiting on the sidelines for clarity on workflows, terms and conditions and ethical guidelines. This leaves us pondering where we stand with the actual usage metrics of these tools with artists in general as this study only targeted artists with already meaningful experiences in GenAI usage.

> "Because it's so new, it's hard to know how to approach it yet—where it's really at its best and how it truly fits into workflows." -Artist 5

New methods to work around some of the limitations are emerging. Features such as inpainting & outpainting or ControlNet's and IP-Adapters that already have been around for a while might have been too troublesome to use, or then doing those small edits with something familiar, such as Photoshop® has been the effortless way out for artists. Tools such as Invoke™, that aim to bring these features much closer to actual workflows can increase the adoption of GenAI as it matures. For example, installing a GPU hungry local version of Stable Diffusion™ model is not hard, but for casual users it is a lot more to handle than

typing a prompt to Midjourney™ from your computer or mobile phone. This is an issue of accessibility and ease of use. Many of the advanced features and applications may require more tinkering too, which is one of the less appealing aspects of this fast progress that is happening.

> "If there's some brand-new app and it requires a huge setup, multiple attempts, and it's difficult to get it running." -Artists 1

We can place this progress with generative AI to Roger's diffusion theory with some additions [68]. Figure 11 aims to visualize where we might stand with current visual GenAI tools as these tools are currently mostly solving specific problems and not the full pipeline yet. "Generative AI-enabled applications" is also placed as one of the upcoming topics on Generative AI focused Hype Cycle® [69].

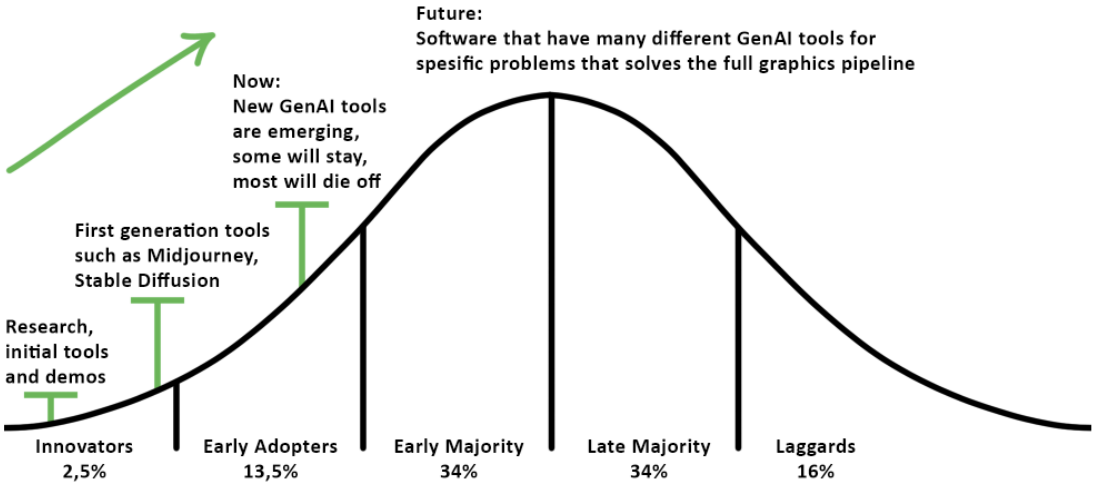

Figure 11. Technology adoption curve and GenAI tools progression, adaptation from Roger's diffusion theory [68].

One of the interviewed artists had discussed with people that work in triple-A companies and heard that it needs five to six years before these tools can become part of the workflows as there are many unclear aspects right now. Kemppainen and Thompson also share this thought [61], [62]. Thompson adds that many of these studios have already concluded after internal research that many of the current tools are not practical and that we need tools to elevate or assist artists in specific ways [62]. So, while these systems are improving at a

fast rate and fingers can now be generated correctly, artists still lack user-friendly software to some extent. Deeper acceptance and penetration of these tools could be expected as they develop, however Thompson reminds that most of these applications will die off, but some will stay [62].

In summary, accuracy in the overall story, details, and functional design cannot be expected from current visual GenAI models, but having a general understanding of how they are trained can enhance their usage. These AI models lack an understanding of causality, which causes problems for complex designs and truly original content creation. Technical ease of use, accessibility, and unclear licensing terms remain barriers that stem up from the rapid progression of AI tools. Some fatigue in usage can be seen from early adopters.

5.3 Benefits of GenAI in current landscape

This section takes a bit more optimistic view as we get into the current possibilities to see how GenAI can empower and enable new ideas to come to life more efficiently than before and to perhaps eliminate mundane tasks artists may have. We have seen the move from traditional mediums to digital application use, which has enabled artists to overcome technical limitations and to allow artists more ways to express themself. This has elevated the production of art, and perhaps with the introduction of GenAI we can hope to achieve something similar?

Game artists sport a variety of roles and know-how between peers can differ widely. All the artists in this study have knowledge in 3D modeling practices, but just some expressed digital painting and 2D as often used in their work. Concept art is highly valued in entertainment work [64], and larger companies often have specialized artists to fill this role if they are not outsourcing it. GenAI may enable artists in smaller game studios to reduce this skill gap in digital painting to some extent and artists mention being lucky to have the opportunity to use these tools now.

> "I feel lucky in that sense because I'm not very good at digital drawing, which is exactly where AI excels at the moment." - Artist 1

> " Like, I can't, as an artist, create a 2D character with all the shadows and lighting perfectly. So, with these tools, at least for me, it's easy to create the 2D character." - Artist 4

With the possibility of improving the starting point with concepts and references, artists in smaller companies may see the quality of the overall work increase.

> "Sometimes I have this issue where I tend to latch onto the first idea. Even though it would be better to start a new sketch and kind of force myself to see it from a different angle. Iterating always brings a better outcome." - Artist 2

In cases where skill levels are not top tier, GenAI can enable the game artists to do art objects that are valued higher than without the usage of these tools [7]. Kemppainen [61] also ponders that AI is valuable if it enables a person to tell a story, the story itself is the result, and AI is just the way to get there.

These tools have been great at reducing manual work in existing tasks. Photoshop's generative fill was seen as one such feature by the artists. It directly targets one of the most common tasks for artists, to fix, remove or to add something into an image. By selecting an area and using generative fill, often without adding a prompt you can easily fill the selected parts with new pixels. One artist mentions backgrounds as a good example along with expanding the image to the sides to show more. Previously, digital painting and some other tools have been the way to accomplish this, and those are still relevant for many uses, but GenAI tools can be helpful additions to existing toolbelts.

> "If it's done manually through image manipulation or directly by drawing or painting, then it's easier, like, 'please AI, fill this area.'" - Artists 2

> "The workflow is to create a base image and then use Photoshop's generative AI to clean up anything." - Artists 4

The hope of other industry veterans is to see quality of life additions to artists and developers. Thompson finds it important to explore how these GenAI tools can automate mundane tasks in our workflows [62].

> "The ideal version would be that these are tools that remove the kind of time-consuming, somewhat unnecessary work from the artist, so they can focus more on creating and on the creative side." - Artists 2

After the interviews in this study, Adobe® showcased new GenAI features in their yearly MAX Sneaks event in October 2024 [70]. We are starting to see more glimpses of what these tools can do in the future as part of existing workflows. Illustrator®, a software specialized in vector graphics, was used to generate new rotations from different perspectives for characters and other elements from just 2D vector art [70]. For Photoshop®, they showed an image blending tool that, with a few clicks, re-generates the lighting for people that are being added to another image with different lighting conditions [71]. Normally such editing would take hours, and the results might be subpar.

There are also new tools such as Invoke™, that aim to make these generative AI features more accessible for artists. An example in figure 12 showcases features such as (1) ControlNet that takes a sketch and colored regional guidance layers to (2, 3) generate variations with different prompts. These colored layers each help to assign content to the right places for the final images.

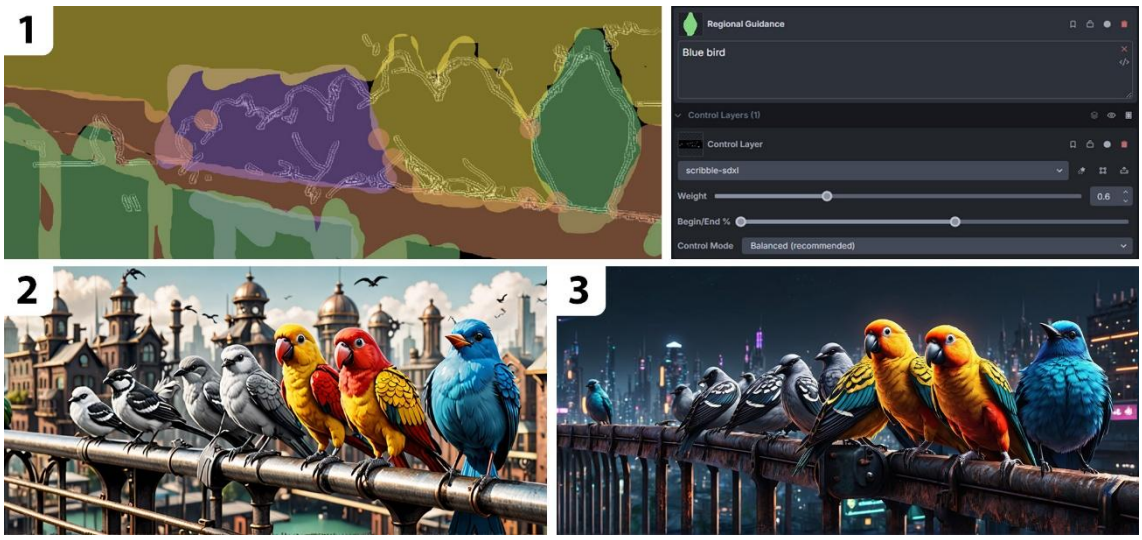

Figure 12. Control with regional control layers and ControlNet.

Traditional digital tools such as Photoshop® or Blender® have always been adding varying amounts of built-in automation to their tools and GenAI is expected to continue this trend and even offer never-before-seen workflows. Adoption and integration of GenAI features from industry standard tools will take some time. Thompson and Kemppainen both agree that we are still early in the development. In addition, Adobe® and new applications such as Midjourney™, Invoke™ and others are both showing innovation towards more artist friendly use-cases and tools.

Wood [3] sees visual GenAI and LLM tools almost like assistants that enable new interactions between the user and the content creation interface. Similarly, Tribe, an artist and lecturer from New York School of Visual arts describes his interaction as “fun, improvisatory collaboration with something that wasn’t creative or intelligent, but felt that it was almost that.” while Holliday, an entrepreneur and design thinker compares it to having a bunch of studio interns that can do all the drafts for you [72].

> "Especially in those client projects where they’re not necessarily looking for my personal style or where I'm particularly skilled, AI easily guides the process. It also allows me to see directly in context how, for example, the shapes and colors should work together to fit the specific style being sought." - Artist 2

> "At work, it has really only been used as an additional concept designer, in a way." - Artist 5

Current GenAI tools have a lot of similarities to existing user interfaces. But as these tools keep improving, we could be seeing more human centered design experiences in the future. It’s still hard to say how GenAI tools or assistants enable new workflows for humans in the future but having a ‘memory’ that can source billions of images is already something out of human scope [18]. These types of possibilities are going to enable artists to take on fundamentally new types of work.

Although we focus on visual GenAI in this thesis, artists also pointed out different uses for ChatGPT™. Some artists found it helpful at generating code for simple interaction or to create shader code that can be used to transform visual effects into life.

> "I'm not a good programmer, but if I ask ChatGPT™ like, "Okay, make me in Unity a ball that is jumping when I press like “a” key," it will give you something." – Artist 4

> "Then there are practical things, like if you're working on a shader or need interaction in Unity, then of course ChatGPT™." – Artist 1

Like we discussed earlier, artists need a visual eye to be able to work well with generated outputs. The same applies to coding. Team AVA notes that AI coding solutions, like GitHub® Copilot does not replace experience, and struggling in custom bespoke code was common for it [3]. But with smaller code-snippets it could improve productivity a lot, Wood says. Thus, for artists, these solutions are becoming more usable each day for small tests and code such as shaders or interactions that work independently. However, it is important to respect the work of programmers because as with artists, their experience cannot be replaced with AI.

Artists must be mindful that the ghost in the machine provides methods for non-artists too. Those team members who can’t draw could be granted better chances to voice their thoughts by creating quick generative visualizations for others.

> "For those who don't have the potential to create quick visualizations, it definitely helps with that.” - Artist 5

> "Let’s say if there are team members who might not know how to draw, it gives them a voice or more of an opportunity to show what they want." - Artists 3

Conveying ideas to others is an important aspect of teamwork and these tools ultimately make communication with visual forms easier than before, may it be the studio head, colleague or the client. The efficiency increases these tools provide have been found to be one of the most alluring aspects and these tools can enable both Individuals and studios to arrive somewhere over this threshold that wasn’t possible before.

> "We wanted to do it in, I think, two weeks or so, but it wasn’t possible—at least not for me—because I’m the only artist at the company. So, the only solution was to start using AI." - Artist 4

The efficiency of these tools came up from all interview participants when asked what makes GenAI appealing. This, of course, is an effect being enabled by the tools, provided they don't divert attention but instead increase the number of possibilities to consider. Artists 4 answers "Yes, a lot" when asked if they use GenAI to generate many ideas and then further note that efficiency increases in some projects and in some specific tasks. Other interviewed artists also point out this increase in efficiency.

> "The speed at which Midjourney™ paints you an image of a dragon breathing fire over a castle with the entire castle in flames—an experienced artist would probably take a day or even several days to render the same image. This definitely makes it appeal because the results always look really good, and it happens so fast." - Artists 5

> "Yeah, just saying that if you had to come up with everything from scratch and spent a couple of hours browsing Pinterest, you might eventually get a good idea. I mean, it really speeds up your own brainstorming process a lot." - Artists 1

Two-dimensional art has seen the most impact at this point, so it doesn't come as a surprise that the illustrative side of concept art was also mentioned as being highly affected by GenAI tools. While some artists specifically mention that "these tools save time to create concept art", others highlight the ideation and prototyping phases of the art process. Wood [3] mentions that it's great at idea visualization and it can provide significant speed increases to concept art workflows. But as mentioned earlier, finding the correct prompts can take time and this must be considered as well.

Efficiency through fast iterations and rapid prototyping is inherently built into GenAI tools. One of the artists mentioned earlier that starting a new sketch would always be beneficial, rather than sticking with the first one. Kemppainen [61] acknowledges that it might take months to figure out what to do in a project. The possibility of creating variations so easily is appealing according to the interviewed artists as well and additionally, variations can be used to explore different workflow parts.

> "And since it allows you to produce so many images, you can get ideas from it yourself." - Artists 5

> “There were about 400 images from which I then chose the ones I wanted, the ones that had the right elements, and based on those, the modeling is done." - Artist 3

> “I mean, the idea was like, we don't know what the people want, so let's try to make five different prototypes of the same game but with different art styles." - Artists 4

While GenAI cannot solve the design problems we discussed earlier, it can generate variations for interesting forms and inspiration, or different art styles, and even solve basic design and art needs [64]. Efficiency is quite all-encompassing as anything that frees up time can be seen as efficient. Almost all the interviewed artists saw GenAI outputs as something they wouldn’t use as a final version. One of the artists had used these for finished work after minor fixes in Photoshop®, but others mostly mention ideation and exploration as their main use for GenAI outputs.

Idea generation with visual GenAI was brought up a lot. Text-based prompting has been the main control method, and the lack of additional control methods probably drives this use-case. Another drive perhaps being quality, which wasn’t that great in the beginning, but still proved to be satisfactory for idea generation.

ChatGPT™ was also regularly used as an idea generator for the different contents project AVA team wanted to put on the screen [3]. Kemppainen on the other hand used AI to come up with ‘500’ different and horrible names for his games title that helped to come up with a good name [61]. He explains that in productions, a big chunk of the work is to investigate the bad options through exploration, and this is one place AI can help. Idea generation was a category seen in a positive light by all interviewed artists. Just like Kemppainen and Wood, many mentioned ChatGPT™ in addition to visual workflows.

> “Well, of course, there's ChatGPT™, I’ve used it for making lists of things, like for example, what kinds of weapons could there be..." - Artist 3

> “...same time that you are asking for text, ChatGPT™ can also send me examples of images or concepts about my ideas." - Artist 4

DALL-E, which is built into ChatGPT™, can be used to create images too, but most interviewed artists seemed to gravitate towards Midjourney™ or Stable Diffusion™ when generating new images. One artist sees these tools as the next version of Pinterest, a well-known website where you can browse images from all over the web. To aid idea generations, one can use existing images as inputs or just roll with a prompt and see what comes out. Unlike the unexpected results in the previous section, sometimes positive results may induce awe.

> "And maybe it's the fact that there's always a chance it will produce something surprisingly positive that you wouldn't have been able to come up with on your own." - Artist 1

> “...then something might come out, like a certain type of bag or asset that you might not have thought about in terms of the design language. So, it gives you direction, but nothing really comes out ready-made." - Artist 3

> "And usually, you can take a few ideas from them, and they might spark some 'Aha' moments. But yeah...as the end result, I wouldn't use them." - Artists 2

Idea generation and exploration as potential use is also highlighted from other sources. Students in a study were ranked higher than their non-AI counterparts in creativity, diversity and visualization quality when using a generative AI tool and thus opted for more iterations [9]. One of the interviewed artists explains that for them to take an idea to the game, it takes multiple steps and people to be involved. So as others highlight, the concept of having an other-worldly assistant is enticing. However, with the possibility of generating endless images and contents, we introduce new problems as well.

> "Perhaps the benefit could be said to be that when you use it as a tool and take advantage of the strengths of AI, it has enormous potential. The risks, however, are the same; its ease of use is a risk in itself, and outsourcing your own creativity to it is another risk. In a way, it's like suddenly being able to produce beautiful images and forgetting the idea that was behind it." -Artist 5

In summary, generative AI improves efficiency and enhances ideation through faster iterations as well as serving as a visual reference bank. It expands artists' possibilities by lessening the burden on mundane tasks, supplementing unfamiliar skills and working as a brainstorming partner. However, while AI is a powerful tool that excels in certain areas, over-reliance may impede creativity.

5.4 Risks, harms and considerations in GenAI use

As the landscape is changing there are worries about how these tools will affect artists and creativity [4], [5], [6]. We can explore the road ahead that current game artists and employers will encounter to see if action can or should be taken.

The interviewed artists had concerns, but some also mentioned unfavorable situations emerging from the use of visual GenAI and LLM's. One of the artists had a coworker who misplaced trust in what ChatGPT™ generated and was repeatedly disregarding other coworkers. This ultimately led to the person being let go of their work. This artist also continues that asking ChatGPT™ is sometimes worse than discussing with team members when trying to get something done efficiently.

> "I don't think it's possible to get good results just you and the machine.... and I don't think it's healthy." - Artist 4

Overly relying on what can be generated can create problems for the artists and cause loss in skill versatility. Artists mentions in the beginning of this chapter that practical and technical skills are important. Thereby, if we focus on what GenAI can do and forget to progress elsewhere, it starts to become a problem. This should be more emphasized to people who are still learning. Creating with GenAI can be fast and results may seem amazing for an untrained eye. The artists & lecturers at SVA also discussed that we must be trained to adapt for these changes and humans should be something more than a tool that may become irrelevant in the future [72]. The question, "Do we still learn skills that we originally accumulated through hard work, if we use AI to do them instead?" was left somewhat open in their discussion. However, they did see taking shortcuts and the easy way out of something as unhelpful from a learning point of view. The artists from the interviews saw this as a potential pitfall that may cause problems in the creative process as we go forward.

> "I don't want to say that it makes people stupid, but I think that using these tools when you are at the beginning of your apprentice... like you're a student, I don't

> think it's a good idea to use these tools. I don't think it's making you improve. " - Artist 4

> "Laziness could be a potential issue, especially for younger people who, in the future, will have learned to work with these tools. It might be that their only experience of the creative process is using these tools." - Artists 2

Artist 5 explains that since it is so easy to adopt these tools, using the tools might supersede critical thinking and cause a loss of motivation to do something well. Do we take it further if it's so easy to get results that are 'good enough' for the artist and the employer. Are we going to go that extra mile to improve overall quality and to learn from doing so or are we losing the skills we obtain by challenging ourselves?

> "Maybe the risk is that people no longer try to learn things themselves, like drawing, thinking things through more deeply, or sketching. Or they might rush to throw an idea into a generation program too early and be satisfied with it, without challenging themselves or their team any further." - Artist 5

One future challenge might be to find your artistic voice. Especially, if visual storytelling and creativity is generated to become a mushy average of everything that already exists artist 5 pondered. A small loss of motivation could be seen from one of the artists as they had to start using GenAI tools to improve efficiency in some work tasks.

> "...in my case, I am an artist in my job, but to make the avatars for my games or some kind of casual games, we don't need to be really creative. You can use any of the characters created by these AI tools. " -Artist 4

It is important to develop in what we do through challenging ourselves with tasks. But if it becomes a norm to choose the easy way out at each crossroad, is there progress beyond that? Maybe, as we then have new problems to tackle. For example, learning to use GenAI models is becoming relevant now. Do we then feel a loss of accomplishment? Probably, at least in some ways.

> "I've left it out of my own projects entirely, because it leaves me with an empty feeling—that I didn't create this, and it's not what I want to express. I might not even know exactly what I want to say, but I want to find and discover it myself. I don't want it done for me." - Artist 2

Wood [3] also provoked this thought with the question: "Do you as an artist really feel proud of this, when you are just guiding AI to do it". This also comes

back to “artistic compromise,” as these tools, if we let them, might force us to take certain roads. From the interviews, at least one artist felt pressured to take this way. Interestingly, this artist had more extensive interactions and knowledge with advanced GenAI control methods.

> "So, it's hard when your teammates say the results from Midjourney™ are better than what you can do in a few hours. " - Artist 4

> "It's really sad when you put a lot of effort into your work, and then a teammate generates another image with AI, and they want you to do it like the AI image." - Artists 4

Unhappiness in one’s work may prompt one to look for new challenges too, which is something to consider when integrating these tools into our systems. From a personal point of view, it would be ideal to find satisfaction from using GenAI tools, but artist friendly workflows are needed to make use desirable. Interviewed artists both show concerns, but also optimism when discussing loss of jobs.

> "These tools are fantastic, so it’s really about how... If they can be used in a way that supports artists in their work instead of taking potential jobs away from them." -Artist 2

> "I think jobs for 2D artists are going to decrease, and they probably already have a lot. But not at the AAA level, though." - Artist 3

And as often happens, we fear the unknown. While one artist sees that “new efficient tools” would cause job loss as they make humans more effective, they also see GenAI as an opportunity.

> "I had a lot of the same thoughts as others—like, is this technology going to replace jobs and things like that. But then I started learning it, just because I kept coming across those images, and maybe I realized that there’s so much potential there that if you don’t use it, you might end up falling behind those who do." ... "But now I feel that the initial fear many people had, that countless jobs would be replaced by this, well... maybe it’s not going to have such a massive effect after all." - Artists 5

Other industry veterans that work with triple-A studios have similar thoughts on this. But Thompson [62] explains that many studios have already concluded from internal research that these tools are not practical yet for elevating artist’s abilities in meaningful ways. Kemppainen [61] also has his hopes up that these tools would improve the life of artists and developers. Po et al. [50] discusses

the possibility of job displacement in creative field but highlights the rise of new job profiles with GenAI.

Zhu [64] mentions that new technologies have a few stages of adoption. First people call it 'cheating', but when everyone starts to use it, 'your career is over' if you don’t follow the masses. This happened when transitioning to digital media and similarly when digital sculpting & 3D modeling became a thing, Zhu explains.

Kemppainen [61], Zhu [64] and artists at SVA [72] agree that AI is going to devalue whatever it can easily and effectively create. For example, there have been plenty of beautiful illustrative renderings online and it can be expected that these types of generative works will continue to improve as time passes. Kemppainen thinks that in the future we will see companies that use AI for rendering, but the control is done by filling the environment using 3D and other traditional means [61]. While some parts of the field can be affected, studies voice that human designers' jobs are still safe as AI cannot be taught empathy and creativity [73]. This links up with functional design, as previously discussed. Zhu points out that we must recognize what AI can do, avoid that type of work and upgrade our skills in areas where AI lacks [64]. Markets and money are usually the deciding factors.

> "It’s kind of like money usually wins in these situations. And then, artists are left empty-handed." - Artist 2

Research has shown that while GenAI can increase novelty in produced art objects and increase efficiency, it effectively shows a decrease in efficiency and novelty when applied to experts at a higher level [7]. Somewhat similar results have been found with the use of LLM’s, where senior programmers see less gains than junior programmers [74]. A few of the artists contemplate this from slightly different angles. One seeing that this high skill-requirement is something AI cannot do.

> "But in Naughty Dogs, for example, or in other companies like Riot, the artists working there designing the characters really need to be creative and understand how a character works, the anatomy and everything." - Artist 4

And even for most artists, this type of high-level work is challenging and hard. As these technologies become more accessible, we may see saturation in novelty if companies and Individuals push content that is just ‘good enough’ and based on the same training material.

> "The overall image might get pretty muddied, with everything starting to look a bit the same. It becomes hard to distinguish who’s doing what, and that unique touch—such an important part of creativity and identity in projects, and even within studios themselves” - Artist 2

> "The quality of things is going down because people don't notice or care about these mistakes." - Artist 4

So, choosing whether to take the easy way or spending extra effort on some parts is important as we progress. As these results have become much easier to achieve, we are already starting to see AI content everywhere. Kemppainen is worried that people are going to be fed up with AI content that doesn’t add anything valuable, thus pushing real gains from AI further [61]. Low-quality content overflow is something we have been seeing with current trends on the internet too.

> “The internet ends up flooded with that junk, making meaningful discussions and genuine content much harder to find and share. This 'dead internet theory' is really starting to come true." - Artist 2

> "And then, if the market gets saturated with that kind of bulk content—like I’ve written some text, and characters have just been copy-pasted from AI—I don’t see that as very creative work anymore." - Artist 3

Lower quality and saturation in novelty are of concerns [9], but the future may not be so bleak. While loss of creativity may be a problem we face, it's also one of the elephants in the room. Artists themselves have noticed many of the problems that may come with these tools. In some cases, action must be taken by the artist, for example to upgrade their own skills to avoid things that AI is good at. But perhaps more importantly developers need to create tools that artists have a use for. Markets and money will affect the direction as well and some studios might take the easy way, but are they hurting themselves more in the process? Do artists want to work for those companies if they thrive to improve their skills?

GenAI has been a heated topic in the creative field, and there are ongoing legal issues regarding the training data of models, which has included copyrighted material [75]. Interviewed artists also view this as an important issue that requires more ethical consideration regarding how data is gathered, as well as clear legal guidelines on how generated outputs can be used in work. Currently, there are risks of misusing generated outputs if one is not careful enough.

In summary, while generative AI offers benefits and new creative possibilities, it introduces risks to personal artistic development, job security, copyright and the creative industry through money driven practices. For some personal skill development may be hindered with extensive AI use, while others may find themselves under the pressure to use GenAI. Repetitive mass-produced aesthetics may further develop the homogenization of artworks in the creative field. To combat risks, updating our skills which the AI cannot do, and the thoughtful integration of AI tools remains important. Balancing the benefits and preserving human creativity and artistic voices will be important and only time will tell how well these challenges were met.

5.5 Creative control

Artists are in control of themselves and should be critical in the use of AI tools. AI tools are a great addition to the toolset human artists carry and game artists still make graphical assets for the markets we cater to. Whether they are made with the help of GenAI or not, they must give something meaningful to the end-user. A study [76] found that only 9,4% of human outputs were more creative than outputs from GPT-4® (ChatGPT) but they note that it requires a human to trigger the creative process, and GenAI can be a very helpful assistant. Thus, creative direction is left for the human collaborators.

Firstly, we must understand the topic to be able to see what landscape we are working in. This can be anything ranging from real-life robotics factories or historical architecture to something more abstract such as humor or horror. One

of the interviewed artists explains that GenAI models can mix things together creating non-cohesive images.

> "...if there’s a project where historical accuracy is needed, then you absolutely have to study that history. Currently, you really can’t rely on these tools for that, which can easily lead to problems... And then you end up with a mishmash—no cohesive architecture, no consistent fashion. Things like that don’t align with the time period in which the story is set." - Artist 2

> "When creating some kind of environment, you need first to think about what kind of environment you want, which requires a human." - Artist 4

This sides with Zhu’s [64] note that AI cannot do functional design. Those that create conceptual designs must place importance on how our world works to be able to conceptualize a believable environment [64]. Similarly, artists who create materials and 3D models need to follow the same principles when deciding on the amount of erosion.

Quality assurance on the personal or studio level is needed too. This links up to the risks mentioned earlier and is of importance as we move forward. This may apply more so to new artists and other users who have now seen and experienced this democratization of art. Spotting the problems often comes with experience as has been discussed before.

> "You need to have the eyes trained... you need to be capable to see that it is coherent." - Artist 4

Project AVA results have reverberated the need to curate and adapt generated artwork. Quality assurance has another side too, which is to make sure the artwork is usable from legal perspectives. Some tools are not production ready, one of the worries for big studios being accidental replication if they used generated outputs [3]. GenAI models can easily generate copyrighted content if prompted for it. Interviewed artists also highlight this layer of quality assurance and to avoid intentional replication. One mentions that background checks on the generated content are needed, and prompts should avoid directly mentioning an artist's name and other elements protected by intellectual property rights.

> "In practice, the only rule is that it’s not used directly for anything." - Artist 5

> "...that if you take an artist's style and then start copying it, I don’t think that’s very cool." - Artist 3

> "We do the background research and make sure that... you know... it doesn’t match anyone else’s work too closely. And then it’s usually easiest to also avoid deliberately trying to create something in someone else’s style or related to a company-owned IP." - Artist 2

Creative direction is built on many of the things we have discussed during this thesis, and much of it comes down to having experience. In our context, creative direction is essentially the ability to tell a story. Similarly, the creative process of creating a digital art object is the message and design we want to convey [22].

> "I need to know what we are selling. If it's a character... or which kind of characters... if they have a story, for example, about Mexico." - Artist 4

Control is needed to keep the game's art cohesive and make the design and other aspects contribute to the bigger picture of what we want to aim for [64], [77]. If this is left for the AI, we get back similar remixes of what it was trained with. This is true for humans to some extent as well as we also reference the ideas we see and enjoy.

> “A few times, we've tried giving the concept of our current game to ChatGPT™. Out of the eight ideas it suggested, six were ones we'd already thought of ourselves.” - Artist 5

As Kemppainen [61] explained, GenAI is good at generating bad outputs quickly, which is one of the strengths it provides. During the development work the variations to go through increases. These unexpected results can divert attention and time from the artist and the team if put forward.

> "Maybe it's precisely the curation aspect—it's easy to get captivated by the images and just copy-paste them, which might lead to forgetting the original idea.", "It's best to be quite selective about which ones really end up on display” - Artist 5

> "It's easy to do things with Midjourney™ or Stable Diffusion™ and not be critical of the results." - Artist 4

Being critical of what you see is self-explanatory, but maybe increasingly important with the influx of these outputs. GenAI itself is not critical of itself, it just gives you something and that's it. Creative direction also means that we can

or may leave something out. Which makes it important to always welcome a healthy amount of critical thinking and creative problem-solving in the process [9].

> "So, in a way, it's about seeing through it, like 'Wow, this is a cool image, but is it actually relevant?' Then maybe add some snippets of text or something to the image to clarify, like 'In this image, for instance, it's about this house, so ignore the background. Or you go into Photoshop® yourself, make a few adjustments, and cover up the parts that didn't turn out quite right." - Artist 5

> "...it always requires a person's approval for the output to move forward in the pipeline." - Artist 1

Ultimately whether to put something forward in the pipeline depends on the usage as well. AI tools may provide a more iterative design process [9]. This may give birth increases in quality if we are able to adapt GenAI to new types of workflows. All in all, we need to keep the thread that ties everything together well in our mind. Good creative direction has been and will continue to be one of the biggest contributors to a well-balanced story.

> "...I'd guess that it's like 5 years, 10 years at most, before we're there—where you're essentially acting as the director of your own media, like for this type of video-based media." - Artist 3

Project AVA team also found that these tools can help in game development and enhance the creative process but lack emotional intelligence to determine the quality of the output [3]. Similarly to the previous quote from the interviews, they also see that following the GenAI development as "vital".

How can generative AI then help in finding creativity? A famous French artist, Paul Delaroche once said, "From today painting is dead" when photography came around. Later he, among other artists, found the medium useful instead [78]. Now photography is essential in capturing references and these images are a source of creativity. Having more options to create art improves the artist's flexibility, which some say directly relates to higher average originality of ideas. This is suggested to happen because more less used categories are sampled [79]. By having a bigger variety, we could see an increase in creativity with GenAI tools. On the other hand, if artists lose this flexibility and see a reduction in alternative options, this could lead to a homogenization influenced by the

visual training material in generative AI models [7]. Also, challenges in communicating our ideas with the control methods, such as prompting may restrict the creativity humans have [80]. Lately GenAI models are becoming more and more fluent in different styles and possibilities in aiding artists are increasing as the tools mature. But ultimately our way of using these tools will decide the results.

As discussed, creative direction guides the art creation process and finding the idea on what to do is usually the first step. Interviewed artists explain that they start tasks by listing things out, discussing ideas with the team, finding references and concept ideas. The order varied depending on the tasks but exploring early possibilities quickly and iteratively was common.

> "After gathering those references, it’s time to pick up the pencil and start sketching.”, “If it's a more complex project, I’ll typically make a list and write down notes for myself." - Artist 2
>
> “...sourcing/gathering those references is really the first thing." - Artist 3
>
> "Usually, it's specified to some degree. I might lay out the specs or sometimes brainstorm with someone else. We come up with a rough idea to guide the direction. Then we talk with those involved in the work, and brainstorm further. Depending on how early we are in the process, it might go to concept development." - Artist 5

Wood [3] notes the use of ChatGPT™ as a sounding board to get a better understanding of what the concept needs. Haase and Hanel [76] highlight the use of GenAI as valuable assistants to review our thoughts and acquire ideas from their extensive knowledgebase. Creative people with an openness to experience have also been found to discern good ideas from bad ideas better than people normally do [81]. Thus, when presented with a flurry of choices and more ways to work, creativity may see rise.

> "An example is that the Concept artists are creating awesome art because now they have more possibilities to expand their creativity." -Artist 4
>
> "I would see it more as an intermediate tool in the process. Of course, it speeds things up, and I don't view it as copying others, but rather to generate variations. Or maybe to combine two different styles and, you know, create a kind of creative flow that you might not have thought of otherwise." - Artist 3

GenAI is seen to enhance both creativity and innovation [9]. And while it has great use as a time saving tool for repetitive tasks, creativity and human empathy were seen as important factors for impactful designs to emerge [73]. Other artists also used AI as a starting point for the creative process and they see that control and chance both play a role when using GenAI [77]. These tools are birthing this new type of targeted and controllable chance, that can promote divergent thinking by producing ideas from unlikely combinations [80].

One study notes that GenAI users were more fixated to designs, and had lowered originality and the number of sketches compared to non-GenAI users when ideation time was only 20 minutes [12]. Participants were university students from different backgrounds that had visual design experience and GenAI or professional industry experience was not required. This implies that in very short sessions current GenAI tools may take too much time to be used for exploration and that prompting practices may limit our creativity. However, skills such as prompting, software knowledge and even reference gathering play their role when efficiently using these tools and following good artistic practices.

This targeted chance can be directed at smaller parts of an image to generatively fill parts based on the prompt and surrounding pixels. As we see efficiency increasing repetitive tasks, it may indirectly increase creativity too. Interviewed artists see that GenAI can save time but also gives a chance to find something good.

> "...please, AI, fill in this area... And then there’s more time left to fine-tune and adjust the more important aspects." - Artist 2

> "In a way, it's not about aiming for something specific, like 'I want exactly this,' but rather experimenting to see what kind of results come when you tweak it a little in one direction or another." - Artist 5

Creativity from reduced workloads can be expected to happen, but the effects it may have on continuous human learning and innovation ability was not considered. Eagleman and Brandt [82] discuss the idea of repetition suppression, where we get excited about something when we first see it but get less excited when it's repeated, explaining why people want to find novelty with the exploration we do. If we find that novelty starts to wear off from GenAI use,

artists, developers and others will most likely find more innovative ways to use GenAI and expand the possibilities. On the other hand, humans often take the road of least resistance [82], which makes this a balancing act.

Value is attached to unique and new things that prove useful for the audience or the creator and thus provide intrinsic motivation for creative acts. Theories on individual creativity that Walia [28] explored, also shared the assumption that the human mind is the “site” of creativity. These theories point us in the direction that human creativity can be supported with generative AI tools as part of our intentional processes to create something new.

Additionally, most of the interviewed artists mention not using generated outputs as final versions and that they require a thorough check for problems, similar to Wood [3]. These points indicate that current GenAI cannot be expected to follow certain ethical considerations in their creation process, nor can we outsource creative processes to them. This would lead to game artists losing knowledge and research skills otherwise gained from acts of creativity and following the creation process. Therefore, keeping creative control remains an important factor in everyday work.

In summary, maintaining creative control is essential when integrating AI into artistic workflows. While generative AI can be a valuable tool for artists, providing much more exploration into variations, productivity, and flexibility, it still lacks the capacity to drive artistic direction. Humans are needed to ensure coherence, originality, and ethical integrity, as well as to solve artistic problems and add creative depth through elements such as visual storytelling. With proper artistic intent, critical thinking, and curation of outputs, we may see generative AI tools become assistants that help us create game worlds that are more interesting and meaningful than before.

6 Guidelines and recommendations

Versatile, technical and practical skills have been the backbone of game artist work, and it remains as such for now. With the addition of new types of tools, such as GenAI, the knowledge requirements for different tools and technologies may increase, at least in the short term. Know-how in the domain, mastery of techniques, and familiarity with existing tools enhance the ability to adapt to new GenAI workflows to save time and create innovations. Other than technical skills, artists are needed to spot the problems in generated outputs and to further modify the content, in other words an ‘artistic eye’ is required.

Similarly in the use of LLM’s, expertise is needed to find out if the AI model is hallucinating or pointing in the wrong direction. Foundation in art is not only very important for concept artists who are in charge of pushing the frontier, but also for more technical artists that wish to further utilize and edit AI generated content. However, GenAI is already strikingly good at creating artworks and human artists shouldn’t turn a blind eye to areas that might get devalued with automation. To combat job displacement, skills development in areas where GenAI cannot do the work needs to be capitalized on.

To understand what the current GenAI models bring to the table, game artists must delve deeper into experimentation and foundational knowledge for GenAI. First exploring creation processes and methods from other users are key to finding the way to the right pastures. Prompt engineering and prompting practices are just one part of this so-called user interface that is first presented to the user when interacting with GenAI. Comprehensive guides on keyword selection for prompting are easily available online and some tools offer automatic prompt enhancements and templates reducing experimentation time. However, careful selection of keywords remains important to guide the direction. And while prompting can be used to influence text-to-image generation to a large extent, randomness and limited finer control persists. Inpainting, outpainting and image-to-image features can add much to the generation and editing process, but developers are busy creating alternative

control methods that artists should be aware of. GenAI technologies such as ControlNet, IP-adapters and LoRa have been created to drive style and add more control mechanisms. User-made sketches and other images can be used to guide the generated content, while ‘plugins’ with pre-trained style can add better control without prompting and keywords. Exploring these are recommended as they show a way toward potential and powerful toolbelt additions, however easier accessibility and usability requires time. Thus, user creativity together with workarounds such as applying style in different steps of the process are needed now as the tools haven’t matured enough. But there is readily available, easy-to-use AI tools such as generative fill in Photoshop®, which already cater for real use cases that many enjoy.

In addition to the control methods, understanding GenAI model training and the resulting limitations can be considered as foundational knowledge. Currently, visual GenAI models lack the ability to do functional design or comprehend causality and context, limiting their use in tasks where pretty visual forms play a lesser role. These models also struggle to realize entirely novel content that hasn’t been added to training data beforehand. Furthermore, the quickly moving landscape sometimes presents challenges in unclear terms and conditions, thus requiring carefulness when considering commercial usage. And in the end, all things need to be taken in considerate amounts, even the use of GenAI as some fatigue can be seen from early adopters. And while the hype has calmed down, development is happening in the background, and surprising new technologies will continue to emerge. Social media or YouTube® follow to a favorite creative that utilizing these technologies can be a worthwhile investment for delivering the news without spending much effort yourself.

Although it’s relatively early in GenAI land, the benefits are already evident. Visual GenAI and LLM’s can enable artists by bridging skill gaps in areas such as concepting, digital painting, writing, coding, 3D and so forth. As a result, both studios and individuals with otherwise limited resources can take on more roles and tasks. With increased efficiency, content quality and quantity may improve, as long as effort is redirected rather than reduced. AI-assisted workflows in

tools like Midjourney™, Photoshop® and Invoke™ already hint at new creative workflows that are reshaping artistic production. Creating variations of existing concepts, exploring entirely new ideas or just filling in the blanks are strong use-cases for image generation. They automate digital art and concepting work for visual development, while unlocking new creative possibilities. A common critique is that AI models have been trained with image data and cannot generate something truly new. However, the ability to reference billions of images surpasses human memory and is one of the unique aspects of GenAI.

Equally important is acknowledging the possible risks of these technologies. Over-reliance on AI may impede creativity and skill development in game artists and other creatives. Whether its effects targets inexperienced artists more or not remain unclear, but taking shortcuts without understanding the fundamentals can be detrimental. On the other hand, artists may be forced to use GenAI to improve efficiency, potentially affecting their artistic motivation and sense of fulfilment from the creative process. As a result, artists may need to adapt, compromise on certain preferences and shift their focus to other aspects, ideally finding new sources of motivation in the process.

Another concern is the homogenization of art, where ‘everything looks the same.’ Using the same training data over and over again can lead to repetitive and uninspiring aesthetics. This is a consideration for companies, but also for artists. Without careful and thoughtful integration, markets may become saturated with mass-produced, low-effort content that lacks originality. So ‘good enough’ results should not become the new standard. And hopefully, reductions in workloads lead to increased creativity instead.

For this reason, creative control needs to remain with human artists and GenAI can serve as a powerful addition to the creative toolkit. Game artists must understand AI’s capabilities, conduct quality assurance and ensure that the content aligns with intended vision for the product. Since GenAI models remix existing training data, their creative ceiling is inherently limited. Artists must seek innovation beyond generated outputs, making skills like critical thinking, creative exploration and visual problem-solving essential at every stage of the

process. While GenAI can expand creative possibilities and enhance the ideation process, it is left for the artist to transform all those smaller ideas into something bigger, cohesive and original that has yet to appear in the training data.

7 Conclusion and limitations

This thesis set out to answer two research questions:

RQ1: What skills, fundamental knowledge or qualities are needed from game artists who use GenAI?

RQ2: Which steps, when using GenAI for visual creation require creative human input and guidance?

The aim of the first question was to explore the type of education and skills that should be considered for human artists accommodating generative AI to their workflows. Findings suggest that generative AI needs a guide, a human who can think creatively and critically, use their domain knowledge, technical know-how and artistic eye to shape its outputs into something more. The confines of what generative AI models produce must be pushed further, rather than settling for their default responses and the solutions must offer value beyond just the quality of brushstrokes, whether created by the artist or the AI.

The goal for generative AI assisted workflows remains the same as before, which is to craft a visually compelling story that connects with the multifaceted aspects of an entertainment product. Perhaps, in the end, not much has changed yet, as artists still need to rely on the same fundamental skills as before to make these creative refinements. However, as generative AI becomes more integrated into creative workflows, certain aspects in the creative field may become increasingly competitive as artists adapt to these evolving tools. Therefore, just purely neglecting their effects on efficiency among other things could lead to self-harm.

Humans must evaluate if outputs provided using generative AI are to the required standards. Creative direction for the process is needed from the beginning to determine what you generate, but further refinement and funneling of ideas require human vision at every step. Generative AI tools can function as an effective brainstorming partner and while their preserving and recovery of information is superior to that of humans, the relevance to the specific case

must be assessed. When generating references during the concepting stage, artists must be selective of what elements of the image contribute to a thematically appropriate feeling.

Limitations in this study include its focus on smaller game studios and a small sample size where most artists were from Finland. The interviewed artists all worked for smaller companies, which have been said to be more open to using generative AI tools compared to larger AA and AAA studios [62]. The aim of incorporating secondary sources was to provide insights from experts working on larger production.

Generative AI policies in major companies remain unclear, though big players have dedicated teams to research its use [3], [62]. While ongoing productions often adhere to established development practices, newly started productions may already utilize generative AI [61]. However, transparency on this topic will likely require some time [61], [62], Artist 4.

One of the interviewed artists was non-Finnish and working outside of Finland. Some cultural differences were noticeable, as AI-generated outputs were more acceptable to be used within the company and the colleagues even pushed for it. However, given the small sample size, this observation remains inconclusive. Nevertheless, cultural differences in GenAI use would be an interesting topic to explore.

Much of the existing research on generative AI and creativity examines its use in a very limited timeframe, often involving participants who are not professional artists. Which presents certain limitations, as these tools, AI models and workflows require domain knowledge time to be properly understood. In contrast, this study focused on working artists, all of whom had experience in the use of generative AI. Fully integrating AI into creative workflows will take time and while some aspects may not yet feel properly incorporated, generative AI is here to stay. The key is to ensure that it enhances human creativity, rather than compromising it.

References

[1] S. Schulhoff *et al.*, "The Prompt Report: A Systematic Survey of Prompting Techniques," 2024*, arXiv:2406.06608.*

[2] Stanford HAI, "AI Index." Accessed: Mar. 08, 2025. [Online]. Available: https://hai.stanford.edu/ai-index

[3] Keywords Studios, "Project AVA - GDC 2024 Talk with Stephen Peacock and Lionel Wood," YouTube, May 29, 2024. Accessed: Mar. 08, 2025. [Online Video]. Available: https://www.youtube.com/watch?v=MFGF2d6iMSk

[4] CD PROJEKT RED, "AnsweRED Podcast - Episode 13: AI vs Fine Arts: The Relationship Between Technology and Creativity," YouTube, Dec. 19, 2024. Accessed: Mar. 08, 2025. [Online Video]. Available: https://www.youtube.com/watch?v=p2sVFLhPPYo

[5] N. Inie, J. Falk, and S. Tanimoto, "Designing Participatory AI: Creative Professionals' Worries and Expectations about Generative AI," 2023, *arXiv:2303.08931*.

[6] L. Tredinnick and C. Laybats, "Black-box creativity and generative artificial intelligence," *Bus. Inf. Rev.*, vol. 40, no. 3, pp. 98–102, Sep. 2023, doi: 10.1177/02663821231195131.

[7] E. Zhou and D. Lee, "Generative artificial intelligence, human creativity, and art," *PNAS Nexus*, vol. 3, no. 3, p. pgae052, Mar. 2024, doi: 10.1093/pnasnexus/pgae052.

[8] P. Cotroneo and J. Hutson, "Generative AI tools in art education: Exploring prompt engineering and iterative processes for enhanced creativity," *Metaverse*, vol. 4, no. 1, p. 14, Jun. 2023, doi: 10.54517/m.v4i1.2164.

[9] K. K. Kaljun and J. Kaljun, "Enhancing Creativity in Sustainable Product Design: The Impact of Generative AI Tools at the Conceptual Stage," in *2024 47th MIPRO ICT and Electronics Convention (MIPRO)*, May 2024, pp. 451–456, doi: 10.1109/MIPRO60963.2024.10569541.

[10] Y. Tang, N. Zhang, M. Ciancia, and Z. Wang, "Exploring the Impact of AI-generated Image Tools on Professional and Non-professional Users in the Art and Design Fields," 2024*, arXiv:2406.10640.*

[11] A. R. Doshi and O. P. Hauser, "Generative artificial intelligence enhances creativity but reduces the diversity of novel content," 2024, *arXiv:2312.00506.*

[12] S. Wadinambiarachchi, R. M. Kelly, S. Pareek, Q. Zhou, and E. Velloso, "The Effects of Generative AI on Design Fixation and Divergent Thinking," in *Proceedings of the CHI Conference on Human Factors in Computing Systems*, May 2024, pp. 1–18, doi: 10.1145/3613904.3642919.

[13] B. Mifsud, "An investigation into the factors that influence the buying process of online role-playing gamers," 2016. Accessed: Mar. 11, 2025. [Online]. Available: https://www.um.edu.mt/library/oar/handle/123456789/14909

[14] D. Gattig, B. Marder, and J. Kietzmann, "The Avatar's New Clothes: An Examination of the Motivations to Purchase Cosmetic Virtual Items in Free-to-Play Games (A Structured Abstract)," 2017, pp. 327–332, doi: 10.1007/978-3-319-45596-9_65.

[15] CareerExplorer, "What does a game artist do?" Accessed: Mar. 08, 2025. [Online]. Available: https://www.careerexplorer.com/careers/game-artist/

[16] S. Wall, "What skills do you need to be a game artist," CG Spectrum. Accessed: Mar. 08, 2025. [Online]. Available: https://www.cgspectrum.com/blog/what-skills-do-you-need-to-be-a-game-artist

[17] J. Oppenlaender, "The Creativity of Text-to-Image Generation," in *Proceedings of the 25th International Academic Mindtrek Conference*, Nov. 2022, pp. 192–202, doi: 10.1145/3569219.3569352.

[18] R. Beaumont, "LAION-5B: A New Era of Open Large-Scale Multi-Modal Datasets," LAION. Accessed: Mar. 11, 2025. [Online]. Available: https://laion.ai/blog/laion-5b

[19] Juego Studios, "A Detailed Guide On Game Asset Creation & Its Workflow," Juego Studio. Accessed: Mar. 08, 2025. [Online]. Available: https://www.juegostudio.com/blog/game-asset-creation

[20] Frozenbyte Wiki, "3D Asset Workflow," Frozenbyte Wiki. Accessed: Mar. 08, 2025. [Online]. Available: https://wiki.frozenbyte.com/index.php/3D_Asset_Workflow

[21] Perforce Software, "Overview of Game Asset Creation," Accessed: Mar. 08, 2025. [Online]. Available: https://www.perforce.com/blog/vcs/game-asset-creation-workflow#workflow-01

[22] A. Fernandes-Marcos, P. Branco, and J. Carvalho, "The Computer Medium in Digital Art's Creative Process," presented at the 2009 International Conference on Digital Arts and Culture, 2009, doi: 10.4018/9781605663524.ch001.

[23] Mages Institute, "Key Skills Required to Become an Expert Game Artist," Accessed: Mar. 08, 2025. [Online]. Available: https://mages.edu.sg/blog/key-skills-required-to-become-an-expert-game-artist/

[24] R. K. Sawyer, "The iterative and improvisational nature of the creative process," *Journal of Creativity*, vol. 31, p. 100002, Dec. 2021, doi: 10.1016/j.yjoc.2021.100002.

[25] R. K. Sawyer, *Explaining Creativity: The Science of Human Innovation*, 2nd ed. New York, NY, USA: Oxford University Press, 2012, pp. xi, 555.

[26] M. Runco and G. Jaeger, "The Standard Definition of Creativity," *Creativity Research Journal*, vol. 24, pp. 92–96, Jan. 2012, doi: 10.1080/10400419.2012.650092.

[27] P. Kampylis and J. Valtanen, "Redefining Creativity: Analyzing Definitions, Collocations, and Consequences," *Journal of Creative Behavior*, vol. 44, pp. 191–214, Sep. 2010, doi: 10.1002/j.2162-6057.2010.tb01333.x.

[28] C. Walia, "A Dynamic Definition of Creativity," *Creativity Research Journal*, vol. 31, no. 3, pp. 237–247, Aug. 2019, doi: 10.1080/10400419.2019.1641787.

[29] M. Boden, "Computer Models of Creativity," *AI Magazine*, vol. 30, no. 3, pp. 23–34, Jul. 2009, doi: 10.1609/aimag.v30i3.2254.

[30] L. Zhang, A. Rao, and M. Agrawala, "Adding Conditional Control to Text-to-Image Diffusion Models," 2023, *arXiv:2302.05543.*

[31] C. Smith, B. McGuire, T. Huang, and G. Yang, "The History of Artificial Intelligence," University of Washington, 2006. Accessed: Mar. 23, 2025. [Online]. Available: https://courses.cs.washington.edu/courses/csep590/06au/projects/history-ai.pdf

[32] C. Stryker and E. Kavlakoglu, "What Is Artificial Intelligence (AI)?," IBM. Accessed: Mar. 09, 2025. [Online]. Available: https://www.ibm.com/think/topics/artificial-intelligence

[33] C. Stamford, "Gartner 2024 Hype Cycle for Emerging Technologies Highlights Developer Productivity, Total Experience, AI and Security," Gartner. Accessed: Mar. 09, 2025. [Online]. Available: https://www.gartner.com/en/newsroom/press-releases/2024-08-21-gartner-2024-hype-cycle-for-emerging-technologies-highlights-developer-productivity-total-experience-ai-and-security

[34] J. McCormack, M. T. Llano, S. J. Krol, and N. Rajcic, "No Longer Trending on Artstation: Prompt Analysis of Generative AI Art," 2024*, arXiv:2401.14425.*

[35] A. Burkov, *The Hundred-Page Machine Learning Book*. Andriy Burkov, 2019, pp. 3, 62–66.

[36] J. Ho, A. Jain, and P. Abbeel, "Denoising Diffusion Probabilistic Models," 2020, *arXiv:2006.11239.*

[37] D. P. Kingma and M. Welling, "Auto-Encoding Variational Bayes," 20*22* arXiv:1312.6114.

[38] D. Bergmann and C. Stryker, "What is a Variational Autoencoder?," IBM. Accessed: Mar. 09, 2025. [Online]. Available: https://www.ibm.com/think/topics/variational-autoencoder

[39] R. Rombach, A. Blattmann, D. Lorenz, P. Esser, and B. Ommer, "High-Resolution Image Synthesis with Latent Diffusion Models," 2022, *arXiv:2112.10752*. Accessed: Nov. 16, 2024. [Online]. Available: http://arxiv.org/abs/2112.10752

[40] R. Suvorov *et al.*, "Resolution-robust large mask inpainting with Fourier convolutions," 2021, *arXiv:2109.07161.*

[41] Huggingface, "Inpainting." Accessed: Mar. 9, 2025. [Online]. Available: https://huggingface.co/docs/diffusers/v0.32.2/using-diffusers/inpaint

[42] Y. Wang, "Stable Diffusion 3 Medium Fine-tuning Tutorial," Stability AI. Accessed: Mar. 9, 2025. [Online]. Available: https://stability.ai/learning-hub/stable-diffusion-3-medium-fine-tuning-tutorial

[43] E. J. Hu *et al.*, "LoRA: Low-Rank Adaptation of Large Language Models," 2021, *arXiv:2106.09685.*

[44] Civitai, "The Ultimate Guide to ControlNet (Part 1)," Civitai Education. Accessed: Mar. 9, 2025. [Online]. Available: https://education.civitai.com/civitai-guide-to-controlnet/

[45] H. Ye, J. Zhang, S. Liu, X. Han, and W. Yang, "IP-Adapter: Text Compatible Image Prompt Adapter for Text-to-Image Diffusion Models," 2023, *arXiv:2308.06721.*

[46] K. Mehreen, "Using LoRA in Stable Diffusion," MachineLearningMastery.com. Accessed: Mar. 9, 2025. [Online]. Available: https://www.machinelearningmastery.com/using-lora-in-stable-diffusion/

[47] M. Zhong *et al.*, "Multi-LoRA Composition for Image Generation," 2024, *arXiv:2402.16843.*

[48] E. Deng, "Midjourney Prompt Guide: From First Steps to Masterpieces," AI Chronicler. Accessed: Mar. 9, 2025. [Online]. Available: https://aichronicler.com/midjourney-prompt-guide/

[49] X. Zhang and W. Liu, "Boosting Architectural Generation via Prompts: Report," 2024, *arXiv:2404.15971.*

[50] R. Po *et al.*, "State of the Art on Diffusion Models for Visual Computing," 2024, *arXiv:2310.07204*, Oct. 11, 2023. Accessed: Nov. 16, 2024. [Online]. Available: http://arxiv.org/abs/2310.07204

[51] Midjourney, "Midjourney TM." Accessed: Mar. 9, 2025. [Online]. Available: https://www.midjourney.com/home

[52] Stability AI, "Stability AI." Accessed: Mar. 9, 2025. [Online]. Available: https://stability.ai

[53] CivitAI, "Civitai: The Home of Open-Source Generative AI." Accessed: Mar. 9, 2025. [Online]. Available: https://civitai.com/

[54] R. Rodriguez, "Top 6 Best Stable Diffusion UI 2024." Accessed: Mar. 9, 2025. [Online]. Available: https://www.aiarty.com/stable-diffusion-guide/best-stable-diffusion-ui.htm

[55] Adobe, "Adobe AI." Accessed: Mar. 9, 2025. [Online]. Available: https://www.adobe.com/ai/overview.html

[56] OpenAI, "OpenAI." Accessed: Mar. 9, 2025. [Online]. Available: https://openai.com/

[57] J. A. Holton, "Grounded Theory as a General Research Methodology," Grounded Theory Review. Accessed: Mar. 16, 2025. [Online]. Available: https://groundedtheoryreview.com/2008/06/30/grounded-theory-as-a-general-research-methodology/

[58] B. G. Glaser, "The Constant Comparative Method of Qualitative Analysis," *Social Problems*, vol. 12, no. 4, pp. 436–445, Apr. 1965, doi: 10.2307/798843.

[59] T. McKenzie, "A Beautiful Roman Villa Made With Disco Diffusion 5.2," 80.lv. Accessed: Mar. 10, 2025. [Online]. Available: https://80.lv/articles/a-beautiful-roman-villa-made-with-disco-diffusion-5-2/

[60] OpenAI, "openai/whisper," GitHub repository, Mar. 10, 2025. [Online]. Available: https://github.com/openai/whisper

[61] XR AI Spotlight, "The Truth of Using Gen AI for Game Development," YouTube, Apr. 16, 2024. Accessed: Mar. 10, 2025. [Online Video]. Available: https://www.youtube.com/watch?v=FopZgptbvHA

[62] XR AI Spotlight, "An Insider Look at the Impact of AI on Game Development," YouTube, Jun. 19, 2024. Accessed: Mar. 10, 2025. [Online Video]. Available: https://www.youtube.com/watch?v=ED7Ukx5aB8k

[63] J. Kemppainen, "Echoes of Somewhere." Accessed: Mar. 10, 2025. [Online]. Available: https://echoesofsomewhere.com

[64] FZDSCHOOL and F. Zhu, "Design Cinema - Episode 110 - What AI Cannot Do," YouTube, Apr. 13, 2024. Accessed: Mar. 10, 2025. [Online Video]. Available: https://www.youtube.com/watch?v=QTj1Y4JW-KI

[65] M. Whiteside, J. Mills, and J. Mccalman, "Using Secondary Data for Grounded Theory Analysis," *Australian Social Work*, vol. 65, no. 4, pp. 504–516, Dec. 2012, doi: 10.1080/0312407X.2011.645165.

[66] "Stable Diffusion Prompt: A Definitive Guide - Stable Diffusion Art." Accessed: Mar. 10, 2025. [Online]. Available: https://stable-diffusion-art.com/prompt-guide/

[67] Discord, "Discord Servers - Home." Accessed: Mar. 10, 2025. [Online]. Available: https://discord.com/servers

[68] C. Roger, "Roger Clarke's Innovation Diffusion Theory." Accessed: Mar. 10, 2025. [Online]. Available: https://www.rogerclarke.com/SOS/InnDiff.html

[69] A. Chandrasekaran, "Hype Cycle for Generative AI 2024," Gartner. Accessed: Mar. 18, 2025. [Online]. Available: https://www.gartner.com/en/articles/hype-cycle-for-genai

[70] Adobe, "#ProjectTurntable | Adobe MAX Sneaks 2024 | Adobe," YouTube, Oct. 16, 2024. Accessed: Mar. 11, 2025. [Online Video]. Available: https://www.youtube.com/watch?v=gfct0aH2COw

[71] Adobe, "#ProjectPerfectBlend | Adobe MAX Sneaks 2024 | Adobe," YouTube, Oct. 16, 2024. Accessed: Mar. 11, 2025. [Online Video]. Available: https://www.youtube.com/watch?v=xuPd0ZZa164

[72] School of Visual Arts, "Crisis or Opportunity: Generative AI and the Education of Artists and Designers," YouTube, May 8, 2024. Accessed: Mar. 11, 2025. [Online Video]. Available: https://www.youtube.com/watch?v=M-jLt0sNbKY

[73] A. A. Alegaonkar and M. A. Avachat-Shirke, "Is Artificial Intelligence Killing Artistic Skills in Designers?," *ShodhKosh Journal of Visual and Performing Arts*, vol. 4, no. 2SE, Art. no. 2SE, Sep. 2023, doi: 10.29121/shodhkosh.v4.i2SE.2023.484.

[74] Z. Cui, M. Demirer, S. Jaffe, L. Musolff, S. Peng, and T. Salz, "The Effects of Generative AI on High-Skilled Work: Evidence from Three Field Experiments with Software Developers," Social Science Research Network, Rochester, NY, Sep. 5, 2024, doi: 10.2139/ssrn.4945566.

[75] "Artificial Intelligence and Intellectual Property – Part II: Copyright | United States Senate Committee on the Judiciary." Accessed: Mar. 11, 2025. [Online]. Available: https://www.judiciary.senate.gov/artificial-intelligence-and-intellectual-property_part-ii-copyright

[76] J. Haase and P. H. P. Hanel, "Artificial Muses: Generative Artificial Intelligence Chatbots Have Risen to Human-Level Creativity," *Journal of Creativity*, vol. 33, no. 3, p. 100066, Dec. 2023, doi: 10.1016/j.yjoc.2023.100066.

[77] V. Guljajeva, M. C. Sola, and I. J. Clarke, "Artistic Strategies to Guide Neural Networks," 2023, *arXiv:2307.07521.*

[78] P. Quennell, "From Today Painting Is Dead," *The New York Times*, Apr. 23, 1972. Accessed: Mar. 11, 2025. [Online]. Available: https://www.nytimes.com/1972/04/23/archives/from-today-painting-is-dead.html

[79] B. A. Nijstad, C. K. W. De Dreu, E. F. Rietzschel, and M. Baas, "The Dual Pathway to Creativity Model: Creative Ideation as a Function of Flexibility and Persistence," *European Review of Social Psychology*, vol. 21, no. 1, pp. 34–77, Mar. 2010, doi: 10.1080/10463281003765323.

[80] T. T. Eapen, D. J. Finkenstadt, J. Folk, and L. Venkataswamy, “How Generative AI Can Augment Human Creativity,” *Harvard Business Review*, Jul. 2023. [Online]. Available: https://hbr.org/2023/07/how-generative-ai-can-augment-human-creativity

[81] P. J. Silvia, “Discernment and Creativity: How Well Can People Identify Their Most Creative Ideas?,” *Psychology of Aesthetics, Creativity, and the Arts*, vol. 2, no. 3, pp. 139–146, Aug. 2008, doi: 10.1037/1931-3896.2.3.139.

[82] D. Eagleman and A. Brandt, *The Runaway Species: How Human Creativity Remakes the World*. New York, NY, USA: Catapult, 2017, pp. 21–26.

Interview schedule

Basics
What is your current role? (Graphics, 3D, 2D, something else?) What kind of tasks are you doing?
How might a creative task start at work? Do you make the idea yourself, does someone give it to you?
Can you describe a typical workflow and its steps?
How did you come to this point, school, work experience? What has influenced your path? How many years have you been in the industry?
Generative AI and workflows
When was the first time you tested GenAI tools yourself? Which tool?
What other GenAI tools have you been experimenting with?
Which GenAI tools have become part of your toolset or workflows and why?
What features are you using mostly from that? Which type of work have you done with them?
What type of workflows are you using?
Is it common to use it to generate many ideas before picking the best ones?
Do you feel that they have improved efficiency? Can you describe how or give an example?
Has the quality of your art output improved somehow?
Have they made work more enjoyable or not? In what way?
How did you start including GenAI tools to your workflows? What changes did you make after? Phases of development of the workflow. Is there something you would do differently next time?

What are the coolest or advanced workflows you have experimented with or come across?
Do you have any other workflows that come to mind that are useful to you? (If not answered yet)
Human collaboration with GenAI tools, creativity
For game artists that work with GenAI, what kind of skills do you think are important to keep on learning?
Are there some skills that feel less required now after GenAI came around?
When working with generative AI, which steps do you think require creative input from a human? Where can a human influence and excel the most to achieve the best outcome?
What processes come to mind that require human touch before/during/after the use of GenAI?
What aspects of GenAI make it appealing to you (or game studios) What is then less appealing?
What problems do you see with GenAI currently, what have felt hard to do or achieve? What about in the future?
What benefits or risks do you see for humans in the future? Do you see risks in creativity?
Company related, IPR
Are there any guidelines or policies in place for the use of GenAI at your workplace?
Do you see any IPR risks and how would you avoid those?