Designing with AI

A User Study to Explore the Future Role of AI as a Collaborative Tool in Graphics Design

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ABSTRACT

This research article explores the potential of AI as a collaborative tool in graphic design, investigating designers' perceptions and concerns regarding its integration. A preliminary study identifies current challenges faced by designers, leading to the development of three scenarios envisioning the future of AI-powered tools. A prototype tool called "*Desain*" with advanced AI features is created. User study and interviews uncover designers' perspectives and ethical concerns. AI is valued as a collaborative tool, but its limitations in capturing human creativity are emphasized. Ethical concerns include lazy design, accountability, and data privacy. The study emphasizes interdisciplinary collaboration, ethical guidelines, and responsible decision-making for the future of AI in graphic design.

KEYWORDS

AI in design, Collaborative design, Digital design, Future implications, User study, Designing with AI, AI tools, User-centered design, Human-AI collaboration, Design process, AI-assistive tools

1 Introduction

In today's evolving digital landscape Artificial intelligence (AI) has made significant advancements in recent years, transforming various industries and fields, including the field of graphic design [42]. According to Andrew Ng, a professor at Stanford University and the founder of Coursera and the Google Brain Deep Learning Project, "Artificial intelligence is the new electricity" [3]. AI adapts human skills to machines, enabling them to evolve and using these skills outside the human body [44]. The ability of AI to analyze and interpret extensive amount of data, coupled with its aptitude for learning and adjustment, has resulted in the emergence of novel tools and methodologies that are revolutionizing the creation and perception of graphic design [55].

In the realm of graphic design, AI-powered tools have emerged as valuable assistants, providing designers with new capabilities and enhancing their workflow efficiency, the field of graphic design has witnessed a transformative shift with the integration of AI into various design processes [31]. AI-powered tools have gradually become indispensable, assisting designers in tasks such as generating ideas, enhancing productivity, and improving overall design quality [42].

Generative AI models have the potential to automate content generation, increase the variety of content, and personalize content based on user preferences [29]. The integration of generative AI tools like DALL-E and MidJourney has brought a revolutionary shift in collaborative design processes [29]. These generative AI tools, driven by deep learning and latent diffusion models, tap into existing image databases to generate new and visually compelling content based on text prompts [54]. AI tools increase productivity and offer assistance in several areas like color selection, layout, and composition [42] and save time and effort [2], but they may lack the creativity and uniqueness of human designers [13]. AI-powered graphic design tools have made advancements but are constrained by algorithmic boundaries and originality in visuals [21,17]. However, regardless of the developments in AI technology, there remains a substantial gap between its potential and the current state of AI integration in graphic design [2]. To bridge the gap, this study investigates the perceptions and perspectives of professional designers regarding AI in graphic design, exploring its future implications. The study intends to explore the current limitations, requirements, and concerns of designers when it comes to AI integration.

The research problem addresses the exploration of AI's potential as a collaborative tool in graphic design. It aims to understand the limited adoption of AI among professional designers and seeks insights into their attitudes and acceptance of AI-driven collaboration. This research problem plays an important role in shaping the subsequent stages of the study and informing the development of solutions that cater to designers' requirements.

This article presents a literature review, existing software and its shortcomings, pre-study followed by prototype development, user sessions and interviews, and a discussion on the implications of findings. Through the integration of these findings, this research article aims to provide valuable insights into collaborative role of AI in design.

1.1 Research Problem

The research problem at hand revolves around exploring the potential of AI as a collaborative tool in graphic design. AI technology has made significant advancements. But its practical application and utilization in the design field are still

underexplored. This research problem seeks to investigate the extent to which AI can be effectively employed as a collaborative tool for professional designers.

1.2 Research Objective

The objective of this study gathers designers' insights on how they envision AI as a collaborative tool by developing futuristic scenarios and a prototype. The study aims to identify barriers, challenges, and opportunities for effectively integrating AI into the design process and enhancing collaboration between designers and AI systems.

1.3 Research Questions

RQ1. What are the perceptions and concerns of designers regarding the integration of AI into graphic design considering the future of AI-powered tools.

RQ2. What are the concerns of designers regarding the ethical implications associated with AI in graphic design?

2 Background

2.1 Literature Review

2.1.1 Generative AI in Graphics Design

The future of graphics design is being reshaped by the integration of generative AI tools [54]. Generative AI refers to AI technologies that automatically generate visual or written content based on text prompts [29]. Tools like DALL-E and MidJourney play a vital role in supporting idea generation, idea expansion, and have gained popularity in graphics design due to their ability to generate realistic images and text by using vast amounts of internet data [54]. These tools offer creative professionals the opportunity to explore new content possibilities and expand their creative horizons. The concept of participatory AI is discussed, emphasizing the involvement of creative professionals in the design and decision-making processes [29]. Generative AI has the potential to automate the generation of high-quality content, leading to increased content variety and personalized experiences for users [29]. However, there are some challenges and potential risks associated with generative AI [40]. When trained on a mixture of real and AI-generated data, generative AI tools may exhibit degraded performance, as indicated by simulations using an image-generation AI tool. This raises concerns about the degeneration of generative AI, emphasizing the need for further research.

2.1.2 Collaboration between Humans and AI in Graphic Design: Opportunities and Limitations

The collaboration between humans and AI in graphic design offers both opportunities and limitations. AI's ability to automate certain design tasks can significantly reduce time-consuming work, allowing designers to allocate more room for the creative process [33]. It can serve as an assistant and complement users' individual needs and capabilities, resulting in enhanced design outcomes [36]. However, it is crucial to recognize the limitations of AI when it comes to creativity and the ability to generate entirely new designs [42]. Despite their capabilities, machines still lack intention and personal goals, requiring human designers to guide and approve designs [47]. The integration of AI and machine learning in design programs requires designers to have a command of design principles and typography rules. AI can automate certain stages of the design process, but designers need to be more creative and adapt to technological advancements [33]. The collaboration between humans and AI should be approached with an understanding of AI's function as a tool to help and amplify the creative abilities of designers because the currently available AI-powered co-creative tools primarily focus on idea generation and execution, with limited involvement in the early stages of co-creation [28]. Future tools should harness the unique capabilities of AI to foster a more collaborative and human-centred creative process and leverage AI's potential in enhancing the creativity of designers [28]. One aspect that can be explored is the use of AI models to evaluate creativity based on factors such as novelty, and value, researchers have discussed the potential of comparing AI-based assessments with human judgments and employing unsupervised machine learning techniques to improve these evaluations [38]. Additionally, the importance of conceptual organization is highlighted as a key factor in enhancing creativity assessments [38]. AI can transform design by determining user preferences and allowing websites to adapt to changing interests. The evolving relationship between AI and graphic design raises important considerations for designers in terms of collaboration and adaptation [22]. Hybrid human-AI systems encourage collaboration between humans and AI, humans can provide guidance, domain expertise, and contextual understanding, while AI systems can process and analyze large datasets, identify patterns, and generate insights. By working together, humans and AI can tackle complex problems that neither could solve independently [41]. By further exploring and integrating these approaches, collaboration between humans and AI in graphic design can be enhanced, opening up new opportunities for more innovative and creative design processes.

2.1.3 Impact of AI on the Graphic Design Industry: Productivity and Creativity

The impact of AI on the graphic design industry is a topic of significant interest. One of the key advantages is increased productivity as it is seen to speed up the whole design process. However, there are chances that AI will impact the overall quality of design by potentially diminishing human creativity and resulting in more predictable and homogenized design [42]. AI may lack creativity in terms of generating entirely new designs, but it can be highly proficient in executing designs created by human designers [8, 9]. Even though AI may not possess the ability to create entirely new designs but it can speed up the design process by automation and save time for designers, meanwhile, designers can have more time on their hands to focus on creativity and innovation [33]. The focus should not be on replacing humans, but on integration of AI systems into design process [52].

2.1.4 Responsible Integration of AI in Design Practices: Guidelines and Challenges

Ensuring the responsible integration of AI in design practices requires the development and adherence to ethical guidelines. Organizations and practitioners are faced with the challenge of aligning ethical considerations with technological advancements. Early adopters of AI have focused on innovation, positioning themselves for growth and increased employment opportunities [7]. However, it is crucial to navigate these advancements with a deep understanding of ethical principles and considerations. Additionally, integrating ethical behavior into AI through the incorporation of pedagogy, moral psychology development, and computer science has been proposed as one approach [53]. Further research and collaboration are needed to establish guidelines and address the complex ethical challenges that arise in the integration of AI in design practices.

2.1.5 Ethical Considerations in the Integration of AI into Creative Processes

The integration of AI into creative processes has raised significant ethical considerations and fairness implications. This becomes particularly relevant when autonomous systems design themselves, learn, and improve over time [18]. To address potential discrimination and promote equitable outcomes, the concept of fair AI has emerged [23]. However, navigating ethical recommendations alongside technological advancements in AI poses a complex task [53]. One proposed approach is to integrate ethical behaviour into AI by incorporating pedagogy, moral psychology development, and computer science [53]. Moreover, the application of a feminist perspective in AI ethics offers valuable insights into ethical theories, real-world implications, power dynamics, and contextual factors [50]. Such perspectives emphasize self-evaluation and addressing blind spots, providing a roadmap for policymakers and practitioners working on the responsible integration of AI into creative processes.

The literature review provides insights into the current state of AI in design. It emphasizes the importance of addressing ethical considerations, impact of AI and generative AI on the graphic design industry.

2.2 Overview of Some Existing AI Software in Graphic Design

This section provides an overview of some of the AI-powered tools, these selections serve as a solid groundwork for the study at hand, providing valuable insights into the current landscape of graphic design software and identifying areas that require further exploration.

Text to image generation tools

DALL-E, Midjourney, and Stable Diffusion are three leading text image generation tools, they employ generative models like Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs). These models have brought together the domains of Computer Vision (CV) and Natural Language Processing (NLP), enabling the creation of images based on textual descriptions. DALL·E 2 excels in generating human images, Midjourney, on the other hand, produces images with rich colors and a high degree of realism across various attempts. This suggests that the model can capture and incorporate detailed visual attributes into its generated images. In contrast, Stable Diffusion stands out due to its open-source nature and the resulting support from a large community [46].

Looka (logo maker)

Looka, formerly known as Logojoy, is a logo maker website founded in 2016. It has assisted over 20 million users across 188 countries, generating 10 billion custom logos [35]. With the help of Looka logo designing is just few clicks away but it's a common perception about Looka, that the logos generated by Looka often lack essential qualities for successful brandings, such as creativity, simplicity, timelessness, and originality. Implementing AI or machine learning may not match the creativity level of a trained graphic designer [33].

Canva

Canva is an online design and visual communication platform launched in 2013. It aims to enable users worldwide to create diverse designs and share them across various mediums [9]. Canva provides photo-editing tools, including a design grid, free icons, stickers, badges, and an interactive color wheel for creating and exploring color schemes [25]. However, some users find limitations in editing designs, as they may not be very flexible and accommodating, sometimes resulting in universal designs [14]. In 2019 Canva experienced a huge data breach, but efforts have been made to address the issue [25].

Adobe

Adobes Generative AI tools, Adobe Sensei that uses Adobe's artificial intelligence and machine learning framework, designed to enhance and automate various creative and marketing tasks [1], another Generative AI tool, Adobe Firefly, that is designed to generate images that are safe to use in commercial settings, leveraging licensed images from Adobe Stock and open-source content. This demonstrates the implementation of AI-generated content in a professional context [1]. Adobe Sensei automates tasks, improves editing capabilities, streamlines design workflows, and provides intelligent recommendations. Machine learning algorithms enable features like content-aware fills, image auto-tagging, and automatic color and font suggestions. Adobe Sensei enhances productivity, but the level of creativity in design ultimately depends on the skills of the designer [33].

Microsoft's Designer Tool

Microsoft's Designer tool uses artificial intelligence, specifically the DALL-E 2 model, to create images based on text descriptions. By entering a few words or a sentence, users can generate an image that matches their description. This highlights the ability of AI to turn textual input into visual output and supports the feasibility of AI-powered design tools [14].

3 Methodology

This research process employed Research Through Design (RtD), this approach refers to the integration of research and design activities to create new knowledge, RtD involves using design methods and approaches to generate insights, explore possibilities, and create tangible artifacts or prototypes that contribute to the research process. [51]. Through design thinking principles [12], the research process embraced a human-centered and iterative approach. Research started with a preliminary study to understand the AI tools landscape in design, creating scenarios for exploring innovative design alternatives, developing a prototype using speculative design, and conducting user study and interviews. This research process allowed to gain a deep understanding of AI integration in design and addressed the research questions effectively.

3.1 Pre-Study

The preliminary study aimed to gather initial insights into the problem domain and understand the existing landscape of AI tools in design [27], and to explore the perspectives of professional graphic designers, a survey was designed to assess their preferences, attitudes, and opinions regarding AI tools [26]. The survey questions were carefully crafted to gather data on the participants' backgrounds, qualifications, and alignment with the research topic. It also included questions related to their usage of AI, the frequency of AI tool adoption, the current challenges faced, and their future expectations about AI tools in graphic design.

Before administering the survey to a larger group, a pilot test was conducted with a small group of designers. The pilot test helped identify any issues with the survey design, such as confusing or leading questions, and allowed for necessary adjustments to ensure the reliability and validity of the survey instrument [39]. The feedback received from the pilot participants played a crucial role in refining the survey questionnaire and ensuring its effectiveness in gathering meaningful insights from the larger sample.

A call for participation was posted on LinkedIn, where professional designers were requested to fill out the survey. A total of 11 responses were gathered from graphic designers, UX designers, and creative directors who participated in the survey. The results of the survey provided valuable insights into the current use of AI in graphic design, its challenges, and future expectations. To visualize the results gathered from the survey, personas were created, personas are fictional characters that represent a group of users, their goals and characteristics and useful personas represent users' wants needs, and motivations [39]. Personas help better understand the problem and serve as foundation for subsequent research steps.

3.2 Design Exploration

This phase involved envisioning the future of design with advanced AI capabilities and acknowledging the current gaps in the design field and the potential of AI. A speculative design approach was employed that involved designing future products and services not through prediction [37, 20] but by prototyping and exploring the social, cultural, and ethical implications of emerging technologies [43]. Motivated by the needs of designers identified through survey results, three scenarios were developed: collaboration, evaluation, and automation. These scenarios were designed and structured conceptual systems that represented equally plausible future contexts [49]. This approach helped to consider the broader implications and benefits of advanced AI in collaboration, evaluation, and automation scenarios within the design domain. Each scenario offered a distinct perspective on how designers would interact with advanced AI technologies in a highly advanced and established design context. To further explore these scenarios and provoke discussions, an interactive prototype called *Desain* was created using Figma. This prototype served as a tool for provocation and exploration, encouraging people to imagine and discuss potential future scenarios [48]. Figure 1 shows a basic sketch developed to visualize scenarios and the prototype.

Figure 1: Initial sketch of visualising scenarios and prototype

3.3 Design Provocation

This phase involves exploration of prototype through research study with designers, user studies were conducted with designers in order to gain insights about experience, perspective, and integration of AI in the design process. The study followed a prototype-driven inquiry approach, where the prototype is used to explore and gather feedback, this involved conducting investigative work and exploring new possibilities to gain valuable insights and enhance understanding [45].

The study began with recruitment, enlisting 12 participants from various design agencies in Sweden, including graphic designers, UX designers, and creative directors. Participants were identified through LinkedIn, and initial contact was made by sending them personalized emails explaining the study and inviting them to participate. Upon confirmation of their interest and availability, suitable times for user sessions and interviews were scheduled. The participants had varying levels of experience in the design field, ranging from 2 to 20 years.

3.3.1 Study Setup

Following the recruitment phase, user studies were conducted with participants, where participants had the opportunity to attend the session face-to-face in person or remotely through Zoom, Face-

moderated sessions involve the researcher and users sitting in the same room, interacting with each other. In contrast, remote moderated sessions occur when the researcher and user are in different places but interact through screen-sharing technology [39].
The first user session began with a total of six participants, four of whom attended in-person sessions, and the remaining two participants participated via Zoom. Each session lasted for 40-45 minutes. This format allowed for flexibility and ensured broader participation. The session started with a brief about the research and then the participants were introduced to the prototype*, Desain,* which served as a catalyst for driving inquiry and stimulating discussions. The prototype was thoroughly reviewed, enabling the participants to interact with it. After participants explored the prototype, semi-structured interviews were conducted, with pre-established questions but the order was changed according to the participants' responses [6]. The interview questions covered various aspects, such as the participants' overall experience with the prototype, their feedback on its design and functionality, and their past experiences with AI in their design practice. Through these interviews, participants had the opportunity to reflect on their own experiences, express their insights, voice concerns, and highlight potential opportunities related to AI in design.

For the second iteration, six new participants were recruited, introducing a better version of the prototype to enrich the research findings. In the final iteration, all 12 participants were sent the prototype via email to gather final feedback. This step allowed for additional insights to emerge after the group discussion, validating the findings and refining the prototype if needed.

The research study progressed through three iterations of prototypes, each involving a different set of participants. Insights were gathered from participants and were incorporated into the prototype. Overall, the structured progression with iterative prototyping, combined with user study and interviews, aimed to provoke thoughtful discussions and gather valuable insights into the potential implications of AI in the design field.

3.4 Data Analysis

Thematic analysis was employed to systematically identify, organize, and offer insight into patterns of meaning known as themes within the qualitative data collected from user sessions and interviews [5]. To facilitate the analysis process, Mural software was used. First step toward analysis was transcription of data gathered from users' sessions and interviews. This involved carefully listening to the audio recordings and converting the spoken words into written form. Transcribing the data ensured the comprehensiveness and accuracy of participants' feedback and insights.

Next, transcribed data was imported into Mural, data was organized into meaningful segments. Within Mural, coding techniques were applied to identify patterns and themes within the data. Data were categorized into codes, which facilitated the organization and further analysis of the data. Sub-themes and overarching themes were identified that emerged from the coded data. According to Braun and Clarke, codes are a building block of analysis, and a theme captures something important from data about research questions [4]. Once the code, sub-themes, and themes were identified, findings were summarised. This involved synthesizing the data and presenting the key insights and patterns that emerged from the thematic analysis. Important quotes were highlighted as examples to support the identified themes, providing a rich and meaningful understanding of participants' perspectives and experiences.

3.5 Method Critique

One of the limitations of the study was that the prototype used for the research did not have any AI functionality. This could have influenced the findings as participants were not interacting with a fully functional AI tool. The lack of AI functionality in the prototype may have limited participants' ability to provide accurate feedback and insights on the potential benefits and challenges of using AI in design.

4 Design Outcome

This chapter describes the prototype used as a design provocation in this study. The purpose of this prototype was to stimulate debate and gather thoughts from the audience about the future role of AI in design. The prototype showcased advanced functionalities to gauge perceptions and reactions. It should be noted that the prototype did not incorporate actual AI functionality but was designed to spark discussions and reflections on the potential impact of highly developed AI in design. The proposed functionalities were motivated by the scenarios which were based on the insights gathered from pre-study and existing AI tools.

4.1 Desain Prototype Description

During the prototype phase, a high-fidelity interactive prototype named *Desain* was created using Figma. The prototype aimed to provide an engaging and interactive experience for users to shape a successful solution and enhance their understanding *Desain* combined design and AI potential capabilities to support designers in their creative process. The prototype featured a clean and intuitive user interface with a color scheme consisting of white, teal blue, and yellow accents to highlight important elements. The *Desain* logo was designed in hand-written lettering to add a personal touch and create an organic and humanistic feel.

4.2 Design Motivation

The motivation behind *Desain* was to create advanced AI design tools that address the limitation of existing tools and empower professional designers to have their creative input. The pre-study revealed the needs, pain points, hopes, and concerns of designers, which served as a foundation for defining the functionalities of *Desain*. The aim was to develop a tool that goes beyond the

capabilities of current AI tools and allows designers to express their creativity. By incorporating evaluation, collaboration, and automation functionalities, Desain sought to enhance the design experience and provide designers with the tools they need to excel in their creative endeavors.

Desain encompasses three main functions aimed at enhancing the design experience:

4.2.1 Evaluation Function

Desain's evaluation function empowered designers to assess their work and gather valuable feedback. Users could upload their designs or share online links for evaluation. *Desain* provides designers with visual and written feedback on various aspects of their work, including design quality, usability, accessibility, and sustainability. This comprehensive evaluation capability filled a gap in existing design tools, providing designers with critical insights to improve their work.

Figure 2 shows the main page of Evaluate function, and Figure 3shows how this function will provide evaluation written feedback as well as visual feedback.

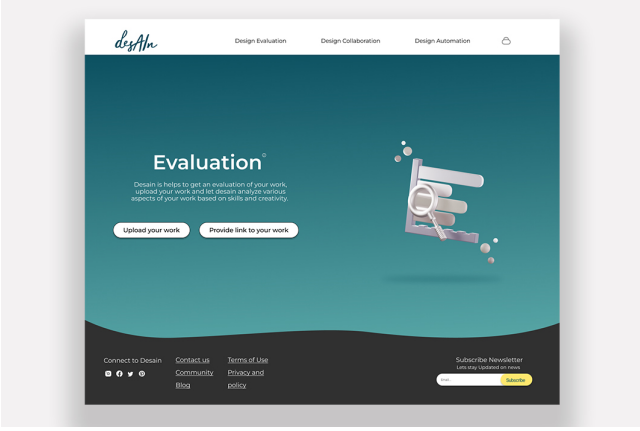

Figure 2: Evaluation Function

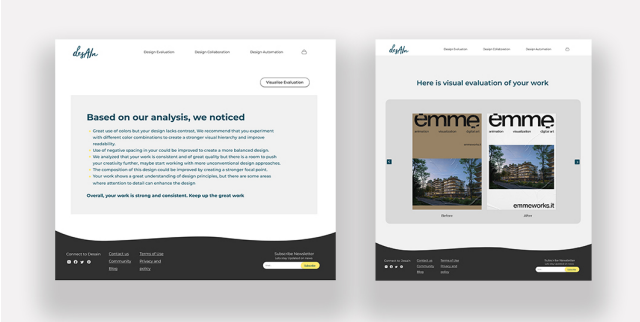

Figure 3: Evaluation Function Results

4.2.2 Collaboration Function

The collaboration function in *Desain* facilitated collaborative design processes by allowing designers to provide and receive creative direction. Designers can provide written feedback, express their ideas, and attach design files such as logos or rough sketches to provide visual references and this tool creates a visual output of written input. Within this function, designers could write prompts or freely express their ideas. They had the option to attach design files, such as logos or rough sketches, to provide visual references. Real-time collaboration allows designers to view and edit designs within the tool itself. Additionally, designers can download their designs in multiple formats and easily share them with stakeholders, promoting seamless collaboration and effective communication. *Figure 4 shows the main page of the Collaboration function and Figure 5 shows the prompt to input direction and the results produced from it.*

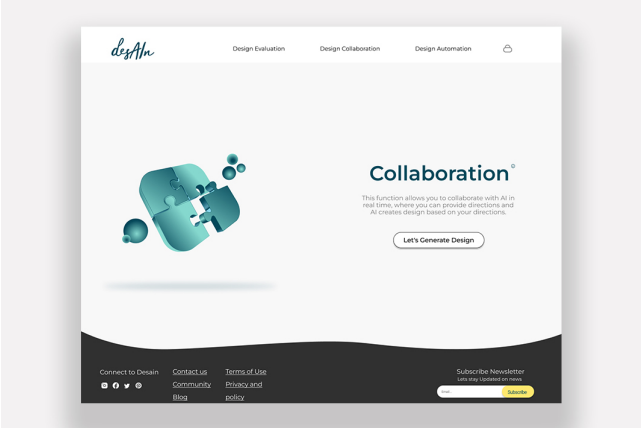

Figure 4: Collaboration Function

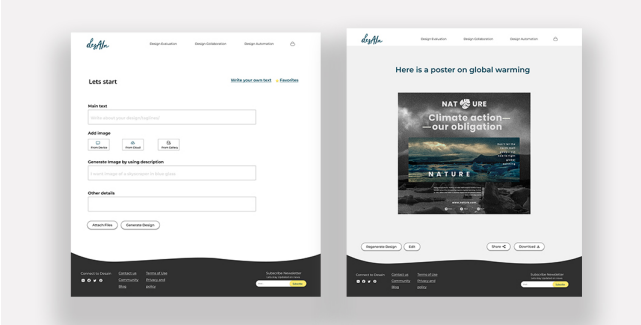

Figure 5: Subpages of Collaboration Function

4.2.3 Automation Function

Desain's automation function enabled designers to automate routine, mundane, and time-consuming design tasks, freeing up their time for more creative aspects of their work. Designers provide a base design and specify desired automation parameters, such as color schemes or layout variations. its versatile automation capabilities allowed designers to generate various design outputs

based on their specific requirements. For example, automation of the generation of different color palettes, layout options, or typography choices. By automating these tasks, Desain aims to free up designers' time and enable them to focus on more creative aspects of their work.
Figure 6 shows the main page of the Automation function and Figure 7 provides simulation of the results produced.

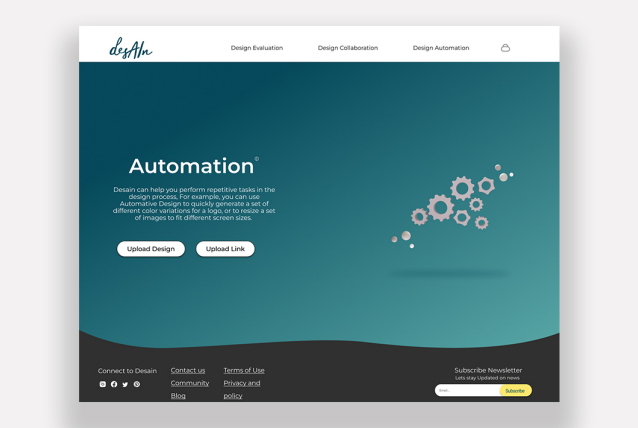

Figure 6: Automation Function

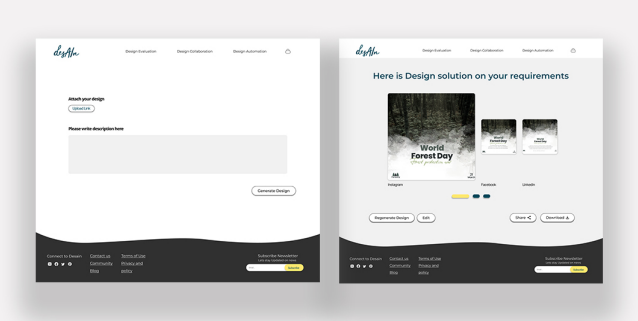

Figure 7: Subpages of Automation

The proposed AI functionalities in Desain align with existing literature and research in the field. There is a wide range of AI systems and functionalities that have been successfully implemented using existing technologies. Research studies have explored the use of AI as image generators, providing visual stimuli for designers to draw inspiration from [11,10, 19,30,34].
Facilitators, such as Adobe Sensei, have also been developed as AI systems to streamline and simplify design actions. [1]. AI-concept evaluators can analyze and rank design proposals based on novelty and level of detail [8]. By leveraging advanced AI technologies such as Computer Vision (CV), Natural Language Processing (NLP), and generative models, CV allows computers to interpret and comprehend visual data extracted from images and videos [32], whereas NLP along with Machine learning mimics human behavior and creates interesting and creative solutions [16].
suggested capabilities can be realistically achieved within the boundaries of current technological advancements.

5 Findings

The thematic analysis conducted in this design research involved the examination of collected data from user study and post-user study interviews. Throughout the research process, a multitude of ideas and concepts were generated, focusing on the potential role of AI in graphic design.
These findings were carefully analyzed to provide valuable data contributing to addressing the research question. “How do graphic designers perceive the role of AI as a collaborative tool in their design process?” The aim was to gain a comprehensive understanding of how AI is perceived and experienced by graphic designers, shedding light on its impact, challenges, and potential benefits in facilitating collaboration.
Additionally, an exploration was undertaken to understand “the perspectives of designers regarding the ethical concerns associated with AI in graphic design”. By delving into their viewpoints, this investigation aimed to uncover the ethical considerations raised by the integration of AI in the field of graphic design, providing insights into the designers’ attitudes, concerns, and considerations surrounding these issues.

5.1 Positive Perception of AI as a design tool

When participants were asked if such a tool to exist (*Desain*) will they use it or not? One participant expressed, *“I would see it as a tool, like something that will help me become more effective in my work. So, I would be generally positive about it because I see the potential.”* This participant views AI as a means to enhance their effectiveness and productivity in their design work, emphasizing the potential benefits it can bring.
Another participant stated, the sentiment of inevitability surrounding AI’s presence in the design field was also expressed by a participant *“I think it’s mandatory and need to get comfortable because it is inevitable and we need to befriend, doesn’t matter if it’s bad or good.”* They emphasize the importance of embracing and familiarizing themselves with AI, acknowledging that whether the implications of AI are positive or negative, its integration into the design process is unavoidable. Furthermore, a participant mentioned, *“I think it's good especially for new designers because I have quite some experiences so I can sit with a client and ask can ask questions, but it’s gonna be great for new designers so they can use it.”* This participant recognizes the potential benefits of AI for new designers, as it provides them with tools and resources to support their design process and client interactions.
Overall, the analysis of the data indicates a generally positive outlook on AI as a design tool. Participants perceive AI as a means to enhance effectiveness, fuel creativity, and increase productivity. The sentiment of inevitability suggests an acceptance of AI’s presence in the design field, with participants emphasizing the importance of embracing this technology to stay competitive.

Participants acknowledge the potential benefits of AI for both experienced and new designers, highlighting its role in supporting their design process and client collaborations.

5.2 AI as a Tool for Automation and Idea Generation

Talking about the features of *Desain*, focusing on the role of AI as a tool for automation and idea generation in the design process. The following quotes illustrate the perspectives of users. One participant expressed the time saving benefits of AI, stating, *"I can use it (Desain) to build some foundation for me, I don't have time to work on things that can be automated."* This suggests that participants appreciate AI's ability to automate repetitive tasks, allowing them to focus on more creative aspects of their work.

Participants also expressed a preference for the automation side of AI, particularly in the production aspects of design. One participant mentioned, *"From a personal perspective, I really like the automation side of it (Desain). I find the production side of design really boring."* This indicates that participants find value in AI's ability to streamline and automate mundane tasks, freeing up time for more engaging and creative work.

Additionally, participants mentioned the role of AI in creating concept designs and filling in the gaps. One participant explained, "*I like creating concepts and ideas, but when it comes to creating hundreds of screens for an app, I don't enjoy that. If AI can fill in those blanks, that is going to be a great implication for me."* This reflects the desire to leverage AI to assist in the creation of repetitive or labor-intensive design elements.

The data analysis reveals that participants are willing to use AI as a tool for automation and idea generation in the design process. They appreciate AI's ability to automate tasks, generate a multitude of ideas, and streamline production. Participants seek to leverage AI to optimize their workflow, enhance creativity, and focus on more fulfilling aspects of their design work.

5.3 AI as a Solution to creative blocks and time saving

Participants were asked how they Perceive *Desain* as a tool and in which ways they find it effective This is how participants responded, the following quotes highlight their perspectives:

One participant mentioned using AI to overcome creative blocks, stating, *"Well, if I hit a block. I don't know what to design and what to do and then I probably go into Pinterest, Behance or something that would inspire me to do something new or something efficient….this tool can be useful in such context"* This suggests that participants can turn to AI for inspiration and to spark new ideas when they encounter creative obstacles.

Another participant expressed the use of AI to facilitate their design process, saying, *"I would use it though to help me personally. And to get things moving if I get stuck. I don't see myself having to rely on it for everything to work."* This indicates that AI is seen as a tool to assist in generating momentum and overcoming design challenges, rather than as a complete dependency.

Participants mentioned utilizing AI to combine and generate ideas. One participant explained, *"I will probably take a bunch of screenshots and apply them into my design. And then you say, okay, how can I combine these?"* This highlights the use of AI to assist in the process of merging different elements and exploring creative combinations.

AI's role in generating ideas was also emphasized, one participant mentioned, *"I will use it to generate ideas or initial prototypes. I see some tasks takes a lot of time but automation can help as filling in the blanks."* This suggests that AI is perceived as a valuable tool for generating initial design concepts and filling in gaps in the creative process.

One participant stated, *"I think it would be time saving. It's gonna save us a lot of time."* Another participant mentioned *"it's definitely gonna speed up my design process"* This highlights the perception of AI as a tool that can expedite certain design tasks and streamline the overall design process.

Overall, the analysis of the data reveals that participants perceive AI as a valuable source of inspiration and a time saving tool in the design process. Participants express that AI can be a source to overcome creative blocks, generate ideas and prototypes, offer alternative perspectives, and expedite certain design tasks. Their perspectives indicate a willingness to embrace AI as a valuable tool in the future of design.

5.4 The Role of Designers and the Value of Human Expertise in the Era of AI

Uniqueness and Human Nuances

The data highlights the importance of designers and the value of human expertise in the context of AI. Participants emphasizes the irreplaceable role of designers, stating, *"Designers are still needed because even though the AI is very smart and can do a lot of things, you will never be able to get those nuances that are actually in every person."* This quote underscores the unique insights, creativity, and nuanced understanding that human designers bring to their work. Another participant highlights the significance of human experience, stating, *"I have been working for 20 years, and nothing beats human experience but having something intelligent or machine learning would be great."* This suggests that years of experience in the field contribute to a designer's deep understanding of visual practices, design principles, and the ability to create meaningful and impactful designs. The participants recognize that AI lacks personal opinions and reasoning beyond what is programmed into it. One participant stated, *"AI doesn't have any personal opinions, they do not have any reasons for creating except for what the code and the data are been telling them."* This highlights the distinction between AI's algorithmic decision making and the ability of human designers to bring their unique perspectives, insights, and subjective judgment to the design process. The participants acknowledge that AI is a tool, guided by

data and code. One participant comments, *"It's just data and code that gives in whatever they've been told to give in."* This underscores the role of AI as a tool to assist designers, rather than a substitute for their expertise and creativity. Overall, the analysis of the data reveals the participants' recognition of the importance of human designers in the face of AI advancements. They value the nuanced understanding, creativity, and personal insights that designers bring to their work.

Valuing Exclusivity and Rare Work

A participant emphasizes the potential homogeneity that could arise if everyone starts relying solely on AI, stating, *"When everybody starts using AI, there will be sameness... people will start valuing exclusivity and will value rare work."* This suggests that human designers can offer a differentiation factor, producing exclusive and distinctive designs that stand out in a landscape saturated with AI-generated content.

The data also highlights the potential for skilled designers to leverage AI as a tool to enhance their creative output. One participant note, *"People who are great at design are going to stay on top of this anyway, and they're gonna use it as a tool to create even more."* This suggests that skilled designers can harness AI to augment their capabilities and generate high-quality artworks. Finally, a participant mentions the desirability of exclusivity in the creative field, stating, *"Exclusivity is something that's gonna float your boat.*" This indicates that unique and rare designs, crafted by human designers, hold value and appeal in a context where AI-generated content becomes more prevalent. Acknowledging the potential benefits of AI as a tool, they emphasize the irreplaceable role of designers in delivering unique, exclusive, and impactful designs. The participants' perspectives underscore the continued relevance and value of human expertise in the era of AI.

5.5 AI as a Collaborative Tool in Design and Embracing its Potential

The data highlights the potential of AI as a collaborative partner in the design process, addressing concerns and resistance among designers. The following quotes provide insights into the participants' perspectives:

One participant suggests that AI can serve as a smooth transition for designers who are fearful of AI taking over their jobs. They state, *"So it would be a really good way to introduce, especially designers that are really scared of AI and AI taking over the jobs. It can be your collaboration partner, basically."* This viewpoint emphasizes the idea of AI as a supportive tool that designers can embrace rather than view as a competitor.

The participant further emphasizes that AI doesn't need to replace human designers but can instead be seen as a collaboration partner. This perspective encourages designers to view AI as a complementary tool that enhances their capabilities and supports their creative process.

Drawing a parallel to historical skepticism towards new technologies, another participant references the invention of the computer and the skepticism that arose around whether it could produce art. They state, "*So even when the computer was invented, people started saying he is not an artist because he is using the machine."* This quote suggests that skepticism towards AI in design may be reminiscent of past concerns, and highlights the importance of having an open and welcoming attitude towards technological advancements.

Overall, the analysis of the data reveals a perspective that positions AI as a collaborative partner rather than a threat to designers. The participants express the potential for AI to support designers, alleviate fears, and enhance the design process. By embracing AI as a tool for collaboration, designers can leverage its capabilities as well as maintaining their creative control and expertise. This viewpoint encourages designers to adopt a positive and receptive attitude towards AI's role in the design industry.

5.6 AI's Limitations in Meeting User Goals

When participants were asked if they use this particular tool (*Desain*) The data reveals the challenges designers face when using AI as a design tool, particularly in meeting their design goals and retaining creative control. Participants express concerns about AI's ability to fully comprehend and deliver on the objectives they set for their designs.

One participant stated, *"I can meet the client's goals with AI, but meeting the user's goals, I think is not something that you can do with just AI."* This sentiment highlights the distinction between satisfying the requirements set by the client and truly understanding and meeting the needs and desires of the end-users. The participant suggests that AI may fall short in capturing the user's perspective and delivering a tailored experience.

Another participant mentions the limitations of AI in capturing the rawness and emotions that are integral to the design process. They emphasize that "*AI can assist in certain aspects; it lacks the human touch and creativity necessary to imbue designs with genuine emotion."* These insights indicate that designers strive to strike a balance between utilizing AI as a tool for efficiency and problem-solving while also preserving their creative autonomy. They seek to leverage AI's capabilities to support their design process but emphasize the importance of their expertise and input in shaping and refining the AI-generated designs to align with their design goals.

Overall, the data highlights the ongoing challenges designers face in effectively utilizing AI as a design tool, particularly in achieving their design goals and maintaining creative control. It emphasizes the need for designers to actively steer and guide the AI-powered processes to ensure the desired outcomes are achieved.

5.7 Ethical Concerns and Transparency in AI-Driven Design

These conversations emerged when participants were asked about their readiness to use AI in the design process. While expressing their openness to incorporating AI, participants also shared their concerns and reservations regarding its potential impact. The data

revolves around the ethical concerns related to the use of AI in design, specifically highlighting issues such as lazy design practices, data privacy, and the need for ethical guidelines.

Potential for Lazy Design and Ethical Concerns

The data highlights the ethical concerns surrounding AI-driven design and the importance of transparency in addressing these concerns. Participants express apprehension regarding the potential for lazy design practices facilitated by AI, as it may lead to corners being cut and compromise the creative process. One participant remark, *"It could make for lazy design for rather than going a pencil sketch some corners are cut, rather AI can join dots, it has some ethical concerns, some managers are concerned about remote working as there staff is having multiple jobs using AI".*
This sentiment raises ethical concerns about the level of craftsmanship and originality in AI-generated designs.

Need for Ethical Guidelines and Education

Transparency and accountability emerge as critical components of ethical AI-driven design. While discussing AI, its benefits Participants also expressed worries about the implications of AI-generated content and the potential for chaos or unintended consequences. One participant acknowledges, *"That's the scary thing about AI, I think. And also, like, the pictures that it could actually create could also make a big mess."* This highlights the need for responsible design practices and the ability to understand and control the outcomes produced by AI.
The discussion also emphasizes the necessity for ethical guidelines and education in AI-driven design. Participants engage in debates surrounding data privacy and the reproduction of user data without consent. One participant raises concerns, stating*, "If AI saves your data and reproduces it in some corner of the world, I will not be happy with it, and I think it is immoral."* This viewpoint underscores the importance of clear ethical guidelines and accountability frameworks to protect users' data and ensure responsible use of AI technologies. Participants stress the importance of developing ethical guidelines to govern AI-driven design practices. They believe that discussions surrounding AI ethics should be promoted and prioritized. One participant mentions "*I think we should have clear guidelines as soon as possible. Before we delve into any danger, dangerous situation"*
One participant acknowledges, *"That's the scary thing about AI, I think. And also, like, the pictures that it could actually create could also make a big mess."* This highlights the need for responsible design practices and the ability to understand and control the outcomes produced by AI.
The comparison to social media platforms like Facebook being responsible for data protection highlights the expectation for AI to uphold similar standard, *"I think it is immoral. Facebook is responsible for data protection I put on Facebook, so I want such responsibility from AI."*

Urgency for Transparent and Accountable AI

Participants emphasize the need for transparency in AI systems and processes. They desire a clear understanding of how AI operates, where the data originates, and how it is utilized. The discussion touches on the notion of fairness when AI taps into the creativity and capabilities of others. Participants express reservations about AI potentially using or replicating the work of other artists, questioning the fairness of such practices. One participant remarks, *"If it taps into other people's creativity and their capabilities, then it is not fair."*
The participant emphasizes the need for recognition and proper attribution, drawing a parallel with how blogs use images and provide credits to the original owners. *"If I use AI to produce something, or something inspired by someone's design or artwork, so those people needs to get value and credit and so when AI produces my artwork it should also link it back to the person's just the way blogs uses images and credits to its owner"* One participant mentioned *"I am Using AI to produce data I would like to have clear instructions or a clear image of where the data is coming from and how AI is dealing with my data."* Transparent AI practices would enable users to have a better grasp of AI's impact on their work and the potential implications for privacy and security. Participants advocate for accountability and responsible handling of user data, suggesting that transparency should be a fundamental principle in AI-driven design practices.

Overall, the data reflects concerns about ethical considerations and transparency in AI-driven design. Participants express worries about lazy design practices, potential risks associated with AI-generated content, and the responsible handling of user data. They call for the establishment of ethical guidelines, education on AI ethics, and transparent practices to ensure accountability and mitigate potential negative consequences.

6 Discussions and Conclusion

Building upon the literature on collaborative problem-solving and hybrid human-AI systems [41], the study supports the notion that designers recognize AI as a valuable collaborative tool in graphic design. The integration of AI in the design process enables designers to leverage its computational power to augment their creative output and explore new possibilities. This finding aligns with the idea that hybrid human-AI systems focus on augmenting human intelligence rather than replacing it, with AI technologies solutions to enhance designers' decision-making [41]. automating tasks, providing relevant information, and suggesting

As highlighted by designers in the study, there are concerns about the limitations of AI in capturing the human touch and unique perspectives that contribute to the richness of design. This aligns with literature that has emphasized the importance of human reflection and meaning-making in interpreting the system's responses[52]. It indicates that designers value the subjective input

and creativity they bring to their work, recognizing the enduring significance of human involvement in the design process.
Furthermore, the study revealed different perspectives among designers regarding AI's role. Some designers saw AI as a valuable tool for providing feedback and generating ideas, while others viewed it as a means to automate and expedite processes[52]. This finding resonates with the notion that the focus should shift from mimicking or replacing human skills and activities to instead understanding how to effectively integrate system in to co-creation practices while aligning with human values.

The ethical considerations raised by designers aligns with the growing importance of responsible AI practices in graphic design. The integration of AI into the design process necessitates the establishment of clear guidelines and frameworks to address fairness and data privacy concerns [4]. Responsible AI approaches, which prioritize fairness, transparency, and accountability in the implementation of AI methods, have been proposed to address these ethical considerations [4]. This aligns with the notion that integrating ethical behavior into AI through interdisciplinary collaboration between pedagogy, moral psychology development, and computer science is crucial [53]. The future of AI in graphic design will likely require ongoing interdisciplinary collaboration and dialogue among designers, developers, policymakers, and ethicists, as suggested by research findings and the literature. This collaborative effort aims to navigate the evolving landscape of AI-driven design, address emerging ethical implications, and shape the responsible development and deployment of AI-powered tools in graphic design [24,4]. By fostering such collaborations, the design community can collectively work towards an AI future that enhances human creativity, supports innovation, and upholds ethical standards.
Whilst exploring the potential of AI as a collaborative tool in graphic design, it is essential to acknowledge the wider implications it may have on the industry. One such concern is the potential for job displacement due to the increased integration of AI-powered tools. The primary objective is to shed light on the role of AI as a collaborative tool and examines ethical implications. job displacement is a valid topic of discussion, it falls beyond the scope of this research and should be examined in dedicated studies specifically addressing its impact on employment dynamics within the design industry.

overall, the study contributes to the existing literature on collaborative problem-solving, hybrid human-AI systems, and responsible AI practices in graphic design. Ethical considerations are vital in shaping the responsible development and deployment of AI in graphic design, and ongoing interdisciplinary collaboration will play a crucial role in realizing the potential benefits of AI while upholding ethical standards and preserving the essence of creative expression.

6.1 Conclusion

This research contributes to the understanding of AI's role in graphic design and presents a positive outlook on its integration. The study highlights the importance of developing AI-powered tools that align with designers' needs, respecting their creativity, and supporting their unique perspectives. It sheds light on the role of AI as a collaborative tool in graphic design, emphasizing the importance of understanding designers' perceptions and concerns. While AI offers efficiency and effectiveness in generating ideas and streamlining tasks, designers highlight its limitations in replicating human touch and creativity. Ethical concerns center around maintaining the integrity of the design process and addressing issues of accountability, transparency, and fairness. The future of AI in graphic design requires interdisciplinary collaboration, ethical guidelines, and responsible practices. By navigating these challenges, designers can harness the potential of AI to enhance their creativity, explore new possibilities, and uphold ethical standards in the evolving landscape of AI-driven design.

6.2 Research Ethics

To maintain the confidentiality of participants ethical guidelines were followed. All participants were provided with clear and detailed information about the study its purpose and its objectives. Before recording the user sessions and interview informed consent was obtained from each participant, emphasizing their voluntary participation and their right to withdraw at any point without consequences. To protect privacy anonymity was maintained of their data, any identifying information was removed to ensure anonymity.

6.3 Future Study and Limitations

For future studies *Desain* can be used as a benchmark against other existing AI-powered design tools. By evaluating the strengths and weaknesses of different tools, researchers can identify gaps and opportunities for improvement in AI integration within the graphic design field.
One limitation of this study is the difficulty in recruiting a diverse pool of professional designers. Professional designers often have busy schedules and tight deadlines, making it challenging to secure their participation.

By addressing these future study opportunities and recognizing the limitations of the current research, further advancements can be made in understanding and harnessing the potential of AI in graphic design.

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