

Co-Creativity: Potential of GenAI in Creative Processes.

Opportunities and risks for the creative process in professional photography

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Abstract

The integration of generative artificial intelligence (GenAI) in the field of professional photography signifies a turning point in professional image creation. This thesis systematically analyses how GenAI tools can be incorporated into the creative process of professional photographers, highlighting both the potential and challenges of this technological innovation and the co-creative approach. Through a combination of literature review, expert interviews, and a case study, the opportunities and risks of GenAI in creative processes are examined, and a guideline for practical integration into the photographic creative process is developed. The results indicate that GenAI can enhance creativity by opening new perspectives and improving efficiency in the workflow. However, this technology also raises questions about authenticity and ethical challenges, particularly concerning the preservation of traditional photographic skills.

Kurzfassung

Die Integration von generativer künstlicher Intelligenz (GenAI) im Bereich der professionellen Fotografie markiert einen Wendepunkt in der professionellen Bildgestaltung. Diese Arbeit analysiert systematisch, wie GenAI-Tools in den Kreativprozess von professionellen Fotograf:innen eingebunden werden können, und beleuchtet sowohl deren Potenziale als auch die Herausforderungen dieser technologischen Innovation und des ko-kreativen Ansatzes. Durch eine Kombination aus Literature Review, Experteninterviews und einer Fallstudie werden Chancen und Risiken von GenAI in Kreativprozessen untersucht und ein Leitfaden zur praktischen Integration in den fotografischen Kreativprozess entwickelt. Die Ergebnisse zeigen, dass GenAI die Kreativität durch das Eröffnen neuer Perspektiven und der Effizienzsteigerung im Arbeitsprozess fördern kann. Jedoch bringt diese Technologie auch Fragen zu Authentizität und ethischen Herausforderungen mit sich, insbesondere hinsichtlich des Erhalts traditioneller fotografischer Fertigkeiten.

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1 Introduction

1.1 Subject of this Work

“Manipulation and mimicry of life have always been the subject and a part of artistic creation” (Gülaçti & Kahraman, 2021, p. 247). With the emergence of generative artificial intelligence (GenAI) tools, skilled at imitating human behaviour and particularly adept in generating content such as images and text, the realm of creative industries is experiencing significant transformations. GenAI bridges the gap between creatives and a variety of resources, introducing new forms of content and creative methods (Gülaçti & Kahraman, 2021, pp. 247–248). Thus, the collaboration of humans and GenAI in creative processes presents great potential. The concept of co-creativity introduces this form of collaborative creative work by describing “the ability for human and AI to co-live and co-create by playing to each other’s strengths to achieve more” (Wu et al., 2021, p. 171). However, the use of GenAI and its integration into the creative process faces negative biases and societal scepticism. “There have been a lot of discussions about the development of AI technologies and the challenges caused by AI such as job replacement and ethical issues” (Wu et al., 2021, p. 172). These concerns also apply to the field of professional photography resulting in new challenges and possibilities for professionals in this industry. This thesis explores the transformative role of GenAI in the creative process of professional photography. It focuses on the potential of GenAI to augment, rather than compete, human creativity, while also examining the challenges and risks associated with this technological evolution. The study particularly investigates how GenAI tools can be effectively integrated into photographers' workflows to enhance their creativity. It also seeks to understand the balance between new technological advancements and the preservation of traditional photographic skills in the evolving landscape of professional photography. This is achieved through a literature review investigating the current state of research, conducting qualitative semi-structured expert interviews with photographers as industry insiders and studying a GenAI-enhanced photographic creative process in a qualitative case study.

1.2 Research Questions

To sufficiently explore the subject of this thesis the following research questions have been established:

Q1: How can GenAI tools augment human creativity?

Q2: How can GenAI tools be effectively incorporated into the creative process of professional photographers to enhance their creativity?

Q3: How does the use of GenAI affect the way photographers approach their work?

Q4: What are the potential chances and risks of incorporating GenAI in the creative process of photographers?

The research question Q1 explores the potential of GenAI tools to enhance human creativity. The exploration of this question is motivated by the need to comprehend the extent to which GenAI can contribute to the creative process, potentially leading to unprecedented forms of visual expression. The second research question Q2 focuses on the practical integration of GenAI tools within the workflow of professional photographers. This question is driven by the desire to identify strategies and methods for effectively utilizing the capabilities of GenAI in a commercial environment. Research questions Q3 explores the transformative impact of GenAI on photographers' approach to their craft. This question serves to understand how the introduction of GenAI tools alters traditional photography practices, decision-making processes, and the overall creative approach. It seeks to uncover the shifts in mindset and technique of photographers. The fourth research question Q4 addresses the broader implications of incorporating GenAI in the realm of professional photography. It seeks to evaluate future chances and risks for photographers in the professional domain. This inquiry provides insights into how GenAI might reshape industry norms and influence market dynamics.

1.3 Methodology

To thoroughly answer the research questions the methodologies of literature review, qualitative semi-structured expert interviews and case study were chosen. A qualitative research approach was found to be adequate since this thesis explores a novel phenomenon with the aim of developing a guideline on GenAI-enhanced creative processes in photography. Openly posed research questions typically are explored using semi-structured data collection methods on a small number of research units aiming to describe a subject matter and develop a theory. The collected data is analysed interpretatively (Döring & Bortz, 2016, p. 184-185).

First the literature review was conducted to establish the foundation for this thesis by searching, reviewing and evaluating contemporary and relevant literature in the fields of creativity, creative processes, generative artificial intelligence, co-creativity and professional photography. The aim of the literature review is to assess the state of research on the mentioned topics to gain sufficient knowledge for further research (Döring & Bortz, 2016, pp. 186–187). Research question Q1 is to be answered using the method of literature review.

Based on the findings of the literature review, qualitative semi-structured expert interviews were developed and conducted with 7 professional photographers during a time span of two months. Qualitative interviews were found suitable for answering the research questions Q2 to Q4 of this thesis as this method allows to pose open questions which enables the interviewee to answer freely and control the interview direction (Döring & Bortz, 2016, p. 365). The interviews were designed as a semi-structured interview. The underlying interview guideline offers a basis structure ensuring the comparability of the answers while simultaneously providing enough freedom to further explore upcoming topics (Döring & Bortz, 2016, p. 372). Since one goal of these interviews is to gather insights on the creative process of photographers, which can differ individually, the flexibility and potential of qualitative semi-structured interviews for exploring various directions make them an ideal approach to acquire comprehensive insights. For the analysis of the interview transcripts the qualitative content analysis was chosen. This analysis method involves extracting substantive statements from qualitative textual material by forming categories (Döring & Bortz, 2016, p. 602). This method is particularly for evaluating qualitative data from transcripts of semi-structured interviews. The analytical approach was conducted according to the framework of Mayring & Fenzl (2019, pp. 637–641) involving the systematic categorization of the transcripts through inductive category formation. The insights from the interviews were synthesized into a guideline that outlines the creative process in professional photography, incorporating the use of GenAI tools.

This guideline is the basis for the subsequent qualitative case study. A qualitative case study is suitable for comprehensively investigating a single event or process and primarily has theory-generating purposes (Döring & Bortz, 2016, p. 215). Hence, this method was used to answer research questions Q3 and Q4 by testing and evaluating the developed theoretical guideline and the co-creative photographic process.

1.4 Relevance of this Study

As identified by Wingström, Hautala, & Lundman (2022, p. 2) the inclusion of AI creativity into current creativity research is necessary. This thesis contributes to this field by exploring the integration of GenAI-enhanced creative processes and co-creativity within the realm of professional photography. The application of GenAI tools in creative industries is a relatively recent phenomenon, having gained attention only in the past two years. The literature review for this thesis predominantly revealed studies focusing on AI, co-creativity, and creative processes in arts, highlighting a gap in research specifically tailored to professional photography. This thesis addresses this gap by examining the practical application of industry relevant GenAI technologies and tools, thereby expanding the understanding of co-creativity in the context of professional photography.

1.5 Structure

The outline of this thesis encompasses seven chapters introducing the findings of the literature review regarding the topics of creativity, creative processes, GenAI, and the concept of co-creativity first, followed by the findings of the qualitative expert interviews and subsequent case study.

Therefore, chapter 2 explains the concept of creativity. This section not only elaborates on the definition of creativity but also dissects the creative process both in a general context and specifically within professional photography. This foundational comprehension of creativity establishes critical understanding for the subsequent interaction of GenAI with human creativity.

Chapter 3 offers a detailed overview of GenAI with regard to its relevance for professional photography. It discusses various models and technologies that drive GenAI, such as GANs, diffusion models, and transformer-based models, with a particular emphasis on tools like Midjourney and ChatGPT.

Chapter 4 bridges GenAI and creative processes. It examines the concept of co-creativity and investigates how GenAI can augment and transform the traditional creative process, offering new perspectives and methodologies.

Chapter 5 presents empirical insights from professional photographers. Through qualitative semi-structured expert interviews and content analysis, this chapter explores the practical implications and perceptions of GenAI in the photography industry.

Chapter 6 showcases the practical application of the insights derived from the interviews. It describes a new GenAI-enhanced creative process for photographers, which is illustrated through a detailed case study.

Chapter 7 concludes the thesis by providing a critical analysis of the research findings in relation to the initial research questions, offering a nuanced understanding of the implications of GenAI in creative processes for professional photography. It summarizes the key findings and contributions of the research and proposes potential avenues for future studies in this rapidly evolving field.

1.6 Delimitation

This thesis specifically focuses on the application of GenAI tools within the realm of professional photography, particularly in commercial settings where photographers engage with clients. The study delves into how these tools are being integrated into the creative processes of commercial photography projects. It's important to note that this research does not extend to the realm of artistic photography, where the creative process and application of GenAI tools may differ significantly due to the nature of artistic expression and the lack of client-based constraints. The intent is to explore and understand the dynamics, challenges, and opportunities that arise when integrating GenAI in a client-driven professional environment, which has its own unique set of requirements and expectations.

1.7 Limitations

The rapidly advancing field of GenAI confines the scope of this thesis to a specific timeframe, focusing on the tools and technologies relevant during July to September 2023. Consequently, the findings and insights presented correspond to the state of GenAI tools as they existed during this time period.

2 Creativity

To comprehensively explore how GenAI enhances human creativity, it is essential to define and understand the concept of creativity first. This chapter provides an overview of different perspectives on creativity as discussed in literature, establishing a foundational understanding for this thesis. With the definition of creativity elaborated, the chapter will delve into the nuances of the creative process within the field of arts. This exploration is critical to gain a deeper insight into the specific character of the creative process in photography, which is the subject of this thesis. This approach forms the basis of a deep understanding of how GenAI interacts with and enhances the human creativity in the photographic domain.

2.1 Definition of Creativity

Through the course of history many different perspectives on the definition of creativity have been established. Motivation, divergent thinking, novelty and usefulness, complex phenomenon and novel ideas through experimentation are some of them (Walia, 2019, p. 1). Additionally, numerous models and frameworks aiming to conceptualize creativity have emerged over the past decades. The much quoted paper of Rhodes (1961) laid the groundwork for further studies in creativity frameworks by establishing the Four P's of creativity – person, process, press and product. Rhodes (1961, p. 305) defines creativity as a result of the 4P's:

“The word creativity is a noun naming the phenomenon in which a person communicates a new concept (which is the product). Mental activity (or mental process) is implicit in the definition, and of course no one could conceive of a person living or operating in a vacuum, so the term press is also implicit.”

Each of the Four P's offers a unique viewpoint on creativity. Person comprises characteristics of creative individuals, such as personality traits or domain-relevant knowledge. Some individuals show more creative qualities than others. Process stands for the mental activities that are executed by people when operating creatively, such as thinking, learning, or communicating. Environmental forces and their relation to humans from both external and internal sources are considered as press. The outcome of a creative process is understood as product. A product originates when an idea is transformed into a tangible form (Rhodes, 1961, pp. 307–309; Sternberg & Karami, 2022, p. 2).

Further studies on creativity frameworks shed light on creativity in various contexts and differentiate additional aspects to the 4P's of creativity. Kaufman & Beghetto (2009) proposed the Four C Model of creativity, that represents "a developmental trajectory of creativity in a person's life". Mini-C, Little-C, Pro-C and Big-C are the stages creators or creative thinkers pass through their progress and growth. Glăveanu (2013) introduced the 5 A's Framework, developing the terms actor, action, artefact, audience and affordances for describing creativity. This Framework is grounded in literature from sociocultural and ecological psychology. The 7C framework from Lubart & Thornhill-Miller (2020) introduces creators, creating, collaborations, contexts, creations, consumption, and curricula as aspects of creativity. Sternberg & Karami (2022) describe the 8P framework encompassing the terms purpose, person, press, problem, process, product, propulsion, and public.

Despite the multitude of literature, studies, frameworks and perspectives on the definition of creativity, there seems to be a general consensus that the creation of novel and useful ideas and products must be involved (Walia, 2019, p. 1). Boden (2009, p. 24) defines creativity as "the ability to generate novel, and valuable, ideas." She assigns valuable many meanings such as interesting, useful, beautiful, or simple. Boden (2009) does not distinguish the concept of idea from the concept of product, as Rhodes (1961) does. She encompasses non-tangible and tangible ideas under that term such as concepts, theories, as well as artifacts like images or sculptures. The aspect of novelty can be differentiated in two ways: psychological and historical. "A psychological novelty, or P-creative idea, is one that's new to the person who generated it. It doesn't matter how many times, if any, other people have had that idea before. A historical novelty, or H-creative idea, is one that is P-creative and has never occurred in history before" (Boden, 2009, p. 24). Whereas Walia (2019, p. 2) defines novel as original.

According to Boden (1998, p. 348) there are three types of creativity for generating novel ideas. These three types include combinational, exploratory and transformational creativity. The first type, the combinational creativity, involves the novel combination of familiar ideas, meaning the new association of two ideas with a similar conceptual structure. An example would be the development of analogies. Exploratory and transformational creativity are closely interconnected. Exploratory creativity is about generating new ideas through the investigation of existing conceptual spaces, often leading to novel and unexpected ideas. On the other hand, transformational creativity involves altering one or more aspects of these conceptual spaces to create structures that were previously unimaginable. Many professionals, such as artists engage primarily in exploratory creativity. They inherit a cultural style of thinking, explore and slightly modify the space to discover its boundaries and full potential. However, some individuals transform these accepted conceptual spaces significantly by changing, removing, or adding new

dimensions. This transformation allows for the emergence of ideas that were once impossible within the original framework. The connection between the old and the new conceptual spaces might not be immediately clear, if the transformation was too radical. This could result in initial rejection or a prolonged period before the connection between these two spaces is acknowledged and accepted (Boden, 1998, pp. 348–349).

2.2 Creative Process

In addition to generating ideas, creative work subsequently involves implementing these ideas, a process that demands the same amount of creativity. The results of this creative effort are often evaluated based on the manufactured product (Mumford, Scott, Gaddis, & Strange, 2002, p. 708). This product can be of physical, mental, or emotional construction. However, to creators the creative process itself can be even more interesting than the finished product (Walia, 2019, pp. 2–4).

According to Mumford et al. (2002, p. 707) there are two main processes when working creatively: “(a) creative processes or the activities underlying initial idea generation and (b) innovation processes or the activities underlying the implementation of new ideas.” For the subject of this thesis, the process (a) equals the ideation and visualization phase, and process (b) equals the production and post-processing phase (see chapter 5.2.1).

Creative work implicates finding solutions to complex and ill-defined problems, which is effectively accomplished through the application of systematic methods (Mumford et al., 2002, p. 708). New ideas are generated in the mind of the creator (Walia, 2019, p. 4). That is why activities to define and construct the problem space are a key component of creative thinking. To achieve this, it's essential to gather information about the problem to develop a comprehensive understanding of it. This process enables the creation of novel ideas by recombining and transforming the collected information. Following the generation of new ideas comes the evaluation and selection of them. During this process, the initial ideas that are considered potentially useful are further refined and extended which allows for a successful implementation. To efficiently gather, manage and evaluate information, individuals require a certain level of expertise and often complex problems require different forms of expertise from multiple individuals. That results in creative endeavours being “collaborative efforts of differing composition, duration, and intensity depending on the nature of the problem at hand” (Mumford et al., 2002, p. 708). Walia (2019, p. 4) argues that experiences and knowledge form the foundation of creativity, but imagination is the important factor of producing novel ideas. Thus, the creative process is an interplay of knowledge, experiences and imagination. Moreover, it is a demanding, resource-intensive and

time-consuming undertaking, that requires high levels of motivation, attention and the ability to cope with negative feedback and stress (Mumford et al., 2002, p. 709).

The generation and implementation of ideas poses an iterative and uncertain effort. Therefore, to reduce the risk of uncertainty in the generation, development, and implementation of a viable idea, it is advised to take measures of goal setting and demonstration projects. The inherent risk of creative work entails the need to experiment and tolerate failure. In transforming creative ideas into tangible products, it's crucial to understand the context and environment of the creative process, both in the ideation and implementation phases. The creative process and its product need to engage with their domain to be considered successful (Mumford et al., 2002, p. 709; Walia, 2019, p. 3).

Visual arts have been traditionally considered to be a major domain of creativity (Botella et al., 2013, p. 161). Mace & Ward (2002) and Botella et al. (2013) describe the creative process in the domain of art. Mace & Ward (2002, p. 183) divide the creative process in four phases: (1) art work conception, (2) idea development, (3) making the artwork & idea development, and (4) finishing the artwork. Botella et al. (2013, pp. 166–167) on the other hand established a framework of six stages and relating each step to the contexts of the material and social world. As portrayed in Figure 1, the six stages are: (1) general idea or vision, (2) documentation / reflection, (3) first sketches, (4) testing forms or ideas, (5) provisional object / draft, (6) final work / series.

Both models start with an initial phase of conception and upcoming of ideas. The conception of an idea can be triggered by a clear vision, like images, sights or sounds, or as a vague concept or feeling. These initial ideas are getting clearer and more concrete through the next stages of the creative process (Botella et al., 2013, p. 166; Mace & Ward, 2002, p. 182). Creators engage in explicit and implicit idea conception activities, whereby explicit being consciously and deliberately performed activities and implicit being unconscious cognitive activities. Throughout the creative process the creator undergoes several selection processes for identifying potentially viable ideas and deciding in which direction to proceed with the artwork (Mace & Ward, 2002, p. 184). Following the initial ideation phase, the generated and selected idea(s) will be further developed and refined. This phase can have several cycles of repetition before moving on in the process. The idea development phase of the model by Mace & Ward (2002, pp. 184–185) comprises the phases documentation / reflection and first sketches of Botella et al. (2013, p. 166). At this stage the incomplete visions and ideas are structured, extended, and restructured, involving decision-making, problem-solving, and information-gathering activities. This can include sketches, drawings or other forms of giving the project a first material form. The next stage of the model by Botella et al. (2013, pp. 166–167) implies testing the generated ideas and sketches. This stage, as well

as provisional object / draft, corresponds to the stage of making the artwork by Mace & Ward (2002, pp. 185–187). Through preparatory activities, testing and acquiring the needed materials, the first drafts of the project can be created resulting in an almost-finished product at the end of this stage. This stage also involves continuous expansive and exploratory activities, such as gathering additional information. The final stage of both models includes finishing steps to complete the artwork and preparations to present it to an audience. The completion of an artwork leads to feeling rewarded and proud (Botella et al., 2013, p. 167; Mace & Ward, 2002, pp. 187–188).

In summary, both models describe a creative process that starts with an initial concept or idea, involves a phase of development and refinement, proceeds to the materialization and execution of the idea, and concludes with the finalization and presentation on the completed work. Both models emphasize the dynamic and non-linear nature of the creative process, where an artist might return to earlier phases or stages.

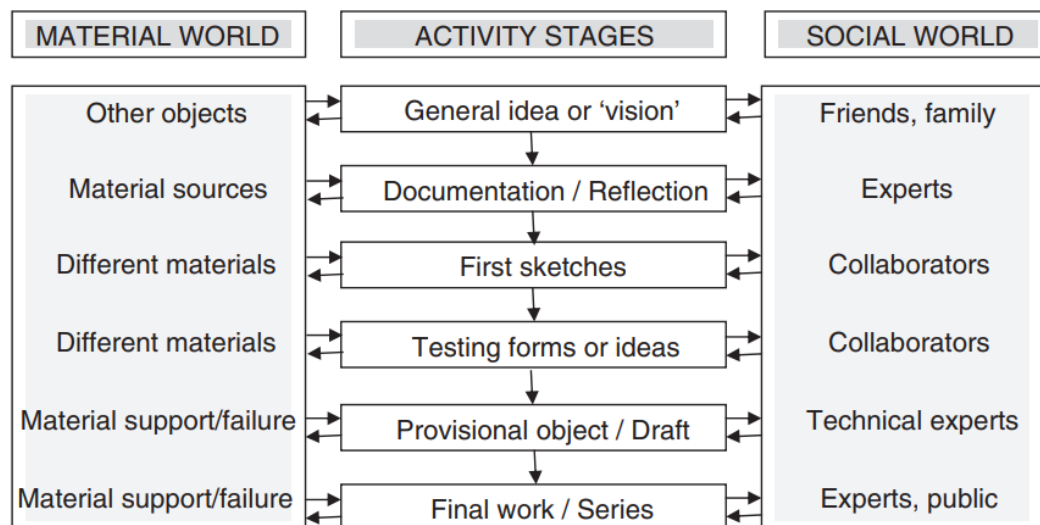


Figure 1: Activity stages of the creative process in art and their link to the physical and social environment (Botella et al., 2013, p. 167)

2.2.1 Creative Process in Professional Photography

Looking at professional and commercial photography, certain factors, particularly the involvement of a client, significantly influence the creative process. Präkel (2010, p. 137) outlines a model workflow for a photographer involved in an advertising production with a client. The involvement of the photographer in the creative process and the development of the creative concept depends on the type of client brief. This can either be a closed or open-ended brief. A client brief in general contains the information and specifications on creative aspects for the photographic job including things like mood, style and finale image usage whether

it is created for web or print. Photographers can receive briefs from clients themselves, from advertising agencies on behalf of the client, or from art or creative directors. When the photographer receives a closed brief, they are not involved in the development of the creative concept. A closed brief contains detailed requirements on the look, composition and final usage of the images. This means that the photographer has to work from a detailed visual or page layout. Figure 2 depicts the creative workflow for an advertisement production with a closed brief provided from creatives. Creatives are the people working in advertising agencies developing creative concepts. An open-ended brief involves the photographer in the development of the creative concept. In this scenario, the brief is more akin to a client's wish list and ideas for the final image. However, it remains essential for a photographer to understand the intended use of the final images (Präkel, 2010, pp. 137–138).

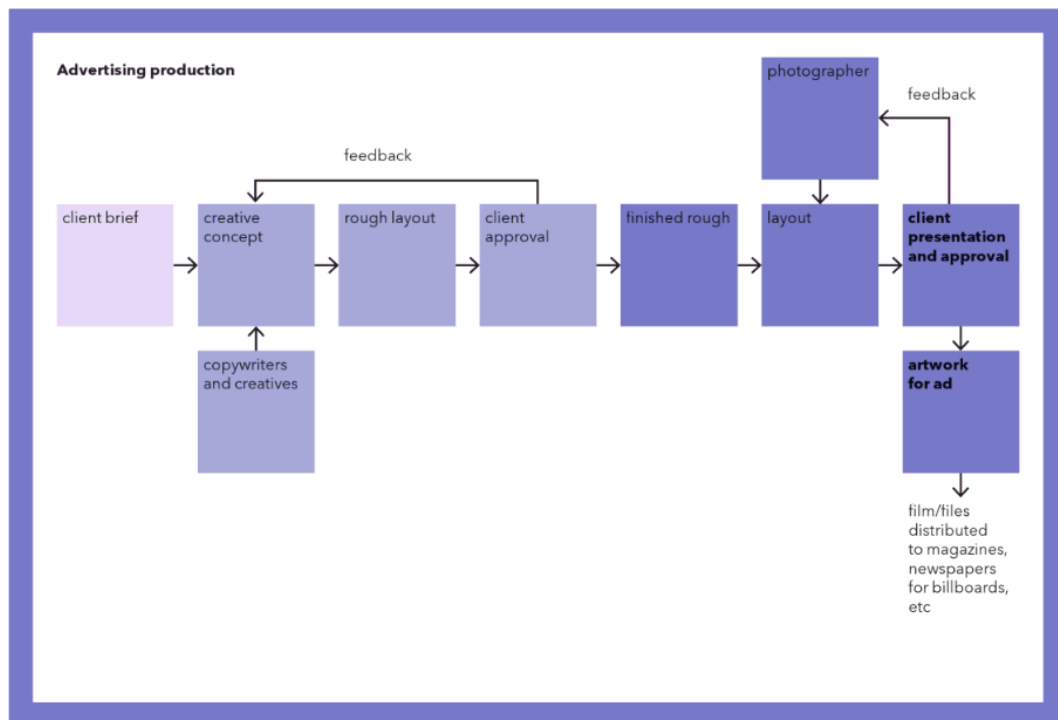


Figure 2: creative process in commercial photography for advertisement including a closed brief (Präkel, 2010, p. 137)

Präkel's (2010, p. 137) model shows the same underlying structures as the models of the creative process of Mace & Ward (2002) and Botella et al. (2013). The creative workflow with clients in photography starts with the client brief, followed by an ideation and visualization phase where the creative concept is developed. This process of development is iterative in consultation with the client until they approve the concept. The concept is refined into a visual layout that illustrates how the final result should look. The photographer is consulted regarding the feasibility and implementation of the creative concept and layout. The concluding stages of

this workflow involve the final client approval, leading to the image production phase, which encompasses both shooting the subject and subsequently editing the image in post-processing.

A professional photographer has to creatively work within the limits and restrictions of the client. To find out where those boundaries are it needs clear communication between all parties involved (Präkel, 2010, p. 143). Speaking a common language with the client helps in communicating ideas for the creative concept and visual approach of a job. Presenting visual concepts to clients often involves utilizing existing images, which carries the risk that clients may fixate on unintended aspects of these images, leading to potential misunderstandings. For example, the client “may pick up on colours when you wanted to show them the mood.” Dedicating time to create visuals that align with the desired look will ultimately be beneficial (Präkel, 2010, p. 141).

3 Generative AI

This chapter serves to give a short introduction in the topic of generative artificial intelligence (GenAI) since the subject of this thesis explores the ways in which GenAI tools can be implemented into the creative process of professional photography and in what ways this technology augments human creativity. Therefore, a surface-level overview of GenAI technology will be provided to ensure better understanding of the big picture, followed by an introduction to the GenAI tools Midjourney and ChatGPT as they have been evaluated most relevant to the field of creative processes in photography.

3.1 GenAI Models

Artificial intelligence comprises codes, methods, algorithms, and data that allow a computer system to mimic human behaviour and make decisions, sometimes even surpassing human capabilities (Anantrasirichai & Bull, 2022, p. 591). Generative AI encompasses deep learning models, which are a subtype of machine learning (ML) algorithms, and are trained to create high-quality content from existing resources such as text, audio, video, images, and even code ('Generative AI Models Explained', 2022; Martineau, 2021; Zewe, 2023). Generative models use a simplified representation of their training data to create new works that are similar yet different from the original data (Martineau, 2021). There are many different ML algorithms for different applications (Anantrasirichai & Bull, 2022, p. 589). For the scope of this thesis the three widely used GenAI models being Generative Adversarial Networks (GANs), diffusion models, and Transformer-based-models like Generative Pretrained Transformer (GPT) language models will be briefly examined ('Generative AI Models Explained', 2022).

3.1.1 GANs & Diffusion Models

The Generative Adversarial Network (GAN) is an unsupervised ML framework that applies two neural networks pitting against each other, the generator and discriminator. The generator creates new data samples from arbitrarily using samples of the predefined training dataset and randomly modifying some characteristics. The discriminator's job is to distinguish the real training data from the generated, synthetic samples. To accomplish this, the discriminator compares an arbitrary mix of real images from the training dataset with the synthetic images created by the generator network. The generator does not have access to the real image dataset. A GAN achieves success when its discriminator is unable to

distinguish a fake sample from a real one. Therefore, the goal for the network is to create new artificial and seemingly genuine data. Both networks are iteratively refined by continuously updating their performance enhancing their ability to produce more convincing fake samples or increasing the number of correct predictions. The backpropagation, as can be seen in Figure 3, is in charge of informing both networks about their activities in order for them to improve (Anantrasirichai & Bull, 2022, p. 598; 'Generative AI Models Explained', 2022; Gülaçti & Kahraman, 2021, p. 245; Hu, 2022).

In conclusion GANs learn to understand the content of an existing dataset to create new and original content. By doing so they consistently incorporate a random factor producing new, varied, and synthesized data that appears authentic and heightens the element of surprise (Gülaçti & Kahraman, 2021, p. 246). GANs can be utilized to imitate any set of data such as images, music, video and speech (Gülaçti & Kahraman, 2021, p. 246).

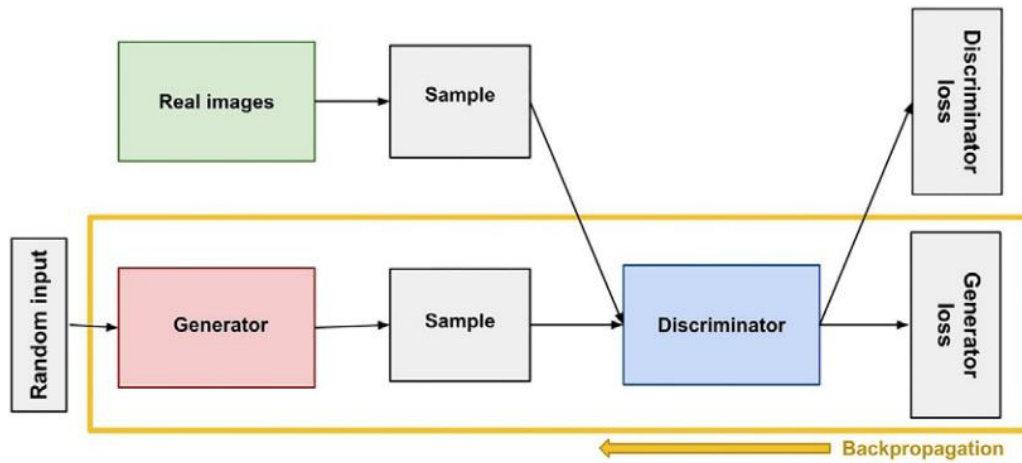


Figure 3: GAN architecture model (Gülaçti & Kahraman, 2021, p. 245)

GANs, however, struggle with training instability and the generation of complex and high-resolution images. Therefore, the most relevant GenAI image tools predominantly utilize diffusion models due to their proficiency in generating high-resolution images of diverse quality with impressive accuracy (Ahirwar, 2023). These models function by initially incorporating Gaussian noise into original data through a forward diffusion process, and subsequently learning to eliminate this noise during the reverse diffusion process as depicted in Figure 4. During the forward diffusion process Gaussian noise is slowly and randomly added to the original input image. In the reverse diffusion process the neural network gets trained to reverse the noising process to recreate the original input (Ahirwar, 2023). Once trained, the diffusion model can be utilized to create new data by processing randomly sampled noise through the established denoising procedure (O'Connor, 2022).

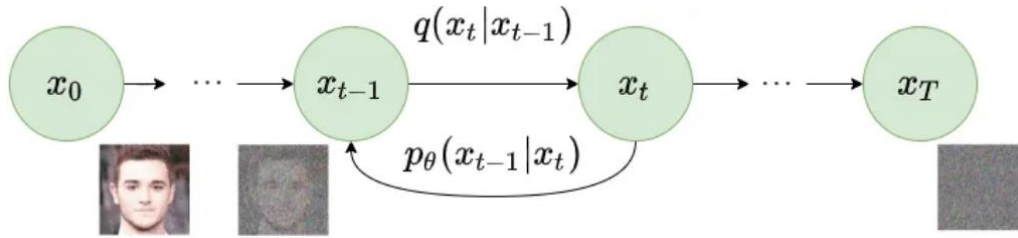


Figure 4: Diffusion model architecture (Ahirwar, 2023)

3.1.2 Transformer-Based Models

Transformer-based models are powerful semi-supervised deep neural networks. They are adept at comprehending context and meaning by observing relationships and patterns in sequential data, often applied in Natural Language Processing (NLP) tasks. NLP, blending linguistics with AI, is a method for processing and understanding large amounts of text data. A prominent example utilizing transformer-based models is OpenAI's ChatGPT ('Generative AI Models Explained', 2022; Rahali & Akhloufi, 2023, p. 54).

Transformers are trained to transform one sequence into another. As shown in Figure 5, they learn in two stages: first, they're trained with a large set of data without specific instructions (unsupervised learning), and then they're refined with more directed tasks (supervised learning). Transformers consist of encoder and decoder. The encoder takes an input sequence (a sentence), breaks it down into elements (words), and converts these into vectors (numerical representations capturing the essence and position of each word). The decoder takes the processed input from the encoder, understands the context, and generates the target output sequence, such as the next word in a sentence. Both parts consist of multiple layers where the output of one layer feeds the next. This builds a complex understanding of the input ('Generative AI Models Explained', 2022).

Transformers are particularly good at understanding sequences, for example predicting the next word in a sentence. They use a self-attention mechanism to extract intrinsic features such as the importance of different words in a sequence. This means transformers don't just look at each word in isolation but consider the context of the whole sentence to determine meaning. Another advantage is that transformers can handle multiple sequences at the same time, making the learning process faster. This makes them efficient and powerful for tasks involving language, like understanding or generating text ('Generative AI Models Explained', 2022; Rahali & Akhloufi, 2023, p. 55).

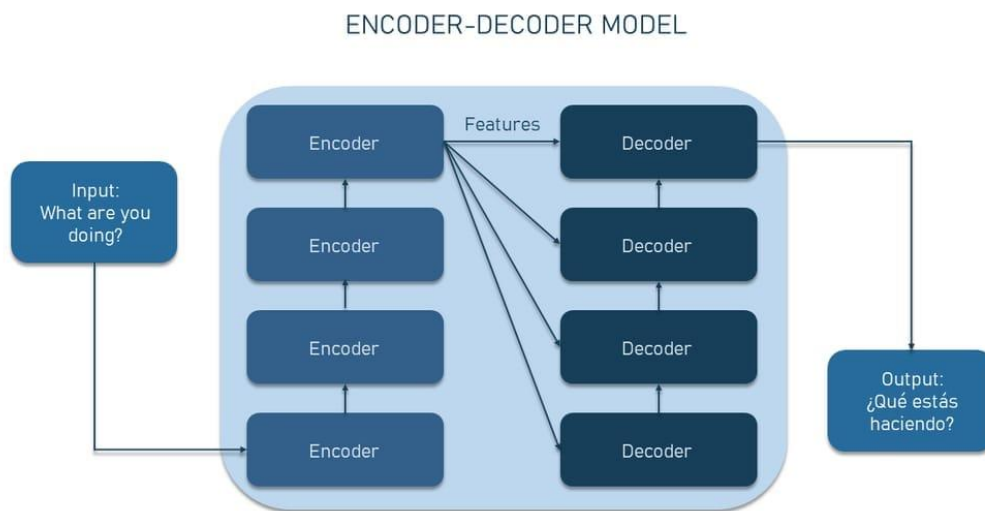


Figure 5: Transformer model architecture (*'Generative AI Models Explained'*, 2022)

3.2 GenAI Tools

In the evolving landscape of professional photography, the integration of GenAI tools has emerged profoundly impacting the creative process. Among these innovations, two tools stand out for their specific applications and contributions to photography: Midjourney and ChatGPT. Therefore, this section delves into the functionalities and unique aspects of these tools.

3.2.1 Midjourney

Midjourney define themselves as “an independent research lab exploring new mediums of thought and expanding the imaginative powers of the human species” (*'Midjourney'*, 2024). They developed a GenAI tool that converts simple text-based prompts into high-quality images. The tool is based on large language models and diffusion models. As for January 2024, Midjourney is still operated through the Discord chat app. This makes the barrier to generate photo-realistic images within the matter of minutes very low and easily accessible (Wankhede, 2023).

Since Midjourney turns simple text descriptions into images, the art of prompting these descriptions is becoming more important. As shown in Figure 6, the Midjourney prompt is written into a chat box using different commands, where the command “/imagine” generates images. The commands “/blend” and “/describe” are examples of a list of many others that allow users to execute different operations. All commands and parameters can be found in the Midjourney documentation as they will not be discussed in detail (*'Midjourney Quick Start Guide'*, n.d.).

After the “/imagine” command was selected, the description of the desired image gets typed into the prompt field. With sending the message the Midjourney bot interprets the prompt and generates the image (‘Midjourney Quick Start Guide’, n.d.).

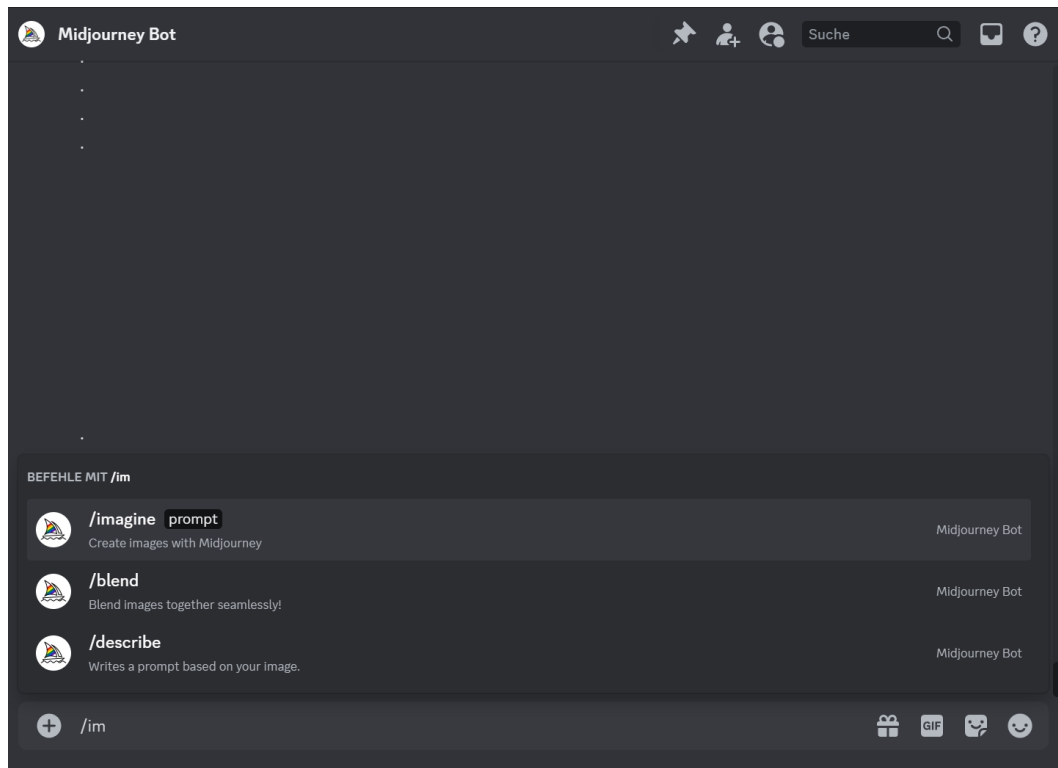


Figure 6: Discord's user interface through which Midjourney is operated

The precision of a prompt directly influences the quality and fidelity of the generated image, determining how closely it aligns with the creator's vision (‘What Is AI Midjourney and How Does It Work?’, n.d.). A prompt can be as basic as only one word or a single emoji, however this will not yield precise results as short prompts rely heavily on Midjourney’s default style. This means that the more descriptive a prompt is the more unique is the look of the image. Nonetheless, prompts shouldn’t be too long either. The focus with prompting should lie on the main concepts since using fewer words describing similar concepts gives each word greater influence on the outcome. The Midjourney bot does not understand grammar or sentence structure leading to structuring the thoughts for a prompt with commas, brackets and hyphens. Furthermore, Midjourney advises to describe what should be depicted on an image rather than describing what shouldn't be depicted. Everything left out will be randomized and is a surprise factor.

Consequently, phrasing prompts vaguely is great to get variety and bad for generating specific details ('Midjourney Quick Start Guide', n.d.).

Therefore, the anatomy of a prompt plays a significant role in achieving good images. One way to structure a Midjourney prompt is shown in Figure 7. The prompt starts out with the "/imagine" command followed by the description of the prefix, the scene, the suffix and finally the Midjourney specific parameters. The prefix defines the medium style of the image which can be a studio photography, a cinematic close-up shot or a renaissance painting. The scene describes the desired content of the image. This encompasses any idea imaginable, provided Midjourney is trained on sufficient datasets to realistically reproduce the content. The suffix modulates the prefix and the scene by providing further descriptive details. The Midjourney parameters include aspects like aspect ratio or randomization factors (Wolff, 2023).

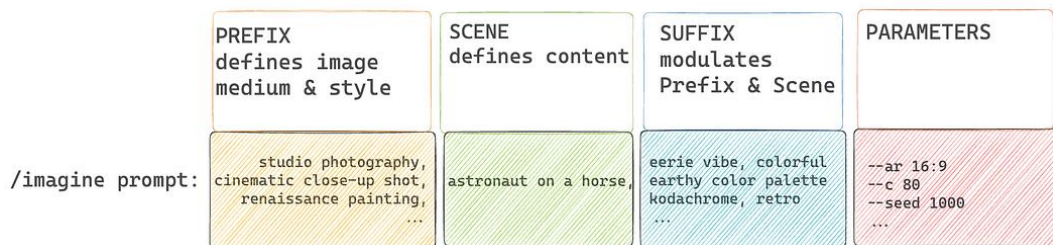


Figure 7: Basic Midjourney prompt anatomy (Wolff, 2023)

3.2.2 ChatGPT

ChatGPT is developed by OpenAI, an AI research company, and was launched in November 2022 (Hetler, n.d.). Numerous updates and new features have been implemented during the course of this study. Therefore, the findings from the expert interviews and the case study discussed in chapters 5 and 6 are based on the capabilities and features of the GPT-4 model as they were from July to September 2023.

ChatGPT is a multimodal chatbot using a pre-trained transformer model, called GPT-3.5 or GPT-4, to create humanlike conversations or images. While the tool offers a multitude of features suitable for various applications, this work specifically focuses on its capabilities in prompt writing and idea generation (Hetler, n.d.; Wolff, 2023).

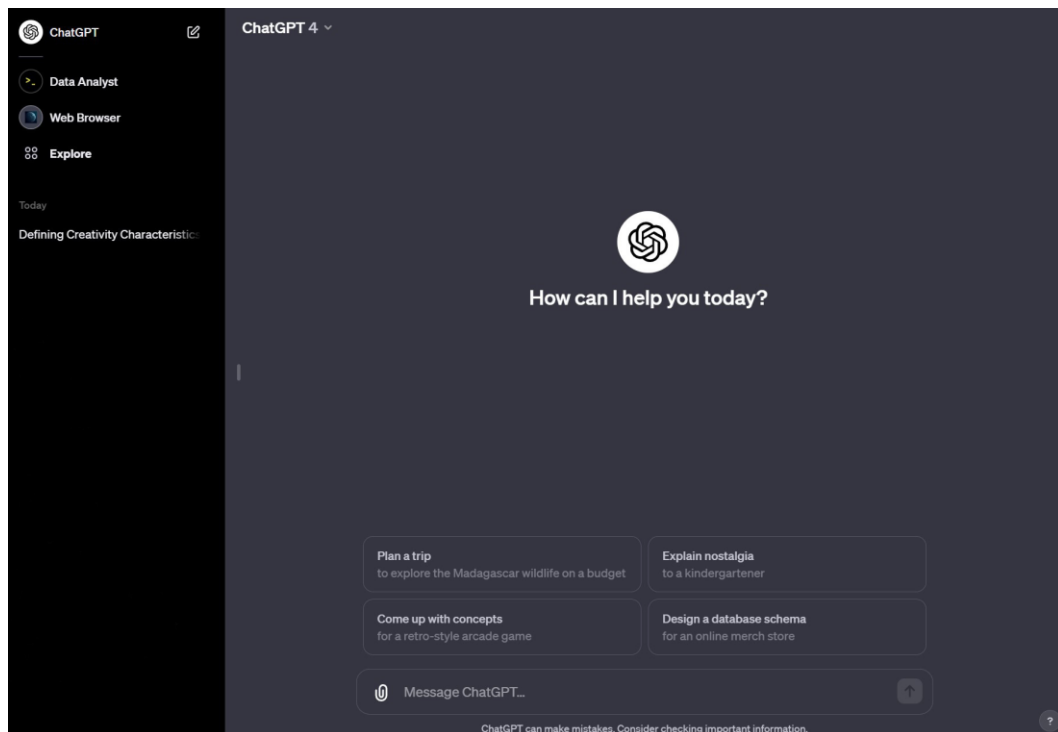


Figure 8: ChatGPT's user interface

When asked “how would you describe yourself?” ChatGPT responds with this answer:

“As an AI developed by OpenAI, I am a large language model based on the GPT-4 architecture. My primary function is to understand and generate human-like text based on the input I receive. I don't possess personal experiences, emotions, or consciousness. I'm designed to assist with a wide range of queries, from answering questions to generating creative content, and I operate based on a vast dataset that includes a wide array of human knowledge up to my last training cut-off in April 2023. My responses are generated based on patterns and information in that dataset, and I aim to provide accurate, helpful, and contextually relevant information.”

The interaction with ChatGPT is therefore started by typing in any question or any instruction for the tool to assist with (see Figure 8). It “remembers” the mentioned topics in one chat and can refer to it throughout the course of a conversation (Lau, 2023). Consequently, it is possible to program ChatGPT as a prompt writing assistant by providing the blueprint of a prompt as described in the previous chapter 3.2.1. For ChatGPT to correctly interpret prompts it is advised to provide the context of the given instructions. Wolff (2023), as shown in Figure 9, developed a structure that describes the individual components of a Midjourney prompt to ChatGPT instructing it to generate prompts following this architecture. Using this approach any image idea can be described to ChatGPT either as broad theme or

with precise instructions on prefix, scene, and suffix. This enables the generation of diverse prompt variants, offering a wide range of exploratory options.

```
This is the basic prompt anatomy for image generation with Midjourney:  
  
/imagine prompt: PREFIX, SCENE, SUFFIX  
  
PREFIX defines the image's medium and style  
SCENE defines the content  
SUFFIX modulates PREFIX and SCENE  
  
###  
  
Create 10 prompts that illustrate the theme "father-son relationship"
```

Figure 9: Instructions to turn ChatGPT into a prompting assistant (Wolff, 2023)

3.2.3 Limitations of GenAI Tools

In the realm of visual creation, GenAI presents significant benefits and notable challenges. One key advantage of GenAI is its potential to generate unique, unprecedented artworks offering a fresh source of inspiration, pushing the boundaries of conventional creativity and supporting the generation of ideas. However, a primary concern is the lack of human touch in AI-generated content. While GenAI can replicate realistic images, it falls short in conveying the emotional depth that is often integral to human-created art, potentially affecting its acceptance and value. Moreover, the reliance on existing data for training GenAI models can lead to a certain repetitiveness or blandness in the images produced. Another challenge lies in the limited control over the creative process and the final product, as the outcome is predominantly determined by the AI's pre-trained algorithms. Ethical concerns regarding copyright and the potential misuse of AI-generated images pose further issues. The realistic look of GenAI leads to concerns about the potential use in spreading false information, highlighting ethical debates about the widespread use of this technology (Kundu, 2022).

4 GenAI and Creative Processes

Having explored the concepts of creativity and creative processes, as well as the technology of GenAI, this chapter looks at the combination of those two fields and how GenAI benefits the process of creation. The aim of this chapter is to answer research question Q1: How can GenAI tools augment human creativity?

4.1 Co-Creativity

The development and integration of AI technologies into the field of creative industries causes a lot of discussion on job replacement, ethical issues and its role for creativity (Griebel, Flath, & Friesike, 2020, p. 1; Wu et al., 2021, p. 171). However, Wu et al. (2021, p. 171) emphasize that the collaboration between human and AI will be far more beneficial than considering this technology as competition. GenAI complements human intelligence and creativity by supporting tasks such as examining big datasets, forecasting outcomes and even creating new content. Hence, GenAI is finding more and more application in creative work (Wingström et al., 2022, p. 1; Wu et al., 2021, p. 1). Consequently, the concept of co-creativity has emerged, which describes the collaborative creative process of human and AI technology (Wingström et al., 2022, p. 1). The research on this concept is still at the beginning (Wingström et al., 2022, p. 6). AI performs well in handling repetitive, predictable tasks, as well as managing complex and multi-tasking workflows. In contrast, humans are flexible and creative, skilled in comprehending knowledge and strategic thinking (Wu et al., 2021, p. 173). Moreover, AI can support human creativity by interacting with humans and accordingly learn and adapt its function in real time (Wingström et al., 2022, p. 6).

Wingström et al. (2022, p. 6) and Wu et al. (2021, p. 174) both agree that the fully autonomous AI creativity is debatable, and AI must be used in collaboration with human input and judgment. This ensures that AI creativity serves human creativity instead of competing against it. Utilizing GenAI in that way can enhance productivity and inspiration throughout the entire creative process (Wu et al., 2021, p. 177).

In the initial phase of ideation and conception of ideas GenAI can support humans by providing knowledge enabling the collaboration with “all achievements of mankind across time and space” (Wu et al., 2021, pp. 176–177). For instance, GenAI can easily recreate any art style which poses a nearly impossible task for humans (Wu et al., 2021, p. 182). GenAI’s capabilities at this stage are at sparking new ideas, offering inspiration that helps to overcome fixation or the challenge of

starting with a blank canvas (Wingström et al., 2022, p. 6). The collaboration between GenAI tools and humans can be compared to a conversation where both parties share ideas, respond and inspire each other (Wu et al., 2021, p. 180). Exploration and inspiration enhanced by GenAI can lead to unexpected considerations that go beyond human capacities. Wingström et al. (2022, p. 11) observed that artists intentionally utilize GenAI tools to yield unconventional and surprising outcomes by experimenting with various settings and parameters. The next stage of the creative process, the development of ideas, includes creating first sketches of the generated ideas. GenAI enables individuals, regardless of their visualization skills, turning “rough ideas into reality” (Wu et al., 2021, pp. 177–180). As Wu et al. (2021, p. 177) puts it: “Creativity matters more than skills.” Additionally, GenAI enhanced sketching supports creating variations of an idea in the testing phase of the creative process (Wingström et al., 2022, p. 6). GenAI's ability to perform detailed simulations enhances the efficiency and effectiveness of the building and testing processes (Wu et al., 2021, p. 178).

Griebel et al. (2020, pp. 2–3) draw comparisons between the stages of creative processes and GenAI algorithms. They divide the creative process in two main phases: the divergent phase, where lots of ideas are generated, and the convergent phase, where the best idea is chosen and further developed. AI algorithms can support both these stages, aiding the overall creative process. Supervised learning derives a function from labelled training data to make predictions about new instances. This aligns with convergent thinking as both involve using known information to arrive at precise solutions. Unsupervised learning systems learn from unlabelled data identifying, clustering, and organizing data more efficiently. This learning mirrors divergent thinking as both involve exploring and organizing knowledge in innovative ways. However, traditional unsupervised learning methods haven't fully captured the entire spectrum of creative activities typical of divergent thinking (Griebel et al., 2020, pp. 3–4). It can be said that AI aids in divergent thinking by generating a wide range of design possibilities and provides tools for summarizing and visualizing information, which helps in making informed decisions (Griebel et al., 2020, p. 8).

The possibilities of integrating GenAI in the creative process are of great potential resulting in a more inclusive and accessible entry to creativity. Whether working individually or collaboratively, people can always partner with AI. It's essential to recognize the strengths and weaknesses of both human and AI capabilities and allocate tasks accordingly for optimal results (Wu et al., 2021, pp. 177–178). That is why co-creativity is distributed variously in the creative process. There are certain times when the use of GenAI tools is more advantageous than others. (Wingström et al., 2022, p. 12).

One limitation of AI technology in the creative process is its inability to give meaning to work and consequently lacking consciousness and intention. Humans are thus essential in interpreting, refining, judging and creating meaning for AI-generated outcomes (Wingström et al., 2022, p. 12).

When it comes to the public opinion and reception of AI-generated content and art, it faces negative biases. This might stem from a lack of understanding of AI technology (Wingström et al., 2022, p. 6). Horton et al. (2023, p. 3) found that people “consistently devalue AI-made art relative to human-made art.” Their research revealed that art collaboratively created by humans and AI was valued less than art solely created by humans but more than art generated purely by AI (Horton et al., 2023, p. 8). Horton et al. (2023, p. 9) draw a parallel between the current scepticism towards AI technologies in creative industries and the initial reaction to the invention of the camera. With the advent of the camera, painting was declared as dead. However, rather than diminishing artistic expression, the camera led to new forms and innovations, such as Impressionism and digital photography. They conclude that “the value of human creativity persists” and the appreciation of it allows for new forms of expression to grow (Horton et al., 2023, p. 9).

5 Perspectives on GenAI – Insights from Professionals

The empirical part of this study comprises semi-structured expert interviews, which laid the groundwork for a subsequent case study. These interviews aimed to provide an insight into the evolution of GenAI within the realm of professional photography. The objective was to explore the current state and best practices in the application of GenAI, as well as to understand its perceived impact on the creative process and the implications for the industry from industry experts. This included assessing the opportunities and risks associated with integrating GenAI tools into professional photography. The findings from these expert interviews served as a foundational guideline and informed the development of a case study, which is elaborated in chapter 6. This study's approach was instrumental in delving deeper into the complex relationship between GenAI tools and the creative process in professional photography. This section will detail the methodologies and insights gained from these interviews.

5.1 Methodology

5.1.1 Qualitative Semi-Structured Expert Interviews

Qualitative interviews were found suitable for answering the research questions of this thesis as they allow to pose open questions which enables the interviewee to answer freely and control the interview direction (Döring & Bortz, 2016, p. 365). The interviews were designed as a semi-structured interview. The interview guideline offers a basis structure ensuring the comparability of the answers while simultaneously providing enough freedom to further explore upcoming topics (Döring & Bortz, 2016, p. 372). Since one goal of these interviews is to gather insights on the creative process of photographers, which differ individually, the flexibility and potential of qualitative semi-structured interviews for exploring various directions make them an ideal approach to acquire comprehensive insights.

Experts were selected as interview subjects due to their practical and operational expertise, which is vital for assessing the industry's response to emerging technologies. Their experiential knowledge and insights are crucial in understanding the transformative effects within the field (Döring & Bortz, 2016, p. 375). For this study, experts were identified as individuals who have been actively

working in the photography industry for at least five years and have shown interest in the development and use of GenAI tools. It was crucial that these individuals could provide insights based on their personal experiences with these tools, along with observed changes in their creative workflow and the broader industry.

Over a period of three months, from July to September 2023, the qualitative interviews were conducted with seven professional photographers. Six out of the seven interviews were conducted in July. The last interview with Janine Kühn was conducted in September due to scheduling difficulties. Since the subsequent case study was carried out in August 2023, this means the seventh interview could not be included in the development of the guideline for the case study. Among the experts, five were male and two were female. Geographically, five are based in Austria, specifically in Vienna and Linz, one operates out of South Tyrol, Italy, and another one from Berlin, Germany. Their expertise in using GenAI in their creative process ranges, providing a comprehensive view of the technology's impact on the field. Four of the seven interviews were conducted remotely via Zoom or Microsoft Teams, with both audio and video recorded. The remaining three interviews were held in person, with only the audio being recorded. Each interview was about an hour long.

The interviewer decided to perform as co-expert in these interviews in order to ask more precise and in-depth questions to ensure profound and subject-specific answers. Having both parties of the interview on the same level of expertise allows for a more efficient discussion (Döring & Bortz, 2016, p. 376).

The interviews were originally conducted and fully transcribed in the German language, only the main statements that were later used for the analysis were translated to English. The transcripts were provided to all interviewees for review (Döring & Bortz, 2016, p. 583).

5.1.1.1 Interview Guideline and Goals

To conduct the semi-structured interviews, an interview guideline was developed to set the outline divided into five thematically structured segments. Each topic included one to four central questions, supplemented by more specific sub-questions to enable in-depth exploration based on the expertise and focus of the respondent (Döring & Bortz, 2016, p. 372). This results in a total of 25 questions. The segments, in the given order, included: (1) gathering data on the expert's professional background, (2) capturing information on the traditional creative process without the use of GenAI, (3) collecting data on the creative process with the integration of GenAI, (4) assessing the perceived impacts of GenAI on personal

creativity and style, and finally (5) discussing personal forecasts regarding the effects of GenAI on the field of professional photography in the future.

The primary goal of these interviews was to gain a comprehensive understanding of the sentiment regarding the profound transformation in the photography industry as perceived by industry insiders. This aimed to capture their assessments of the opportunities and risks of this transformation for the field of photography. Concurrently, the interviews sought to gather insights and experiences of the experts regarding the integration of GenAI into their creative process. These insights served as the foundation for designing a guideline for a GenAI-enhanced creative process for photographers. The developed guideline formed the basis for the subsequent case study in chapter 6.

5.1.1.2 Experts

The selection of experts was thoroughly carried out, targeting professionals with recognized expertise in photography and various depth in experience with GenAI technologies. Each expert brought a unique perspective, enriching the understanding of the subject matter. Their backgrounds, ranging from commercial photography to experimental and artistic photography, provided a well-rounded view of the industry's current state and future potential.

The following section introduces the seven experts, each accompanied by a brief background description. Their presentation follows the same sequence as the order in which the interviews were conducted.

Christoph Hofbauer, a self-employed photographer since 2011, has cultivated a rich and diverse portfolio. Initially focusing on product photography during his apprenticeship, Hofbauer's professional scope has since broadened to encompass both commercial and people photography. His creative collaborations often involve working with musicians, crafting music videos and designing album artwork. Beyond photography, Hofbauer is adept at retouching, 3D modelling, and rendering. This versatility underscores his expansive reach in the visual media field. For him, photography and editing are tools for crafting surreal creations, deviating from photography's traditional role of capturing reality and documenting surroundings.

Ines Thomsen, based in Linz, has been a self-employed photographer for a decade. Her expertise lies in people photography, where she captures individuals in various contexts, including business, private, and fashion settings. Additionally, Thomsen is known for her work in cover shoots and employer branding. While she doesn't identify strongly with being a conceptual photographer, her skills are multifaceted. Thomsen also dedicates her time to educating others, frequently

leading workshops at photo fairs. This not only underlines her proficiency in photography but also her commitment to sharing her knowledge with the photography community.

Peter Berger, who shifted his career path towards photography in 2006 by starting his apprenticeship, characterizes himself as a commercial photographer, distinguishing himself from the artistic sphere. Throughout his career, he has explored a diverse array of photography genres, including event, wedding, architecture, children, family, and product photography. In 2013, Berger began teaching at the photography department of WIFI Vienna. In 2019 he was appointed as the head of the department, a position he continues to hold to this day.

Andrea Pizzini, a filmmaker and photographer based in South Tyrol, completed his education at the Zelig film and television school in Bolzano. Initially, his career focused on documentary filmmaking until 2008, when he began to shift towards photography. Currently, he operates as an independent photographer and artist. In addition to his photographic endeavours, Pizzini actively engages in writing and discussing current technological advancements in photography via various platforms, including his own website and YouTube channel.

Florian Payer has been engaged in the field of photography for over 20 years. He pursued his initial studies at the Academy of Applied Photography in Graz, where the focus lied on analog artistic photography and creative processes. Subsequently, he attended the College of the Höhere Graphische Bundes-Lehr- und Versuchsanstalt for photography in Vienna. After his formal education, Payer gained practical experience by assisting established photographers. His professional journey led him into advertising photography. Eventually, he ventured into self-employment, concentrating on commercial, advertisement, and product photography.

Gerhard Roza has been in the field of photography for 18 years, dedicating the last eight to working in advertisement at a photo agency in Vienna. He separates his commercial endeavours from his personal artistic pursuits. As a freelance artist, Roza explores experimental projects that blend photography with image manipulation and compositing, defining himself as an experimental photographer. His broad portfolio encompasses high-end product photography, as well as food and people photography. Specialising in creative compositings and retouching, Roza's skills extend beyond still images. He also engages in animation and the creation of short motion pictures.

Janine Kühn, a Berlin-based artist, initially began a career in hairdressing before transitioning to makeup artistry, driven by the desire to delve into image creation. Alongside her professional pursuits, Kühn has always maintained a passion for painting, a practice that complemented her evolving artistic expression. Her

journey into photography began with experimenting on her phone, eventually leading her to develop her skills in the photography field through self-directed learning. Kühn currently works as a freelance artist, employing a mixed media approach in her creations. Her diverse portfolio spans people photography, creating visual artwork for musicians, product photography, and image retouching. A distinctive aspect of her approach to photography is her commitment to transforming and personalizing images through manipulation, ensuring each piece bears her unique creative signature.

5.1.1.3 Reflexion

The methodological limitations of this study are evident in its restricted geographic coverage, which limited data collection to the photography industry within specific regions (Austria, South Tyrol, Berlin).

Qualitative research approaches do not yield generalizable results but instead reflect the subjective perceptions and assessments of the interviewed subjects. However, detailed examinations of individual cases provide starting points for hypotheses in further research and contribute to a deeper understanding of specific situations, such as the subject of this study (Döring & Bortz, 2016, p. 184).

A challenge in conducting the interviews was identifying professional photographers who had already integrated GenAI into their creative process and felt sufficiently competent to provide informed statements. The opportunity to include creative agencies in the study emerged only during the interview phase and thus could not be realized. Including creative agencies might have yielded potentially insightful findings, especially since these agencies often are responsible for the conception of ideas and image concepts in commercial advertising photography, making them an interesting subject for future research.

Another issue is the rapid development in the field of GenAI. In the context of a master thesis, it is not feasible to timely integrate the latest advancements into the research, potentially limiting the currency and relevance of the findings.

Nonetheless, the insights gained were of substantial importance for the conception of the guideline for the subsequent case study. The consistency of the statements from the interviewed photographers enabled the development of a clear perspective on the integration of GenAI into the creative photography process.

5.1.2 Qualitative Content Analysis

For the analysis of the interview transcripts the qualitative content analysis was chosen. This analysis method involves extracting substantive statements from qualitative textual material by forming categories (Döring & Bortz, 2016, p. 602). This is particularly a method for evaluating qualitative data from transcripts of semi-structured interviews, as is the case in this study. The analytical approach was conducted according to the framework of Mayring & Fenzl (2019, pp. 637–641) involving the systematic categorization of the transcripts through inductive category formation. This approach is appropriate for the research questions of this master thesis and the available data.

According to this model, the first step involves the clarification and theoretical justification of the research questions, which was already explained in chapter 5.1.1. Therefore, the specific task for the analysis was to identify the key factors of GenAI's impact on the creative process of photographers, with a focus on opportunities and risks for the profession, as well as its perceived influence on personal creativity. Additionally, the analysis aimed to elaborate the described use cases of GenAI in professional photography, as these were instrumental in developing the guideline for the co-creative photographic process.

The five categories described in 5.1.1.1, which structured the interview guideline, can be understood as "deductive" thematic areas. These were used as a starting point for the development of inductive categories during the evaluation process.

- (1) the expert's professional background
- (2) the traditional creative process without the use of GenAI
- (3) the creative process with the integration of GenAI
- (4) the perceived impacts of GenAI on personal creativity and style
- (5) personal forecasts regarding the effects of GenAI on the field of professional photography in the future

The level of abstraction was set so that all statements in the material regarding the use of GenAI and its impacts on the creative process and the field of photography were coded into inductive categories. The following analysis units were established:

- *Coding unit*: meaningful and significant phrases, which can consist of as few as one to a few words.
- *Context unit*: the entire text including the response to one of the posed questions.
- *Evaluation unit*: all seven transcripts.

Once the criteria had been defined, it was possible to begin with the inductive categorisation of the material. It was permissible to assign parts of the material to multiple categories.

Based on the five "deductive" thematic areas, nine main categories, each with three subcategories, were identified in the first round of category creation after a third of the material had been analysed. The decision to expand the main categories from five to nine was made to allow for more specific coding and nuanced analysis of the material's statements. The subcategories aid in providing a more precise and detailed understanding of the main categories and in the more nuanced assignment of text components. The main categories were numbered with codes K1 to K9. The subcategories follow the pattern K1.1, K1.2, K1.3, and so on.

In the second round of category revision, categories K3, K4, and K8 were supplemented with one or two additional subcategories, as this facilitated a more precise response to the research questions through a more detailed analysis.

In the third round, a tenth main category with three subcategories was added. This category emerged from parts of the material that did not fully fit into the existing categories.

In the fourth round one new subcategory was added to each of the categories K2 and K10. In the fifth round, an additional subcategory was added to category K5.

In the final sixth round, all transcripts were categorized according to the inductively developed category system. This was done by marking the relevant data in the text and noting the corresponding subcategory in the text margin. During this process, the third subcategory of category K1 was removed due to its infrequent occurrence in the overall material, which did not present enough relevance for the evaluation.

This results in the category system for the five subject areas concerning the integration of GenAI into the creative process of professional photographers, divided into ten main categories, each encompassing two to five subcategories. This category system (see Table 1) was then transferred to Microsoft Excel to create a clear representation of the coding guideline, the individual categories, and the corresponding text components from each expert. For the creation of these evaluation tables, the text components labelled with categories from the material were translated into English and assigned to the respective column of the corresponding category and expert in Excel. Using these tables, the interpretive evaluation was carried out in the following chapter 5.2.

Code	Main Category	Sub Code	Sub Category
K1	<i>Background and Professional Experience</i>	<i>K1.1</i>	<i>Education and training in photography</i>
		<i>K1.2</i>	<i>Years of experience & areas of specialization</i>
K2	<i>Pre-GenAI creative process</i>	<i>K2.1</i>	<i>Traditional creative workflow</i>
		<i>K2.2</i>	<i>Approach to ideation and concept development</i>
		<i>K2.3</i>	<i>Techniques and tools commonly used</i>
		<i>K2.4</i>	<i>Traditional creative workflow in commercial photography</i>
K3	<i>Integration of GenAI in the workflow</i>	<i>K3.1</i>	<i>Types of GenAI tools used</i>
		<i>K3.2</i>	<i>Specific purposes for which GenAI is used</i>
		<i>K3.3</i>	<i>Transition process</i>
		<i>K3.4</i>	<i>Best practice for GenAI application</i>
K4	<i>Impact of GenAI on creativity</i>	<i>K4.1</i>	<i>Changes in creative output</i>
		<i>K4.2</i>	<i>New opportunities and styles explored</i>
		<i>K4.3</i>	<i>Perception of GenAI as a creative partner or tool</i>
		<i>K4.4</i>	<i>GenAI enhances creative possibilities</i>
		<i>K4.5</i>	<i>Role of human creativity and artificial creativity</i>
K5	<i>Client work and GenAI</i>	<i>K5.1</i>	<i>Influence of GenAI on client projects and collaborations</i>
		<i>K5.2</i>	<i>Reactions and feedback from clients / an audience on work including GenAI</i>
		<i>K5.3</i>	<i>Strategies for incorporating GenAI into client-focused projects</i>
		<i>K5.4</i>	<i>Difficulties with the use of GenAI in the client workflow</i>

K6	<i>Challenges and Limitations of GenAI</i>	K6.1	<i>Technical and quality limitations of GenAI tools</i>
		K6.2	<i>Ethical considerations and authenticity concerns</i>
		K6.3	<i>Personal challenges in adapting to GenAI</i>
K7	<i>Personal style and artistic identity</i>	K7.1	<i>Influence of GenAI on personal style and artistic expression</i>
		K7.2	<i>Conflicts or synergies between personal style and AI-generated content</i>
		K7.3	<i>Reflections on maintaining artistic integrity in the age of GenAI</i>
K8	<i>Future perspectives</i>	K8.1	<i>Predictions for the future of GenAI in photography</i>
		K8.2	<i>Potential long-term impacts on the photography profession</i>
		K8.3	<i>Personal plans or ambitions related to GenAI in photography</i>
		K8.4	<i>Chances for photographers</i>
		K8.5	<i>Risks for photographers</i>
K9	<i>GenAI and market dynamics</i>	K9.1	<i>Effect of GenAI on the photography market and business</i>
		K9.2	<i>Competitive advantages or disadvantages</i>
		K9.3	<i>Adaption strategies for the evolving photography market</i>
K10	<i>New creative process / workflow with GenAI</i>	K10.1	<i>Benefits and positive aspects</i>
		K10.2	<i>Enhanced possibilities and feasibility</i>
		K10.3	<i>Limitations in the creative workflow due to GenAI</i>
		K10.4	<i>New creative process: synergies/differences old and new creative process</i>

Table 1: Coding system of the qualitative content analysis

5.2 Insights

In this section, the insights gained from the qualitative content analysis are presented and interpreted. The objective is to answer research questions Q2 to Q4 and to derive a guideline for an approach to the creative process for photographers incorporating GenAI. This guideline served as template for the subsequent case study, aiming to explore the creative possibilities provided by the use of GenAI.

The outcomes of this analysis aim to answer the following research questions:

- Q2: How can GenAI tools be effectively incorporated into the creative process of professional photographers to enhance their creativity?
- Q3: How does the use of GenAI affect the way photographers approach their work?
- Q4: What are the potential chances and risks of incorporating GenAI in the creative process of photographers?

By meticulously contextualizing and interpreting the data, the goal is to achieve a comprehensive understanding of these aspects. The qualitative content analysis enables capturing and interpreting the opinions and experiences of the interviewed experts in the field of photography and GenAI.

This section follows the thematic structure of the interview guideline and is thus divided into the five thematic areas (*the expert's professional background, the traditional creative process without the use of GenAI, the creative process with the integration of GenAI, the perceived impacts of GenAI on personal creativity and style, personal forecasts regarding the effects of GenAI on the field of professional photography in the future*). This ensures a clear and systematic presentation of the results. Each topic is introduced first, followed by a detailed analysis and interpretation of the data, each focusing on answering the specific research questions. Since the first area (the expert's professional background) has already been thoroughly discussed in section 5.1.1.2, the analysis here begins with the second thematic area (*the traditional creative process without the use of GenAI*), followed by the remaining three.

The results of this analysis are crucial not only to gain theoretical insights, but also to provide practical guidelines for the use of GenAI in photography. It is intended to make a valuable contribution to current research in the field of photography and GenAI.

5.2.1 Traditional Creative Process

In order to understand differences between two varying approaches on creative processes the assessment of the prior state before the change is necessary. That is why it is important to understand the conventional steps photographers go through in the ideation, visualization, production and post-processing phase in a commercial setting.

The creative process for commercial client projects follows the structures as described by Präkel (2010, p. 137) and as previously explained in chapter 2.2.1. Präkel's (2010) model represents the creative workflow for a client project in advertising. Figure 2 shows that the process of concept development and final approval involves an iterative feedback loop in coordination with the client.

The reports of the experts align with Präkel's (2010) model. From the experts' descriptions, the following creative process in the commercial photography sector can be described.

The creative process begins with the client's briefing, which can be either an open-ended or closed brief. In the case of a closed brief, agencies approach photographers with fully developed concepts, and the photographers are solely responsible for implementing the brief (Präkel, 2010, p. 138). In this scenario, photographers, as Hofbauer and Payer describe, act as consulting entities, using their photographic expertise to assess the feasibility and means of executing the concept. Here, the photographers' creative freedom is quite limited, extending only to parameters like framing or perspective. Roza illustrates this by saying, "In most cases, advertising agencies come to us with a fixed idea, and our responsibility is to visualize it. The process typically involves reviewing the idea internally and figuring out how to implement it." This scenario is most common in product and advertising photography, as Payer confirms.

Hofbauer describes the process of a closed brief as follows:

"The agency works with a big client that provides a brief, creates the concept, and then they hire a photographer, like me, to execute the already existing concept. Where I have relatively little personal input, except when I'm on location and decide how to frame it."

In the case of an open-ended brief, the photographer is involved in the development phase of the creative concept (Präkel, 2010, pp. 137–138). Thomsen describes situations where clients approach her with either a rough idea or no idea at all of what they want and need. The first step here is a joint brainstorming process to determine the direction the client wants to pursue. Identifying what a client likes is often a "challenging task" for Thomsen, as clients are frequently uncertain about their own preferences. Payer describes the brainstorming process

as: "Typically, you sit together and brainstorm. [...] You just throw out all ideas, even the silliest ones." After two or three rounds of brainstorming, a direction emerges that is further developed and refined. An important aspect of this initial ideation process is the ability to rule out many options. For Payer, the challenge in the creative process is "to function immediately and implement ideas on the spot, producing something presentable." In the case of an open-ended brief, Berger engages in initial conversations with the client. He emphasizes the importance of very attentive listening to understand what the client wants, in order to avoid ending up with a result that does not meet the client's expectations. Hofbauer describes this initial phase as "a process of clarification with the customer." Questions about the desired style, client positioning, or desired mood are clarified through conversations. The client also needs to be advised about the feasibility of ideas and concepts in photography. Berger sees his role as "to ensure that their concepts [...] are feasible and will look good through the lens and on a final product."

To leave no room for misinterpretation between the client's and photographer's vision, the next essential step in the creative process is the visualization of the ideas discussed in the brief. According to Berger, it is crucial "to clearly outline or visualize what the client will receive." The most common tool for this is the moodboard. Berger recommends creating several moodboards for different aspects of a shoot. "One moodboard only for posing, [...] another one for the mood, one for colour schemes, one for props." This approach ensures alignment on all aspects with the client. Thomsen, Kühn, and Berger use Pinterest collaboratively with their clients to create these moodboards. Pinterest, as a visual search engine, aids in visual communication, allowing the client to translate their verbally expressed visions into visual language through reference images.

The visualization of ideas helps to speak the same language when it comes to visual descriptions, which is especially important when communicating with individuals who are not accustomed to expressing themselves this way. Hofbauer finds that "language as a form of communication is often not particularly clear," leading to potential misunderstandings if the parties in a conversation are not familiar with specific jargon. Thomsen illustrates the wide interpretative scope of language in describing visual elements with an example: "The concepts of 'light' and 'dark' can vary greatly from person to person - what I consider light might be very different from someone else's interpretation." For Thomsen, it's "necessary to define these terms more specifically so that everyone has a clear understanding of the direction the project should take." Berger emphasizes that "through moodboards, clients can more easily communicate their preferences – whether they dislike or like a photo, and most importantly, why they like it. Is it the lighting, the mood, the pose?" Berger describes this dialogue to figure out the expectations and demands of the client, as "the first step to success." Moodboards, according to Roza, help to give clients an idea of what "the final product might look like." What

is visually promised in the moodboard or concept is what the client expects as the result.

Thomsen reports that the extent of creative input and decision-making authority she has in the creative process “varies depending on the client and the specific project. It largely depends on how well the clients know what they need. Usually, there's a substantial amount of [her] own expertise involved.”

Kühn's approach deviates somewhat from the typical structure of the creative process, as she adopts a much freer approach, leaning more towards an artistic direction. She likes “to have a concept, a direction, but not something that's completely planned out. Styling, colours, and the general direction of the image are roughly set beforehand, but often they still evolve during the process of shooting.” She describes her concept development as “freestyling,” allowing new influences from the situation to flow into her image concept during the shoot.

Once the moodboards, and thus the concept, are established and approved, the project moves into the production phase. As Berger explains, this involves “location, props, and team selection, depending on the budget.” During the shoot, typically only minor decisions are made in the creative process. New ideas or inspirations that arise from the setting might be tested and incorporated. Thomsen often finds “inspiration on the spot”. Similarly, Hofbauer notes that the decisions he makes during the shooting process are based on “experience and micro-decisions”. He always tries to put himself in the client's perspective and not to let his own preferences dominate too much. Berger emphasizes the importance of photographic expertise in execution, noting that “many clients don't understand the limitations of photography and can't visualize their ideas”. Thomsen further emphasizes that

“these are aspects where my expertise as a photographer comes into play. I need to guide my clients by understanding the light and other technical aspects, advising them on what is needed, how to approach the shoot most effectively, and what the options are. Some clients may have limited time windows, so finding solutions within these constraints is part of the job.”

External factors such as weather, time, or team play a significant role in the photographic process and can greatly impact the creative possibilities of a project. Despite these variables, photography is a medium that allows for precise control over many creative aspects and offers substantial influence over the final outcome, as Hofbauer describes: „You can cast the model, choose the location, and eliminate a lot of errors to get exactly the image and the framing you want.”

Roza describes a practical use case that is interesting for the integration of GenAI:

“We often have photo shoots where we need to incorporate backgrounds into a setup, especially when shooting in a studio. Until now, we've typically had to work with stock material for these backgrounds. Regarding photography, working with stock backgrounds can be somewhat limiting, as you have to adjust aspects like the lighting setup and camera perspective to match the background and ensure everything fits together cohesively.”

The creative workflow concludes with post-processing. For Pizzini, post-processing is “another creative process, because there are other decisions that need to be considered.” Prior to editing, there is a selection process for all the images taken during the shoot. Kühn often makes her choice of the final image at a “first glance,” immediately knowing “this is the one.” Once a selection is made, image editing can proceed according to the creative concept. Depending on the composition of the final image, whether it’s purely photography or combined with 3D or graphic design, Roza emphasizes the importance of planning “how to integrate these different elements in the image editing process to ensure a cohesive final result.” The most important goal is to create a harmonious and coherent image. The extent of creativity and new ideas infused into the image editing process depends on the concept as well as the personal working styles of the photographers. Payer remarks, “post-production and image editing is usually 90% of my work, but I don't bring in any new ideas at this stage.” In contrast, Hofbauer tends to incorporate his “personal taste and preferences” during post-processing in aspects like “the visual appearance, the colour grading, and the retouching.” He also doesn't shy away from experimenting with the final image, regardless of the initial concept:

“I am experimenting with new things, and then, when it reaches the point where I'm colour grading, I look at various aspects. Often, I realize that I could go in a very extravagant direction, giving it an unnatural look that might also be interesting for the client.”

Kühn also tailors her image editing to meet client specifications, depending on the amount of creative freedom she is given. In post-processing, she uses Adobe Lightroom for tasks like colour grading, and then Adobe Photoshop for refining details or taking the images in an experimental direction. Kühn often integrates many analog techniques and pursues a mixed-media approach. She mentions methods such as “photographing from the screen, printing, painting over it,” or “working with materials on the images and then scanning them back in or photographing them again [or] layering them in various ways.”

Thomsen outsources her post-processing by collaborating with a professional retoucher. She emphasizes that her retoucher “is well-acquainted with [her] specific image style, which is crucial.” She ensures that her retoucher reflects her style and creative visions in the final refinements. Pizzini highlights the importance

of post-processing in the creative process, stating that “image editing is equal to, if not more important than the photography itself.”

When it comes to the creative processes of the photographers, each of their approaches vary, particularly in the ideation phase. Pizzini reports that “there is a spark of an idea” that is either worth pursuing or not. He draws inspiration from reality, which he describes as “more creative, interesting, and unexpected than our mind.” Reality also serves as the driving factor that influences and modifies Pizzini’s ideas during the creative process. Similarly, Hofbauer describes his workflow as a dynamic process, starting with image creation and then flexibly moving towards new ideas and directions that seem interesting to him. He usually does not have a clear vision of his final outcome, preferring to stay up to date with trends and popular styles, incorporating them into his projects as needed. He gains inspiration from the “thousands of pictures” he consumes daily. Consuming and analysing images aids in internalizing principles of composition, colour theory, and other design principles. Thomsen refers to this knowledge as “intrinsic inspiration,” which she can always rely on. Decisions about lighting, framing, poses, and perspective are made passively, based on experience and in the moment of photographing. In contrast, Payer reports that he has a vision of his end result from the beginning. He tries to work within thematic areas, as it helps him achieve a flow state and generate more ideas “than [he] can implement.” He finds inspiration in the disparity of everyday life in different places and during travels. Payer tries to avoid “looking at what others are doing and copying that,” striving to keep his ideas uninfluenced by others. Kühn follows a similar approach. She places great importance on realizing her own ideas without external influences: “I try to rely on my own ideas, using what’s in my head rather than something I might see elsewhere.” For her, “the essence of being an artist is the urge to create something from within. The process of creation is rewarding.” This statement highlights the importance of the creative process in artistic work. Kühn also draws inspiration from music and nature. Berger, on the other hand, adopts a “remix approach.” He selects reference images and draws inspiration from them to create something new. For him, “it’s about borrowing elements and giving them a new spin, rather than outright copying. Nothing is entirely new in creation, but [he] aim[s] to infuse each project with unique and creative ideas.” Roza tailors his creative approach to each specific project. He decides whether the final image requires precise planning or extensive post-processing based on the desired outcome. For image ideas that are not meticulously planned, he allows himself “a lot of creative freedom during the editing process. This could involve projects where [he is] just experimenting for fun, leading to the birth of new ideas.” He organizes his ideas in a notebook. “An idea might end up in that notebook and then be rediscovered later” if it’s not feasible or too time-consuming.

The diverse approaches of the interviewed photographers illustrate the individuality in their creative processes and idea generation. While some follow a clearly defined vision from the beginning, others allow their ideas to be guided by the process, responding spontaneously to emerging inspiration and influences.

From the descriptions of the seven experts about their photographic creative process, several parameters have been identified that are essential for creating a successful outcome. These can be divided into technical and styling parameters. Technical parameters encompass aspects like lighting, time of day, aperture, shutter speed, focal length, aspect ratio, and framing. The aspects of background/location, model, poses, makeup, styling, mood/style, look and feel, colour schemes, and props are categorized under styling parameters.

5.2.2 GenAI-Enhanced Creative Process

Following the presentation of the traditional creative processes of the interviewed experts in the previous chapter, this section focuses on a detailed examination of the creative process incorporating GenAI. It starts with a discussion on the process of integrating GenAI, followed by an analysis of how GenAI has influenced the creative workflow in commercial photography. Finally, the challenges and limitations, as well as future opportunities for photographers, are explored.

5.2.2.1 Integration Process

The interest for the photographers to use GenAI arose with the upcoming of image GenAI in the beginning of 2022. When Tools like DALL-E 2 and Midjourney achieved to generate images that looked photorealistic they caught the attention of the photographers.

The moment Pizzini saw AI-generated images that resembled real photographs, he realized “that there is potential.” Just as for Hofbauer and Roza, the turning point was when “AI could create photorealistic images, indistinguishable from actual photos,” where they saw potential for the professional use of GenAI in photography. Roza describes his initial experiences with GenAI image tools as “almost addictive.” That is when he started to explore the possibilities of achieving “incredible results” through text input. Since the beginning of 2022, Roza has been using “elements generated by Midjourney for image compositings” in commercial client projects, as the quality was deemed sufficient by then. However, Roza does not yet consider GenAI tools as a “tool for daily professional use,” whereas Hofbauer already categorizes it as such.

After initial reservations about integrating GenAI into the workflow, concerned that it might not be “quite authentic”, Kühn decided to incorporate GenAI, “but still with [her] own signature.” It’s particularly important to her that her work is not pigeonholed as AI creations and do not resemble the typical AI-generated look. Originally, her focus was on creating purely AI-generated images, “but recently [she has] been focusing on generating additional elements for [her] photographed images.”

The greatest challenges in integrating GenAI into the photographic creative process arise in crafting effective prompts. It is particularly time-consuming to formulate prompts so that the generated results align with one’s own vision. To achieve this, Pizzini studied, compared, and tested prompts from other users “day and night.” His goal was to “understand how the algorithm works.” Pizzini realized that “[he] can transfer all the techniques [he] use[s] in photography to AI.” Kühn “invested a lot of time” as well, to find the best phrased prompts for her style. Thus, Kühn and Pizzini documented their best practices for prompting in a prompt manual.

Thomsen is already quite proficient in integrating GenAI into her workflow, having completed several client projects using these tools. Consequently, she has already accumulated valuable feedback and experience to build upon. Thomsen notes “there are many new issues arising that [she] hadn’t fully considered before.” She draws parallels to starting out in the photography industry, where one encounters unforeseen situations that are necessary to happen to identify problems, learn from them, and find solutions. It’s like starting all over again, but with enhanced and more precise communication skills in the professional jargon.

The experts mentioned various GenAI tools from the realms of image and text generation that they have tested. The three most commonly used tools are Midjourney, Adobe Photoshop, and ChatGPT. Midjourney was predominantly perceived as the tool offering the best image quality and realism in its generated images. Photoshop, with its generative fill feature, is the most common tool alongside Midjourney when it comes to generating images or image elements. ChatGPT is the only GenAI tool that doesn’t fall into the category of image generation but still plays a significant role in the GenAI-enhanced creative process. Berger refers to Midjourney and ChatGPT as the “flagships” of GenAI tools in the field of photography.

5.2.2.2 *The Co-Creative Process*

The potential applications of GenAI tools in the photographic creative process are wide-ranging. From the experts' statements, commonalities and intersections of specific use cases can be indicated. The identified application areas of GenAI tools can be categorised into the individual phases of the creative process: ideation phase, visualization phase, prompting, production, and post-processing.

5.2.2.2.1 Ideation Phase

In the initial phase of the creative process, the ideation phase, the integration of GenAI tools has become increasingly central. "AI is already being used a lot" to quickly generate ideas and conceptual visualizations that are both appealing and presentable to a client, as Payer points out. Tools like Midjourney and ChatGPT have become especially valuable for photographers and creative agencies, aiding in the development of ideas, concepts, and moodboards.

ChatGPT is the primarily used tool at this stage. This text based GenAI tool is employed for generating new inspiration or input for an initial idea. Midjourney, as highlighted by Roza, serves as a "huge source of inspiration," offering access to a vast collection of images created by other users, and can thus be effectively integrated into the ideation phase as well. ChatGPT is used experimentally, seeking for potential new ideas, associations, or variations of an initial thought or direction. Berger refers to ChatGPT as an "idea starter," using it to seek "creative, extraordinary image ideas for a shoot." While he may not find all results directly usable, "with some things suggested [he] associated new ideas." Similarly, Pizzini employs ChatGPT to generate prompt variations, automating the generation of variations of his fundamental idea rather than manually testing different prompt styles over months. Hofbauer emphasizes GenAI tools' superiority over humans in the speed of idea generation, suggesting that "just asking for an idea is not a mistake as a first step into a project." Payer notes that "in the creative process [one] needs to function immediately and produce and implement ideas on the spot." This task was previously perceived as extremely challenging, where tools like ChatGPT and Midjourney can now offer significant support. The speed of these tools allows for a rapid assessment of the AI-generated input's usefulness for idea development. Depending on this, tools like ChatGPT are either utilized in the creative process or not.

Payer sees the potential of ChatGPT and GenAI tools in idea generation, particularly "after the initial brainstorming process," acknowledging that AI cannot yet independently replace the initial creative idea. For Payer, "the initial idea needs to exist beforehand." ChatGPT can be used supportively in formulating this initial idea. GenAI tools rely on human input in the form of a prompt to generate

something. In the field of photography and the creation of photographic concepts, there are certain conditions, specifications, and limitations which influence the foundational requirements for the ideation phase and must therefore be considered in the input for GenAI as well. Thus, GenAI tools are most effectively employed after finding an initial idea and taking place either after or in collaboration with human input.

Consequently, ChatGPT is primarily utilized as a source of inspiration for new input to further develop, refine, or redirect ideas, while Midjourney serves both as an inspiration source and a tool for visualizing these ideas.

5.2.2.2.2 Visualization Phase

The ideation phase is followed by the visualization of the generated ideas. In this phase of the GenAI-enhanced creative process, GenAI image tools like Midjourney are utilized. Kühn sees the value of these tools, aside from providing new input, in “the ability to visualize.” All interviewed experts agree that GenAI is suitable to “visualize ideas” and “create moodboards for clients.” In the visualization phase, GenAI tools like Midjourney are thus used to generate images for the creation of moodboards. Payer highlights in this context that with GenAI, “you simply input a few words and it produces something you can show to the client.”

When generating images with a GenAI tool, a certain number of result images are returned depending on the tool, usually ranging between one and four. The results include not only the specified elements in the prompt input but also new random image elements. As Thomsen describes, she is often “inspired with new ideas that influence [her] process” when “examining the outcomes.” The generated results of GenAI image tools therefore provide additional input in the creative process. Berger confirms that the “very creative results” might “include things [one] might not have thought of before.” Roza explains that “AI offers the advantage of being able to visualize ideas more precisely,” benefiting clients by providing “a much better idea of what the final product will look like.” Due to the customizability of AI-generated images, Kühn was able to show clients very clearly “how a shoot could look like [...] with specific outfits and styles.” This makes photographers less dependent on finding suitable stock photos for moodboards, as these often do not precisely align with the client's visions and discussed ideas. Kühn notes that image GenAI tools additionally “simplify the communication with the client.” A precisely visualized idea enables the client and photographer to discuss the same visual aspects, thereby avoiding potential misunderstandings and supporting the initial process of determining client desires. “Visualizing ideas with AI for a concept is particularly helpful for non-models or clients, as it gives them a clear concept of the final image,” elaborates Thomsen further. The use of AI-generated images in

moodboards for commercial projects thus eases the workflow with clients and models by ensuring clearer visual communication. Payer reports that “creative agencies use AI images to present concepts to their clients, working almost exclusively like this anymore.” This indicates that this method has already found application in the industry.

The downside, as Berger explains, is that “the things you present in a mood board are promised to the client.” Therefore, the client expects the final results to closely match the presented moodboard or concept. Consequently, photographers are more frequently confronted with the challenge of recreating AI-generated images, that were developed by creative agencies and already approved by the client, as photographs. The necessity to recreate AI-generated images as actual photographs stems from the limited resolution of AI-images, which makes them impractical for specific uses.

Similar to the ideation phase, GenAI tools can offer new input and inspiration for developing ideas in the visualization phase, as well as facilitate communication between photographers and clients through providing precise visualizations of concepts.

5.2.2.2.3 Prompting

The mere generation of images through prompts represents another application area that has opened a new field in photography and introduced new commercial avenues. One such avenue is the generation of stock images. Hofbauer recognized this option as a new “scalable” source of revenue and focused on generating stock images with Midjourney. As virtually any image subject is theoretically possible to create with GenAI tools, there's the need for a strategy to identify in-demand images. For this, Hofbauer uses “research tools that track current trends” to understand “when certain content is needed, and which styles are popular.” To write prompts for GenAI image tools, experts use ChatGPT to quickly create multiple prompt variations and make the process of writing prompts more efficient. Thomsen utilizes ChatGPT for writing her prompts in order to “generate a background with Midjourney.” For this purpose, she specifies the image requirements as precisely as possible to ChatGPT and receives “five different prompts for each scenario.” These prompts then serve as a basis for creating images with Midjourney, allowing her to test various options for potential backgrounds. After reviewing the results, she adjusts the prompts based on her vision to get closer to the desired result. This process is repeated until the desired background image is achieved.

5.2.2.2.4 Production

The use of GenAI image tools for creating backgrounds also falls within the application area of production. AI-generated backgrounds are combined with a photograph of a person or object, creating a fusion of GenAI and traditional photography. Thomsen emphasizes that the “combination of real people and AI-generated backgrounds” offers many possibilities and advantages. For instance, this approach allows for thorough planning in advance what is needed for the desired images. As a result, image subjects that would normally be very complex in production can be quicker created and implemented. For example, Thomsen undertook a “virtual journey around the world,” photographing “locations like Paris, Cappadocia, Cuba, Iceland, and Ibiza, all within three or four hours” using this approach. As Roza mentioned, it's often the case in professional photography, especially in commercial settings, that only the subject is photographed in a studio, and a different image is integrated as a background in the editing process. Until now, photographers were “mostly dependent on stock images. Nowadays, however, it is possible to confidently move away from stock images and create one's own custom background,” as Roza confirms. Thomsen adds, “instead of shooting on location, you shoot the person in the studio and prompt the background [yourself].” This process requires that the AI-image is generated beforehand to correctly replicate the lighting conditions from the AI-image in the photo studio. Roza also confirms that “it's still necessary to generate these images before setting up the shoot. This sequence remains important because, despite the advancements in AI, there are still limitations in the flexibility of AI-generated images.” If the real photography is taken first, it is very likely that the lighting will not harmonize with the later generated background, resulting in an inconsistent overall image. Currently, GenAI does not offer the flexibility or precision to adjust the lighting afterwards to match the real photo. However, the integration of GenAI broadens the range of visual possibilities for an image, as any desired location can be generated as a background, while simultaneously reducing the production effort for on-location shoots. Besides generating backgrounds to be combined with real image elements, Kühn mentions the possibility of “creating additional elements to incorporate into a real image, like a collage or a compositing.”

As previously mentioned, another method of integrating GenAI into the execution of concepts is the photographic reconstruction of AI-generated images. Roza describes this option as “an exciting and creative process in itself, having to find a solution to achieve the desired result.” The challenge lies in authentically replicating the colour harmony, lighting conditions, and the scene depicted in the AI-generated images. Berger emphasizes that this requires profound photographic knowledge, as the overall image produced by GenAI is “already quite perfect.”

5.2.2.2.5 Post-Processing

The final application area of GenAI in the photographic creative process is post-processing. Here, the primary tool used is Adobe Photoshop, especially its GenAI tools such as generative fill or generative expand that are available since the Photoshop Beta version was launched. Roza already refers to these two Photoshop tools as “everyday life” tools in a professional context. Hofbauer uses “generative fill instead of using the clone stamp tool” for retouching images, and Roza for “removing elements from images”. The use of generative fill in retouching and removing or replacing image elements was found particularly useful by the interviewed experts. The smart extension of image content, such as converting a portrait format into a landscape format using generative expand, is perceived as process-optimizing. Generative expand eases the challenge of needing one image subject to work in all formats (portrait, landscape, square) for specific applications like social media or print. Due to the intelligent expansion of images by Adobe Photoshop and the short processing time, almost any image subject can now be adapted to the desired format, making the composition of a picture more flexible. Roza even reports that the generative expand tool positively impacted his photographic process and work. “Clients often want as much 'extra space' around the main subject as possible” to be able to crop it appropriately for different formats later. For Roza, this requirement was

"quite frustrating because it significantly influenced the photography process. For example, if [one] want[s] to use a telephoto lens to get close to the subject for more depth of field and isolating the subject from the background, having to step back to include more space around the subject can compromise the shot's intended effect."

Since the release of the generative expand tool, Roza can photograph and frame his subjects as he wants. If the client needs more space around the subject, or a different format, it can be easily expanded with GenAI afterwards.

Another factor simplified in the editing process by the use of GenAI, as Roza notes, is the reduced reliance on “stock images for editing tasks, which is a common issue in [the] field.” When it comes to the image editing of a compositing, clients often don’t have “the budget to commission photography” to create certain image elements. “Instead, they provide stock material” and expect it to be used, regardless of whether the material matches in terms of perspective and lighting. Roza emphasizes that “having AI as a tool in such situations can be a blessing, as it offers more flexibility in creating coherent compositions from diverse elements.” This is due to GenAI image tools being “exceptionally good at matching colours,” and therefore “these images are very harmonious in terms of colour and contrast,” Payer reasons.

5.2.2.3 *Best Practices and Tips*

From the experts' shared experiences, best practices, learnings, and tips have been derived on how to optimally integrate GenAI tools into the photographic creative process and workflow. Clear patterns and overlaps were extracted from the statements, which will subsequently be elaborated.

The most significant experiences were gathered in prompting images and writing effective prompts. Through trial and error, experts learned key aspects to consider in prompting to achieve desired results. The best practices identified focus on the most commonly used tools, Midjourney and ChatGPT. To learn prompting, it's helpful to "look what others have prompted," as Thomsen suggests. The Midjourney Community Feed is a great resource for this purpose. It's an archive of all publicly generated Midjourney images, that can be searched by keyword. Clicking on an AI-generated image reveals the underlying prompt and parameters used for its creation. The feed offers a lot of inspiration and showcases the possibilities of GenAI. Roza follows a similar approach as Thomsen, searching the Community Feed for images similar to his idea and drawing inspiration from their prompts. He either uses a prompt "as it is or taking elements from it to create [his] own customized prompt." Pizzini recommends writing precise and short prompts for Midjourney. He labels long prompts as "useless" since Midjourney "ignores the things in the middle of the prompt. Only the beginning and the end of a prompt count". Roza explains that "there is indeed a certain order" to be followed "when crafting prompts for Midjourney". This order starts with specifying the medium (photography, illustration, etc.), then describing the scene to be generated, followed by the vibe, look and feel of the image, and finally adding Midjourney specific parameters like aspect ratio. This order can be used as a script or blueprint for a prompt and fed into ChatGPT to automate prompt writing. Thomsen "explained [her] style of photography to ChatGPT and then asked it to write a prompt tailored to [her] style". This ensures a better fitting outcome to a photographer's personal style when using ChatGPT generated prompts for generating images with Midjourney. Hofbauer furthermore advises specifying camera parameters, one would normally set physically, in the Midjourney prompt for more photorealistic results. For example, he specifies "exactly what aperture or camera style" he wants depicted. He often includes "the colours of a Portra 400 analog film" to make the grading resemble the real film look. When prompting a detailed image, "there is a lot of personal decision-making involved, from the hair colour to every single detail," as Hofbauer describes. This highlights the shift from determining real-life parameters for a photo shoot to describing them in words. It also illustrates the effort involved in creating AI-generated images with a unique scenery, look, or feeling, distinguishing them from generic AI-generated images.

Another key insight is that the ability to generate GenAI images opens up the potential to create any imaginable scene. However, the boundless possibilities can sometimes lead to indecisiveness and a sense of being overwhelmed. To avoid getting lost in the multitude of options, “it might be helpful to have a precise concept” or “at least setting a framework for oneself” beforehand, as Kühn suggests. This approach ensures that once the predefined goal is reached, it's easier to recognize the point at which to stop optimizing the image. Hofbauer has also realized that having “specific ideas” in mind beforehand facilitates the creative process with GenAI tools, helping to maintain focus.

From the experts' experiences with the GenAI-enhanced creative process, they have gained valuable insights and identified new aspects that can be considered in future projects. As Ines Thomsen notes, the integration of GenAI into the photographic creative process brings up “many new issues that [she] hadn't fully considered before.” She believes that “these situations need to occur to understand why they happened and how to deal with them.” Thomsen compares these learning experiences to the early days in the photography business, where one encounters numerous unexpected situations and must learn from them. One learning experience for Thomsen involves recognizing photographic details, such as rapid transitions from sharpness to blur. When combining AI-generated backgrounds with real photographed people or objects, it's crucial to match the blurriness of the background to the aperture used for the subject to achieve a natural result. However, Thomsen counters this by saying, “[She] always approaches this from a target audience perspective. Who [is she] creating this for? Who will notice?” Such minor discrepancies are unlikely to be noticed by the majority of people not working in the field.

5.2.2.4 Guideline for the Co-Creative Process

Building on the insights, best practices, and use cases derived from the interviews with experts, a guideline for a new approach to the creative process of photographers integrating GenAI tools has been developed. This guideline serves as a practical instrument in this work to demonstrate the research findings derived from expert interviews and theoretical exploration in a real-world application. It forms the foundation for a case study conducted to showcase these principles in practice, offering a tangible example of how GenAI can be effectively incorporated into photographic creativity.

This guideline focuses on the methodology and workflow for combining photography with AI-generated backgrounds. It provides a structured approach to integrating these two elements, offering photographers a systematic way to

enhance their creative process with the capabilities of GenAI. This approach can be individually tailored to fit client specifications and requirements.

Ideation Phase

In the ideation phase, based on the brief and customer requirements, various ideas for implementation are developed. The brainstorming process for generating potential ideas is conducted using ChatGPT. To obtain suitable results for the brief, it's essential to describe the requirements as specifically as possible to ChatGPT via text input. Customer requirements such as the number of subjects needed, target audience, intended use of the images, as well as the desired look and feel can be provided to ChatGPT to enhance understanding of the context. Once ChatGPT has all necessary information, a collaborative brainstorming session can begin, characterized by an experimental nature. Essentially, working with ChatGPT resembles a text-based conversation. ChatGPT can be asked for suggestions, variations, and associations related to the initial scenario of the brief. Depending on the satisfaction with the output from ChatGPT, this conversation, consisting of human input and AI-generated output, can be iteratively repeated until a suitable result is achieved. Consequently, this process can vary individually and according to personal brainstorming preferences. Additionally, the Midjourney Community Feed can be searched for visual inspirations using keyword search. The order of using both tools can also vary individually as needed and is generally iterative as well.

Visualization Phase

After generating various ideas and directions through collaborative brainstorming with GenAI tools in the ideation phase, the ideas suitable for potential implementation can be refined and evaluated in the visualization phase. The goal of this phase is to create a concrete idea for developing a moodboard and concept.

To visualize the previously generated ideas, the GenAI image tool Midjourney is used. The image ideas are first formulated into Midjourney-specific prompts and then put in Midjourney to generate the images. Each prompt yields four result images. Based on these, the prompt and thus the generated image can be further modified and tailored to the requirements. It's important to define technical parameters like lighting or perspective during the prompting. Styling parameters should also be established in the AI-generated images. This includes poses, mood, look and feel, or colour schemes. Iteratively, multiple variants of an image idea can be generated to find the best fit.

In this phase, ChatGPT can support the prompting by generating any given number of prompt variations to visualize image ideas efficiently through Midjourney. This aids to decide which image idea best matches the brief. For instance, ChatGPT

can be instructed to write five variations of a prompt, each time using a different scenery but keeping the rest of the specifications the same.

Once satisfactory results are achieved, they can be used to create a mood board for communication with the client.

Production Phase

In the production phase, the elements that must be photographed are created. Depending on the assignment, this might involve a person, a model, a product, an object, or other items. The Midjourney image to be used as a background should already be approved by the client at this point. This image sets certain parameters that need to be considered when photographing the subject or object. Factors like lighting setup, perspective, aperture, and depth of field must be matched to the Midjourney background to create a seamless and harmonious overall result. The styling parameters, such as model, pose, styling, and makeup, follow the specifications of the approved moodboard and can be planned and organized in advance. During the photo shoot, it's important to ensure that the model strikes the desired poses or that the object is placed in the intended position.

Post-Processing

Once the appropriate subject for the background has been successfully photographed in the production phase, the final step is the composition of both elements. This is done using Adobe Photoshop and its GenAI tools like generative fill and generative expand. The process starts by preparing the Midjourney image so that it is suitable for integrating the photographed elements. This might involve removing or adding elements using generative fill. Next, the subject or object from the photograph can be isolated and integrated into the AI-background using masks, layers, and other common image retouching tools to achieve a natural and realistic result. Finally, further adjustments to the colour scheme, exposure, contrast, etc., of both elements, AI-image and photograph, can be made to create a harmonious overall image. If the result is needed in various formats, generative expand can be used for this adjustment.

5.2.2.5 Similarities and Differences

The integration of GenAI into the photographic creative process results in several key changes and differences compared to the conventional creative process, while also exhibiting similarities. This section will first explain the differences, followed by the similarities between the two processes.

Pizzini notes that the “creative process won't be any different with AI,” yet the manner in which ideas are developed and implemented undergoes significant

adjustments. The biggest change and challenge lie in mastering the art of prompting, so as to realize desired visual concepts with GenAI tools. For Pizzini, the challenge was “to master the prompting so well that when [he] had an idea, [he] could achieve it with prompting.” Prompting heightens the importance of describing images, making the role of language in the creation of visual content more important. The ability to describe images ultimately influences the quality of AI-generated images. Hofbauer notes that when describing very abstract image ideas, language is “quite limited” and reaches its boundaries, which can make it challenging to achieve good results.

Hofbauer describes the new creative process, in contrast to the traditional one, as “a very automated process, where [he] mostly just copy-pastes, or selects what is interesting.” He now primarily works with ChatGPT, which generates ideas and writes prompts for Midjourney. This shift leads to an increased emphasis on the selection process of images generated by Midjourney. Consequently, Hofbauer sees a creative aspect in “determining which is the good photo, or which one to select from the hundreds of images” produced by Midjourney.

Thomsen perceives the difference in the creative process with the use of GenAI, as opposed to without it, in the newfound control over the technical and styling parameters of a photoshoot and the independence from external influences like weather and time constraints. She describes the process as “nothing other than location scouting beforehand [...] instead of physically going to a location to see it, [she] generates and reviews it digitally.” Furthermore, she emphasizes that the process with GenAI is overall more efficient for the client, as she can precisely plan and photograph sets within a matter of hours.

For Roza, a significant difference brought about by GenAI in the creative process is the new possibilities it creates. Specifically, it enables individuals to execute specific tasks that are usually outside their skill set. Under normal circumstances, such tasks would require the involvement of other professionals, which can be costly or inaccessible. “AI can be a valuable tool in such scenarios, enabling [one] to accomplish tasks that were previously beyond [one’s] capabilities,” he notes.

Payer particularly highlights differences in post-processing. For him, the retouching of AI-generated images compared to real photographs currently differs mainly due to the inferior resolution of AI images. He explains that

“photographs have sharpness and blurriness, clear edges, and well-defined elements. With these features, you can work incredibly well in image editing. That’s the problem with AI-generated images. They don’t offer the same level of clarity and definition, making them less effective for detailed image editing.”

A similarity noted by Pizzini lies in the applicability of photographic parameters to the prompting of GenAI images. “Everything I've learned in photography can be applied to the AI,” Pizzini illustrates. This includes aspects of technical parameters such as the choice of focal length, aperture, and exposure time, as well as aspects of styling parameters like location, model, and mood. Thus, a photographer's photographic thinking can be transferred and applied to the prompting of images. Pizzini finds that in terms of image composition, “the creative process is very similar.” Building on this, another similar aspect is the need for extensive creative input when using GenAI tools to create images that stand out and are distinctive. For Hofbauer, specific decision-making remains crucial. “When something specific is wanted, there's a lot of personal decision-making involved, from the hair colour to every single detail. This brings it back to being similar to a photo shoot.” This emphasizes that despite advanced technology, human input in the creative process still plays a central role, and that GenAI should be viewed as a supporting tool that complements, rather than replaces, the vision and creativity of the photographer.

The creative process with the integration of GenAI retains similarities to the traditional process, while introducing significant changes and new challenges, especially in ideation, planning, and efficiency. However, the ability to transfer photographic techniques and a deep understanding of image aesthetics into working with GenAI, along with the necessity for creative personal input, remain fundamental pillars that continue to be valid in the era of AI-assisted photography.

5.2.2.6 Benefits

The integration of GenAI tools into the professional photographic creative process offers several positive aspects for both clients and photographers. Some of these aspects have already been described in the previous chapters. Consequently, the most significant benefits will be summarized once again.

A benefit of GenAI lies in its potential for time saving and efficiency, though experts have differing views on the extent of the time savings it actually offers. Therefore, the aspect of time saving must be viewed in a nuanced way. As Pizzini notes, in contrast to photography, one can create “an image very quickly” with GenAI, but this requires months of learning how to prompt images and consequently involves a significant investment of time. Additionally, the field of GenAI is rapidly evolving, necessitating continuous learning of new functions and prompting capabilities. However, for Berger, GenAI makes “daily applications” like “removing image elements or expanding the image” more time-saving and efficient. Thus, GenAI streamlines everyday tasks. Yet this “didn't decrease the working hours” as Payer opposes. Hofbauer confirms accordingly that with the increased efficiency in

everyday tasks and image creation, there is a corresponding rise in the output of images. Since the integration of GenAI he has an “output of 100 to 200 images a day,” that would not have been possible before. Kühn also believes that the use of GenAI in the workflow does not lead to overall time savings. “The multitude of options means you spend just as much time as before, because you experiment more,” Kühn explains. The endless creative possibilities of GenAI lead to more time being invested in experimenting with different image design options. Thomsen remains uncertain as well as to whether the creative process with GenAI is more efficient compared to previous methods. From the experts' statements, it can be concluded that GenAI makes certain steps in the creative process more efficient, but the time saved is then again invested in generating new images and content.

The independence from external influences and limitations, as well as reliance on stock material, is seen as a clear advantage of GenAI, in contrast to the aspect of time saving. The capability to generate images with GenAI allows for the creation of individually tailored backgrounds or image elements for compositings, simplifies the achievement of cohesive final results, and frees photographers from dependence on existing stock material. As Thomsen notes, image elements and backgrounds can be generated “at any time of the day,” eliminating the constraints of a photoshoot, such as weather or daylight, by the possibility of generating the desired weather and lighting conditions with GenAI. This independence from these factors leads to greater flexibility and freedom, and simultaneously provides more control over the parameters (technical, styling) influencing the creative process and professional workflow.

A further distinct benefit of integrating GenAI into the creative process is its role as a source of inspiration and the rapid visualization of ideas. For Kühn, “the real utility of AI tools, aside from providing creative input, is the ability to visualize things.” The results interpreted and generated by GenAI from human inputs offer new insights for the further development of ideas. Additionally, resources like the Midjourney Community Feed, which archives AI-generated images, can be, as Roza notes, “a valuable source of creative ideas.” The capability of GenAI image tools for precise visualization of individual ideas replaces the need to “search the internet for images that roughly match your ideas and concepts,” Roza explains. Creating moodboards consisting of AI-generated images allows for an accurate visual representation of the concept of a project or job. For Kühn, being able to “show clients what the final result might look like [...] simplifies the communication with the client.” It not only eases communication with clients but also aids in working with people being photographed. Thomsen finds it particularly helpful that the Midjourney images she generates beforehand “pose ideas and guidance for the person later photographed.” She also emphasizes that “this method is particularly helpful for non-models or clients, as it gives them a clear concept of what the final image could look like.”

The most evident benefit of GenAI in the photographic creative process is the ability to realize image concepts that were previously impossible, too time-consuming, or too expensive to execute. “Some images are practically not achievable with photography but with AI they are just a few clicks away and you get a cool looking result,” Payer highlights the new options offered by GenAI. For Roza, this aspect even represents “the biggest benefit of AI” in the photographic process. With this technology, Roza is able to reassess “all ideas written in [his] notebook that [he] did not tackle because they were off-limits to create” and reevaluate their feasibility with GenAI. Berger adds that photographing certain subjects can involve “significant effort.” Through the integration of GenAI, such subjects can now be considered for implementation. Thus, GenAI opens up new avenues and possibilities in photography for realizing previously unachievable image ideas and concepts.

5.2.2.7 Challenges and Limitations

Despite the significant advantages GenAI offers in the realm of photographic creativity, there are also some drawbacks associated with integrating this technology. The disadvantages of GenAI identified from the interviews can be categorized into various groups, including technical aspects, client-related issues, personal challenges, overwhelming effects, ethical concerns, and public feedback.

5.2.2.7.1 Technical

The most significant technical drawback of GenAI for the use in professional photography is its lower resolution compared to professional cameras. “The limited resolution of AI-images has the consequence that it is not usable for every medium,” Hofbauer explains. Currently, the resolution suffices for web postings, but according to Payer, it falls short for “professional print.” Roza, Hofbauer, and Payer agree that the resolution of GenAI images is particularly inadequate for “professional advertising subjects for large billboards.” The low resolution often necessitates finding a “workaround” for image concepts or moodboards created by creative agencies using AI images that have already been approved by clients. One workaround, as Roza explains, involves using a GenAI tool to upscale the resolution. However, the effectiveness of this upscaling and whether the results still resemble the original depend on the image and its content. Another workaround involves recreating the AI-generated image through photography, especially when upscaling the image doesn't produce satisfactory results. The low resolution also poses a challenge in creating compositings consisting of both real photographs and AI-generated elements. For Roza, it's “difficult to integrate AI

images into compositings because they are usually too small” compared to the high-resolution photographed elements.

GenAI image tools lack the flexibility, control, and precision to fully utilize their potential in the photographic creative process. As Pizzini explains, “there is always a large grey area in prompting,” highlighting the limited controllability of the results from GenAI systems. This is because “Midjourney sometimes ignores or completely omits certain details,” Berger points out. “AI just throws something back as a result and you have to work with it,” Roza describes. Payer agrees, labelling GenAI as “hit or miss.” He also sees a problem in the inconsistency of GenAI results, which are not always reliably good and lack controllability. When GenAI is given a prompt as input, there is no certainty that the output will match the desired ideas and visions. The lack of control and precision in GenAI image tools is evident when trying to implement very specific requirements that would be easily realized in photography. Roza notes that the tools lack “the precision to really get where the result should be,” which can be particularly frustrating when there is a clear vision of the end result that cannot be fully realized in all its details. Often, it involves nuances like “adjusting the perspective slightly, those crucial ten centimetres down the viewpoint,” Roza gives as an example. Berger agrees that GenAI image tools cannot implement very “specific requirements” with the same precision as it is possible with photography. Payer also wishes for more control and flexibility when working with these tools. “Image generating AIs are not able to combine different aspects of the result images from one prompt into a newly generated image.” Results from GenAI image tools are always unique and not replicable. If a suitable image is generated that only needs one detail modified, it’s not possible to achieve this with a new prompt that considers only that change. Even though GenAI can be tasked with changing the detail, it will generally alter other parts of the image as well. Payer would thus find it helpful if “these creations were re-creatable, allowing for post-creation modifications.” The current solution to this problem, as Roza explains, is “to resort to Photoshop to artificially construct the desired scene.”

A significant drawback of GenAI tools in the creative process is their lack of originality. Andrea Pizzini highlights the risk of uniformity associated with using GenAI. “There is a risk of uniformity with GenAI. At some point everything conforms to a certain consensus,” he says. However, he sees an opportunity for photographers to maintain relevance through original, creative image ideas. Pizzini describes GenAI as a “self-reflecting mirror, a loop” that eventually reproduces itself without new human input. He points out that while AI tools like ChatGPT and Midjourney can accurately replicate certain styles and looks, anything that deviates slightly from the norm requires one’s own creative efforts. Berger adds that GenAI responses can sometimes be better than those of humans, but they are merely reformulations of its training dataset. “AI can’t judge what’s right or wrong.” Hence,

for the time being, differentiating what is good and what is bad continues to be a task for human judgment.

Another technical limitation of GenAI image tools is their inability to accurately represent certain objects. The reason for this, Hofbauer explains, is that “they haven't been fed with enough images of the object,” which can limit the creative freedom in the process.

From these limitations arises an opportunity for photographers in the era of GenAI to explore new, creative paths and preserve true originality. The challenge is to use the technology as a tool that expands the creative horizon without undermining the uniqueness and authenticity of the human vision.

5.2.2.7.2 Clients

The problems and challenges that arise with the integration of GenAI in the creative process with clients often stem from the technical limitations. According to Payer, similar challenges have been encountered in the past when working with unusable image material provided by clients. The difference now is that GenAI material often has low resolution, a fact that clients and creative agencies may not be aware of. As a result, clients are impressed by the AI-generated images and approve the concept, only to later realize that the generated material is not usable for print due to its insufficient resolution. Once the concept has been approved, the AI-image then needs to be recreated through a photoshoot as a workaround solution in order to provide the promised result to the client. “This process can be quite challenging and time-consuming, as it involves replicating what the AI initially generated but didn't deliver in a usable format for professional purposes,” explains Payer.

Legal implications also present an unresolved obstacle. Roza notes that there are “uncertainties about the legal implications” regarding “copyright and intellectual property rights.” “The legal framework around AI-generated images is still unclear,” agrees Payer. Roza remains “cautious about using AI to generate images directly for clients.” Therefore, he mainly uses GenAI for creating partial aspects, especially for background details in images, which due to depth of field are often blurred and thus do not require the same precision and recognizability as the main subjects. The question of whether certain images can be used and who owns the usage rights is another significant concern that needs to be addressed in the future.

Overall, these challenges demonstrate that the integration of GenAI into the creative process with clients is not just a question of technical feasibility but also of legal and practical implementability. The ability to contribute one's own creative inputs and think beyond merely replicating AI-generated templates remains an important aspect of professional photography and creative work.

5.2.2.7.3 Personal

Personal challenges associated with integrating GenAI into the creative process often lead to a rethinking of one's professional role. The conflict regarding the extent to which GenAI should be integrated into the photographic creative process or viewed as a separate approach is a common concern among all experts. Hofbauer describes a strong feeling of uncertainty about what role he will have in the future if “90% of [his] job won't be needed in 2 years.” Payer expresses uncertainty about the ambiguity and complexity of authorship in creations produced in collaboration with GenAI tools. Questions arise such as “did I create this or didn't I?” Hofbauer also struggles with viewing AI-generated images as his own creations, because “it's something anyone can quickly do.” The boundary between the contribution of the GenAI tool and the human creator's contribution continually blurs and cannot be clearly delineated. For Roza, the thought that people might consider his previous photographic works as AI-generated raises “questions about the value and uniqueness of the skills and effort [he has] put into [his] craft.” If the same results can be achieved through simple text input, it devalues the photographic craftsmanship and skillset in his view. “The essence of craftsmanship being dissolved and replaced merely by text input is a concerning prospect” for Roza. The increased integration of GenAI raises concerns that photographic craftsmanship could be replaced by simple text inputs, leading to a loss of valuable knowledge. Additionally, the flood of AI-generated images leads to a devaluation of one's own photographic work. For Kühn, “the process of creation is rewarding, and that positive urge to create is somewhat diminished by AI.” She reports a loss of drive and passion to be artistically and creatively active every day due to the introduction of GenAI.

The integration of GenAI in photography blurs the line between human creativity and technology, pushing photographers to redefine their role and art in this evolving landscape.

5.2.2.7.4 Overwhelming Effects

Berger describes his initial experience with GenAI tools as a “mix of shock and fascination,” noting the compelling nature of the technology that all interviewed photographers report. The rapid development and continuous updates in this field amplify this feeling. Pizzini, trying to keep up with these advancements, had to take a break from using GenAI tools due to exhaustion. Roza finds the fast-paced evolution of the technology “challenging to thoroughly explore and master each new development” and to “integrate them into daily workflows.” For him, the challenge of continuously educating himself on the latest developments in GenAI carries the risk that this could limit his creativity. Engaging with the theoretical aspects of GenAI might lead to “[one] drifting away from the practical, hands-on

creative process.” However, it's not only the rapid development that's overwhelming but also the seemingly endless possibilities GenAI offers. This, coupled with the feeling that the next generated image could always be better than the one before, can be daunting. For Kühn, it's difficult “to know when to stop generating new images and be satisfied with a result. [...] There is no end anymore.” Without a clear vision, deciding when to cease optimizing the generated images becomes challenging, and the overwhelming array of options can actually constrain the creative process.

5.2.2.7.5 Ethical Concerns

The use of GenAI in photography, a medium traditionally anchored in depicting reality, raises several ethical questions and concerns. A key issue is the increasingly difficult distinction between real photography and AI-generated photorealistic images. Pizzini perceives the danger that “it will take a while for people to understand that any image can be faked by AI.” People must adapt to the idea that “images can no longer be seen as evidence or proof of a certain fact.” Thomsen also questions “which photo can still be trusted?” However, she notes that “this is not a new issue. It's been driven to an extreme now.” Image manipulation has long existed, but it has never been as easy as it is now. The inability to distinguish between a real photograph and an AI-generated image, according to Roza, undermines the “appreciation and value” of photographic creations. Berger reflects this view in his considerations. He illustrates this with the example of a nature photographer. They often invest considerable time capturing the perfect image of a species, an effort that can now be matched in quality with images generated using Midjourney. “This diminishes the joy and value of the original photograph. To the viewer, both images appear the same, one is authentic, the other AI-generated.”

5.2.2.7.6 Public Feedback

According to the interviewed experts, the feedback from people on photographic works created in combination with GenAI tends to be negative and resistant. Pizzini observes that “there is a lot of resistance” towards the use of GenAI. He even notes resistance to AI-generated images within his social circle. Pizzini compares the emergence of GenAI to the advent of photography itself. When a new technology emerges and starts replacing existing methods, it takes time for this new technology to gain widespread acceptance. Similarly, GenAI and its use in photography is currently still struggling to be recognized as a legitimate art form. Kühn shares similar experiences as Pizzini. She has produced many images with GenAI but hesitated to publish them, as reactions were often reserved and people

even gave the impression of being “personally attacked by it.” She describes the feedback as “super uncomfortable” and different from usual comments on her photos. In general, Kühn finds discussions about GenAI in photography to be “very intense” and heated.

The scepticism and reluctance from the public towards GenAI-integrated photography work presents a significant dilemma for photographers, who find themselves torn between embracing this emerging technology for creative expression and navigating the cautious, often critical, public perception.

5.2.3 Perceived Impact on Creativity & Personal Style

The use of GenAI impacts the creativity and the style and photographic expression of the interviewed experts. This section delves into how the use of GenAI tools expands the creative possibilities for photographers. It explores the experience of collaborating with GenAI tools and what role human creativity might play compared to artificial creativity in the future. Furthermore, it discusses how GenAI has impacted photographers' personal style and artistic expression. This includes examining the similarities and differences between their own style and AI-generated content, as well as the strategies photographers use to maintain artistic integrity in the era of GenAI.

5.2.3.1 Creativity

GenAI is predominantly perceived as creativity-enhancing. Reasons why the use of GenAI expands creativity include “providing a lot of impulses,” “creating things that would be incredibly difficult or even impossible to achieve otherwise,” and “allowing for the exploration and implementation of ideas that might have been unfeasible before,” as reported by Hofbauer, Payer, and Roza. The enhanced feasibility that GenAI brings allows photographers to think bigger, as “it opens up possibilities that were once off-limits,” according to Roza. Integrating a tool like GenAI, which “can handle a wider array of tasks,” into the workflow “can spark fresh ideas and concepts.” Thomsen also emphasizes that “artificial intelligence enriches [her] work” and that the “fusion of real and virtual elements opens up new possibilities for creativity and storytelling.” This leads to “virtually limitless boundaries of imagination” in the photographic creative process, according to Thomsen. Hofbauer and Payer highlight that working with GenAI tools is a “fun process that spits out new things you wouldn't have thought of on your own” where due to GenAI interpreting inputs differently than intended, it produces “ideas that led to exploring new directions” or “results that could be applied to a different idea”.

Roza specifies that for him, “AI expands intellectual creativity” rather than practical, applied creativity, which in photography would correspond to the implementation of ideas. By intellectual creativity, Roza means “all the ideas [someone] has in their mind.” Therefore, Roza considers GenAI to be enhancing creativity in the ideation phase but not in executing ideas in the photographic production phase. The implementation possibilities are increased with GenAI, yet as Roza notes, “in a boring way, through text input.” Kühn views this “boring” way of implementing ideas not as a risk for “human creativity, but the expression might be” at stake. She states that “the passion could be endangered because the reason behind the creation seems weakened.” Removing the physical process of creation can diminish the passion and drive of photographers for their craft. Thus, GenAI is seen by Roza and Kühn as expanding when considering intellectual creativity and generating ideas, but as a potential threat to the craft of photography and the creative process of taking photos itself. Nevertheless, when it comes to intellectual creativity Kühn finds integrating GenAI “as a form of co-creativity” into the creative process fascinating. Since “at least 50% of every piece must originate from [her] own creativity” she rather uses GenAI as a source of inspiration than platforms like Pinterest to ensure her ideas truly stem from her mind. Kühn states that since AI-generated images are not “copied from someone else” and her providing the initial input for further developing an idea, she allows herself to work collaboratively with GenAI.

5.2.3.2 Collaboration with GenAI Tools

The collaboration with GenAI tools has been perceived by the experts in certain aspects as both positive and negative.

Among the positive perception of working with GenAI tools the experts described the collaboration with adjectives like supportive, helpful, expanding, funny, and inspiring. These descriptions are based on the use of GenAI as a tool that offers a “starting point,” which, as Payer elaborates, “can be refined and tailored to specific needs” during the course of the process. Hofbauer describes the collaboration with GenAI tools as a “communication” or “conversation” where initial input or ideas are refined by providing more details to the AI and allowing the process to be influenced by the generated results. Thomsen emphasizes the importance of “being open to this process” and “allowing oneself to be inspired by [the results].” Not working with the AI-generated results and wanting to strictly stick to one’s initial idea can lead to frustration due to the lack of complete control over how GenAI interprets input. Payer finds that “not having control over the results of an AI is an advantage in the creative process but annoying to work with afterwards.” In the creative process, the unexpected outcomes generated by GenAI can enhance the ideation phase by experimentally offering fresh inspiration. However, in situations

where an image needs to be edited to match a precise concept, the lack of control over the outcome can become a disadvantage.

The negative aspects of collaborating with GenAI tools in the photographic creative process were described as frustrating, overwhelming, stressful, consuming, distracting, and boring. These descriptions stem from the speed at which this technology evolves and the endless possibilities of GenAI. “Keeping pace with AI advancements can be exhausting,” explains Roza. Pizzini felt “stressed” and “frustrated” and even “had to take a break from working with GenAI tools” because they consumed too much time in his creative process. The photographers often felt overwhelmed by the sheer number of ideas and directions they could take on for a project. Learning when to be satisfied with a result and move on to creating the final image is a new process that photographers need to navigate.

5.2.3.3 Human Creativity vs. Artificial Creativity

In considering the future of human creativity amid the rise of artificial creativity, photographers emphasize the enduring value and significance of human involvement in creative processes.

“At the moment, AI tools still require human input”, states Berger. These tools can be used to support the creative process. Without human input, guidance, and judgment of the output generated by AI, the creativity of GenAI remains limited, often resulting in uniformity in its produced results. Payer emphasises that “creativity lies in creating something new and not just imitating”. This observation highlights the constraints of AI, which, while proficient at reassembling existing elements, may lack the human capacity to genuinely conceive something entirely novel. GenAI replicates elements from the dataset on which it was trained. Anything beyond that scope still relies on human creativity. Pizzini further stresses that “input from the real world is still needed to create something creative in the digital world”. Roza thinks it is good “if creativity still remains human” because “if AI wouldn’t even be dependent on human input anymore, [...] than humans would only function as a monitoring and control party.”

Berger and Hofbauer, on the other hand, argue that the way GenAI creates images and styles is similar to the way human creativity works. Berger describes human creativity as “reassembling something one has seen in a new way”. According to Hofbauer, creating something entirely new is quite rare. More often, humans tend to blend various styles and remix different inputs and inspirations to produce something unique. In that sense “AI functions like our brain when it comes to creativity”, agrees Hofbauer. Berger believes that “artificial creativity is already on par with human creativity today.” He would even argue that GenAI is already

“superior” to human creativity when looking at the quantity of output in a short amount of time and perfect execution of the output.

Nevertheless, Hofbauer, Pizzini, Payer and Roza agree that the “inherently human aspect of creativity will remain intact” and that “human creativity is still the big factor” in the creative process. Truly original and fundamental ideas remain a uniquely human domain, necessary as the initial input for GenAI to produce something distinctive. Pizzini and Hofbauer agree that “humans will always play a role” in the creative process. They highlight the necessity of human involvement in initiating the conversation with GenAI, providing the initial input, and assessing the generated output. This includes making judgments about what is good or bad and determining what alterations are needed to ensure that the result is unique and distinct from others' work. Payer assumes that “it will lead to a different way of working, but the creative force behind it, [...] will always be human”. Kühn and Thomsen conform that in an increasingly tech-driven environment, human interaction and shared creativity remain crucial and fundamental. Conversations with people can spark new ideas, refine existing ones, and open up new possibilities. For Kühn, the future is envisioned as a collaborative effort between humans and GenAI, emphasizing the importance of people working together and utilizing AI as an aid in the creative process.

5.2.3.4 Personal Style and GenAI

The impact of GenAI on the photographic styles of the photographers was relatively minimal. While they experimented with various styles, they were more inclined to incorporate their existing photographic style into the process of prompting and generating images. For instance, Pizzini “attempted to recreate images from famous photographers,” but he also mastered translating his unique style into prompts. Contrary, Roza hasn’t “focused on pursuing [his] style in Midjourney or continuing [his] artistic activities through prompting.” He views image GenAI tools not as a creative outlet for his work, but rather as a tool to support his process.

Hofbauer criticizes that, particularly in its early stages, “Midjourney had such a distinct style,” making AI-generated images easily identifiable. He believes that visually, everything created with GenAI “has the same character,” which he finds monotonous. It is more intriguing to him “when people look at an image without having in the back of their mind that it's AI-generated”.

The increased flexibility that GenAI introduces to the creative process presents the risk of seeking inspiration in a pool of generated images that may not align with one's individual style. Thomsen emphasises that “it's crucial to remain true to one's

style, even with the vast possibilities now available. Just because everything is possible doesn't mean [one] should start creating and producing completely different types of photos.”

5.2.4 Future Perspectives & Market Dynamics

The emergence of GenAI tools in professional photography brings notable changes and shapes future trends in the industry. This technological evolution not only alters creative processes but also significantly impacts market dynamics. The following discussion will delve into the anticipated and potential effects of GenAI on photography and its industry, examining how this emerging technology will redefine both the art and business of photography.

5.2.4.1 Future Perspectives for Photography and GenAI

According to the interviewed experts, the potential impact of GenAI on the field of photography mainly concerns which photographic genres will be replaced by GenAI tools. Genres like advertising, fashion and stock photography undergo “significant changes” and potentially be fully taken over by GenAI, according to Berger, Roza, Pizzini and Hofbauer. Genres that need to depict reality, be authentic or convey emotions are estimated to be less likely replaced by GenAI. These genres include reportage, documentary, weddings, events or journalistic photography. “These fields rely on capturing real, spontaneous moments, something AI can't replicate” as Roza explains. Yet, all of the interviewed experts agree that professional photography won't completely be replaced by GenAI. Pizzini thinks that “perhaps there will be a new form of photography”. Kühn suggests separating photography from creating images with GenAI and using the term “synthography” for this new form.

The experts anticipate technical advancements in the resolution of AI-generated images, along with additional features in Adobe Photoshop to “facilitate the blending and harmonizing of different elements into a cohesive picture”, according to Payer. They also foresee that the user interface of GenAI tools will become more user-friendly, making the editing process simpler and more flexible. Achieving high-quality results is expected to become easier, leading to an increase in the anticipated output. Thomsen furthermore predicts that traveling to different countries for photo shoots will become unnecessary, as the production costs can be significantly reduced through the use of GenAI.

Pizzini sees keeping “authenticity and one's style” as a chance for photographers to elevate ones work against AI-generated images. Pizzini and Hofbauer are of the

opinion that an understanding of photography and composition helps in prompting better images than people who don't have an understanding of creating images. Berger sees the chance for photographers in judging the AI-generated outcome based on the knowledge gained in the photography profession. Thomsen argues that "post-production skills become increasingly important". Payer supports that statement, saying that GenAI "can't replace the artistic judgment, attention to detail, and creative problem-solving skills that professional image editors bring to the table". According to him photographers will still be needed, probably even more specialized.

Roza, on the other hand, thinks that "knowing how to prompt effectively is a much more valuable skill for the future than a photographer's knowledge of aperture, shutter speed, and even image composition". He doesn't see an advantage in photography specific knowledge for prompting since GenAI tools are trained on images that incorporate all these rules and therefore such elements are automatically implemented by GenAI. Berger contemplates the idea that through ongoing feedback to GenAI tools about which resulting images are the best, they will continue to learn, and perhaps even human judgment may become redundant "because the images will already be perfect from the start."

Thomsen also acknowledges the potential risk for photographers of "overlooking the change" and becoming less competitive in the future compared to those who incorporate GenAI into their creative process and workflow.

Nonetheless, the experts agree that chances for photographers lie in focusing on genres that emphasize depicting reality, authenticity, and emotions.

5.2.4.2 GenAI and Market Dynamics

The impact of GenAI on the dynamics of the photography market is significant, leading to fundamental changes in how images are created, distributed, and utilized. Hofbauer mentions the partnership between stock image platforms and image GenAI tools, which allows users to input prompts directly within the platform and purchase the generated images. "This is probably the future because most images are still sourced through stock platforms," he says. Hofbauer predicts that stock platforms will integrate GenAI image generators into their services, which will be particularly attractive for smaller companies with limited budgets.

As the integration of GenAI into professional photography evolves, photographers like Thomsen are navigating new challenges, such as pricing for AI-integrated projects. Thomsen reports that "so far, no client has requested a project with this new approach of integrating AI." She recognizes the need to develop a portfolio first showcasing GenAI's capabilities to inform clients about the possibilities it

offers. Consequently, Thomsen initially includes AI-generated images in her existing rates, acknowledging the need to explore appropriate pricing strategies for this novel service.

Payer highlights the global cost savings and process streamlining made possible by the use of AI-generated models. Photography with real models is labour-intensive and often involves extensive retouching. The transition to AI-generated models can significantly simplify these challenges, eliminating the need for extensive photo shoots and the complexities of coordinating and retouching multiple models.

Thomsen reports that jobs where she is only required to prompt images are already emerging, indicating that the market is slowly moving in this direction. Pizzini emphasizes the necessity for photographers to learn and integrate GenAI to remain competitive. "Now everybody can create perfect images," he notes, signifying a democratization of image creation. Kühn compares the fear that professional photographers will become redundant due to AI to the difference between McDonald's and a star-rated restaurant. This implies that despite the availability of AI tools capable of creating customized images, there will still be a demand for high-quality, professional photographic work that requires a unique artistic touch.

Overall, it is evident that GenAI is revolutionizing the photography industry by simplifying and making the image generation process more accessible. This leads to a shift in market structures, with the role of the professional photographer being redefined and potentially appreciated in new ways.

6 Co-Creative Process

The case study builds on the insights gathered from the co-creative processes of photographers and GenAI tools, as discussed by the experts in the previous chapter. Its objective is to apply and test the established guideline (outlined in chapter 5.2.2.4) across all phases of the co-creative process within a hypothetical job scenario. This approach aims to thoroughly examine the practicality and effectiveness of the guidelines in a simulated professional setting. This case study aims to offer an in-depth exploration and evaluation of both the challenges and benefits associated with this novel method of content production within the realm of professional photography. Additionally, this case study seeks to offer a more comprehensive understanding of GenAI's impact on the various stages of the creative process. It aims to assess the effectiveness of GenAI in enhancing creative possibilities and to explore the intricacies of integrating GenAI into the creative workflow.

6.1 Methodology

The method of qualitative case study was chosen due to its suitability for comprehensively investigating a single event or process. (Döring & Bortz, 2016, p. 215). Hence, this approach was employed to address research questions Q3 and Q4, by implementing the developed guideline in a simulated job scenario. This simulation of a real job brief and photographic process was designed to closely mimic real-world conditions.

The case study was carried out with one professional photographer as a test person with little prior experience in the use of GenAI tools in the creative photographic process. A photographer with little prior experience will likely encounter different challenges that more advanced users may not experience. Documenting these challenges can provide valuable insights into potential barriers and obstacles to the adoption of GenAI in photography. Therefore, the selected test participant is Petra Wassermann. She works as a photographer since 2019 in Vienna focusing on the areas product, business, employer branding and architecture photography.

The case study took place in August 2023 over a seven-hour period in the photo studio of the University of Applied Sciences in St. Pölten.

A follow-up semi-structured interview with the participant to reflect on the use of GenAI tools in the creative process complemented the case study. This interview

utilized the same interview guideline as the expert interviews, ensuring consistency and comparability in the collected data.

The data collection methods of this case study included audio recording, loud thinking of the test person, observations, note-taking, and review of artifacts that were created during the study. Audio recordings were made of the ideation and visualization phase of the creative process as well as of the follow-up interview. These recordings were fully transcribed in the German language and provided to the test person for review. Only the main statements of the transcript that were used for the analysis were translated to English (Döring & Bortz, 2016, p. 583).

Since the interview is based on the same interview guideline as the expert interviews, the method of qualitative content analysis was chosen as well to analyse the generated data of the case study. The transcripts were therefore analysed and coded according to the developed coding system (see Table 1) and transferred to the same Microsoft Excel document. Based on this analysis the interpretive evaluation was carried out.

6.1.1 Reflexion

The methodological limitations of this study arise due to the fictional setting of the investigation of this individual case. Consequently, the subject operates under laboratory conditions, where the usual work environment and own equipment were not available. The method of observation, which is implicit in a case study, leads to a different work environment than the usual as well. The fictional setting also limits the mimicry of client feedback and decision-making that would normally influence the process. Furthermore, the limited timespan for carrying out the creative process is a limitation of this study. Another issue is the rapid development in the field of generative artificial intelligence. In the context of a master's thesis, it is not feasible to timely integrate the latest advancements into the research, potentially limiting the currency of the findings. Therefore, the state of the utilized GenAI tools refer to their state of August 2023.

6.2 Structure of the Case Study

The structure of the case study aligns with the steps outlined in the developed guideline, covering ideation, visualization, production, and post-processing phases, and tests the co-creative photographic process in a simulated client job scenario. This included the development of a fictional open-ended client brief.

6.2.1 Fictional Client Brief

The open-ended client brief was designed from the perspective of a company that manufactures sunglasses and wants to promote their latest model. The online campaign for this model of sunglasses includes two image subjects: a product photo and a lifestyle image with a female model showcasing the sunglasses. Therefore, the creation of a moodboard and two final images was required.

The campaign concept revolves around the theme of "Dolce Vita" and aims to convey the essence of Italian joy of life. Accordingly, the aesthetics of the images should be bright, summery, yet chic and stylish. The atmosphere should be dynamic and energetic to reflect the dynamic design of the sunglasses.

The target audience for this fictional campaign has been defined as fashion-conscious women between the ages of 18 and 35.

6.2.2 Preparations

Prior to the case study, a framework was developed to guide the creative process. This framework detailed the procedures to be followed at each stage, along with key observations to be made throughout. The ideation phase was assigned 30 minutes followed by a 15-minute break for reflection on the generated ideas. The visualization phase, including moodboard and concept creation, was scheduled for 30 minutes post-break. ChatGPT was programmed as prompt writing assistant according to the instructions explained in chapter 3.2.1. The test person was encouraged to think out loud to verbalize their thoughts for better insight. These stages were audio recorded and observed focusing on GenAI tool usage, upcoming challenges, and GenAI's impact on the creative process.

The production stage involved 30 minutes of setup for lighting, equipment, and model preparation, followed by 45 minutes of shooting for each of the needed elements for the product and lifestyle image. Observations focused on workflow challenges or enhancements.

Post-processing, lasting 45 minutes, involved selecting and editing images with AI-generated backgrounds in Adobe Photoshop Beta, with continuous verbalization from the participant. Notes and observations were taken on the procedure of the editing process and the incorporation of new ideas or additional image elements.

Key elements like sunglasses, a female model, and styling were pre-arranged. The study concluded with an semi-structured interview to reflect on the collaborative creative process.

6.2.3 Conducting the Case Study

Before starting the case study, the test person was given an introduction to the topic, the agenda, the procedure and the used GenAI tools, being ChatGPT, Midjourney and Adobe Photoshop Beta 2023. Further tools that were used apart from GenAI tools were Pinterest, Unsplash.com, Midjourney Community Feed, DeepL and Adobe Color Wheel. Following the introduction Wassermann was handed the fictional client brief to familiarise with the assignment. After clarifying upcoming questions, the co-creative process was conducted.

6.2.3.1 Ideation and Visualization Phase

Wassermann initiated the ideation process by formulating the task description of the brief in German and translated it into English using DeepL, due to the later use of Midjourney. She pondered whether to explain both subjects at once or individually. She decided to explain both subjects to ChatGPT to provide more context. However, the output was not found helpful. Consequently, Wassermann switched to the chat, which was trained as a prompt assistant, and asked for a prompt with the following specification: "Write me an image prompt for a product photo of sunglasses – focus on capturing the essence of the sunglasses that echoes the Italian 'Dolce Vita'." Wassermann further created variations of the first prompt generated by ChatGPT, but she found the initial prompt to be the most appealing (see Figure 10). The first prompt already contained the inspiration to depict the campaign's scene at an Italian piazza.

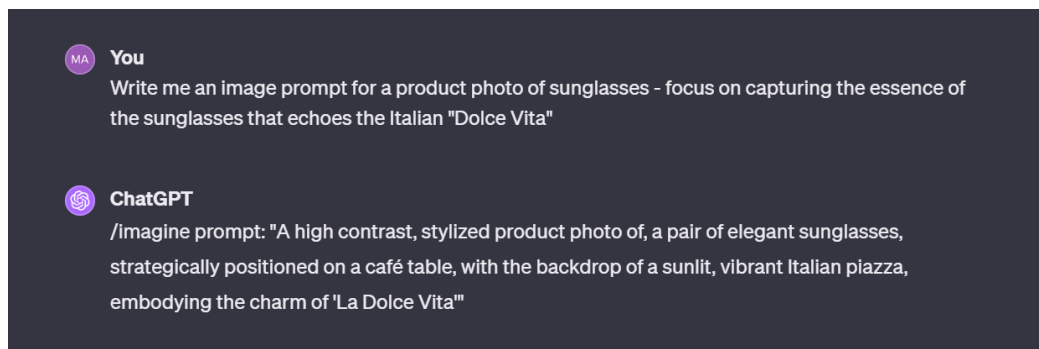


Figure 10: First prompt suggestion generated by ChatGPT

Wassermann's next step was to generate an image from the initial prompt using Midjourney. Due to the colour of the predetermined sunglasses, she added "light pink" to the description of the sunglasses in the prompt. This step was exploratory, with Wassermann ready to refine or alter aspects based on the results from Midjourney, acknowledging a flexible and iterative process to develop the final visual concept. Her statement "let's just try it" highlights the experimental nature of

creative processes, especially in collaboration with generative AI tools and their integration into the workflow.

The initial images generated by Midjourney based on the initial prompt are showcased in Figure 11. Wassermann was satisfied with the results, particularly drawn to the depiction of the sunglasses on a coffee table overlooking a piazza, as it effectively conveyed a chic and elegant theme. Among the generated options, she found version 3 (bottom left) to be the most appealing and chose to have it upscaled. Despite Wassermann further considering and generating other options, she ultimately decided to use the AI-generated image created from the first prompt as the background for the final product photograph (see Figure 12).

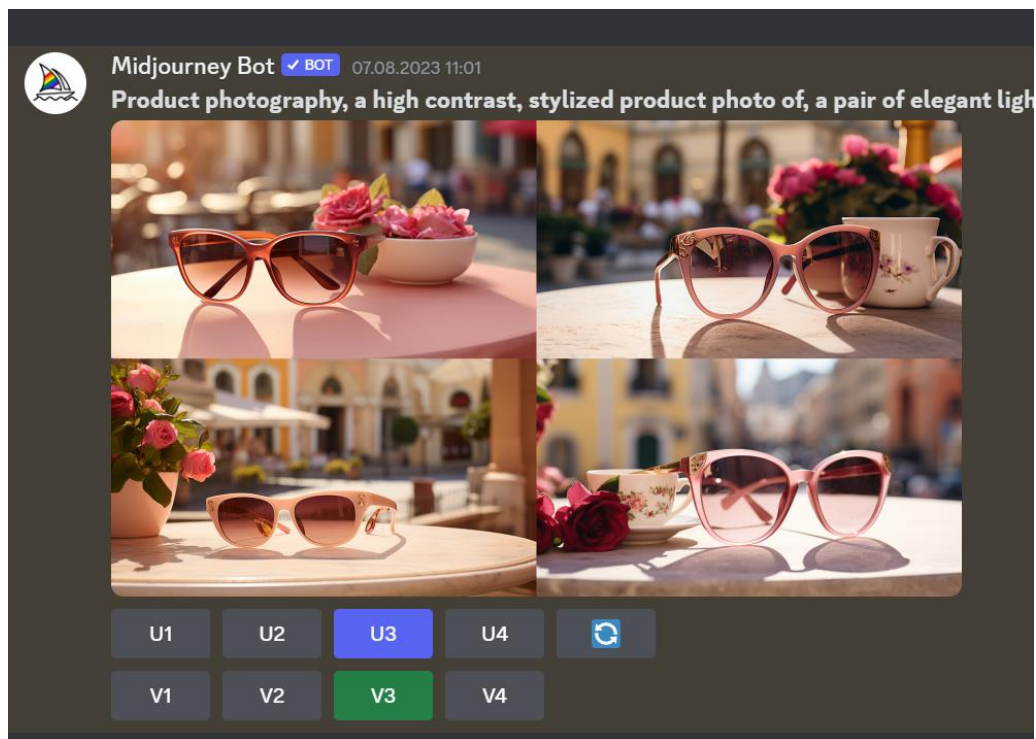


Figure 11: Midjourney result images of the first prompt

Starting from version 3, Wassermann had Midjourney generate more versions of this image with the addition of “with espresso cup.” However, Midjourney consistently failed to create a small espresso cup, instead always depicting a larger cappuccino cup, which distracted too much from the actual subject of the image: the sunglasses. Even the additional description of “close-up” to focus on the sunglasses did not yield the desired result. After a brief reflection on the process and realizing that focusing on phrasing the prompt was already too close to the final outcome, bypassing the generation of different idea variations, Wassermann took a step back. “I’m not creating a moodboard, but already the final photo, because I can create it with such precision”, she explains.



Figure 12: Final AI-generated background for the product image

Using Pinterest, the image database Unsplash.com, and the Midjourney Community Feed with search queries for “sunglasses” and “Dolce Vita,” Wassermann sought new visual input. However, the search results did not yield anything more appealing to Wassermann than the pink style of the images generated by Midjourney. After testing two slightly different styles with image generation in Midjourney, Wassermann decided to continue pursuing the direction of the pink style and coffee table from the first prompt. At this point, Wassermann committed to using the coffee table scene suggested by ChatGPT and generated by Midjourney for the product image of the sunglasses. Based on these AI-generated ideas and inputs, Wassermann developed her concept of telling a story with both images. In her vision, the model featured in the lifestyle image with the sunglasses should be sitting at the same coffee table where the sunglasses were previously placed.

Thus, Wassermann solidified the image idea for the second subject. For this, she needed a prompt that took the style of the product photo and added a woman with sunglasses sitting at a table. To create this prompt, she had a previously generated image by Midjourney described (see Figure 13). Wassermann used one of the four descriptions provided by Midjourney as the basis for creating the subsequent prompt of the lifestyle subject.



Figure 13: Generated image used to let Midjourney describe the style of the fictional campaign

Using ChatGPT, Wassermann expanded the description of Midjourney to include a female model, as seen in Figure 14, and further refined the generated prompt through several iterations with her own inputs.

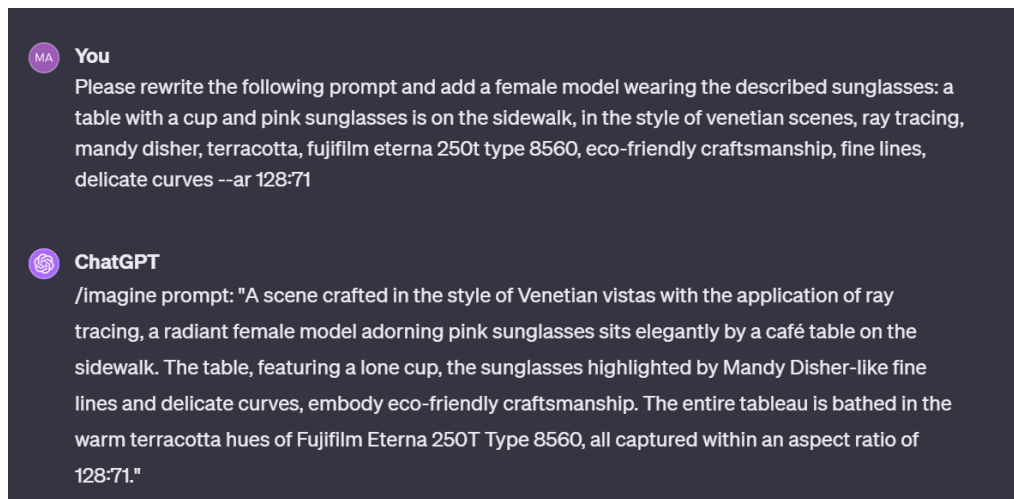


Figure 14: Using ChatGPT as prompt writing assistant

As a result, after continuous fine-tuning of the prompt and generating images in Midjourney, the following prompt for generating the lifestyle image was created: "commercial photography, a high contrast, stylized photo of an italian female woman wearing pink sunglasses, sits elegantly by a café table on the sidewalk, having fun, enjoying life and dolce vita and interacting with someone behind the camera. The table, featuring a lone espresso cup, the entire tableau is bathed in the warm terracotta hues of Fujifilm Eterna 250T Type 8560, --ar 128:71". The final AI-generated background for the second subject can be seen in Figure 15.



Figure 15: Final AI-generated background for the lifestyle image

To complete the mood board, a colour palette was created using the Adobe Color Wheel tool, based on the pink tones of the AI-generated images (see Figure 16).

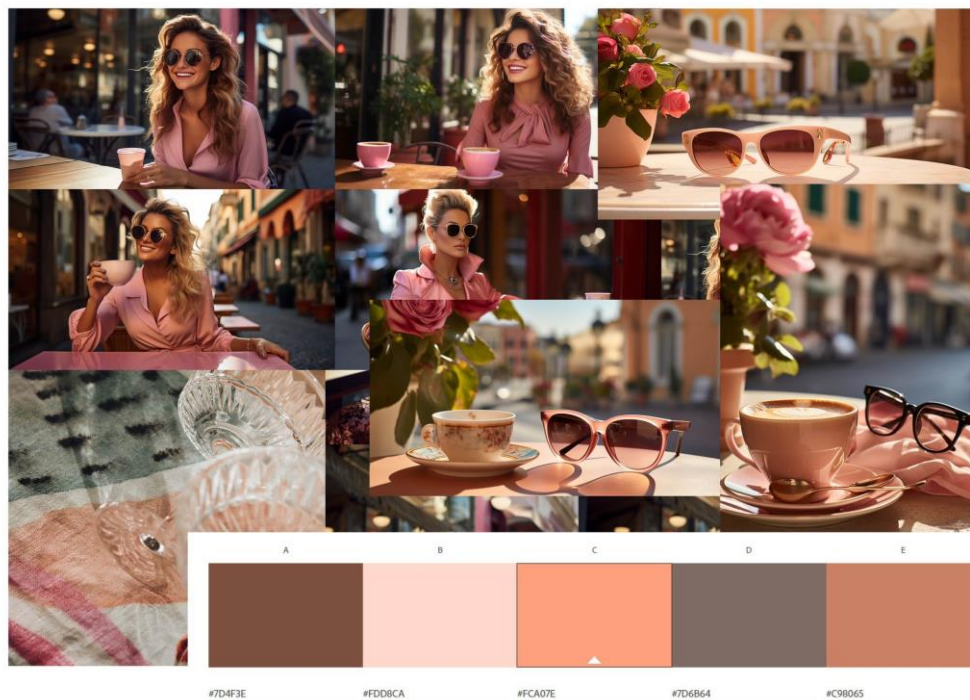


Figure 16: Final moodboard created in collaboration with GenAI tools

The most notable difficulties observed at this stage were the challenges in formulating a purposeful prompt and articulating visual content as Wassermann had envisioned. She stated: “It is always quite difficult to describe things or to say what you want and how you imagine it.” Furthermore, Wassermann found it very

frustrating to make fine adjustments to a Midjourney-generated image, as the tool often couldn't implement what was desired. The lack of control over adjustments and changes was perceived as bothersome. Wassermann highlighted this with the statement: "After the second or third attempt, it was frustrating, and I thought, okay, do I just have to accept it as it is now?" Another hurdle Wassermann encountered in this process is that the formulation of the initial idea by ChatGPT and its visualization via Midjourney quickly set a specific direction, as the generated images already looked so good and concrete. This could potentially lead to ideas being dismissed too early or not considered at all. It was also observed that the inputs from the two GenAI tools were very appealing to Wassermann from the start, which led to her maintaining the first style direction that emerged and further developing the concept and moodboard based on it.

6.2.3.2 Production Phase

In the production phase, the sunglasses and the model wearing them were photographed in the photo studio, as inspired by the AI-generated images (see Figure 12 and Figure 15). The challenge for Wassermann lay in analysing the lighting scene of the AI-images and subsequently replicating the light setting correctly in the studio. After a few test shots and proper setup of the flash systems, Wassermann was able to achieve suitable results relatively quickly (see Figure 17 and Figure 18). Wassermann attributes the quick production process to the precise guidelines provided by the AI-generated images. Because the layout already specifies so accurately how the product and model should be positioned, the required results can be photographed in a short time. The styling and pose of the model still offer creative freedom during this phase.

6.2.3.3 Post-Processing

Wassermann began the post-processing with selecting the two final images from the photographed ones. The selection process was quick, as there wasn't much range to choose from due to the few needed test attempts in the production phase. The best existing shot was chosen for each subject. Wassermann implemented the approach of combining real photographed image elements with an AI-generated background using Adobe Photoshop Beta.



Figure 17: Final photograph of the sunglasses



Figure 18: Final photograph of the model wearing the sunglasses

First, she removed the sunglasses and the model from the AI-generated images using the generative fill tool. Generative fill appropriately filled in the gaps to match the rest of the image content. Wassermann expanded the AI-generated lifestyle image using generative expand to have more headspace for integrating the model. Then, she isolated the photographed model and the sunglasses from their background and incorporated both elements into their respective generated scenes. The fine-tuning involved considerable retouching, adaptations, and blending in Photoshop to create a realistic final result. Wassermann found the post-

processing of the product image easier due to the simpler scene. The results are depicted in Figure 19 and Figure 20.

For Wassermann, the challenge in the post-processing phase was that all the mistakes made earlier in the process became evident here. Incorrectly generated shadows by Midjourney or unrealistic proportions of image elements become noticeable when merging them with real photographed elements. Therefore, understanding how these three elaborated GenAI tools function and interact, is essential for a realistic result in the co-creative photographic process with GenAI tools.



Figure 19: Result of the product image co-created with GenAI tools



Figure 20: Result of the lifestyle image co-created with GenAI tools

6.3 Insights and Findings

From the follow-up interview, several parallels can be drawn between the findings of the expert interviews and Wassermann's reflections on the GenAI-enhanced creative process. Additionally, new aspects were also identified. Wassermann concluded that she definitely let herself and her creative process be influenced by GenAI tools.

Furthermore, in terms of enhancing creativity, Wassermann acknowledges significant advantages of GenAI in the ideation phase. It assists in initiating projects on a “blank canvas” and overcoming fixation, often a challenging aspect for her. She found the inputs from tools like ChatGPT and Midjourney instrumental for “brainstorming and collecting ideas.” In particular, she values the ability to produce diverse variations of an initial concept, such as obtaining four different result images from Midjourney or exploring numerous options with ChatGPT, which she believes “is great for a creative process.” Wassermann comments that she “didn't have a very concrete idea to start with, so [she] was quite satisfied with the suggestions.” Wassermann didn't really discard any of the suggestions from the two GenAI tools. She “actually continued to work with everything that came back.”

Wassermann perceives GenAI as both inspiring and overwhelming in her ideation process. On the one hand, she finds it expanding, “but on the other hand, it offers you insanely more possibilities.” She describes the multitude of options presented by GenAI as distracting. In her view, GenAI “just offers far too many possibilities of ideas,” which can lead to a loss of focus due to the abundance of potential paths. She justifies her quick settlement on one direction within this study due to the given time constraints. She remarks that if she were working independently, she might “start at two in the afternoon and suddenly it's 11 PM,” overwhelmed by the numerous ideas generated, uncertain of where to begin. Wassermann resonates with the sentiments of the interviewed photographers, feeling overwhelmed by GenAI's endless possibilities. Yet, unlike Kühn, who struggles with deciding when to stop optimizing AI-generated content, Wassermann's challenge lies more in determining a starting point.

Despite this, Wassermann recognizes the superiority of AI-generated images over stock images in creating moodboards. The ability to customize AI-generated images allows for the creation of precisely tailored moodboards that align closely with client needs. She considers this capability an “incredible advantage.”

However, Wassermann points out that customizability with Midjourney hinges on the AI's accurate interpretation of the prompt. She believes one must be “adept enough to articulate what [one] needs and lucky enough that the AI interprets it correctly.” She notes that Midjourney sometimes overlooks or misinterprets certain aspects of a prompt. This can make fine-tuning and small image adjustments

frustrating. Wassermann questions whether AI-generated images really surpass stock images if they don't fully match one's vision and include undesired elements. In such instances, she would “prefer to submit a hand-drawn sketch, with a mood and a colour scheme” rather than spending hours trying to generate the ideal image. For her, “editing this [generated] image in Photoshop is too much effort for a concept.”

Wassermann stresses the need for careful attention throughout the process of blending GenAI with photography. Overlooking even small details or errors can significantly impact the post-processing, as elements like lighting, perspective, and proportion must harmonize in the final image to achieve a photorealistic and cohesive look. For her, this precision is a matter of practice and experience. She says: “It is about being able to recognize the mistakes in order to avoid them in the first place.” This reflects Thomsen's view that this innovative creative process involves learning by doing. Wassermann believes that repeating the co-creative process “two or three times in a row” would make it easier and likely lead to different outcomes.

Wassermann expresses concerns that AI-generated images might not adequately reflect her unique style or personal touch. She highlights the necessity of deeply engaging oneself in the prompting process to incorporate more individual style. Wassermann observes a shift from the importance of visual skills to the significance of being able to describe and articulate visual aspects. She points out, “If I can't articulate that I like high contrast, for example, as a photographer, then Midjourney won't generate it either.”

Wassermann believes the effectiveness of this approach should be assessed on a case-by-case basis. The practicality of this collaborative method depends on time and resources. If shooting the subject in real life is quicker, that's preferable. However, if external factors restrict production options, then the co-creative process becomes more suitable. She acknowledges the efficiency of the co-creative process, particularly the use of AI-generated backgrounds, for shoots in remote locations or for specific client requests.

Wassermann finds the collaboration with GenAI tools, especially their comprehensive utilization — like generating text with one tool and using it to create an image with another — quite fascinating. However, she acknowledges that the most challenging aspect is learning to use these tools effectively and to “make it the right tool for oneself.” Nevertheless, Wassermann sees the primary benefits of this new method in its efficiency, adaptability, flexibility, and its ability to inspire, especially in moodboard creation. However, she emphasizes the importance of having expertise in photographic knowledge to effectively implement this process.

Wassermann acknowledges the substantial potential of integrating GenAI into photographic workflows, particularly for its role in cutting down production costs. Merging real photographs with AI-generated backgrounds doesn't require many resources yet yields impressive outcomes in a short amount of time. "You see what we needed? Just a studio and a table," Wassermann points out.

On ethical matters, similar to Kühn, Wassermann wouldn't label a collaboratively created image as her own unless she photographed its main portion. Consequently, she doesn't view the two outcome images of this case study as her own creations, given the significant presence of AI-generated content. Nonetheless, she doesn't see an issue using such images for moodboards, as they usually comprise images that are not personally created. Additionally, she mentions potential challenges in selling these due to copyright uncertainties.

Wassermann identifies opportunities for photographers in the continued need for expertise in photography and being "well-informed about photographic possibilities" to effectively merge AI-generated images with photography. She observes a shift in focus towards editing and post-production skills, as well as the ability to articulate and express the visual aspects of images.

However, Wassermann perceives no particular advantage in being able to apply photography expertise to prompt images, as anyone can copy and modify prompts from other creators. Additionally, she views the biggest risk of this development as the possible loss of teamwork and collaborative brainstorming. For her, this is a significant drawback, as she believes that "the best ideas still come from discussing and working on them together."

Looking ahead, Wassermann envisions adopting this co-creative process into her regular workflow only if it becomes essential for her financial survival in the profession. However, she continues to monitor the technology, its advancements, and potential applications to stay up to date.

7 Conclusion

To conclude this master thesis the four research questions presented in chapter 1.2 will be answered by providing an analysis of the research findings from the conducted literature review, expert interviews and case study. After drawing a conclusion, this work presents new, emerging questions based on its findings, setting a direction for future studies.

Research question Q1 (“How can GenAI tools augment human creativity?”) can be answered based on the current state of research and literature in the fields of creativity, creative processes, GenAI, and co-creativity. GenAI algorithms reflect the human creative process, which includes phases of divergent and convergent thinking. Consequently, they assist photographers in their creative endeavours by offering new possibilities and inspiration to explore a wide range of ideas, or by summarizing and visualizing these ideas to facilitate decision-making. In the initial phase of ideation and conception of ideas GenAI can support humans by providing knowledge, spark new ideas and offer inspiration which helps to overcome fixation and the challenge of starting with a blank canvas. GenAI further supports the ideation and visualization phase by enabling individuals, regardless of their visualization skills, to generate images that depict their ideas. The use of GenAI allows to think bigger, empowering photographers to realize ideas that were previously not feasible due to constraints such as time or money. The collaboration between human and GenAI expands the boundaries of creativity, leading to innovative new approaches of creating visual media.

To answer research question Q2 (“How can GenAI tools be effectively incorporated into the creative process of professional photographers to enhance their creativity?”) expert interviews were conducted that provided insights on incorporating GenAI tools in the creative process of professional photographers in several ways. The main use cases that were established are the collaborative generation, brainstorming and refinement of ideas and the use of AI-generated images for the creation of moodboards, backgrounds, and additional elements for image compositings. These use cases are especially beneficial for photographers to be independent from stock images, which offer not as much customizability as generating images with GenAI tools. This independence of stock photography and the virtually limitless boundaries of imagination due to GenAI allows photographers to explore new artistic concepts and styles that might have been challenging or impossible to achieve manually. These tools can also be used for experimenting with different styles and techniques, broadening the creative scope of photographers. GenAI can assist in editing and processing images, saving time in

everyday tasks such as expanding images or removing image elements. The ability to expand images in post-processing reshapes how photographers approach their workflow, as it eliminates the need to capture subjects with extra surrounding space to crop them later.

This leads to addressing research question Q3 (“How does the use of GenAI affect the way photographers approach their work?”). The use of GenAI affects photographers' approach to their work by encouraging a more experimental and innovative mindset. This approach enables photographers to reconsider past ideas that were once not feasible but can now be implemented into concepts with the use of GenAI. AI-generated backgrounds or image elements makes photographers less dependent on external influences such as weather, time and location. The increasingly frequent use of AI-generated images brings a shift with it from the importance of visual skill to being able to describe and articulate those visual aspects verbally for effective prompt writing. The skill of writing a prompt to be able to translate one's vision into an AI-generated image will therefore become a key factor for photographers in the future.

This also presents an opportunity for photographers to infuse their photographic expertise and personal style into AI-generated images in the future, thereby distinguishing their work from the more generic AI-generated content. This insight contributes to addressing research question Q4 (“What are the potential chances and risks of incorporating GenAI in the creative process of photographers?”). Furthermore, blending AI-generated images with photography demands considerable knowledge and skills in photography, particularly in areas like lighting and image editing. As GenAI tools depend on human input and feedback, there will be a continuing need for photographers to evaluate and choose AI-generated outputs, drawing on their years of experience and accumulated knowledge. The integration of GenAI in photography could, on one hand, pose threats to genres such as advertising, fashion, and stock photography. On the other hand, it could elevate the significance of genres that require the depiction of reality, authenticity, or the conveyance of emotions. These genres include reportage, documentary, weddings, events or journalistic photography.

Alongside the advantages and conveniences offered by GenAI, this study has identified various challenges and risks for photographers and the industry. Concerning the risks, the multitude of options provided by GenAI is perceived as overwhelming, leading to challenges in determining when to stop optimizing the AI-generated output or with which generated idea to start creating and continue the process. The limitless potential of viable ideas makes it increasingly difficult to define a clear path or direction to follow. Furthermore, the growing trend of generating images through text input instead of traditional photography, which removes the physical aspect of the creative process, could lead to a decline in

photographic knowledge and diminish photographers' passion and enthusiasm for their craft. Ultimately, all the described advantages and applications of GenAI in photography are underscored by legal concerns regarding copyright.

This thesis, by addressing and answering the posed research questions, not only provides insights into the current state of GenAI in photography but also sets the stage for future research, indicating new directions and questions emerging from these findings.

Firstly, it's crucial to investigate the long-term impacts of GenAI on the professional photography industry, particularly how it reshapes market dynamics and job opportunities. Another key area of exploration is understanding photographers' perceptions of the interplay between creativity and technology as GenAI becomes more prevalent. This leads to critical ethical questions, especially concerning copyright and artistic ownership, which require thorough examination in the context of GenAI's use in photography. Additionally, there's a need to explore how educational curricula and training programs in photography can evolve to effectively integrate GenAI tools, preparing future photographers for a landscape increasingly dominated by these technologies. Furthermore, examining the role of advertising agencies in the development of photographic concepts in the era of co-creativity offers valuable insights into how commercial photography might evolve with GenAI's influence. These questions not only underscore the multifaceted impact of GenAI in photography but also highlight the necessity for ongoing research to navigate this rapidly changing field.

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