Artificial Intelligence (AI) in Graphic Design
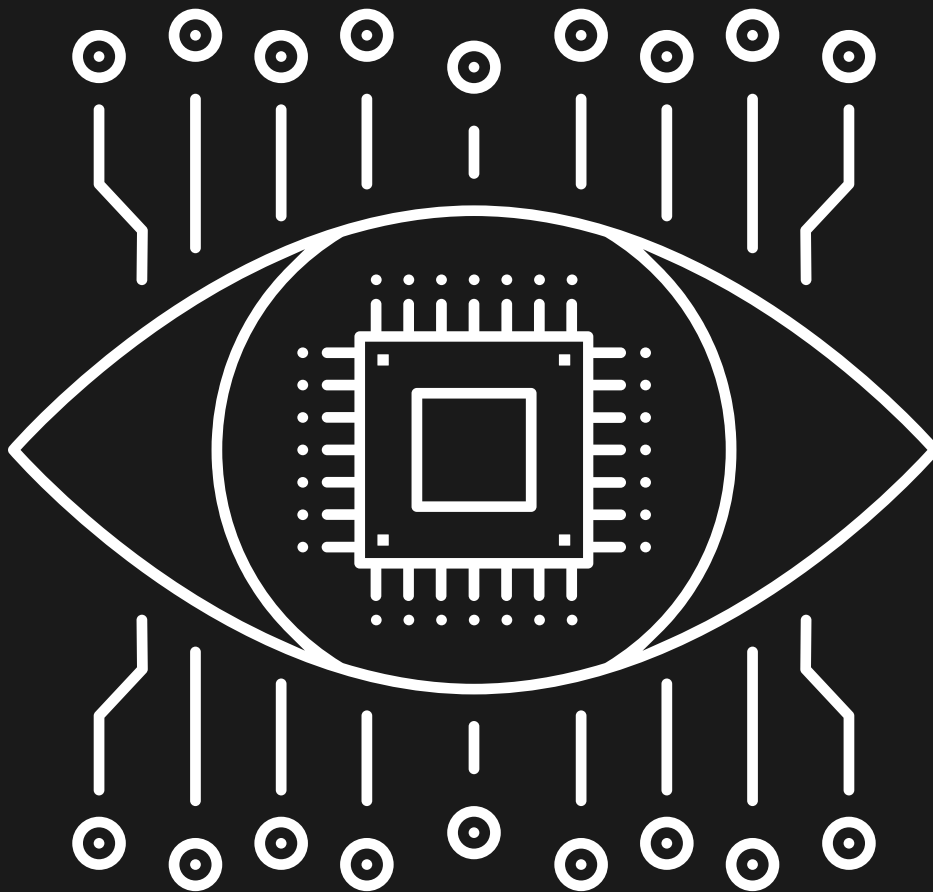
Identifying Benefits, Challenges, and Ethical Considerations

By Habiba Elgendy

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Abstract

Artificial Intelligence (AI) has evolved at an accelerated rate over a short period of time. Its influence is already evident in graphic design practices, driven by its capabilities to automate and streamline various design activities and practices. This ranges from creating visual content, generating complex and realistic images and graphics, to editing images, transforming design aesthetics, and inspiring design concepts. As technology continues to advance, AI has the potential to have more significant influence which raises ethical concerns and challenges that need to be addressed. These include intellectual property issues, data bias, job displacement, privacy threats, and issues with transparency of source and influence.

This research project will explore the perceptions of incorporating AI into graphic design processes. Through a contextual review, a series of interviews with graphic design professionals, and an analysis of current AI applications and tools, the study will highlight potential benefits, challenges, and ethical considerations surrounding the integration of AI in graphic design. The aim of this investigation is to help graphic design professionals make informed decisions regarding the use of AI in their work, and shed light on the changing graphic design landscape and the implications it will face due to the integration of AI.

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> *Thank you for being my sherpa—guiding me to the summits of knowledge—and for believing in my potential.*

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> *Thank you for lighting the path and showing me the endless possibilities of the future.*

To the readers of this MRP:
> *Thank you, sincerely, for taking the time to explore, engage with, and embrace the findings of this research.*

Dedication

Habibty Sofie,
May you always walk your path with courage, grace, and an unwavering belief in yourself.

Habibi Nader,
Your consistent support has made this pursuit not only possible but also a shared achievement.

To Baba and Mama,

أَنَا مَمْتَنَةٌ لَكُمْ إِلَى الْأَبَدِ عَلَى الْقِيَمِ الَّتِي زَرَعْتُمُوهَا فِي نَفْسِي، وَالْفُرَص الَّتِي قَدَّمْتُمُوهَا لِي، وَدَعْمكُمُ الَّذِي قَادَنِي إِلَى مَا أَنَا عَلَيْهِ

I am forever grateful for the values you have instilled in me, the opportunities you have provided, and the support that has led me to where I am.

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Introduction

Chapter 1: Introduction

Scope & Context

Artificial Intelligence (AI) has evolved at an accelerated rate in a very short period of time. Within the field of graphic design, it is often positioned in a rather binary way; as either a threat to job security and proprietary rights, or as a promising technology that could effectively streamline design activities.

While the opportunities of AI in graphic design range from daunting to promising, it is important to critically examine emerging implications and identify potential benefits, challenges, and ethical considerations related to its use. Moreover, the potential threats associated with the integration of AI in graphic design, such as the potential displacement of jobs, privacy threats, intellectual property concerns, data bias, and transparency issues demonstrate the need for comprehensive research to navigate the evolving creative landscape. Accordingly, this research aims to examine these implications on a deeper and more comprehensive level through the perceptions of those who have been working in the field of graphic design and are contemplating and experiencing the disruption of AI interventions in their day-to-day practices. This research paper is comprised of a contextual review to explore the current context of the subject; a collection of current AI applications and technologies that can be utilized in graphic design; and nine semi-structured interviews with graphic design professionals in order discuss their perspectives on AI integration within their current practices.

This exploration occurs in tandem with a societal shift, where AI is reshaping traditional notions of work and creativity. This intersection of artistry and algorithm prompts an evaluation of fundamental beliefs about creativity and its relationship with technology. Accordingly, this study offers a unique opportunity to examine the discourse surrounding AI's impact on the graphic design industry as an emerging and transformative technology.

Research Question

The central focus of this Major Research Project (MRP) revolves around the exploration of a primary research question:

> *How might the integration of AI technologies impact graphic design processes, and what benefits, challenges, and ethical considerations arise as a result?*

Additional questions that motivate and guide the exploration of this research include:

> *Has AI emerged in the field of graphic design as a powerful assistant or as a competitor to human designers? Can AI match the unique emotional intelligence, cognitive skills and impeccable creativity of humans or will the human touch prove to be irreplaceable?*

By revealing the complexities of AI's role in graphic design through these questions, this study aims to assist practitioners, educators, and industry stakeholders in anticipating and embracing AI's impact in the field.
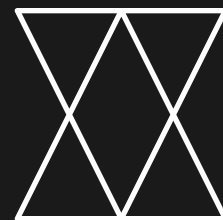
Methodology

Chapter 2: Methodology

Research Design

Contextual Review

This research employs a mixed-methods approach to investigate various facets of AI integration and impact on graphic design. Firstly, a contextual review was conducted to gather and synthesize information on the historical context and current state of graphic design methods and processes; the current state and potential of integrating AI into graphic design; and the overall impact of AI on the graphic design industry. Additionally, current existing AI tools and software that can be used in graphic design were identified and assessed in terms on functionality. This approach aims to help contribute insights into the current state of the design landscape as well as determine the possibilities and challenges of integrating AI in graphic design.

Research Ethics Application

In addition to the contextual review, this study included semi-structured interviews with graphic design professionals from various backgrounds, including freelance, agency, and in-house designers. The interviews aim to explore the potential benefits, challenges, and ethical concerns of using AI in graphic design, based on the perspectives of the participants. Participants were selected based on the following selection criteria:

1. The designer practices graphic design in a design agency, as a freelancer, or as an in-house designer.
2. The designer must have more than five years of professional graphic design experience.
3. The designer speaks and understands English fluently and can fully conduct the interview in English language.
4. The designer can conduct the interview virtually via Microsoft teams and accepts being recorded during the process.

The selection criteria outlined above was chosen to ensure that the participants have specific qualifications and would to be able to speak about their processes and experiences within the graphic design practice, and how the increased access to AI tools was changing or had the potential to change the field. More specifically, the first criterion ensured that participants have practical experience across various work settings (design agency, freelance, and in-house), enabling the study to capture diverse perspectives on the integration of AI in different professional contexts. Similarly, the second criterion required participants to have a minimum

of five years of professional graphic design experience. This ensures they have encountered significant industry changes, such as those experienced during the COVID-19 pandemic, along with other practical aspects of graphic design practice that have evolved beyond entry-level design positions.

Designer directories from design associations such as the Association of Registered Graphic Designers (RGD) and the Design Professionals of Canada (DesCan) were used to solicit participants. From these directories, designers were selected based on the criteria outlined above and contacted via the contact information provided in the directory. Once the selection criteria were met and designers agreed to participate in the interviews using the methods outlined above, a consent form (see Appendix A) was sent to them to ensure they are fully aware of the study's purpose and their voluntary participation.

Once the signed informed consent form was obtained from participants, and prior to conducting the interviews, a primer (see Appendix B) that highlights the current state of design thinking frameworks and graphic design processes was shared with them via e-mail. This primer offered participants an overview of dominant graphic design terminology, frameworks, and processes to establish a common ground and a shared language for the interviews.

Through this approach, a sample size of nine diverse participants was obtained. During the interviews, the nine participants were asked ten open-ended questions that generated discussions and insights around their graphic design methods and processes, their background in using AI in their work, ethical concerns related to the use of AI in graphic design, and how they perceive the future of AI in graphic design (see Appendix C for the complete Interview Protocol). After conducting the interviews, all participants were given the opportunity to withdraw as well as review and approve their final interview transcripts prior to the analysis stage. This ensured ongoing consent as well as the accuracy of the data before conducting the analysis. Finally, once the transcript was approved and no request of withdrawal was received, the raw data was analyzed using grounded theory methodology to identify emerging themes and concepts that informed and guided this research.

The outlined research procedure was reviewed and given ethical clearance by OCAD University's Research Ethics Board (REB), approval #2023-42.

Grounded Theory

The methodology for analyzing the interview data is based on grounded theory, a research approach designed to generate concepts and frameworks emerging directly from the collected data (Chun Tie et al., 2019; Williams & Moser, 2019). This process is based on a coding system that involves labeling and categorizing parts of the interview data based on themes, patterns,

or concepts that emerge (Chun Tie et al., 2019; Williams & Moser, 2019). First, open coding is conducted to identify specific concepts within the data. This is then followed by axial coding, where relationships between codes are identified to establish broader categories and subcategories. Consequently, selective coding is conducted to integrate broader themes and to lead to the theoretical understanding that reflects the essence of the data (Chun Tie et al., 2019). Based on these steps, the grounded theory gets established to allow a deeper understanding of the research topic rooted in the perspectives of the participants of this study (Chun Tie et al., 2019).

Futures Wheel

In this study, the Futures Wheel foresight tool was used to systematically map out the potential impacts of AI integration in graphic design and their associated implications. The tool, originally invented in 1971 by Jerome C. Glenn, aids in organizing thinking and questioning about the future and facilitates structured brainstorming (Glenn, 2021). The insights gathered are based on data from interviews conducted with graphic design practitioners, which provided valuable perspectives on the professional and practical applications of AI in the field. The Futures Wheel was specifically chosen as a method for its ability to structure and facilitate the exploration of primary, secondary, and tertiary consequences arising from a central change: AI Integration in Graphic Design. Given the rapidly evolving nature of AI technologies in the field, it is important to identify a broad range of possible outcomes, both positive and negative, along with their implications. Overall, this approach offered a framework for understanding the diverse ways in which AI could reshape the landscape of graphic design.

Limitations

In the context of grounded theory, reaching theoretical saturation occurs when enough data on the research topic is collected, and when no new information or themes emerge from the data collected. This critical aspect of grounded theory methodology ensures an insightful emerging theory and a deep understanding of the different perspectives on the research topic (Chun Tie et al., 2019).

Achieving saturation during this study was not possible given the unexpected variety of design processes and practices across the three areas of design practice (design agency, freelance, and in-house) as shared by participants. Since grounded theory relies on diversity in data, this limited the success of reaching saturation but also offered an opportunity to identify commonalities and variations within the small dataset. Despite these limitations, this study contributes meaningful insights and lays the groundwork for future research in this dynamic and evolving field.

Contextual Review

Chapter 3: Contextual Review

The following contextual review aims to gather and synthesize information on the historical context and current practices of graphic design, while exploring the current state and potential of artificial intelligence (AI) integration within this domain. In addition, it explores the ethical impact resulting from the intersection of AI and graphic design, while also contemplating its future outlook. This review not only contextualizes the issue but also intertwines with the gathered interview data from participants, offering a comprehensive and contemporary perspective on AI's adoption in graphic design.

In the past few years, AI has acted as a transformative force in the landscape of design, challenged traditional methods of working, and redefined the boundaries of creativity. While the world has seen a similar paradigm shift during the Industrial Revolution followed by the Digital Revolution decades ago, many believed that tasks that require creative intelligence were unlikely to be automated by computers in the future (Frey & Osborne, 2023). This is due to the complexity of encoding human values, the variability of creative values across cultures and time, and the inherent subjectivity in evaluating creativity (Frey & Osborne, 2023). As such, creativity was perceived as something that requires a human touch and intuitive understanding that machines could not replicate. Contrary to this notion, creative fields today are witnessing profound impacts that will likely change them forever, as well as redefine human intuitive approaches to creativity. As with any transformative event there comes a range of benefits, challenges, and ethical considerations that have yet to be brought to public awareness or highlighted to those who will experience this impact the most.

This intersection of artistry and algorithm has demonstrated the need for a radical re-evaluation of our fundamental beliefs about work and creativity. These developments also highlight that AI is not just a passing trend, but a lasting technology that is reshaping our futures. The transformative impact of AI on various aspects of work and creativity is challenging conventional norms and making it evident that adapting to this shift is necessary for navigating the evolving demands of our professional creative landscape. Accordingly, by synthesizing existing research and insights, this contextual review serves as a compass, guiding through the implications, possibilities, and potential pitfalls of AI integration in the dynamic landscape of graphic design.

Historical Context

To preface, it is important to unpack and reflect on the concept of creativity, alongside the emergence of visual communication. Creativity extends deep into human history and way beyond technical ability. Ancient African and European art, dating back over 200,000 years to periods spanning from the early Paleolithic to the Neolithic era, were discovered in sites such as the Lascaux caves in southern France (Figure 1) and Altamira in Spain (Meggs et al., 2006). These paintings portrayed representations of animals, hunting scenes, and aspects of daily lives using analog techniques such as finger-painting and natural pigments. Similarly, early Egyptians expressed themselves through simple drawings that evolved into a complex writing system— known as Hieroglyphs—based on pictographs (Figure 2), while employing simple tools as creative instruments (Meggs et al., 2006). Around the world, Indigenous people also expressed themselves through petroglyphs—carved or scratched signs or simple figures on rocks—that depict scenes from their lives and beliefs (Meggs et al., 2006). Furthermore, Chinese calligraphy, a logographic writing system, served not only as a practical means of communication but also as a form of artistic expression and spiritual cultivation (Meggs et al., 2006).

Figure 1 | *Prehistoric Visual Communication: Lascaux Caves in Southern France.*
From "Lascaux II", by Jack Versloot, 2008, Flickr,
https://www.flickr.com/photos/80749232@N00/2563365462. CC BY 2.0.

Figure 2 | *Prehistoric Visual Communication: Egyptian Hieroglyphs.*
From "Egyptian hieroglyphs: Detail of coffin base of Iufenamun, an early 22nd dynasty senior priest of Amun-Ra.", by
Steven Straiton, 2015, Flickr, https://www.flickr.com/photos/st33vo/19650281680/. *CC BY 2.0.*

These examples did not mark the beginning of art forms as we know them, but rather the emergence of visual communication, as these early images and writings served practical, utilitarian, and ritualistic functions crucial for survival, demonstrating the early sparks of human creativity (Meggs et al., 2006). The insights give us valuable perspectives into the lives and creative capabilities of prehistoric humans long before the integration of technology. As such, technological progress has played a crucial role in driving communities towards enhanced efficiency and productivity in both creativity and visual communication. This dynamic interplay between creativity and technology shapes a rich discourse in the evolution of human expression and societal advancement, prompting reflection on our uncertain futures amid the ongoing paradigm shift of AI integration in visual communication.

Current State of Graphic Design

Skills in practices such as typography, image creation, colour theory, and layout principles are crucial for conducting graphic design work. In addition, a myriad of technical knowledges and skills are required to keep pace with ever-evolving printing techniques, publishing, software, and digital tools. However, graphic design is more than a technical discipline; it is an epistemic practice intertwined with language, information, and communication (Gillieson & Garneau, 2018). It involves not only crafting visually appealing artifacts but also engaging deeply with the process of knowledge creation and dissemination. As such, Gillieson and Garneau (2018) challenge the notion of design as solely a "materially-oriented science," proposing instead

an "epistemology of design" that embraces a dialogical dimension and social responsibility (Gillieson & Garneau, 2018).

This shift in perspective from Gillieson and Garneau's conceptualization of design as an epistemological practice also highlights a fundamental evolution towards human-centered practices. In recent years, graphic design has witnessed a significant shift from a focus on products and materials to a consideration of human-centered practices (K. Visocky O'Grady & J. Visocky O'Grady, 2017). The emergence of user-centered design methodologies such as participatory design, co-design, and service design emphasize collaboration and empathy with users during design processes (Matthews et al., 2023). In addition, various techniques including ethnographic studies, surveys, questionnaires, market research, and data analytics are employed to craft and convey messages with greater impact (K. Visocky O'Grady & J. Visocky O'Grady, 2017). Despite this evolution, graphic design education still largely revolves around traditional aspects like typography, layout, web design, publication design, and logo design; with limited emphasis on user-centric methodologies and adaptation to emerging technologies like AI (Matthews et al., 2023). This conventional approach leaves the visual communication industry unprepared for automation, AI, and machine learning. While there is existing literature on user-centered visual communication education, it lacks explicit focus on adapting to automation and AI (Matthews et al., 2023).

Overall, graphic design today emerges as a multifaceted discipline that bridges the gap between creativity, cognition, and ethical engagement (Gillieson & Garneau, 2018). It can also be described as a central ingredient in mass communication systems due to its linguistic nature (Gillieson & Garneau, 2018). Whether it is through descriptive elements, amplification of the message's impact, or even serving as the visual embodiment of the text itself, graphic design plays a crucial role in shaping how information is perceived and understood (Gillieson & Garneau, 2018). The introduction of AI, particularly generative design tools, promises to augment and disrupt these capabilities significantly while revolutionizing visual communication in the process.

Generative Design

Generative AI (GenAI) is a term that refers to advanced computational methods capable of producing "new" and relevant content like images, audio, and text from training data (Feuerriegel et al., 2023). Popular GenAI examples include Dall-E, Chat GPT, and Copilot (previously known as Bing) illustrate the transformative impact of GenAI on our work and communication methods (Feuerriegel et al., 2023). AI-powered generative design tools can produce countless design variations based on a set of prompts and specifications provided by the designer. This not only speeds up the design process but also introduces novel and unexpected design solutions that

might not have been conceived manually. Additionally, GenAI has the potential to democratize graphic design by making design tools and capabilities more accessible to non-designers, thereby expanding the pool of individuals who can create visually compelling content.

A report by McKinsey & Company (2023) suggests that when GenAI is utilized across various sectors, it has the potential to contribute between $2.6 trillion to $4.4 trillion to the global economy on an annual basis. The research also highlights that existing GenAI technologies have the capability to automate tasks that currently occupy 60 to 70 percent of employees' time, thus enhancing productivity and efficiency in different fields. McKinsey & Company further suggest that GenAI can enhance productivity by collaborating with human workers rather than replacing them. By processing large volumes of data and generating valuable insights, it can greatly assist workers in various tasks. This collaboration allows employees to "devote more time to higher-impact tasks," ultimately leading to faster progress and higher efficiency (McKinsey & Company, 2023).

While McKinsey & Company emphasizes AI's capacity to enhance productivity and efficiency by collaborating with human workers, Karaata (2018) highlights that various graphic design tasks today are conducted using AI without the need for a graphic designer. These tasks include visual identity design, layout design, and web design. Karaata (2018) argues that the use of AI in the field will have the most impact on speed and time efficiency. However, as graphic design programs/software led by AI grow in popularity, designers using these programs must have knowledge of design principles and rules; otherwise, these programs will result in "pollution in design." Although Karaata (2018) states that AI does not have enough creative awareness to compete with human levels of creativity, she highlights that, by automating certain design tasks that do not rely on creativity alone, AI will allow graphic designers to focus more on the creative process—eventually becoming a useful technology as opposed to a threat (Karaata, 2018).

Building upon these insights, the increased accessibility and integration of AI in graphic design not only streamlines processes but also presents significant cost-saving opportunities and potential profit increases. Huang and Grady (2022) further discuss the evolution and potential of GenAI, highlighting its potential economic impact on creative and knowledge work. They highlight AI's possible integration into various creative applications, including copywriting, code generation, art creation, gaming, and design. GenAI, enabled by advancements in AI models, data availability, and computational power, has the potential to make billions of workers more efficient and creative, generating trillions of dollars in economic value (Huang & Grady, 2022).

Further emphasizing resource savings, McKinsey & Company (2023) highlights that GenAI offers the potential to streamline ideation and content creation processes. This is partly achieved by promoting consistency in brand voice, writing style, and format across diverse content pieces (McKinsey & Company, 2023). In addition, collaboration among team members can

be facilitated through GenAI, as it allows for the integration of multiple perspectives into one cohesive narrative (McKinsey & Company, 2023). Creative teams can also achieve higher levels of personalization in marketing messages tailored to different customer segments, geographic regions, and demographics (McKinsey & Company, 2023). As such, GenAI has the capacity to enhance customer value, attraction, conversion, and retention on a large scale, surpassing the capabilities of traditional methods (McKinsey & Company, 2023).

As creatives and organizations increasingly adopt GenAI for content creation, there is a parallel with the use of AI in graphic design practices, encompassing conception, prompting, generation, refinement, and deployment (Fenwick & Jurcys, 2023). While GenAI liberates design professionals from time-consuming tasks like creating conceptual images, moodboards, and storyboards after their conception, achieving outputs aligned with designers' visions and clients' preferences often requires frequent and detailed prompting (Booth et al., 2024; Fenwick & Jurcys, 2023). Although a brief prompt might spark intriguing ideas, the resulting output may not necessarily meet a project's criteria of accuracy, feasibility, or relevance (Booth et al., 2024). As such, a prompt is "a deliberate choice by a human creator, aimed at materializing their concept." It necessitates an iterative approach, evolving based on users' interests and explorations (Fenwick & Jurcys, 2023).

Following the iterative use of prompts to generate content using AI, refinement is an essential stage of the creative process that requires a critical eye for detail. Refining, in that sense, involves a wide range of sophisticated activities such as "curation, collation, compilation, and assemblage" (Fenwick & Jurcys, 2023). It also may involve re-visiting the prompting and generation stages, where the use of GenAI becomes a dynamic, cyclical, and iterative process overall. Another notable advantage of contemporary GenAI is its ability to " remember" the context from a previous stage of the interaction with users. This feature not only heavily impacts the refinement phase but also facilitates the improvement of the performance of AI over time as it "learns" from its exchanges with users (Fenwick & Jurcys, 2023).

In summary, the current state of GenAI reflects a significant advancement in content creation and design processes. It specifically offers remarkable potential for efficiency, innovation, and collaboration in graphic design. These tools leverage machine learning algorithms to analyze design patterns, generate diverse design iterations, and assist designers in overcoming creative challenges. To better gain a perspective of how these generative tools can enable designers to explore design possibilities, the following section outlines the current AI tools and applications that exist within the creative landscape.

Current AI Tools & Applications

To categorize the rapidly evolving landscape of AI-driven resources and further explore the realm of generative AI (GenAI), this research involves identifying AI tools and applications that can be utilized in graphic design processes. The data was gathered in a table format, outlining key information such as the tool/application name, category, function, payment structure, release date, founder, and website (See Appendix D).

As the domain of AI continues to rapidly expand, this table serves as a resource aimed at capturing the latest advancements in AI-powered tools and platforms within the field of graphic design. By documenting these tools and outlining their purposes, we gain a clear understanding of how AI can streamline processes and enhance efficiency within graphic design. As such, designers and creative professionals can utilize this table as a strategic resource, identifying areas within their workflow that could be impacted by AI integration. This documentation ultimately captures a moment in time during a significant historical shift, allowing for ongoing assessment of how these tools evolve in terms of ownership, accessibility, and functionality.

The table of AI tools and applications (Appendix D) is selected based on a comprehensive set of criteria designed to highlight their functionality, creative potential, relevance to graphic design workflows, and accessibility to the public (whether free or for a fee). The criteria for selection used to scan for the tools and applications are:
- Is it a tool that functions or is enhanced by artificial intelligence?
- Does it have potential to aid in creative work processes?
- Can it be leveraged in graphic design-related workflows?
- Is it accessible to the public either for free or for a fee?

Each tool or application in the table is either powered by artificial intelligence or significantly enhanced by it. In addition, the table is organized into seven columns that provide all necessary information to ensure easy navigation. The columns include the name of the tool/application, the category based on their primary functionality, the main function, price structure (Free, Freemium, Pay-Per Use, Subscription-Based, Tiered-Pricing, etc.), release date, founder or CEO, and official website. The selected categories of AI tools and applications are: Design Tools, Image Generators and Editors, Video Generators and Editors, Colour Palette Generators, Animation Tools, Drawing Tools, Chat Bots, Copywriting Tools, Presentation-Building Tools, Web Design Tools, UX/UI Design Tool, App Development Tools, and Business/Marketing Tools.

It is also important to note that this list was compiled between September 2023 and April 2024, primarily through searches on platforms like Google and Bing. It is restricted to the tools accessible within this timeframe and found by the researcher via the search engines used. Over

time, many of these tools may be subject to name alterations, adjustments to pricing/payment structures, acquisitions, changes in ownership, discontinuation, or expansion of operations and functionalities. See Appendix D for the complete table.

Ethical Considerations

As we identify the possibilities that AI holds for graphic designers, it is crucial to acknowledge that realizing its benefits in the field requires a deep understanding of both its capabilities and limitations along with a commitment to addressing its ethical implications. Accordingly, this section explores research aimed at understanding and addressing the ethical dimensions of AI adoption within the graphic design domain.

While GenAI offers several benefits, there is a concern that it might dilute the human element in design and potentially lead to the homogenization of design. The use of AI-generated designs also raises questions about misinformation, the perpetuation of biases in AI algorithm, intellectual property rights and ownership, authenticity, job displacement for human designers, and economic impacts. These issues highlight the need for thoughtful consideration of the ethical implications of AI technologies in design and the importance of addressing their broader societal impacts.

Feuerriegel et al. (2023) highlight several limitations of current GenAI systems in real-world applications. Firstly, GenAI models often produce incorrect outputs due to their reliance on probabilistic algorithms, thus leading to errors in generated content. This issue, known as "hallucination," can result in misleading or nonsensical output and challenge the trustworthiness of generated content (Feuerriegel et al., 2023). Additionally, concerns arise as GenAI models trained on biased data may perpetuate societal biases or stereotypes (Feuerriegel et al., 2023; Gautam et al., 2024; Matthews et al., 2023). Chuan et al. (2023) outline how biases in training data can manifest in the outputs of GenAI systems. More specific examples include ChatGPT exhibiting prejudice against marginalized groups, and DALL-E generating images that overrepresent light-skinned people and perpetuate gender stereotypes (Chuan et al., 2023; 2024; Samuel, 2022). Despite these biases, such AI tools are being integrated into major stock-image websites without adequately warning users of potential biases (Samuel, 2022; Chuan et al., 2023).

Currently, there are efforts to address AI biases but they require further research. For instance, Stable Diffusion developers identify "probing and understanding the limitations and biases of generative models" as a critical research area (Rombach et al., 2022, as cited in Feuerriegel et al., 2023). Open AI, the company behind ChatGPT and Dall-E, also outlined the risks of biases when utilizing its Dall-E 2 model to generate images (Samuel, 2022; OpenAI, 2022). Published

on the company's "Dall-E 2 Preview" document on GitHub—A web-based platform for hosting and collaborating on software development projects—they stated that "The use of DALL·E 2 has the potential to harm individuals and groups by reinforcing stereotypes, erasing or denigrating them, providing them with disparately low quality performance, or by subjecting them to indignity" (OpenAI, 2022). They add that the standard output of DALL-E 2 often generates images that tend to disproportionately depict individuals with features associated with white ethnicity and predominantly Western ideas. This includes the over-representations "of people who are female-passing (such as for the prompt: 'a flight attendant')" while in some other cases, it over-represents "people who are male-passing (such as for the prompt: 'a builder')." Consequently, OpenAI made efforts to address these biases in Dall-E 2 outcomes by filtering its training data, but they found that this solution can "amplify biases" instead. More specifically, they found that "models trained on filtered data sometimes generated more images depicting men and fewer images depicting women compared to models trained on the original dataset." (OpenAI, 2022).

Furthermore, some researchers believe that AI models could develop the ability to recognize and fix their own moral mistakes when given explicit instructions to do so in natural language. Based on a study by Ganguli et al. (2023), this potential ability appears to stem from two key factors: the models' enhanced capability to understand and follow instructions, and their improved capacity to learn normative concepts of harm from training data. If this is implemented on AI models in the future, it could help reduce worries about biases in AI outputs, therefore promising an avenue for addressing fairness and bias concerns in AI (Ganguli et al., 2023; Feuerriegel et al., 2023).

Copyright violation is another limitation associated with AI usage, as AI systems can sometimes generate content that infringes upon copyright laws, either by directly copying existing works or creating derivative works (Feuerriegel et al., 2023). Lim (2023) discusses the implications of GenAI on copyright law, particularly focusing on the balance between recognizing AI as a tool versus an author. He highlights a United States District Court decision taken on August 18, 2023, that stated that artwork created solely by AI without human input does not qualify for protection under the Copyright Act (Lim, 2023; Brittain, 2023). This ruling emphasizes human creativity as essential for copyrightability while raising questions about the level of human input necessary for AI-generated works to qualify for legal protection (Lim, 2023). As such, Lim (2023) highlights the need for accurate documentation by content creators to establish authorship and prevent challenges to copyright validity.

In response to copyright concerns surrounding AI use, various national approaches have emerged. For example, the European Union plans to incorporate a transparency requirement mandating AI platform operators to disclose copyrighted content in training their AI models (Lim, 2023; Mukherjee et al., 2023). In addition, the United Kingdom has contemplated, but currently delayed, plans to create a new rule allowing people to use text and data for any reason

without allowing rightsholders to opt-out. If implemented, this rule would cover both copyright and database rights and could make it harder for original owners to control how their work is used (Lim, 2023). Lim (2023) suggests practical alternatives to copyright law for content owners, such as asserting rights to publicity and leveraging trademark law, while also emphasizing the importance of cross-functional collaboration and obtaining permissions or licenses from copyright owners. Ultimately, there is a call for a comprehensive framework that adapts to the evolving landscape of AI-generated content while safeguarding the rights of creators and copyright holders, emphasizing the importance of clarity, collaboration, and adaptability in preserving the integrity of copyright law (Lim, 2023).

Biases, misrepresentations, and ownership issues prompt the need for incorporating diverse perspectives in AI systems and embedding them within their algorithms. For instance, it is crucial to contemplate the insights from Indigenous knowledge systems that could guide the adoption of AI, alongside the considerations of its governmental and philosophical implications (Walsh et al., 2019). Maitra (2020) emphasizes that Indigenous viewpoints provide a unique perspective capable of acknowledging the non-human, which is valuable when considering AI as part of our system. As such, Maitra (2020) advocates for a relational shift in our approach to AI, suggesting that Indigenous perspectives could offer a solution to the loss of control and authenticity potentially resulting from AI advancements (Maitra, 2020).

Further discussing the ethical dimensions to AI integration, Stahl (2021) proposes several suggestions aimed at addressing ethical considerations in the deployment of AI across various fields. These suggestions include providing clear conceptual definitions for AI, ensuring that AI tools incorporate social and ethical considerations, establishing a framework for assessing AI's impact on human flourishing, encouraging stakeholder engagement and societal debate, and creating central nodes (such as regulators, agencies, and centers of excellence) to oversee AI ecosystems. These proposals contribute to the clarification of ethical debates surrounding AI and enhance our understanding of AI ethics. Stahl (2021) concludes that AI technology can be a double-edged sword, capable of both promoting and diminishing human flourishing. Accordingly, the responsibility lies within humans to critically examine how they use AI in professional industries to support their well-being and create a positive impact (Stahl, 2021).

Future Outlook

The future outlook on AI integration in graphic design is multifaceted, presenting both promising benefits and concerning impacts. Drawing from the literature, as AI technologies advance, expectations include increased automation, a potential shift in design education, and labour impacts. Still, a critical question persists: Will AI serve as a collaborative partner or emerge as a competitor to human designers?

Matthews, Shannon, and Roxburgh (2023) explore the intersection of automation, AI, and machine learning with the field of graphic design, focusing on their implications for the future of work in the industry. Based on their research, three key themes emerge: The automation of graphic design tasks, the changing role of human designers, and online communities and networked forms of design education. Firstly, the automation of graphic design is led by easily accessible design software that is allowing clients to bypass human designers and generate design solutions quickly and cheaply. The integration of AI and machine learning technologies is seen to accelerate this automation process. Secondly, the changing role of human designers is impacted by the rise of automation and AI-driven tools and their portrayal as more efficient, reliable, and cost-effective than humans. This theme highlights that "human designers will be required to pivot toward the roles of curation and facilitation of context sensitive design solutions." Thirdly, for the theme of online communities and networked forms of design education, internet access has transformed design practices and education, allowing designers to showcase their work, learn techniques, and share knowledge online. the rise of online platforms such as YouTube, Skillshare, and Lynda as sources of design education, challenging the traditional role of formal educational institutions (Matthews et al., 2023).

Matthews et al. (2023) also discuss the concern that software utilizing AI could make graphic designers obsolete by quickly and affordably producing visual content. However, they note arguments emphasizing the importance of distinctly human skills in design. Based on their literature review, some researchers propose strategies for design educators to adapt to these changes, while others suggest that traditional graphic design skills are becoming outdated due to automation. Predictions of disruption in various design roles by algorithmic learning are also mentioned, alongside recognition of emerging demand in fields like virtual reality and AI content creation. Overall, the authors suggest a shift in a designer's role "toward the immaterial disciplinarity of service, rather than product" (Matthews et al., 2023).

Further highlighting the impact on labour, research by Su, Togay, and Côté (2020) suggests that the development of AI is expected to create a surge in skilled jobs dedicated to supporting and enhancing AI-related technologies. Furthermore, the growing integration of AI within skilled fields is restructuring the nature of interactions between humans and machines. This evolution is shaped by a shift towards symbiotic relationships, where humans and AI systems collaborate synergistically to achieve outcomes. However, despite AI's advancement, there remain aspects of job roles that are currently beyond its capabilities such as jobs that demand "abstract" managerial skills like critical and systems thinking, or that are distinctively human-centric and not yet comprehensively replicated by AI (Su et al., 2020).

On labour dynamics and AI technological advancements, McKinsey & Company (2023) highlight that labour economists often note that automation technologies typically affect workers with lower skill levels the most, a phenomenon referred to as "skill bias". However, McKinsey &

Company (2023) have identified a contrasting trend with generative AI (GenAI): it is expected to have the greatest incremental impact by automating tasks performed by more educated workers. In fact, research conducted in 2017 suggests that AI was projected to reach human-level proficiency in technical tasks related to creativity by approximately 2030 to 2045. However, experts now believe that this milestone may be achieved earlier than anticipated, with 2023 being considered the new benchmark (McKinsey & Company, 2023). This reflects a larger confidence in AI capabilities and highlights their transformative future.

The evolving landscape of AI, as highlighted by McKinsey & Company, presents a contrasting trend to traditional labour dynamics, particularly regarding the impact on workers with varying skill levels. This perspective intersects with McCormack et al.'s (2020) exploration of AI's potential to engage in real-time interactions with humans while facilitating the production of creative content and fostering human creativity. McCormack et al (2020) advocate for specific design considerations essential for the creation of AI systems designed to collaborate with humans, including team cognition, feedback, trust, autonomous agency, and reflection. Despite acknowledging the early stages of AI, their research envisions a future where it serves as a partnering tool for creatives and offers new possibilities for collaboration that enhance human ingenuity. Ultimately, the authors believe that the most effective results occur when both creative practice and the design of AI systems impact each other. In this context, AI can bring new ideas to the table, becoming a kind of trendsetter and acting as a "cultural influencer." As portrayed in Figure 3 below, these new ideas then inspire even more innovation in both creative practices and AI technology, creating a cycle of mutual growth and development (McCormack et al., 2020).
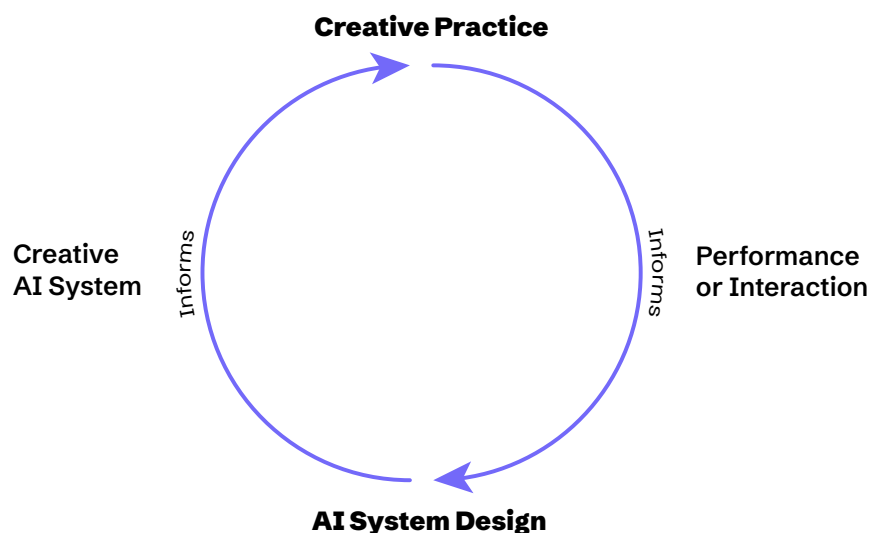
Figure 3 | *Creative Practice and AI System Design mutually informing each other.*

Recreated from "Design Considerations for Real-Time Collaboration with Creative Artificial Intelligence" by McCormack et al., 2020, in accordance with intellectual property rights.

Overall, the future of graphic design is expected to be largely shaped by the increasing automation of design tasks and the evolving role of human designers in a digital ecosystem. Designers will need to adapt and integrate AI tools into their workflow while preserving their unique creative vision. In this context, integrating user-centered approaches with automation and AI could be a promising direction for the future of visual communication design. The following chapter will explore the perception of this impact in more detail, examining it through the eyes of graphic design experts and practitioners and their real-world applications of AI in the field.
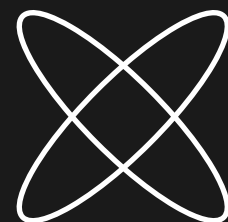
Study Findings

Chapter 4: Study Findings

In the past few years, diverse perspectives and numerous articles have explored the potential impact of AI on the world, particularly within the design fields, due to the rise of image and content generators. As valuable as these perspectives have been, little emphasis has been placed on the perspective of graphic design practitioners based on their own experiences and interactions with AI tools. To address this opportunity, this research involves nine interviews with graphic design experts and practitioners sharing their perspectives on the integration of AI in graphic design processes based on their knowledge, experiences, and contemporary design practices. This section explores each participant's perspective, bringing to light the multiple dimensions of AI integration in graphic design.

Daniel Asel

Daniel Asel, a Creative Director and educator based in Vancouver, discusses various aspects of AI integration in graphic design during his interview. To start, he highlights his familiarity with design thinking frameworks such as the *IDEO Human-Centered Design Model*, which he uses to support his team and foster human-centered design leadership; and the *Stanford 5-Stage Design Thinking Model*, which he uses to deliver empathy-driven results that are end-user focused. When approaching those frameworks, Asel highlights that he alternates between them not only based on the needs of clients, but also to address the capabilities of team members who are creating the work.

Regarding AI integration in graphic design, Asel highlights his firsthand experience with Adobe Sensei and other AI-powered tools like generative assets in Adobe Photoshop and Midjourney. He emphasizes the role of AI in the inspiration and ideation phases of design and how they have the potential to augment human creativity and provide efficiency in tasks like populating colour palettes and generating initial ideas. Asel also shares his experience using large-language models such as ChatGPT, for building case study content, SEO, and other marketing purposes, as well as for crafting sales and reporting tools. From his perspective, this is due to the ability to integrate different plugins into ChatGPT that can extend its functionality and allow for customization of its outputs to meet specific requirements.

Asel also saw AI's value in supporting neurodivergent designers. He states that certain AI-powered tools can "enhance the superpowers that come with being neurodivergent" and help neurodivergent designers "decode and comprehend" various aspects of work that they would typically struggle with otherwise. Despite highlighting those benefits, Asel is cautious about the potential drawbacks of relying too heavily on AI, as it tends to skip certain critical parts of the design thinking process, making the overall creative journey prompt dependent.

"For me, as somebody who is neurodivergent, for example, there are a lot of AI tools that, coupled with the challenges that I've faced, also enhance the superpowers that come with being neurodivergent. So, there's a lot of tools that can really work with people who are within the neurodiversity spectrum." – Daniel Asel

Asel stresses the importance of maintaining a human-centered process and authenticity in design. In his perspective, "our experiences and emotional drivers still have to be at the core of what we do" as designers. As such, Asel identifies a threat in losing that human empathy and creative exploration when relying on AI. He also discusses ethical considerations surrounding AI's impact on originality and consent and highlights the need for revenue-sharing models to compensate artists fairly for AI-generated work. From his perspective, copyright infringement could have a bigger negative impact, particularly if a creator's work is being used for "nefarious reasons" when they "would never sign off on something like that." Asel also highlights that, in today's design landscape, there is a large number of artists online who "speak out about how their style, their aesthetic, and everything that makes or gives their work its own fingerprint, is being replicated." In terms of concerns related to bias, he acknowledges that AI-powered writing assistants and models such as Grammarly, for example, may reflect language bias as they flag certain statements as incorrect without accounting for different dialects and language that each has their own unique set of rules.

In essence, Asel envisions AI as both a collaborative partner and a potential competitor to human designers while acknowledging its ability to enhance productivity while raising concerns about job displacement and preserving authenticity. Further highlighting job displacement, Asel discusses the historical shift from analog to digital processes due to the adoption of desktop publishing applications. He draws a comparison between the declining profession of sign painting, which has seen a decrease in artistry due to technological advancements, and the current transformative impact of AI integration on the design landscape.

"How do you become a strategic partner with your clients? Because that is the biggest thing. At the end of the day, if you are a strategic partner with your clients, AI's place in your workflow is there to augment what you can already do incredibly well. And that's the biggest thing: it needs to be that augmentation of your creativity and give you the space and the runway to pursue that creativity further." – Daniel Asel

In addition, Asel highlights the necessity of transparency in using AI tools to mitigate biases and ensure ethical practices. He also advocates for gathering and discussing Indigenous perspectives on AI integration to gain a wider understanding of its social implications, commenting that it is something that is yet to happen in the creative industry. Overall, Asel urges for a balanced approach that utilizes AI's potential while upholding human creativity and ethical standards.

Catherine Charbonneau

Catherine Charbonneau, a Publication Designer from Quebec, begins her design process by focusing on discovery while ensuring clarity on communication objectives and gathering necessary information. Following these steps, she enters the exploration phase, where she focuses on iterations, experimentation, and testing ideas out. Once satisfied, she consolidates options and ensures coherence across all elements. Throughout this journey, she maintains continuous communication with project stakeholders to ensure success.

During her interview, she reflects on the novelty of AI in graphic design, sharing her firsthand experience with AI-powered tools for tasks like image editing and text generation. Charbonneau primarily uses generative tools for refining images she has captured while also experimenting with generating visuals and text using platforms like Adobe and Midjourney. However, she sees that considerable time and effort are required to obtain satisfactory results from these tools. She also notes her experimentation with text-generation tools like ChatGPT and QuillBot for writing case studies or ensuring clarity in original text.

Charbonneau recounts her experience using Notion's text generator to assist her in writing an outreach e-mail where the AI tool repeatedly labels her as a "brand designer" despite her not mentioning the word "brand" in any context. In her perspective, the AI model made its own assumptions about her being a brand designer because those two words are typically used together. Charbonneau concludes that "It is just word arithmetic," which is bound to have errors that require human checks and oversight.

> *"I think it is important to not think that AI is going to replace us. It is going to replace the people that do not think before doing." – Catherine Charbonneau*

Emphasizing the need for thoughtful integration of AI into creative workflows, Charbonneau perceives it as a natural evolution in design with the potential to enhance efficiency and streamline certain aspects of design processes. However, she cautions against its uncritical adoption and highlights the importance of critical thinking. She also expresses concerns about ethical issues regarding the fair use of AI-generated content and the protection of intellectual property rights.

Charbonneau questions the ethicality of using stock images for AI-generated outcomes without proper consent from creators. She states that ethical washing can be a concern since stock images that were created long before the spread of AI image generators are being pushed to the forefront of AI-generated content creation without explicit consent or compensation. As such, Charbonneau acknowledges the need to outline clear regulations for ethical data usage and for a consent system that highlights how humans are feeding data into AI models.

Despite these challenges, Catherine sees AI as a valuable tool that can complement designers' skills and improve productivity, especially when it comes to automating repetitive tasks and enhancing creative output. With that being said, she acknowledges the potential of AI acting as a competitor to human designers as clients who seek autonomy and control in design start experimenting with it. Charbonneau highlights that many small businesses today are already using DIY design tools like Canva that offer templates without needing designer expertise. In her perspective, these clients tend to be satisfied with the often average or below-average results because they do not have extensive marketing needs or budgets. Overall, Catherine acknowledges the importance of designers providing value beyond templated solutions, especially for clients with more demanding marketing needs.

Andrew Reutsky

Andrew Reutsky, Art Director at Leo Burnett advertising agency in Toronto, discusses his familiarity with design frameworks, highlighting the value of the *Stanford 5-Stage Design Thinking Model* in guiding his work. Based on this framework, the five steps are: Empathize, Define, Ideate, Prototype, and Test. When starting a new project, Reutsky focuses on understanding the client's needs and objectives. After grasping the brief, he collaborates with the copywriter and creative director on his team to conceptualize the design before creating a mock-up. Overall, Reutsky emphasizes the importance of understanding client needs and problem-solving, and highlights the need to focus on functionality rather than only aesthetics.

Reutsky also shares his extensive use of AI tools in his advertising career and notes that it serves two main purposes: generating ideas and prototyping. In his perspective, this integration has significantly enhanced his productivity and resulted in financial gains within the agency as processes are expedited and becoming more efficient. He shares that the "ideation" phase in his design process is where he sees the most potential for utilizing and benefiting from AI tools. Similarly, he sees prototyping as "the second half of the deal," where AI can significantly impact its success by presenting ideas successfully and quickly to clients.

Reutsky specifically highlights the benefit of using AI text-generation tools such as ChatGPT in ideation phases due to being able to "nudge" it between two directions using specific prompts.

This ability to exchange ideas with a chatbot allows Reutsky to test different perspectives in an iterative process for a customized final output. Reutsky continues to state that "At the end of the day, it is like a discussion where I talk to AI and it talks back to me, and we think together," highlighting the collaborative benefit of AI Large Language Models in the design process.

Reutsky also acknowledges that paid AI tool subscriptions, especially in the context of ChatGPT Plus, can offer noticeably better results. He highlights the role that design agencies play in providing these subscriptions and premiums to their employees in order to facilitate their accessibility and encourage AI integration. He also notes that design agencies often have technology offices that monitor AI development closely to ensure caution in its usage.

> *"I think there is nothing wrong with progress. We went from analog to digital. We did that precisely because it was more convenient. We could do more work, and AI is moving us in the same direction, saying, 'you can do more work now, you can be more productive.'" – Andrew Reutsky*

Regarding the future of AI in graphic design, Reutsky believes that designers will inevitably use AI to conduct their jobs more efficiently, but raised concerns about job displacement, privacy, transparency, intellectual property rights, and transparency. Accordingly, he acknowledges AI as both a competitive as well as a collaborative force. He noted that "the companies that do not integrate AI or will not integrate AI into their design frameworks will be the ones that lose business," and that AI can have a significant impact on individuals such as storyboard artists who might be on the verge of losing their livelihood due to AI's capabilities. He also highlighted the lack of transparency regarding the content and data that are fed into AI systems.

> *"To me, it is like a paintbrush. It is just a better paint brush. You are still directing it. You are still painting the picture." – Andrew Reutsky*

Andrew argues that there is a pressing need to establish a standard of transparency in AI. He suggests that AI companies could introduce the ability to track the various images and assets used in the creation of AI-generated assets. This would allow for a better understanding and tracing of the sources used in the creation process. Consequently, Andrew suggests that if creators know the work behind the AI-generated content, they might be more comfortable with AI companies using their masterpieces and incorporating AI into their work.

Alex Boland

Alex Boland, Creative Director at Bruce Mau Design agency in Toronto, follows a flexible and adaptive approach to design. While he expresses familiarity with design frameworks such as *the Double Diamond* Framework and the *Stanford 5-Stage Design Thinking Model*, he does not strictly follow one specific approach. Instead, he employs various methods based on understanding the context and the people behind the work. He believes that exploring client personas is crucial and encourages asking questions such as "Who are our clients? What are they after? What does success look like for them? What makes them tick? What is their demeanor as people?" to envision success from their perspective and reach ideal solutions. Boland also stresses the significance of "research and immersion" and highlights the process of "Converge/Diverge" during the ideation phase, where ideas are first expanded upon (diverged) and then refined (converged). A key aspect of Boland's design process involves constant prototyping and testing with an ongoing exchange of ideas and feedback from clients. Ultimately, Boland views design as a collaborative exercise that requires strong communication and actively involving stakeholders.

Regarding AI technologies in graphic design, Boland is somewhat hesitant to use and integrate AI tools. He acknowledges that he is not an "early adopter" of technology by nature; however, he describes himself as someone who is constantly learning and exploring, which encourages him to experiment with AI and eventually recognize its value. Boland believes that the use of AI can be particularly beneficial in graphic design for new starts or exploring different paths in the design process. When it comes to its usage, he mentions using tools like ChatGPT for copywriting, and Midjourney for ideation, acknowledging their capability to aid the creative process.

In terms of copywriting, Boland notes that AI can be particularly beneficial in situations where a designer is not working with a copywriter and may require outsourcing one. In his perspective, AI can eliminate the need to engage an external party and go through multiple rounds of revisions, which can make the process more efficient. However, Boland emphasizes that AI does not replace the need for human writers. He believes that there is a time and place for AI in the copywriting process, but it should be used as a complementary tool rather than a substitute for human creativity and expertise.

> *"I think ChatGPT, to me, is more valuable for designers than Midjourney. I have been saying this for years: I think designers need to be communicators through and through. They need to know how to verbally communicate their ideas, and they need to know how to write their ideas. They need to be good writers, and a lot of them are not." – Alex Boland*

In contrast, Boland emphasizes the potential negative consequences for technical creative labour, including photographers, video editors, and copywriters. With AI being capable of

implementing creative technical tasks traditionally performed by humans, concerns about the future of creative labour arise. Similarly, he points out that until we can effectively track the assets used in creating AI-generated images, we are also going to face many challenges regarding ownership and maintaining distinction and credibility as designers. However, Boland states that tracing AI sources back to their creators can be hard to achieve. This is because AI can draw on thousands of references from the internet to generate one image, which can make it challenging to trace and credit such a large number of creators.

Boland also discusses concerns about the ownership and credibility of work created with the assistance of AI. He shares an example of a situation where an AI tool was used to generate technical designs, but the creator was legally held accountable when it was discovered that the work had errors and mistakes. In Boland's perspective, AI does not absolve the user of accountability. Accordingly, he states that "we are just going to have to be really specific and transparent about where these things come from," emphasizing the need for human input and transparency in its utilization.

In terms of the future, Boland predicts that there will be a period of augmentation where clients will be interested in AI-generated designs, similar to the initial hype around NFTs (Non-Fungible Tokens) a few years ago. He warns that clients can sometimes be easily influenced by trends and emphasizes the importance of designers maintaining a critical perspective and focusing on the real value of design. In addition, he believes that there may be a shift towards tangible and experimental human-made design that focuses more on processes to distinguish between human work and instantly AI-generated work.

> *"I think a lot of the things that we see as quite menial tasks or quite tedious in our day-to-day— hopefully, my hope ultimately is that AI helps with those things and allows us more time to actually be creative, think conceptually, and spend more time with the idea." – Alex Boland*

Furthermore, Boland highlights the issues around AI accessibility. He points out that, as AI becomes more popular in graphic design, many parts of the world may not have access to these technologies for a considerable amount of time. He questions what will happen to these individuals and communities if AI becomes a dominant force in the industry. He also acknowledges that technology itself is already a barrier for many people, and the integration of AI into the design industry could create additional barriers.

To mitigate ethical concerns, Boland believes that radical transparency and informed consent are key. However, he suggests that the handling of AI and data will likely be managed like large-scale data agreements, where users often agree to terms without fully understanding the implications. Accordingly, Boland encourages AI exploration and experimentation but calls for a cautious, critical, and ethical approach that preserves human creativity. Ultimately, he sees AI's role as both a collaborative tool and a potential competitor to human designers.

Stüssy Tschudin

Stüssy Tschudin, Creative Director and Co-founder of Forge Media & Design agency, follows a design process that focuses on early involvement, extensive research, and client collaboration. He begins with the "Discovery 360" phase, where he interviews key stakeholders as well as gathers insights from clients or end-users. Next, the research phase involves methods such as written and visual surveys. In the synthesis phase, he analyzes the gathered information to identify design elements. Prototyping, client feedback, and re-evaluation are crucial to lead to project success.

Reflecting on AI integration in graphic design, Tschudin acknowledges his limited direct experience but shares his use of ChatGPT for text generation, specifically for proposals and websites. However, Tschudin notes that the results do not fully meet his expectations or needs and always require human editing and input. Despite this, Tschudin uses AI tools as a starting point for further work, acknowledging that some designers may struggle with writing.

Regarding image generators, Tschudin notes that he has not found significant value in using their outputs in commercial work yet. However, he comments on the notable speed of AI tools and the impressive quality of their outcome. He also shares his experience using an AI website generator for a personal project, which resulted in a useable website in just a few minutes. To Tschudin, this highlights the promising potential of AI. He states that "It is not fantastic yet, but if it is doing that in a minute now at these early stages of AI, I could see that, in a couple of years, you can just guide it and tell it to do this or do that, and it will become really efficient."

Although Tschudin is generally impressed by AI capabilities, he is cautious about its potential impact on creative labour. He suggests that a skill shift is expected due to labour impact and changing market dynamics. In his perspective, the future may prioritize individuals who are capable of strategically prompting AI tools over those proficient in technical skills and manual tasks like sketching or navigating interfaces with a mouse. Accordingly, he highlights the need for designers to adapt and embrace AI, and the importance of human-centered input in guiding AI applications.

Tschudin describes AI as a tool that will enhance speed and efficiency in the creative world. In recognition of this impact, he highlights the potential for shorter workweeks in the future as a result. However, he also counterbalances this idea by highlighting the possibility of a shift in expectations, suggesting that there may be an anticipation for graphic designers to generate a higher volume of work overall. He compares this concept to the transformation in production timelines for projects during past eras of analog design processes to the era of desktop publishing applications that facilitated rapid work.

"I think the skill of the future is going to be filtering and editing. It is people who can efficiently take humongous amounts of data or work that they see in front of them and filter out what is relevant."
– Stüssy Tschudin

Tschudin acknowledges AI's growing role in tasks like image manipulation and writing, raising concerns about misinformation, copyright issues, and authenticity. He touches on the concept of deep fakes when it comes to visual AI outputs, noting that deep fakes have long existed before the rise of AI tools as we know them today. Programs like Adobe Photoshop have been often used with malicious intent for decades and humans have to be more aware of this potential use due to AI's capabilities. Tschudin advocates for education and regulation to address these concerns effectively. He also notes that humans need to continuously monitor and re-evaluate AI as it is constantly changing and evolving.

Furthermore, Tschudin believes that designers can still maintain authenticity and personal design aesthetic even as they use AI tools. He notes that designers are still in control of their work, but their process and tools are changing, and they need to adapt accordingly. However, Tschudin is concerned about people who use AI without critical thinking, filtering, and editing. He notes that these actions could lead to "watering down the quality of design and aesthetic in the world."

Tschudin also expresses concerns regarding using AI-generated images in commercial work. To him, it is important to source images from legal sources for which he has usage rights. However, because the sources of the data AI image generators draw from are unclear, uncertainty and reservations about commercial use arise. Accordingly, Tschudin believes there should be government regulations and rules governing the use of AI-generated images. He also emphasizes the need for guidelines to determine what can and cannot be legally used to ensure proper authorization and ownership.

Lastly, Tschudin expresses concerns about the potential risks of AI evolving to make independent decisions and becoming fully autonomous. From his perspective, this could signify a significant turning point in AI technology, but it remains unclear when or if AI will reach that stage. Overall, Tschudin sees AI as a competitive force in graphic design that has the power to transform workflows and challenge designers to adapt to new roles and skillsets.

Dianne Semark

Dianne Semark, a Creative Director and design educator based in Vancouver, shares that she mainly employs the *IDEO Human-Centered Design Model* in her work. This framework guides her creative approach to problem solving that focuses on clients' needs and wants. Semark highlights that graphic design is a dynamic and adaptable discipline that requires varying processes depending on client requirements and unique contexts. While there are common principles, the design process can be an individualized process that involves reflecting on the needs of each project, or a collaborative process in which the designer brings diverse perspectives, sometimes through interviews and third-party input, to create innovative design solutions. Semark's design process concludes with stress testing and rigorous testing which ensure the overall success and effectiveness of her work.

Semark recounts her first interaction and experimentation with AI using ChatGPT, where she utilized it to research topics and generate ideas. In her experience, ChatGPT outputs sometimes seem inaccurate but also often guide her to reflect on new ideas or to simply find inspiration. Although Semark values the interactive nature of ChatGPT, she cautions against its tendency to produce outputs lacking human "finesse" and "context." She comments on its identifiable outputs, which can impact a brand's authenticity. Semark states that it is up to users to decide whether AI-generated outputs by tools like ChatGPT generate optimal solutions. Designers should ask themselves questions like "Does it make sense? Is it the right context? And is it the right feel?" and filter the outputs to reach contextually fitting outcomes.

> *"The bottom of it all is the human mind. And I do not care how great the AI evolves, it is the human component that is going to always be the deal maker." – Dianne Semark*

Furthermore, Semark sheds light on the value of Midjourney AI image generator, stating that she perceives it as "an invaluable tool" when it comes to presenting a "company's product in action and to help develop brand personas." She highlights the remarkable "detail" and "depth" to which Midjourney's images can be customized to communicate ideas for diverse objectives. While stock images provided the same benefit prior to AI integration in graphic design, Semark considers AI to be significantly more efficient for this purpose. She also highlights the grey areas surrounding AI-generated content versus human creativity. She believes that in certain cases like generating a reference for a project, using AI generators as opposed to hiring a professional might be both time and cost efficient.

In contrast, Semark highlights that some learned biases are inevitably embedded in AI tools, which is something that designers do not have control over. She sheds light on the potential of misrepresentation, particularly in relation to Midjourney, due to these biases. She states that

"whoever is controlling the input of data is going to be creating learned bias" and that, as AI reflects learned biases acquired from humans and human-made systems, it is going to say, for example, that "a farmer is a white male in his 40s." She continues to question why such roles are automatically assumed to be represented by a white male, challenging the idea that it has to be limited to that specific demographic, and highlighting the risk of profiling that AI tools can reflect.

Semark also shares concerns about the accessibility of AI. She states that "People that don't have the means to pay for subscriptions are being locked out of the tool, or they don't get quite the same accessible accessibility to AI in its full form." In Semark's perspective, this constitutes a form of restriction and exclusion, and highlights disparities and limitations present in current AI tools.

In addiition, Semark points out that public opinion about AI integration is influenced by fear. She states that "People have an emotional reaction to it, and a lot of it is, quite frankly, fear mongering." She compares this reaction to the launch of desktop publishing applications, when people feared that digital tools would take over their jobs. Accordingly, she believes that AI "needs time to be integrated into the creative process with designers who know what they are after, who understand the ethical aspects of it, who understand the problem-solving processes that they need to go through," highlighting the role and responsibility of designers towards the integration of AI.

To mitigate concerns related to intellectual property and transparency, Semark anticipates the future implementations of guidelines and mechanisms that can identify and track images generated by AI. She suggests that this type of digital registration can protect content and intellectual property. Ultimately, Semark has a positive outlook on AI integration in graphic design and describes it as a tool with great potential to aid and inspire human creativity.

Lastly, Semark believes that people need to understand what is happening when it comes to AI, how to use it, and when to use it. She advocates for strong media literacy and education for younger generations to empower them to make ethical decisions regarding its use. Semark highlights the importance of critical thinking and encourages designers to engage in this conversation as well as voice their needs when it comes to this technology. From her perspective, this call for engagement and human responsibility is key to shaping a brighter future for AI integration in design.

Jay Wall

Jay Wall, Principal Creative Director at Briteweb, begins his design journey with a structured and iterative approach founded on research, collaboration, and creative exploration. He starts his projects by researching, listening, and asking questions to understand client needs. At the end of this research phase comes the "landscape analysis," where he synthesizes the gathered information and insights to identify opportunities within a given landscape. Iterative client feedback is a key factor in guiding and refining the work towards the desired outcome. Wall notes that this collaborative process ensures that the final design not only resonates aesthetically and creatively but also with the client's goals and vision.

Wall discusses his experience with AI integration in graphic design and states that he experiments with various AI technologies and engages in conversations about them. He acknowledges the different approaches and attitudes towards AI adoption among designers, with some embracing it and others sticking to traditional methods. He also highlights that AI will challenge and change the traditional paradigms of design, just as the cultural context of graphic design has always shifted in tandem with the tools and technologies used.

> *"If you look back at the context of communication over thousands of years and different tools—or even just the last few hundred years—and the sort of more contemporary graphic design as we know it since the Industrial Revolution, there have always been different tools. We are always changing, and the cultural context of graphic design has always been shifting, as have the tools and technologies that we use." – Jay Wall*

Although Wall acknowledges tools like Midjourney and AI functionalities within the Adobe suite, he personally has not fully embraced AI for producing visuals due to personal aesthetic preferences and ethical considerations. More specifically, Wall describes the visual aesthetic of Midjourney outputs as "illustrative fantastical" imagery that has strong fingerprints of AI. In Wall's perspective, that deters some designers, including himself, from using these tools, especially if they do not associate with that style or if they fear the impacts it can have on their creative voice. Additionally, Wall believes that if everyone is using the same tool which has limitations in terms of aesthetic outputs, then it could be overall restrictive on creative expression.

When it comes to ChatGPT, Wall uses the popular tool for research, to synthesize his thoughts, and to "connect the dots" between two different ideas. He notes that this ability is "super-charging" his natural capabilities of being a "dot connector" and his talent for seeing patterns between concepts and ideas. Wall also highlights ChatGPT's strength in quickly and immediately producing answers in fractional seconds, which increases his time efficiency when working on

projects. Although Wall notes the need to prompt and guide AI towards the desired direction, he comments on ChatGPT's capacity to introduce varied perspectives when contemplating specific topics or ideas. In addition, Wall emphasizes the need to develop prompt-writing skills when utilizing tools that depend on human guidance like ChatGPT.

"AI will change us, but we don't have to just be in the passenger seat." – Jay Wall

In contrast, Wall also cautions against the use of ChatGPT by stating that "we need to be careful to not think that ChatGPT is always going to have a complete answer, or an accurate answer." In his perspective, designers should approach ChatGPT's responses critically and recognize the potential for errors, misinformation, or incomplete information.

Wall also mentions that some learned biases are inevitably embedded in AI tools, which is something that designers do not have control over. Users can now very quickly create harmful imagery that can leave a lasting negative impact. He also emphasizes that if harmful representations of indigenous people are embedded in AI tools, they can lead to significant social impacts. Similar to misrepresentation, cultural appropriation can also occur in "patterns, shapes, and symbols" generated by AI tools. On the other hand, Wall believes that, as long as designers can be critical and are aware of AI biases and their personal ones, they can "challenge the [AI] tools to do better" and have a more positive social impact. He further emphasizes the need "to become intentional about what parts of the process we use what tool for."

"I think, for me as a creative director, I think less about artistic voice and more of what we are here to support. We are here to help our clients tell their story and amplify their voice. So, how is the tool going to help me reflect my client's unique voice in terms of graphic elements and composition? And how do all these elements come together with copywriting to tell a story?" – Jay Wall

Furthermore, Wall states that the integration of AI can have broader economic impact. This impact is especially significant for marginalized communities like Indigenous groups who may lose opportunities for storytelling and economic reconciliation. To mitigate some of these concerns, Wall highlights the need for social responsibility and designer accountability when utilizing AI tools. Overall, he feels that AI tools have the potential to become both collaborators and competitors to human designers. However, he believes that it is up to humans to become proactive and critical in shaping them and intentionally guiding them towards collaboration, emphasizing that decisions about technology should not be left solely to the leaders of tech companies.

Rahul Bhogal

Rahul Bhogal, Principal Creative Director at Nothing Design Studio, discusses his journey from illustration to graphic design, highlighting his evolution and passion for the field over the past decade. Regarding his design process, he highlights incorporating empathy and research into his design approach. He also stresses the dynamic nature of the design process, noting the importance of flexibility and adaptation to each project's needs.

Regarding AI integration in graphic design, Bhogal acknowledges that he is not an expert on the topic. However, driven by curiosity, he frequently experiments with AI in this field. He notes that the rising popularity of AI in graphic design is largely trend-driven due to designers who utilize AI as a creative tool inspiring others to produce similar content. Bhogal discusses his experiences with AI tools such as Midjourney and Dall-E, which he primarily uses for inspiration, style development, or as sketching tools. Concerning Dall-E, Bhogal points out that using it demands time and involves a learning curve that might discourage some designers from its utilization. While Bhogal recognizes Midjourney's capability as a sketching tool and for generating initial ideas, he raises concerns about overstimulation and distraction. He emphasizes that using Midjourney can be overwhelming due to the complexity of the dashboard and the user interface (UI), and due to seeing lots of other people's work as one explores the tool.

Bhogal further elaborates on his experience with using Midjourney for image generation and highlights the risk of inaccuracy. He recounts using the generative tool to create imagery for a project related to World War I, where the uniform along with other visual details were not accurate to the historical event. Accordingly, he cautions against using AI outputs without due diligence and proper reference checks in order to avoid the unintentional spread of misinformation.

> *"I think that's primarily where the negative side would come in: if it is to reference people, time, history; and if you put something out there that isn't reference checked properly, it could potentially hurt a lot of people. It can have a negative impact."– Rahul Bhogal*

Regarding ethical considerations, Bhogal highlights concerns about labour displacement, copyright, privacy, and misinformation. In terms of labour concerns, he acknowledges the fears of creatives, particularly young designers, of AI taking over their jobs. However, he views AI-powered tools as additional tools to be used appropriately within the design workflow and states that designers "still need to do the work to get this output." On the other hand, intellectual property is a huge concern for Bhogal, where AI-generated outputs might not be protected by copyright in the same way that traditional designs are. He further expresses concerns about the potential misuse of AI technology including deep fakes and AI tracking. He notes that the

creators of such tools should be more responsible and implement better screening mechanisms to prevent misuse.

Bhogal emphasizes the importance of responsible usage and proper attribution, particularly when referencing or recreating existing work. He touches on the notion of originality and authenticity, suggesting that nothing today is entirely original as everything is a remix of existing ideas. As such, he compares traditional creative processes, such as gathering inspiration from books and sources, with the use of AI tools, and highlights that both involve ethically referencing and remixing existing content. However, he acknowledges the challenge of maintaining distinct voices when using AI tools due to the similarity and receptiveness of AI outputs.

"I think there's still a skill required to having a good outcome from using AI." – Rahul Bhogal

Furthermore, Bhogal reflects on the potential impact of AI on the future of graphic design and shares that he envisions it as a collaborative partner. He highlights the importance of intentionality in utilizing AI tools, emphasizing that creativity remains a human-driven process even if it is assisted by AI technologies. In addition, he expresses that, as people increasingly use AI-generated designs and content, there may be a growing appreciation for handcrafted and human-made designs. He suggests that over time, people may come to find AI-generated designs to be lacking uniqueness. Overall, Bhogal emphasizes the need for designers to develop their people skills, build their communication skills, and advocate for fair compensation during this transformative era.

Tomomi Lo

Tomomi Lo, Art Director & Interactive Specialist at McOuat Partnership, starts her interview by sharing insights into her design background. She acknowledges familiarity with the *IDEO Human-Centered Design Model* but emphasizes the practicality of the *Double Diamond Design Framework* in her fast-paced work environment. She notes overall limited use of user-centered design due to time constraints but highlights occasional client demand for such approaches.

When discussing AI in graphic design, Lo describes its integration into her workflow mainly for image editing tasks such as removing objects or extending backgrounds. She expresses interest in further utilizing AI for image creation. Tomomi mentions using Adobe's AI tools and experimenting with Bing (now known as Copilot) Image Generator and Canva's AI tools, specifically for generating visuals, headlines, and copy. Although some of the results are rough due to the novelty of these tools that depend on iterative human input, Lo still finds value in using them to present ideas.

Overall, Lo's perspective on AI's impact in graphic design is largely optimistic, viewing AI as a tool that enhances efficiency rather than a threat to creativity. She emphasizes the importance of human input in guiding AI and maintaining originality. In addition, she does not see ethical problems regarding using AI tools in design and views them as no different from other tools in design. However, she still acknowledges considerations related to transparency and fair compensation. Overall, Lo states that "image sourcing takes a huge part" of her time, and that she aims to use image generators to create images she would otherwise spend hours to source so she could "focus more on the strategy and the creative."

Lo also sheds light on the changing dynamics between designers and clients in the AI era. She states that clients may use and experiment with AI due to seeking autonomy and control. Consequently, AI may be perceived as a threat by designers who may lose these clients as a result. However, Lo suggests that designers can benefit from AI by leveraging it to expand their capabilities rather than feeling threatened by it.

> *"All these tools, they are great if you want to spend the time to guide them. But, I still feel that people employ designers because they do not have that expertise. And if they want to customize it themselves, they still need the knowledge to utilize it. You need to guide AI or the tool, and usually, people do not have the time or the expertise." – Tomomi Lo*

Ultimately, Lo emphasizes the positive impact of labor on designers in terms of the expansion of their capabilities and skills. She suggests that designers do not need to be "Photoshop masters" to create visuals that are in demand. Instead, she envisions AI as an inspiration and assistance in handling tedious tasks. Overall, she believes that by designers asking themselves "what can we now provide that AI cannot?", they can pave the way for a fruitful partnership with AI.
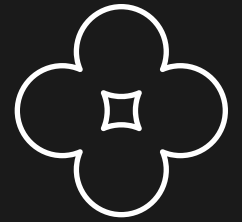
Discussion

Chapter 5: Discussion

Participants' Design Approaches and Processes

To gain insights into the integration of AI in graphic design from participants, a foundational approach was adopted through the distribution of a primer on graphic design frameworks and processes prior to conducting the interviews. This initial step served to establish a common understanding among participants and to foster a shared language during interview discussions.

The primer (see Appendix B) highlighted the current state of design thinking frameworks typically applied to graphic design as well as graphic design processes according to a comprehensive literature review. In exploring these core principles of graphic design in the primer, participants ultimately reflected on their individual workflows which facilitated the identification of potential pain points and areas where AI could impact existing processes.

When discussing graphic design practices, it is important to acknowledge that this field encompasses a wide range of mediums including print, digital, and interactive media. Participants come from a diverse range of experiences and backgrounds that uniquely guide the way they conduct their work. Graphic design, by nature, is a creative and strategic process that involves visual communication and problem-solving. This can be achieved in multiple different methods and processes in a wide range of styles, mediums, applications, and contexts (Ocepek, 2003). However, graphic design is overall viewed by participants as a human-centric discipline that prioritizes the experiences of the people who will view or interact with the final design. Emphasis is placed on choosing methods or combinations of methods depending on the context of each project.

The semi-structured interviews started with an introductory question, followed by two inquiries concerning graphic design frameworks and processes. The first question addressed the participants' familiarity with the design thinking frameworks outlined in the primer. The second question identified the specific frameworks and graphic design processes they employ in their work (See Appendix C for full list of questions). Accordingly, these two questions situated at the start of the interviews paved the way for the discussion on integrating and implementing AI into participants' existing approaches and workflows.

Based on the data, participants represent a diverse spectrum of approaches and perspectives

towards graphic design. Some employ a specific design approach or framework, others adapt it to suit their needs, while some employ a few different methodologies depending on the context and requirements of each project. From the emphasis on human-centered design frameworks to methodical processes of discovery and consolidation, each approach reflects a distinct perspective. The common themes of empathy-driven research and collaborative exploration highlight the significance of understanding end-users' needs to participants. Ultimately, this diversity showcases the dynamic and flexible nature of graphic design. It emphasizes the necessity of versatility, empathy, and adaptability in delivering impactful solutions. By each designer outlining their work process and methods used, we gain insight into their intentions and motivations in the field of design.

These findings demonstrate the importance of human-centric approaches and client explorations in the graphic design process and shed the light on the potential of AI integration in exploration, ideation, and implementation phases. Overall, the conversation about graphic design processes and frameworks paved the way for participants to discuss AI in the context of graphic design in more detail and allowed them to share their individual experiences with it.

Key Themes

As participants discuss AI integration dynamics in relation to their design practices and individual experiences, they reveal a set of interconnected themes that highlight the potential value of AI in graphic design and the anticipated broader-scale impact. These themes are categorized into two main areas: **Adoption and Integration** of AI in Graphic Design, and the **Challenges and Ethical Concerns** related to its use.

Based on these two categories, the most prominent themes identified are:
- **Adoption and Integration**
  - Generative AI
  - Inspirational and Educational Use
  - Ideation
  - Prototyping

- **Challenges and Ethical Concerns**
  - Labour Impact
  - Accessibility
  - Intellectual Property and Consent
  - Authenticity and Transparency
  - Misinformation and Misrepresentation
  - Privacy Concerns
  - Learned Bias

The following section examines these two main categories in the context of the collected data and in relation to the specific themes highlighted.

Adoption and Integration of AI

The adoption of AI in graphic design has revolutionized the industry by providing designers with innovative tools to enhance their workflows. AI algorithms can automate repetitive tasks, allowing designers to save time and concentrate on more complex and creative aspects of their work. As a growing technology, designers are implementing AI into their work across a diverse spectrum, with some being more hesitant and others acting as early adopters. Based on the interviews, participants highlight their strategies for incorporating AI into existing graphic design systems and workflows with the aim to achieve three main goals: enhancing productivity, increasing efficiency, and improving design outcomes.

As the integration of AI in graphic design is increasing, design practitioners such as Daniel Asel and Stüssy Tschudin acknowledge its potential to augment creativity and enhance speed and efficiency. Catherine Charbonneau leverages AI tools primarily for refining images and generating text, while Andrew Reutsky sees its value in idea generation and prototyping emphasizing its potential to accelerate design processes. However, While Alex Boland experiments with AI tools for copywriting, he advocates for a balanced approach between human creativity and the use of technology in order to maintain authenticity. Similarly, Dianne Semark acknowledges AI's utility for tasks like text and image generation but notes its limitations in achieving human "finesse" and "context." Furthermore, designers such as Jay Wall and Rahul Bhogal view AI as a valuable tool for research, idea synthesis, and style development. Nevertheless, they emphasize the importance of approaching AI responses critically to mitigate the risks of errors and misinformation. Expanding on time efficiency benefits of AI tools, Tomomi Lo expresses interest in further utilizing AI for image creation and editing in the future, highlighting that it could save a significant amount of time and effort during design processes.

As these perspectives converge, the integration of AI continues to reshape the landscape of graphic design, offering new possibilities while prompting a thoughtful consideration of its broader impact. In addition, participants highlight the importance of ethical practices, transparency, and the preservation of artistic authenticity in the design process when utilizing AI tools. Overall, there is a notable cautious optimism about AI's potential to enhance efficiency and expand capabilities in graphic design, but an emphasis on the irreplaceable value of human creativity, intuition, and critical thinking in guiding AI and maintaining the integrity of the design process. This section dives deeper into the perspectives and insights of participants, exploring how they adopt and integrate AI into their processes.

Generative AI

Large Language Models (LLMs)

Unexpectedly, the most frequently utilized AI tool by participants in their design practice is not an image generator, a logo builder, or even a website creator. Instead, it is the AI chatbot: ChatGPT, a large language model (LLM) developed by OpenAI that allows users to engage in human-like conversations (Figure 4). Although this tool has been used in multiple diverse ways by participants, it is clear that it has been especially beneficial during ideation phases of design, with six of the nine designers providing specific examples as follows.

Daniel Asel highlights the versatility of ChatGPT in terms of the ability to integrate plugins for diverse needs. He mentions that there are specific plugins for ChatGPT that can present data and even skim through external links, PDFs, and reports on a website to compile information. He finds those plugins useful, especially for those in design leadership who need to present a lot of data, graphs, and other information in board meetings and similar settings.

Catherine Charbonneau has experimented with text-generation tools to write case studies and improve text clarity. When creating Zines, small-circulation self-published work of original or appropriated texts and images, she specifically uses tools like ChatGPT and Quillbot "to help better re-phrase sentences." Charbonneau also uses Notion AI writing assistant to help write outreach e-mails, but highlights the need to edit those outputs due to writing assistants often reflecting errors or making assumptions.
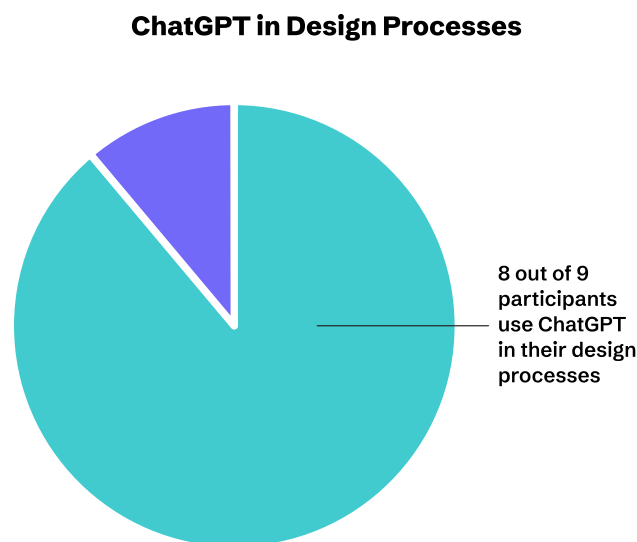
ChatGPT in Design Processes

8 out of 9 participants use ChatGPT in their design processes

Figure 4 | *Pie Chart: The Use of ChatGPT in Design Processes.*

Stüssy Tschudin notes that he finds value in using ChatGPT for getting started on writing content for websites or for proposals. However, he is not usually satisfied with the results, and needs to heavily tweak and edit the outputs to reach the desired quality. Despite his reservations about the quality of the content, Tschudin acknowledges that the LLM helps him speed up the writing process, emphasizing that this is particularly beneficial since designers are not usually professional writers.

Echoing Tschudin's remarks about designers' writing skills, Alex Boland point out that many designers may not possess strong writing skills, as they often rely on the "a picture is worth a thousand words" approach to communication. As Boland highlights, designers should not only be skilled in visual communication through images, but also proficient in verbal and written communication. As such, tools like ChatGPT can be extremely valuable for designers, enabling them to better express and convey their ideas.

Furthermore, Boland recounts a situation where he used ChatGPT to assist with a design project after he and another designer received feedback that the headlines they created were not effective. In this case, he describes ChatGPT as "another set of eyes" that can suggest words or phrases that they might not have thought of during that time. This is particularly valuable for Boland as he did not have a copywriter to collaborate with on his team at that time. However, he cautions against using ChatGPT outputs "exactly verbatim," emphasizing the importance of maintaining authenticity and originality in the design process.

Lastly, Jay Wall utilizes ChatGPT for research purposes, to synthesize his thoughts, and to draw links between disparate ideas. He finds that the tool enhances his innate ability to link concepts and identify patterns, as well as offer diverse perspectives on particular topics. He also praises the LLM's ability to quickly produce answers, which boosts his efficiency on projects. Furthermore, Wall stresses the importance of honing prompt-writing skills when using AI tools that rely on human input and guidance like ChatGPT.

Although most participants acknowledge the potential of ChatGPT in the design process as well as its collaborative nature, some are still careful of its integration. More specifically, Daniel Asel warns of language biases that may be embedded in writing assistants like ChatGPT. In addition, Dianne Semark and Jay Wall have observed occasional inaccuracies and a lack of context in ChatGPT's outputs. Both these perspectives highlight the risk of misinformation and the importance of human perspectives. In fact, users of ChatGPT can find the cautionary statement "ChatGPT can make mistakes. Consider checking important information." as a small print right below the chatbot's text input box (ChatGPT-3.5, April 29, 2024). This indicates that designers should not solely rely on AI outcomes and that human editing and input are crucial in the process.

Although ChatGPT seems to be the most used LLM amongst participants, some highlight their use and experimentation with other LLMs and AI-powered writing assistants such as Bing (now known as Copilot), Quillbot, and Notion. Overall, based on research findings, there is no doubt that LLMS and chat bots such as ChatGPT are powerful additions to graphic design workflows. Participants primarily highlight their use for content creation, idea generation and brainstorming, copywriting assistance, text editing, and information gathering. However, they emphasize the need to critically assess their responses and be aware of the potential for errors or misinformation. The importance of developing prompt-writing skills for using LLMs is also highly anticipated by participants. Mastering this skill not only addresses current skill shifts in the industry but also maximizes the effectiveness of interactions with AI systems that rely on human input.

Image Generation

AI-powered Image generators have been utilized by participants to get inspiration, showcase ideas and concepts, create moodboards, and to populate colour palettes. More significantly, Midjourney, an AI tool designed to create images from text inputs, was the most frequently used tool, utilized by six out of nine participants (Figure 5). This was notable despite its unfriendly user experience (UX), as pointed out by Rahul Bhogal. Other AI image generators used by participants include Dall-E, Adobe Firefly, and Photoshop Generative Assets.

The use of AI image generators greatly varies among designers. Stüssy Tschudin and Andrew Reutsky have acknowledged experimenting with them for personal projects, but expressed reservations about the commercial use of images generated by AI tools. This is due to the untraceable and unclear sources from which these image generators draw data from. A part of that concern also stems from legal liability and the crucial need for transparency and appropriate licences for third-party assets in published and commercial work.

In contrast, there are concerns about the use of image generators due to common biases and misrepresentations that may be present in their outcomes. For example, Jay Wall raises concerns about the harmful representation of indigenous people in branding, packaging, and sports mascots, noting that such problematic imagery can have significant negative social impact. He expresses worry that these biases can be integrated into AI systems, allowing more people to easily produce harmful images. Wall stresses the importance of being intentional and knowledgeable when selecting images for designs. Additionally, he highlights the need to be cautious about cultural appropriation, including the misuse of patterns, shapes, and symbols, when using AI.

Due to being trained on datasets containing biased or stereotypical images, AI can inadvertently learn and reproduce these biases. For instance, Dianne Semark recounts her experience

using Midjourney to create brand personas. She cites an example where a farmer's persona is depicted as a while male in his 40s. She questions the rationale behind such a specific visual representation, and believes it is a result of the AI's learned biases. However, while Semark acknowledges learned biases in AI image generators, she views Midjourney as an invaluable tool in design for two reasons. Firstly, it facilitates the depiction of a client's product in action using tailored visuals. Secondly, it is pivotal in crafting detailed and specific brand personas. Instead of resorting to generic stock photos, the tool allows for customized outputs using prompts. This approach enables designs to move beyond generic representations, and strategically align with the client's goals. As such, there is a call to integrate AI image generators into design processes, but with exercised caution and human guidance due to potential biases in their outputs.

Furthermore, Rahul Bhogal cautions about the risk of inaccuracy when utilizing AI image generators. He shares a firsthand experience where AI-generated images for a project on World War I reflected historically incorrect details. Bhogal's experience highlights a significant concern and validates the hesitancy around using AI-generated images in commercial work. In such instances, inaccuracy and misinformation can also lead to increased legal concerns for designers as well as clients, risking a loss of trust and credibility.

When it comes to aesthetics, many participants highlight that they believe AI image generators often produce generic and repetitive visuals that have a certain artificial quality. This can result in a lack of uniqueness and distinctiveness in visual content. More specifically, Jay Wall describes the visual aesthetic of Midjourney outputs as "illustrative fantastical" imagery, which does not necessarily align with a designer's personal style. This observation emphasizes the potential of losing one's voice and authenticity when relying on AI generators.

In contrast, the use of text-to-image generators has a notable impact on time efficiency due to the ability to rapidly produce high-quality images using simple prompts. For example, Andrew Reutsky praises the efficiency of AI tools like Midjourney and Dall-E 3 in design processes, noting that they can produce a sketch in just a few minutes. He compares them to traditional methods of sketching, which could take at least an hour to achieve similar results. Similarly, Tomomi Lo sees the potential of image generators in saving time, noting that image sourcing currently consumes a significant portion of her work hours. Accordingly, she aims to utilize these tools to create images more in the future.

Based on these insights, AI image generators like Midjourney offer significant advantages in terms of in streamlining graphic design processes and enhancing productivity in various design phases. This includes finding inspiration, increasing efficiency, presenting ideas, and creative exploration for many designers. Yet, several concerns still arise due to their integration. These concerns include misinformation, biases, and potential loss of authenticity. Overall, the use of image generators proves as a major part of AI-integration in graphic design and highlights

the need for a balanced approach based on human responsibility, transparency, and ethical considerations.

Midjourney in Design Processes
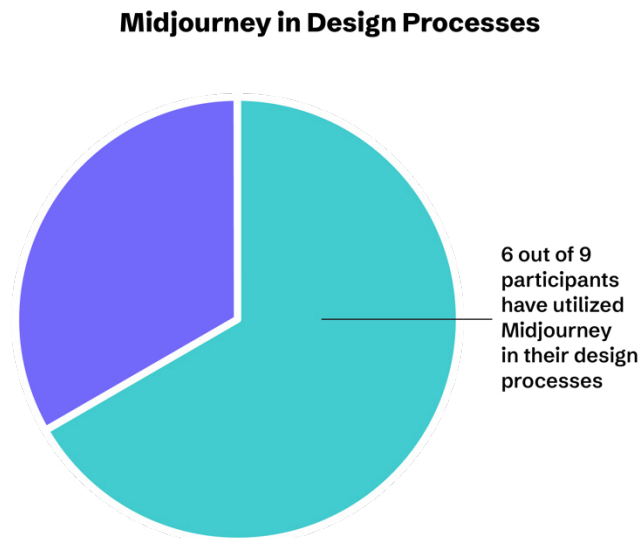
Figure 5 | Pie Chart: The Use of Midjourney in Design Processes.

Inspirational and Educational Use

Research findings highlight the potential of using AI for inspiring designers and enhancing educational experiences and outcomes in graphic design. For instance, designers can use AI to create images and references for practicing design, sketching, and illustrating. As highlighted by Rahul Bhogal, AI can generate examples of various art styles for educational purposes. Similar to traditional methods of referencing books and articles, these AI-generated images can aid artists in practicing their skills by analyzing and referencing them.

In addition, as highlighted by Andrew Reutsky, AI-powered chatbots can offer real-time feedback and support to designers. They are able to provide creative suggestions and assist in the resolution of design challenges through an exchange of prompts. The ability to have these interactive conversations with AI highlights the potential to gain a variety of perspectives and to enrich a designer's work process. This is especially relevant for freelancers or self-employed designers who do not necessarily have the ability or resources to exchange ideas with other designers or team members.

Moreover, as highlighted by Dianne Semark, AI can serve as a source of inspiration for designers, similar to browsing social media, design blogs, magazines, or design publications for inspiration today. Similarly, Daniel Asel states that he uses AI tools primarily in the inspiration phase of design. For example, he uses tools like Midjourney to populate colour palettes and

get inspired to create rough ideas. This highlights the symbiotic relationship between human creativity and AI assistance, demonstrating how these tools can aid in inspirational phases and enrich the creative journey.

Furthermore, the role of AI in design extends beyond simple inspiration. Although it is visibly criticized for its lack of human empathy, Liao et al. (2020) view it as an "empathy trigger" for users. In this role, AI can potentially support the designer's descriptive thinking, often applied for building scenarios and design ideation (Liao et al., 2020; Figoli et al, 2022). The authors state that AI systems can be used "to provide inspiration, widen design scope or trigger design actions by suggesting texts or images" (Liao et al., 2020). As such, content generated by AI can serve as "external stimuli" to inspire and trigger a designer's creativity in different contexts (Figoli et al., 2022). This perspective supports participant's utilization for AI tools for inspirational and educational uses. Overall, the integration of AI in graphic design can enhance the creation of personalized, inspirational, and educational resources, leading to enhanced learning experiences and design outcomes.

Ideation

Using AI for ideation offers a transformative approach to the creative process by generating innovative and personalized visuals and design concepts. AI-powered tools can analyze vast amounts of design data, trends, and user preferences to motivate and inform designers. This facilitates the exploration of new styles, techniques, and approaches that may not have been considered otherwise.

Participants demonstrate a frequent use of AI in ideation phases of their design processes. Using large language model chat bots is especially relevant due to their interactive capabilities. For example, designers can provide a prompt or a starting point, and the AI model can generate a variety of ideas or concepts based on that prompt. They can also use the tools for scenario-based exploration, where they explore how a design might adapt to different scenarios or needs.

Andrew Reutsky views ideation as one of the main uses of AI in graphic design. More specifically, he turns to ChatGPT to guide his thought process and explore potential solutions based on a design brief. He perceives his interaction with ChatGPT as a collaborative discussion, where the AI assists him in problem-solving and idea generation. Once he has developed a promising concept using the AI tool, he revisits and refines it independently before sharing it with his team for further input. As demonstrated by Reutsky's experience, AI tools can help graphic designers formulate and refine ideas related to design challenges, facilitating creative brainstorming and innovative solutions. Additionally, they can act as collaborative tools where designers engage in a dialogue with AI to address design challenges, resulting in more effective design outcomes.

Further highlighting the interactive advantages of AI, Dianne Semark regards AI as an efficient stress tester in ideation phases. She states that whether a designer is utilizing AI for writing or sketching, they can pose questions to the tool such as "What am I not thinking of? What might I have missed? What else could it be?," emphasizing that AI serves as "a fantastic 'what if?' tool." Moreover, Daniel Asel and Rahul Bhogal acknowledge the use of AI tools such as Midjourney for generating initial concepts and sketching preliminary ideas, emphasizing the tool's utility in the early stages of design exploration.

While AI tools can help generate initial concepts and offer fresh perspectives, the essence of innovative design still relies heavily on human strategic thinking and the ability to conceptualize and contextualize unique and meaningful ideas. As such, a balanced approach of leveraging AI capabilities to enhance creative processes without replacing human intuition is crucial. Supporting that notion, Tomomi Lo and her team incorporate AI into their daily workflows, primarily using it to generate ideas for writing and to brainstorm social media content. In her perspective, AI serves to inspire and streamline tasks, allowing the team to focus on elevating their ideas further without replacing their creative input. Similarly, Rahul Bhogal highlights that he encourages his team to explore new AI tools when they encounter creative blocks in ideation phases. This sheds the light on AI's potential in overcoming creative stagnation, therefore enhancing efficiency and productivity.

Overall, AI-powered tools such as large language model models like ChatGPT and specialized image generators like Midjourney, are commonly utilized by designers to facilitate creative brainstorming, problem-solving, and the exploration of design concepts. While AI serves as a valuable ideation tool, the essence of innovative design continues to rely on human input. As highlighted by Jay Wall, strategic thinking and craftsmanship in design are two key components to ensure that that AI complements rather than replaces the design team. Therefore, a balanced approach that leverages AI capabilities to augment human intuition is crucial for achieving impactful design outcomes.

Prototyping

Although AI has gained popularity in recent years with the rise of LLMs like ChatGPT, LLaMA, and Gemini (formerly known as Bard), and the widespread use of image generators such as Midjourney, Dall-E, and Adobe Firefly; several AI-powered tools and applications have emerged to support diverse purposes in work processes. These tools are designed to enhance and streamline fundamental aspects of graphic design workflows. More particularly, prototyping has seen a remarkable impact in terms of enhanced quality and functionality, which contributes to more user-centered and effective design solutions.

Prototyping is an experimental process where design teams translate ideas into tangible

forms, transitioning from paper sketches to digital models (Interaction Design Foundation, 2019). In the realm of graphic design, it involves creating preliminary models or drafts to test a design's concept, functionality, and aesthetics before finalizing it. According to participants, the prototyping phase in design stands to benefit significantly from AI integration. For instance, Andrew Reutsky regards prototyping as a primary function of AI tools. He emphasizes the importance of mocking up and testing designs for the success of his advertising projects. Reutsky finds it "incredibly efficient" to use AI tools like Midjourney or Dall-E 3 to showcase ideas within minutes instead of spending hours sketching them. His insights highlight the time-saving benefits of AI tools in the design process.

Alex Boland and Stüssy Tschudin view design as a collaborative exercise that necessitates continuous prototyping to visualize and communicate ideas to stakeholders. If AI tools can enhance the efficiency of the prototyping phase, designers like Boland and Tschudin may see value in integrating these tools into their workflows. Furthermore, Dianne Semark highlights the crucial importance of stress testing in the design process. In this regard, AI has the potential to serve as a valuable tool for stress testing, ensuring designs anticipate variables and yield optimal solutions. Moreover, Tomomi Lo expresses a desire to allocate more time for prototyping and testing during stages of her advertising work. However, she notes the challenge of doing so due to time constraints in the fast-paced commercial environment. This highlights the potential of AI tools to address this issue by facilitating quick and efficient prototyping.

While participants generally agree that AI can enhance time efficiency in prototyping processes, there is a concern raised about whether accelerating this process is beneficial for design outcomes and quality. Prototyping inherently involves multiple iterations, extensive sketching, and continuous editing. This prolonged process enables design teams to identify crucial errors or strengths in their design and enhances the overall success of the project. As such, there is a risk of losing these benefits by over-relying on fast prototyping processes facilitated by AI tools.

In conclusion, integrating AI into prototyping phases in graphic design not only can enhance efficiency and time management but also offer valuable tools for stress testing and collaborative visualization, addressing the evolving needs of designers in fast-paced environments. With that being said, as emphasized by participants, it is crucial to use these AI tools in a balanced manner that maintains human perspective and input.

Challenges and Ethical Considerations

Shedding light on the value and impact of AI in graphic design, it is crucial to acknowledge the concerns and ethical considerations that come with its integration. In fact, eight out of nine participants have ethical concerns regarding the use of AI in graphic design. Based on the interview data collected, these concerns are divided into seven main categories:

- Labour Impact
- Accessibility
- Intellectual Property and Consent
- Authenticity and Transparency
- Misinformation and Misrepresentation
- Privacy Concerns
- Learned Bias

Labour Impact

The integration of AI into graphic design workflows has initiated discussions about its labour impact, highlighting skill shifts, job displacement, and competition within the field (Figure 6). Daniel Asel acknowledges concerns about job displacement and compares it to the historical shift from analog to digital processes that impacted professions like sign painters. Similarly, Catherine Charbonneau notes the rise of DIY design tools like Canva among small businesses. She acknowledges that this trend could potentially reduce the demand for professional graphic designers, especially for clients with simpler marketing needs and who seek more control and autonomy.

Perception of AI Among Participants
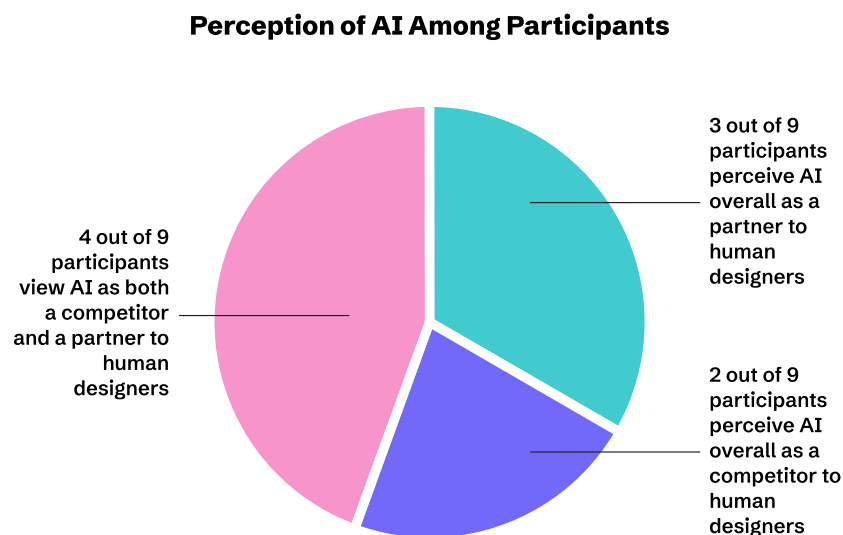
Figure 6 | *Pie Chart: Perception of AI Among Participants.*

Alex Boland also discusses concerns about creative labour and acknowledges the potential for AI to perform technical tasks traditionally done by photographers, video editors, and copywriters. Such implications could reduce the demand for human creative jobs and result in a shift in roles and responsibilities. Furthermore, Andrew Reutsky believes that companies that do not integrate AI may lose relevancy and business in the field. His statement shed the light on the financial gains resulting from using AI in design workflows and the impact on labour as a result.

On the same note, Stüssy Tschudin suggests that a skill shift is expected due to labour impact and changing market dynamics (Figure 7). He believes that the future may prioritize individuals who can strategically prompt AI tools over those proficient in technical skills. Additionally, he expresses concerns about the potential risks of AI evolving to make independent decisions and becoming autonomous, which could further impact labour in the industry. He also adds that AI integration can promote the shift towards a four-day-workweek. The emerging global trend towards the four-day-workweek proves as an indicative factor and could further impact employment opportunities.
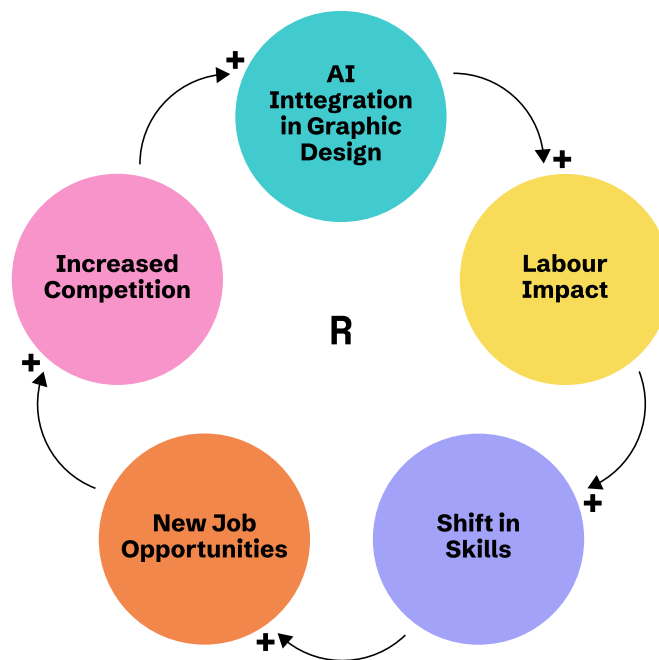
Figure 7 | *Causal Loop Diagram: Labour Impact of AI Integration.*

Furthermore, Rahul Bhogal acknowledges concerns about labour displacement, particularly among young generations of designers. However, he emphasizes that AI-powered tools should be seen as additional tools to be used appropriately within workflows. This sheds light on the importance of human input and oversight even when prompting AI to generate content. Additionally, Dianne Semark pointed out the grey areas surrounding using AI-generated content versus hiring creatives. She believes that in certain cases like generating a reference for a

project, using AI generators might be time and cost efficient. Similarly, Tomomi Lo views AI as a tool that enhances efficiency rather than a threat to creativity and suggests that designers can leverage AI for improved work and possibilities. She provides an example of using AI for tasks like image sourcing, suggesting that it can save a lot of time and effort when working on projects.

In contrast, concerns about broader economic impact of AI integration also arise. Jay Wall highlights that the use of AI could deprive marginalized communities like Indigenous groups from their storytelling and economic opportunities. Instead of hiring indigenous people to authentically share their narratives, participate in economic development, and contribute to cultural representation, there is a risk of relying on AI-generated content to do that work. Accordingly, there is strong emphasis on social responsibility and designer accountability when utilizing AI tools. Similarly, Daniel Asel calls for discussing Indigenous perspectives on AI integration to gain a deeper understanding of its social impact. Wall and Asel's perspectives shed the light on the disparities and inequalities that could result by this rapid technological advancement. If not carefully managed, AI has the potential to widen the existing socio-economic gaps and further marginalize vulnerable communities. Therefore, it is essential for developers, policymakers, ethicists, community leaders, and AI users to work together to prioritize inclusivity and develop AI systems that consider cultural heritage and traditions.

Overall, the labour impact of AI integration in graphic design is a complex issue. It reflects concerns about job displacement, economic consequences, and shifts in skill requirements and work processes. Despite these challenges, some participants perceive AI as a tool to enhance creativity and efficiency rather than replace human designers. While AI has the potential to streamline processes and enhance efficiency, there is an emphasis on the irreplaceable value of human creativity, intuition, and critical thinking in the design process. The interviewees emphasize the importance of strategic and responsible usage of AI tools, proper attribution, and the need for designers to adapt and evolve their skill sets to remain relevant in this evolving landscape. The interviews also highlight opportunities for designers to leverage AI as a tool to expand their existing capabilities, enhance their work, and focus on higher-level creative tasks.

Accessibility

In terms of accessibility, not all AI tools are created equal. While many AI platforms offer free trials due to the novelty of the technology, they often operate on freemium models that provide limited features for free and charge a premium for more advanced functionalities and extended usage (See Appendix D for a list of current AI tools). As highlighted by Dianne Semark, since ongoing payments are required to access these subscription-based models, accessibility and inclusivity barriers become prominent concerns. On the other hand, as ethical concerns related to AI integration arise, government bodies attempt to regulate and occasionally restrict AI tools to mitigate their potential risks.

Echoing Dianne's remarks, Alex Boland brings attention to the disparity in global access to AI technologies. He raises concerns about the future of individuals and communities who do not have access to AI tools, especially if AI becomes a dominant force in the industry. Boland further acknowledges that technological barriers already exist for many people, and the integration of AI in graphic design could potentially create more barriers and socio-economic disparities.

Andrew Reutsky also acknowledges the superior results that paid AI tools can produce and highlights the roles of design agencies to offer these premiums to designers in order to help them do their jobs more efficiently. In Reutsky's perspective, design agencies that do not utilize AI and encourage their designers to use it are likely to lose business in the future. In contrast, Stüssy Tschudin highlights that the widespread accessibility of AI tools can amplify the risk of misinformation. Accordingly, he advocates for education, regulation, and continuous monitoring to mitigate these risks.

Ultimately, the accessibility of AI tools is a concern especially with the shift towards subscription-based models that can cause inclusivity issues and widen socio-economic disparities. Participants foresee a large impact on designers and businesses that fail to integrate AI into their processes, predicting that they may eventually lose clients and miss out on financial gains. In addition, censorship can play a key role in limiting the flow and accessibility of resources and information. Limitations in access hinder the democratization of AI and prevent many designers from equal participation in the field. To mitigate this, there is a need for initiatives and governance frameworks that promote ethical guidelines, inclusivity, and ensure fair distribution of resources.

Intellectual Property and Consent

One of the main challenges highlighted by participants are the issues of intellectual property and consent. Intellectual property rights, such as copyright and trademarks, protect a designer's original works and creations from being unlawfully copied, used, or distributed by others without permission. On the other hand, consent in graphic design pertains to the authorization given by the creator for the use, modification, or distribution of their designs. In the context of AI in graphic design, the relationship between the two revolves around respecting the rights of creators and ensuring legal and ethical compliance in the use of AI-generated content. This is especially relevant given that AI systems work by learning patterns, styles, and structures from large datasets of images that may be copyrighted (Fenwick & Jurcys, 2023). Some key aspects of intellectual property and consent highlighted by participants include copyright protection, infringement, fair use, and licencing.

For example, Catherine Charbonneau and Alex Boland both raised concerns about the ethical implications of using stock images for AI-generated outcomes without explicit consent from

creators, emphasizing the risk of ethical washing and the need for clear regulations to ensure ethical data usage and proper compensation. There is also a growing concern surrounding the potential for AI to not only replicate visual styles but also to impact artistic expression as more and more designers use the same tools. This discussion raises questions about the preservation of creative integrity and the protection of artists' intellectual property rights in the digital age.

In addition, to addresses intellectual property concerns, Dianne Semark foresees future advancements in the form of guidelines and "digital registrations" designed to protect content generated by AI. Implementing these digital systems can help creators protect their original works and ensure they receive recognition and compensation for their contributions. Creating these systems can be achieved through various technological methods such as employing AI-based content recognition systems or implementing digital watermarking and metadata to embed unique identifiers and track content origin.

Similar systems have been recently implemented in some AI-powered tools. For instance, Adobe firefly uses *Content Credentials*, which are tamper-evident metadata that creators can add to their content to provide extra information about themselves and their creative process. They are part of the Content Authenticity Initiative (CAI) and allow for the sharing of contextual details like the creator's identity, contact information, and the history of the content's creation across various platforms (Adobe, 2023). Currently, Content Credentials are applied to assets generated with Adobe Firefly features, such as Text to Image, Generative Fill, and Text to Vector Graphic. By using metadata to identify and track the origin, ownership, and usage rights of the content, Content Credentials help protect intellectual property rights, ensure proper attribution, and facilitate compliance with copyright regulations.

Overall, the integration of AI in graphic design disrupts traditional understandings of intellectual property and consent, leading to a significant gray area. Unlike human creators who have clear rights to their original designs, determining the ownership of content generated by AI becomes challenging and requires the creation of advanced technological systems to protect intellectual property rights. Additionally, AI can produce designs that may replicate or closely resemble existing works, complicating determinations of originality and eligibility for copyright protection. Accordingly, there is a need for a re-evaluation of legal frameworks and ethical practices to address the unique challenges posed by AI-generated content.

Authenticity and Transparency

Authenticity and transparency in the context of AI in graphic design emerge as common ethical concerns in the insights provided by the participants. In the context of this research, authenticity refers to the ability of designers to maintain the genuine and original creative expression in their work, even when utilizing AI tools. Transparency, on the other hand, refers to the clarity and

openness in how AI tools are employed and the processes they undertake to create or assist in creating designs.

These two themes intersect with the participants' views on the need to uphold the integrity and originality of design work when utilizing AI. More specifically, Daniel Asel emphasizes the necessity of a human-centered design approach and highlights the risk of losing human empathy and creative exploration with excessive reliance on AI. Similarly, Catherine Charbonneau and Andrew Reutsky advocate for a balanced integration of AI within creative processes to maintain the authenticity and integrity of design work. Dianne Semark emphasizes the importance of human judgment in evaluating AI-generated content and encourages designers to critically assess whether the AI outputs align with the brand's context and feel. In addition, Tomomi Lo views AI as a tool that enhances efficiency but emphasizes the importance of human input in guiding AI and maintaining originality and authenticity in design.

Furthermore, Jay Wall discusses the potential for AI-generated outputs to have a strong "fingerprint" of AI, which may deter some designers from using these tools if they do not resonate with that style or fear its impact on their creative voice. Alex Boland reflects on the credibility and ownership of designs produced with AI assistance, highlighting the need for user accountability and designers ensuring the accuracy of AI outputs. Stüssy Tschudin discusses the role of human-centered input to maintain authenticity and expresses concerns about the potential dilution of design quality due to overuse of AI without critical evaluation and editing. Lastly, Rahul Bhogal touches on the subjective perceptions of authenticity and originality and suggest that all creations are remixes of existing ideas. This raises questions about the ability to maintain authenticity using AI particularly in creative fields.

These perspectives highlight the importance of maintaining authenticity and transparency in the design process. Both are foundational in building trust with clients, stakeholders, and end-users. Transparency in particular is essential for ethical AI integration as it can help prevent unintended biases, misrepresentations, or unethical practices. By being transparent about AI's role, designers can ensure that AI enhances rather than detracts from the authenticity of the final design. On the other hand, authenticity ensures that the design aligns with ethical standards and the brand's values which fosters responsible design practices. Graphic designers can maintain their artistic integrity by understanding AI technology, filtering, and editing its outputs, incorporating their unique style and vision, and using it as a supportive tool rather than a replacement. Overall, participants advocate for a cautious, critical, and ethical approach to AI integration, and emphasize the need for radical transparency, informed consent, and clear regulations to ensure that AI serves as a collaborative tool. Despite the growing role of AI in graphic design, research findings demonstrate a shared commitment to preserving and enhancing the authenticity and transparency of the design process.

Misinformation and Misrepresentation

As designers continue to utilize and experiment with AI in their work, important considerations regarding the risk of misinformation and misrepresentation arise. Both of which can be exacerbated by the widespread adoption of advanced generative AI (GenAI) tools (Gautam et al., 2024).

Based on the data collected, misinformation and misrepresentation are central themes. More specifically, misinformation in the context of AI and technology refers to false or inaccurate information that is spread using AI-generated content. It can spread quickly through social media and online platforms, regardless of intent to deceive (Gautam et al., 2024). Daniel Asel, Stüssy Tschudin, and Rahul Bhogal highlight the potential risks associated with AI-generated content, particularly in the context of deep fakes and the use of AI to manipulate visuals. Stüssy Tschudin notes that the wide accessibility of AI tools increases the risk of misinformation globally. Alex Boland also raises concerns about the credibility and ownership of work created using AI, pointing out the challenges of tracing their sources. Rahul Bhogal highlights the potential of AI content being inaccurate and potentially spreading misinformation if not fact-checked by humans.

In a similar context, misrepresentation, whether intentional or unintentional, is another prominent risk linked to the power of AI to manipulate images and create realistic yet fictional scenarios. This particular issue can be further enlarged due to learned biases embedded in AI systems (Gautam et al., 2024). As such, Dianne Semark points out that some learned biases are inevitably embedded in AI tools, leading to misrepresentation and potentially harmful stereotypes. Jay Wall also cautions against the use of AI tools that can create harmful imagery or perpetuate cultural stereotypes, highlighting the potential social impacts especially for vulnerable communities.

These insights highlight a shared concern about the potential risks and challenges related to misinformation and misrepresentation when using AI. These issues can lead to ethical concerns such as deceptive content and copyright infringement, or social risks such as cultural insensitivity and the reinforcement of stereotypes. Participants emphasize the importance of responsible usage, critical assessment of AI outputs, education, proper attribution, reference checks, and better screening mechanisms to ensure accuracy, authenticity, and transparency in the design process.

Privacy Concerns

The integration of AI in graphic design raises significant privacy concerns, particularly concerning the use and manipulation of sensitive data. AI algorithms often require access to large datasets to learn and generate new content, which may include personal data and proprietary information. There is a risk that AI users or AI systems could misuse this data, leading to privacy breaches, unauthorized use of personal information, and violations of data protection regulations (Walsh et al., 2019).

Catherine Charbonneau emphasizes the necessity of proper consent for data usage in AI models. Currently, there is a lack of a clear framework for obtaining user consent when utilizing AI tools. This absence raises serious concerns about the potential misuse or unauthorized access to personal data. Additionally, AI systems could utilize vulnerable information to generate answers for other users without the original contributor's knowledge or consent. Andrew Reutsky echoes this concern by pointing out the lack of transparency regarding the data fed into AI systems, which raises privacy and intellectual property concerns.

When discussing obtaining consent, designers may feel pressured to agree to broad data usage terms to avoid missing out on using AI technologies. On that issue, Alex Boland shares concerns about the sources of data that AI is using and how this data is being collected and kept. He anticipates possibly misleading consent mechanisms in the future where users are presented with expansive consent forms, and automatically agreeing without fully understanding the implications. This lack of clarity and transparency in data collection and consent is seen as a potential source of privacy issues.

In addition, there are concerns about the potential autonomy of AI in the future, where AI systems begin making decisions independently by drawing from the large amounts of data accumulated from users. Highlighting this issue, Stüssy Tschudin expresses his fears surrounding AI autonomy. His apprehension lies in the idea that AI might evolve to the point where it no longer requires human input to make decisions. Currently, AI utilizes vast amounts of data to generate outputs, but this process is still prompted by humans. As long as human input remains a prerequisite, there is a sense of control over AI. However, Tschudin is alarmed by the prospect of AI becoming self-sufficient, given the amount of personal information freely provided to AI systems by users. While this scenario may currently seem abstract, Tschudin believes that we are closer to it than we were a few years ago.

Furthermore, the dangers of AI misuses such as facial replacements and voice mimicking are a significant ethical concern. For example, the advancement of AI in recent years has resulted in the phenomenon of deepfakes, advanced audiovisual counterfeits created using AI that rely on artificial neural networks—intricate systems that recognize patterns in data (Fletcher, 2018).

This phenomenon can result in the creation of non-consensual content by faking an individual's face onto explicit material, which is a serious violation of privacy and can lead to harassment, blackmail, and defamation. Andrew Reutsky highlights the significance of deepfakes, especially in the context of political misinformation, highlighting their potential to influence public opinion. Moreover, Rahul Bhogal stresses the need for clear boundaries and screening processes to safeguard privacy and security in relation to deepfakes and AI tracking.

As AI becomes more integrated into design processes, addressing privacy concerns is crucial to safeguard users' rights and maintain trust in AI-powered tools. Accordingly, insights gained from participants emphasize the need for comprehensive data protection regulations and ethical practices within the industry to protect users' privacy and rights.

Learned Bias

The broader AI discourse as well as the research findings highlight that AI algorithms are trained on vast datasets that may contain biases, leading to biased AI algorithms and design outcomes. Addressing these biases requires a conscious effort to diversify training data and implement ethical design practices.

Learned bias in the context of AI can contain inherent biases present in society, including gender, racial, cultural, and other biases. Dianne Semark expresses concerns about the profiling in AI, fearing that AI systems will learn and perpetuate these biases in their training data. She gives an example where an AI might incorrectly profile a farmer as a white male in his forties, emphasizing that learned bias in AI can perpetuate discriminatory assumptions and stereotypes. Semark also highlights that companies or individuals controlling the input of data into AI systems are responsible for the level of biases embedded in them. This sheds the light on the role of governance when it comes to the social impacts of AI systems.

Although Jay Wall acknowledges that AI systems will always have embedded biases, he emphasizes the role of designers mitigating these biases and their social impacts. Wall believes that being aware of AI biases as well as personal biases when utilizing AI tools is key to improve AI systems and avoiding their negative impact. In his perspective, if these biases are not addressed and are instead incorporated into design work, it can lead to the rapid and widespread of problematic or harmful content.

Language bias also emerges as a significant concern, particularly when it comes to the use of AI writing assistants and LLMs such as Grammarly and ChatGPT. As highlighted by Daniel Asel, AI models are often trained on datasets of standardized language, which may not represent the diversity of languages and dialects spoken globally. As a result, grammar recommendations and choices made by AI may favor standard language forms and neglect the rules and structures of

indigenous and less-represented languages and dialects. In addition, as linguistic norms vary from one culture to another, AI recommendations might not accurately reflect the linguistic diversity and richness of those cultures.

As designers increasingly rely on AI for creative assistance, it becomes more critical to ensure equitable and inclusive design outcomes. A part of that responsibility relies on awareness, critical thinking, and thoughtful use of AI tools to challenge and improve both the tools and the societal biases they may reflect.

The Future of AI in Graphic Design

Chapter 6: The Future of AI in Graphic Design

Artificial Intelligence (AI) has established itself as an integral component of the future of graphic design, with most participants viewing it as a complementary tool to human creativity. Based on the findings of this research, there is great potential in using AI to automate and handle repetitive tasks and to aid in ideation and implementation phases of design. However, the true potential of AI tools in the graphic design industry is only unlocked when used in synergy with human thinking and input.

Despite AI's anticipated quick advancement and inventible integration in the graphic design process in the future, human input remains central. Participants expect a scenario where human creativity and strategic thinking refine and augment AI capabilities to ensure personalized design outcomes that fit specific contexts. In fact, according to Alex Boland and Rahul Bhogal, there is an anticipation that AI's accessibility and repetitive outputs may eventually lead to an increased appreciation for handcrafted and human-created work. According to research data, this may lead to a shift towards distinguishing human-made designs through physical, tangible, and experimental approaches that clearly reflect a human touch. Overall, as AI technology evolves, a shift towards honoring human creation skills will foster a design culture that values uniqueness and individual expression.

While participants foresee an increased value in human creation, labour impacts due to AI integration are inventible. Historical movements like the Industrial Revolution transformed printing technology and fueled the rise of advertising, thus shaping the role of designers and their workflows to meet the needs of industrialized production processes (Meggs et al., 2006). This was followed by the Digital Revolution, which transformed graphic communication by introducing computer technology and digital tools. As such, the Digital Revolution resulted in great impacts on the jobs of layout designers and typesetters who manually conducted their jobs, leading to intensified competition within the industry (Meggs et al., 2006).

As demonstrated by these examples and as highlighted by participants, the labour impact of AI integration is particularly increased for illustrators, photographers, web designers, and/or motion graphic designers whose work can be more easily replicated by AI-powered tools and applications, given the current state of technological advancement. To mitigate these concerns, designers and creators are encouraged to adapt and demonstrate their ability to work with new tools, just as they have previously done with traditional and digital mediums. Central to this

adaptation is the recognition that the skills of a designer must evolve to meet the demands of a changing landscape. In essence, this proactive approach highlights the ongoing evolution of the designer's role and the imperative for embracing change while maintaining the core principles of design.

Furthermore, as AI takes on a more prominent role in the future of graphic design, there is an anticipation of ethical issues and challenges that may arise as a result. Concerns about the quality of AI outputs, job displacement, misinformation, misrepresentation, privacy, and intellectual property are amongst the persistent ones. Despite these concerns, all participants agree that AI integration will result in a significant impact on productivity and efficiency within the graphic design field.

With increased productivity and time efficiency being highly anticipated in the future, some designers are expected to resist the change in fear that AI tools might act as potential competitors. In response, there is a growing call for designers to actively shape AI into collaborators, encouraging them to voice their preferences for tools that enhance creativity rather than competing against it. In addition, there is a call for embedding AI in educational initiatives to empower upcoming generations of designers to make ethical decisions regarding AI integration.

Overall, the rise of AI is anticipated to lead to the democratization of graphic design, where graphic design is more accessible for a broader audience beyond traditional design professionals and experts. This transformative shift enables design automation and customization while enhancing time efficiency and productivity. However, ethical concerns loom large and demand thorough investigation and intervention by all stakeholders affected by this transition. Nonetheless, human input and guidance remains central in the use and integration of AI. Designers are encouraged to demonstrate their value and ability to utilize these tools despite the impacts of graphic design democratization on them. Ultimately, the synergy between human creativity and AI capabilities holds great potential to unlocking new avenues for communication, expression, and innovation in the digital era.

Foresight Tool: The Futures Wheel

This study has demonstrated the great potential and significance of the integration of artificial intelligence (AI) into graphic. To visualize this potential and impact, based on the perception of the research participants and the research data, the futures wheel foresight tool is used. This dynamic method allows to systematically explore and visualize the ripple effects of AI in graphic design while offering an understanding of its consequences on creativity, graphic design industry dynamics, and broader social implications (Figure 8). In addition, each identified implication

is assigned a STEEP+V category (Social, Technological, Economic, Environmental, Political, or Values). This provides a structured way to categorize implications according to different aspects of the environment, enhancing the understanding of the context in which AI will impact the industry. Additionally, analyzing implications within these categories helps in understanding how changes in one area can affect others, while emphasizing opportunities and challenges across various spheres. Ultimately, by employing the futures wheel and using STEEP+V categories, we gain valuable insights into the future of AI-driven graphic design and pave the way for informed decision-making that aligns with diverse perspectives and needs.
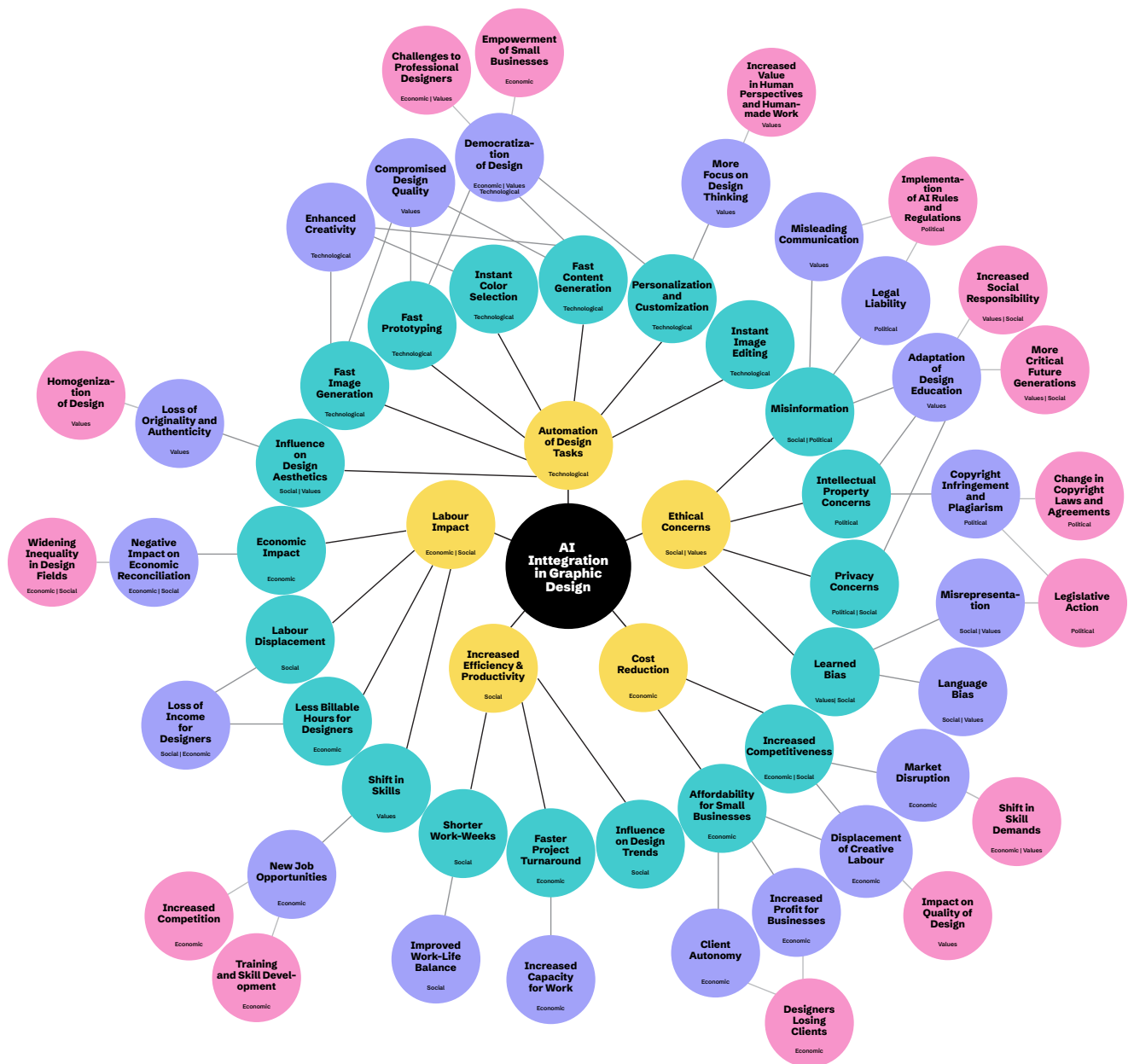

Figure 8 | *Futures Wheel: The Impact of AI Integration in Graphic Design.*

Conclusion

Conclusion

This study offers a unique opportunity to examine discourse surrounding AI's impact on the graphic design industry as an emerging and transformative technology. The following research question was explored: *How might the integration of AI technologies impact graphic design processes, and what benefits, challenges, and ethical considerations arise as a result?* Accordingly, the study involved a contextual review to gather and synthesize information on the historical context and current state of graphic design methods and processes; the current state and potential of integrating AI into graphic design; the ethical impacts of AI integration on graphic design, and the future outlook on this issue. In tandem with this review, nine interviews were conducted with graphic design professionals and practitioners, shedding light on their perspectives, experiences, and contemporary practices regarding AI's impact. Employing grounded theory methods, the interviews were then analyzed to unravel emergent themes and frameworks directly derived from the participants' insights. The combination of these empirical findings and scholarly discourse formed the foundation for a discussion encompassing various factors and considerations surrounding the adoption of AI in graphic design. In essence, this research documents and captures a historical moment where AI leads a paradigm shift in how creativity and visual communication are approached within the realm of graphic design. By contextualizing this shift, the study not only enriches our understanding of AI's implications but also offers valuable insights to inform future practices and discourse in the field.

The research findings highlighted the diverse ways in which design practitioners can integrate AI into their creative processes. Based on the perspectives of participants, specific benefits, challenges, and ethical considerations related to AI use in graphic design were revealed. Among the identified benefits are the augmentation of creativity, heightened time efficiency, increased productivity, improved inspiration and education, aid in ideation, and enhanced prototyping processes. In contrast, the challenges and ethical concerns include issues such as labour displacement, intellectual property concerns, accessibility barriers, privacy concerns, potential loss of authenticity, the spread and reflection of biases, circulation of misinformation, and potential misrepresentations.

In identifying these benefits and challenges, participants highlight that the true potential of AI in graphic design emerges when harmonized with human input and expertise. However, labour impact is especially a looming concern due to generative AI (GenAI) replicating several aspects of graphic design activities. These GenAI tools most utilized by participants include large language models (LLMs) such as ChatGPT, and image generators such as Midjourney. Furthermore, the increased accessibility of AI tools results in the democratization of graphic

design, further impacting design practitioners by reshaping traditional workflows. Amidst these concerns, participants advocate for a cautious yet thoughtful integration of AI, recognizing the irreplaceable value of human perspective and creativity. They envision a future where human ingenuity refines and amplifies AI capabilities, steering towards personalized design solutions tailored to specific contexts.

Based on the highlighted findings of this research, the primary research question of "How might the integration of AI technologies impact graphic design processes, and what benefits, challenges, and ethical considerations arise as a result?" was thus successfully explored. Through the exploration of primary research and existing literature, the research highlights AI's potential in enhancing creativity and efficiency within graphic design, while also emphasizing the need to address accompanying challenges and ethical considerations. Overall, as the landscape continues to evolve, this study not only offers an understanding of the exchange between AI and graphic design and its varied implications, but also serves as a guide for informed dialogue and future research.

Next Steps

The interviews conducted as part of this research offer extremely valuable and insightful information about the real-life applications of AI and how it is perceived on the ground. It provides a snapshot of the current landscape, aiding in the comprehension of the implications of this transformative transition during this point in time as the technology is starting to get integrated into our systems of work. With that being said, as highlighted in the limitations section in Chapter 2, it is essential to recognize that despite the depth of these insights, the research did not achieve saturation. In this context, saturation refers to the point in data collection when no new insights are highlighted and where data begin to repeat itself. Accordingly, it is acknowledged that there still may be more benefits, challenges, and ethical considerations worth uncovering beyond this research.

In addition, because primarily Canadian databases were used to solicit participants, the research as a result covers the perceptions of a group of experts from a limited geographic scope. Therefore, further research with a larger, more diverse, and more global participant pool is necessary. As we look ahead to the next steps in this research journey, expanding the participant pool globally opens exciting new opportunities for deeper exploration and understanding. Each corner of the globe offers its own distinct blend of design practices, industry norms, and societal values, all of which shape the way AI is embraced and utilized within the graphic design community. By embracing this diversity, we can gain a more comprehensive understanding of the ways in which AI is transforming the field of graphic design across the world.

Further research that engages various stakeholders from varied cultural, economic, and professional backgrounds can also highly enrich the discourse surrounding AI in graphic design. This may include AI developers, software companies, technology providers, government agencies, industry associations, design agencies, graphic design end-users, and educational institutions. These diverse stakeholders can help identify common concerns, explore innovative solutions, and work towards a more inclusive and equitable future for AI-driven design practices.

In conclusion, this research highlights that the influence of AI extends beyond technology and design industries. Instead, it encompasses our entire society, politics, and economy; and requires responsibility as well as the involvement of all stakeholders. As stated by Figoli et al. (2022), "The debate on AI is a technical-practical discourse and an ethical, social, and cultural one." As such, it is crucial that we thoughtfully consider its potential in those areas and also to understand its impact, whether negative or positive, on a deeper level. There is an opportunity to foster a truly global dialogue on the intersection of AI and graphic design that includes these perspectives. Moving forward, this can foster creative collaboration between designers and AI systems, and foster innovation rather than replacement.
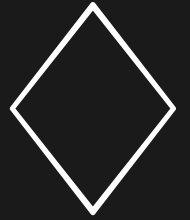
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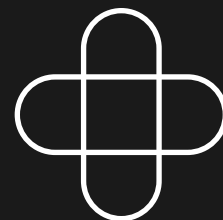
Appendices

Appendices

Appendix A: Informed Consent Form

Invitation and Purpose of Study

You are invited to participate in an interview that is part of a study on the integration of AI technologies in graphic design processes. The research aims to shed light on the changing graphic design landscape and the implications it will face due to the integration of AI, as well as assist graphic design professionals in making well-informed decisions concerning the incorporation of AI's emerging technology into their work. The purpose of this interview is to collect insights from different expert perspectives to support the research objective and highlight the impact of AI in graphic design, including the benefits, challenges, and ethical considerations that may arise as a result. You have been selected as a potential participant based on your expertise in graphic design and your rich design background which holds promise in generating valuable insights for this research.

Criteria for Participation

By agreeing to participate in this study, you confirm that you fit the following criteria:
- The participant practices graphic design in a design agency, as a freelancer, or as an in-house designer.
- The participant has 5+ years of professional graphic design experience.
- The participant speaks and understands English fluently and can fully conduct the interview in English language.
- The designer can conduct the interview virtually via MS teams and accepts being recorded during the process.

Language Use

In this research project, English will serve as the primary language for all aspects, including the interviews.

Interview Procedure and Technology Use

The interview will involve ten open-ended questions following a semi-structured approach allowing for flexibility and in-depth exploration of the research topic. The process will take approximately one hour, will be conducted online via Microsoft Teams, and will be recorded

using MS Team's built-in feature. In addition, Otter AI software will be used to transcribe the interview in real-time to provide an accurate transcript of the spoken words. After the interview is conducted, the participant will receive a copy of the transcript to review and approve it within three to five days, after which the research analysis stage will begin. Participants will be asked to delete the transcription file once it has been approved.

Potential Benefits and Risks

Participating in this study offers the benefit of reflecting on one's views about AI in graphic design and gaining a better understanding of AI's implications in the field, including its benefits, challenges, and ethical considerations. By gaining this understanding and awareness, participants may be able to make informed decisions regarding the integration of AI technology in their work as well as anticipate the changing landscape of their work. Participation in this study may also be associated with social risks, such as potential judgment, criticism, and the inadvertent sharing of proprietary work-related information. Furthermore, there is a risk that the ideas and information shared may be misunderstood or misinterpreted by the public. Overall, Participants are encouraged to not share any confidential or proprietary information that might make them, their organizations, clients, or colleagues vulnerable to these risks.

Confidentiality and Anonymity

All information you provide is not considered confidential nor anonymous. This is to maintain the credibility and authenticity of this research while shedding the light on expert knowledge shared by professionals in the graphic design field. In addition, during the qualitative interviews, participants may engage in open conversations about their work or personal experiences. These discussions have the potential to reveal enough information that readers might make assumptions about the identities of the participants even if they are not named. Hiding this information may impact the quality and authenticity of the research data collected, as well as be an extremely challenging process. However, participants are encouraged to not discuss any confidential information that might make them vulnerable during the interview. It is also important to note that after the interview has been conducted, participants will be given the opportunity to review and approve the transcript before the analysis stage begins.

Data Handling

All interview data and recordings will be saved in a private folder using OCAD U's email credentials and protected using two factor authentication. Only the principal investigator, Habiba Elgendy, and the faculty supervisor, Nancy Snow will have access to the data. However, the interview transcript may be published in part or in full in the final research paper and academic presentations, exhibitions, conferences, colloquia, and/or publications.

Voluntary Participation

Participation in this study is voluntary. If you wish, you may refuse to participate or withdraw from the study at any time before the beginning of the analysis stage. You may also decide to withdraw before, during, or after the interview. Withdrawal or refusal to participate is without penalty or loss of benefits. Desire to withdraw from the study must be communicated to the researcher prior to the data analysis stage, which will begin one week after reviewing and approving the interview transcript. After the data analysis has begun, withdrawal from the study will no longer be possible.

Publication Of Results

This Major Research Project (MRP) will be published in OCAD University's online research repository to fulfill the requirement for the completion of the Strategic Foresight and Innovation Master of Design Program at OCADU. Additionally, the results and findings from this major research project may be shared and presented through academic presentations, exhibitions, conferences, colloquia, and publications.

Contact Information and Ethics Clearance

If you have any questions about this study or require further information, please contact the Principal Investigator, Habiba Elgendy, or the Faculty Supervisor, Nancy Snow, using the contact information provided above. The principal investigator, Habiba Elgendy, has completed the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans Course on Research Ethics (TCPS 2). In addition, this study has been reviewed and received ethics clearance through the Research Ethics Board at OCAD University by proxy.

Consent Form

I self-identify with all of the selection criteria listed above. I agree to all the terms discussed, to be recorded during the interview process, and to participate in the study described above. I have made this decision based on the information I have read in this consent document, and I am aware of any benefits and risks associated with my participation. I have had the opportunity to receive any additional details I needed about the research, and I understand that I may withdraw this consent at any time before the beginning of the analysis stage of this research.

Name: _____

Signature: _____   Date: _____

Thank you for your assistance in this project. Please keep a copy of this form for your records. (REB Approval #2023-42)

Appendix B: A Primer on Graphic Design Frameworks and Processes

Purpose

The purpose of this primer is to provide research participants with an overview of the current state of design thinking frameworks and graphic design processes, established according to a comprehensive literature review. Through this document, participants can gain insights into the key principles, methodologies, and emerging concepts in design thinking that influence graphic design practices today. It will serve as a guide for participants to reflect on their own design processes, methodologies, and creative decisions in light of the latest advancements and innovations within the field. By grounding participants in the existing design landscape, the primer aims to facilitate more informed and meaningful discussions and dialogues during the interviews, contributing to the main research objective of investigating the implications of AI integration in graphic design processes.

Executive Summary

Graphic Design is a rapidly evolving field as technologies, societies, and the world quickly change. However, it is still rooted in the fundamental principle of being a field of visual communication aimed at problem-solving. At its core, visual communication originates from well-established design thinking frameworks and methods that have influenced the work of designers in the past and continue to shape their work today. Although frameworks may vary from one designer to another or between agency work, in-house design, or freelance design processes, they are all ultimately built upon the same established foundations.

Nonetheless, in recent years, artificial Intelligence (AI) has become more present in the graphic design industry due to its potential to automate and streamline design processes efficiently. This includes supporting the creation of visual content, generating complex and realistic images and graphics, editing images, improving design aesthetics, and inspiring design concepts. As technology continues to advance, AI is expected to have significant impact on the graphic design field, disrupting the way graphic design is implemented today, and potentially becoming a standard tool in its processes. Still, the integration of AI in graphic design raises ethical concerns and challenges that need to be addressed. These include job displacement, privacy threats, intellectual property issues, AI ethics concerns, data bias, and transparency issues.

The aim of this primer is to investigate current design frameworks and processes used in the graphic design industry and provide graphic design practitioners the information needed to

situate themselves within the graphic design landscape. This investigation also aims to foster informed discussions and dialogues on the responsible integration or exclusion of AI during the interviews, contributing to the main research objective of investigating the implications of AI integration in graphic design processes.

What is Graphic Design?

Graphic Design is the process of creating and combining visual elements to convey a specific concept or story in a visually appealing and effective manner. It is created as a direct response to the visual communication needs of a client and covers a wide range of areas of communication such as advertising, signage and environmental design, packaging, social and political communications, identity systems, publication design, business communication, and digital communications (D. Ocepek, 2003).

Problem solving is an integral part of the graphic design process where the designer's creative and analytical resources are fully employed. Designers are especially proud of their ability to create engaging solutions that are uniquely tailored to their clients and their needs (D. Ocepek, 2003). Although every designer's artistic ability varies, all design solutions are created based on predictable creative pathways. By deconstructing and understanding these pathways along with the thinking methodologies that they are founded upon, designers can employ diverse solutions that meet their main purpose: satisfying clients, users, and themselves (Lupton, 2011).

Design Thinking Frameworks

To gain an understanding of the design process and explore potential integration points for AI in later stages of this research, we must first identify established design thinking frameworks that designers widely use to conduct their work. The selection of frameworks in this section is driven by their user-centric and problem-solving characteristics, which align seamlessly with the primary objectives of graphic design—facilitating effective visual communication. These frameworks include the Double Diamond Model by the British Design Council, the Stanford D.School 5-Stage Design Thinking Model, and IDEO's Human-Centered Design Model (HCD) and Design Thinking Process.

The Double Diamond

One of widely adopted and accepted depictions of the design process is the double diamond model, which was developed by the British Design Council in 2003 as a visual problem-solving framework for design and innovation. The model (Figure 1) consists of four distinct phases that designers can navigate when undertaking a design project: **Discover, Define, Develop and Deliver**. The first diamond includes the **'discover'** divergent phase where designers undertake in-depth research of their subject. Next, in the **'define'** convergent stage, designers synthesize

their research findings and confirm or re-frame the design problem. The second diamond signifies the **'develop'** phase where creative ideas are generated and developed; and converges into the **'deliver'** phase where the best solution is selected, prototyped, and implemented. The double diamond uses critical thinking and reflective practice to apply design characteristics to reach creative solutions, and emphasizes divergent and convergent thinking as the design process is conducted (The Design Council, 2005).
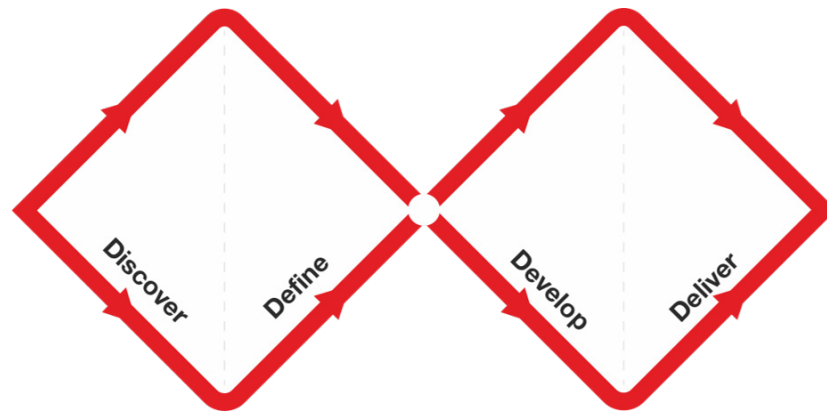
Figure 1: *The Double Diamond*, Design Council. CC BY 4.0.

Stanford D.School 5-Stage Design Thinking Model

Another commonly used design thinking framework is the 5-Stage Design Thinking Model (Figure 2) developed by Stanford D.School, now known as the Hasso Plattner Institute of Design, which outlines five steps of design thinking: **Empathizing, Defining, Ideating, Prototyping, and Testing** (D.School/Hasso Plattner Institute of Design at Stanford, 2004). This human-centered problem-solving process highlights the importance of gaining a deep understanding of users' needs, aspirations, and challenges.
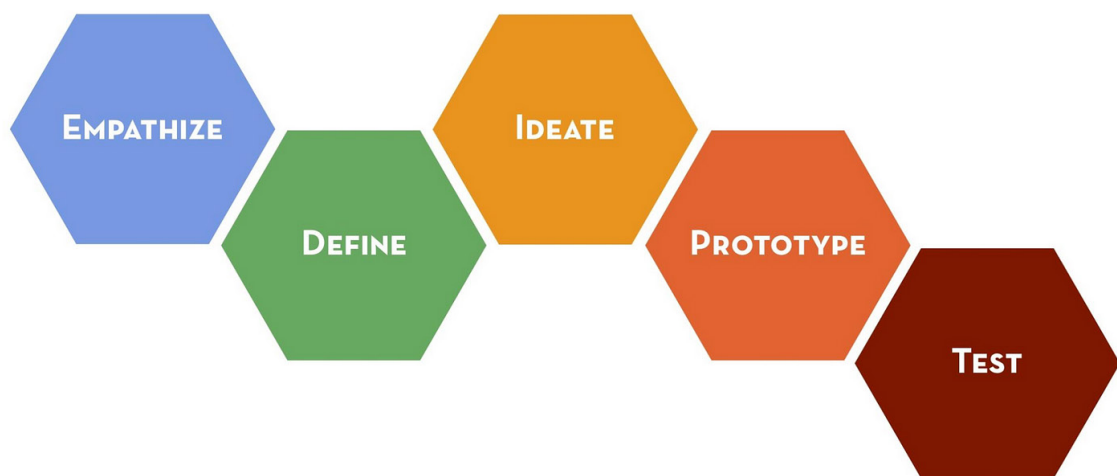
Figure 2: *Stanford D.School Design Thinking Process Diagram*, Hasso Plattner Institute of Design at Stanford

IDEO Human-Centered Design Model and Design Thinking Process

IDEO, a pioneering design and consulting company known for its human-centered and interdisciplinary approach, is an advocate for using design thinking methods in order to "make decisions based on what customers really want instead of relying only on historical data or making risky bets based on instinct instead of evidence" (IDEO U, n.d). Based on this viewpoint, in 2009, the company designed and launched the HCD Toolkit, a unique book that laid out how that highlights the impact of human-centered design approaches. In the book, IDEO identified three primary steps designers can incorporate into their process: **Inspiration, Ideation, and Implementation** (Figure 3). The **'Inspiration'** phase involves defining, framing, and exploring the problem and the subject matter. Next, **'ideation'** involves generating, testing, and refining ideas and solutions. Finally, the **'implementation'** phase involves bringing the design solution to life and offering it to the target user/audience (IDEO, n.d; Design Kit, n.d).
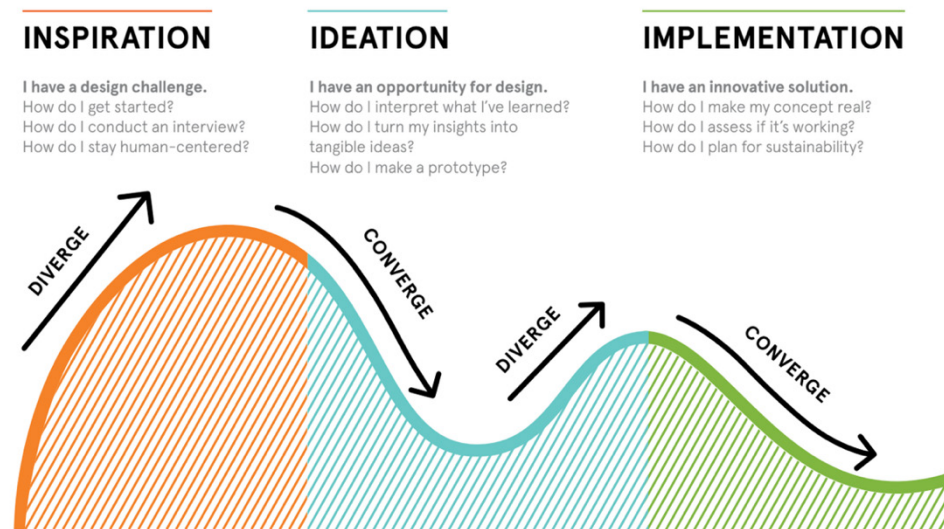
Figure 3: *The IDEO Human-Centered Design*, via Medium, 2021

To further develop this approach into a contemporary design thinking process, IDEO developed a model consisting of six phases: **Framing a Question, Gathering Inspiration, Generating Ideas, Making Ideas Tangible, Testing to Learn, and Sharing the Story**. This iterative model (Figure 4) has been widely adopted today and emphasizes understanding user needs, generating creative ideas, and rapid prototyping for testing and iteration (IDEO U, n.d).

Figure 4: *The IDEO Design Thinking Process*, IDEO

Graphic Design Processes

Now that we have an understanding of several established design thinking frameworks and frameworks, it is imperative to explore renowned graphic design processes according to leaders in the field. By examining these processes, we can gain a holistic view of how graphic design is conducted, and use it as a perspective to help designers situate themselves in the professional landscape.

The graphic design process is based on a series of repeatable steps and procedures that guide designs from concept to completion. Terry Lee Stone (2010) identified nine elaborate phases that illustrate the systematic graphic design workflow in depth. The nine phases are:

5. **Project initiation:** Establishing main project parameters.
6. **Orientation/Research:** Clarifying objectives and identifying design opportunities.
7. **Strategy:** Developing the overall strategy and design approach of the project and deciding on the final deliverables.
8. **Exploration:** Generating and evaluating preliminary ideas.
9. **Development:** Developing ideas and finalizing the design direction.
10. **Refinement:** Refining the design based on feedback and achieving final approval.
11. **Production:** Final production of the design and preparing materials for release.
12. **Manufacture/Launch:** Collaborate with teammates and supplies to launch the designed materials.
13. **Project Completion**: Review with the client the project outcomes, build relationships for future opportunities, archive project files, and prepare case studies as needed.

To make things simpler, Stone (2010) also divided these stages into three main categories: **understand, ideate, and execute**. The 'understand' category includes stages 1–2, 'Ideate' includes stages 3–4, and execute represents stages 7–9.

Furthermore, Bowers (2011) emphasizes the need to use divergence and convergence for problem seeking and solving as an underlying framework for graphic design work. This framework, similar to the Double Diamond design thinking model, consists of four main phases: **learning, identifying, generating, and implementing**. In the graphic design context, **'learning'** involves learning about the conditions that shape a problem before attempting to solve it. This step relies on collaboration and exchange with clients and design team members. In the **'identifying'** step, designers typically focus on discovering the purpose and goals of the project and identifying the next steps to achieve them. This includes visual audits, writing a design brief, filtering content, and presenting the information gathered. The **'generating'** step involves generating ideas that can develop into final solutions. At this stage, concept formation is important and creative directions are taking shape. This involves making thinking maps, crafting concept statements, creating sketches and drafts, performing design iterations, and reviewing and presenting the work. The final step, **'implementation,'** focuses on evaluating and refining the design solution. This may involve focus groups, usability testing, seeking feedback, conducting project assessments, and reviewing the final result.

Jenn & Ken Visocky O'Grady (2017) also highlight **that research-driven design** can help "define an audience, support a concept, advocate for an aesthetic, or measure the effectiveness of a campaign." Tools such as ethnographic studies, surveys, and questionnaires, market research, and data analytics can be used to create and communicate more effective messages. This traditional methodology is necessary in successful graphic design processes. In addition, philosophies such as **user-centered** and **human-centered design** are employed in this phase, emphasizing the graphic designer's role in assessing client needs, behaviors, context, and culture (K. Visocky O'Grady & J. Visocky O'Grady, 2017).

According to D. Ocepek (2003), graphic design is an active process where "designers employ an almost universal design process as a means by which to generate effective communications solutions". Although based on universal principles, the process of graphic design in inherently dynamic and allows designers to apply their intuition and spontaneity. To further establish an understanding of design essentials, Ocepek divided the process into six elaborate stages: **planning and preliminary negotiations, pre-visual research and analysis, visual conceptualization, comprehensive layouts and representation, graphic production, and delivery.**

Moreover, Nancy Skolos and Thomas Wedell (2012) offer a detailed investigation into the activity of graphic design and divide it into a chronological model of seven stages: **research, inspiration,**

drawing, narrative, abstraction, development, and collaboration. The beginning steps of **'research'** and **'inspiration'** progress into techniques and strategies to transform concepts and ideas in the **'drawing,' 'narrative,' 'abstraction,' and 'development'** steps. Consequently, the **'Collaboration'** stage examines the ways in which the graphic design practice is enhanced through co-creation both within and outside the field (Skolos & Wedell, 2012).

Deconstructing the Graphic Design Process

To further elaborate on the steps identified through this exploration, below is a breakdown of the graphic design process according to each stage, along with an elaboration on its guiding principles. Although the processes in this section are presented in a linear fashion, the graphic design process is non-linear, non-sequential, and iterative. Different steps can be executed in parallel or repeated in loops at any point of conducting the work.

Researching & Mapping

Understanding a project's context through research is a critical step in any design process. This process begins with studying the brief or the assignment, looking at the project's purpose, target audience, lifespan or timeline, budget, and overall objectives (Skolos & Wedell, 2012; Sherin, 2017). It is then followed by a systematic investigation of the different aspects of the design project as well as a completely picture of the target audience, competition, similar projects, and the environment where the outcome will exist. During larger design projects, this phase can take up at least a third of the time allocated for the project (Sherin, 2017).

During the information gathering or research phase, there are two primary approaches for acquiring relevant data. The first group involves experiencing, doing, and sharing, and describes learning from direct experiences. The second group involves observing, listening, and reflecting, and describes actively seeking knowledge outside of one's immediate experiences (Bowers, 2011). In extension, the dominant research forms used in graphic design include case studies, ethnographies, primary research, and experimental research (Bowers, 2011).

To foster a comprehensive understanding of the design assignment at hand, it is also important to use concept mapping and modeling during the research phase. These models can also serve as a practical and effective ways for sharing project contexts and research ideas with stakeholders involved (Skolos & Wedell, 2012). Hugh Dubberly, a design planner and teacher known for his critical thinking in contemporary design practice is a strong advocate for strategic planning and mapping in the creative process. At his firm, Dubberly Design Office (DDO), he uses mapping systems such as concept maps to explore big ideas and present research, working models to show user goals and tasks, and task-flow maps to document existing processes and services (Skolos & Wedell, 2012).

Sketching

Sketching is considered a quick prototyping tool that graphic designers can employ to communicate concepts and ideas. It can be applied on paper or on other digital programs and mediums. This stage can allow designers to visually present compelling moodboards, storyboards, mind maps, renderings, comps, and wireframes to effectively present concepts to clients and teams. Sketching is considered the most widely used form of design research practice (K. Visocky O'Grady & J. Visocky O'Grady, 2017).

Paul Rand, a pioneering graphic designer renowned for his innovative and influential design approach, always initiated his design process by impulsively making sketches and scribbling ideas to stimulate his thought process. He referred to this as a "natural urge" when trying to figure out a design solution (Heller, 2014). At this stage, visual concepts first emerge in the designer's mind and then get reflected onto paper using pencils, pens, brushes, or digital mediums. While the specifics of this process may vary among designers in terms of structure, it consistently remains one of the primary stages in a graphic designer's workflow. The sketching phase typically occurs during the early stages of the design process but involves multiple iterations at various project phases (Heller, 2014).

Sketchbooks are also an excellent tool for graphic designers to sketch and catalog thoughts. Ed Fella, an American graphic designer and educator, always used sketchbooks during his creative process with a mantra of "Execution before conception. Meaning before perception," highlighting spontaneous sketching. In this process, he intentionally turned the design process upside down where he starts with sketching and lets ideas develop as images and thoughts emerge in his mind. This ensures that the spontaneous thoughts that are often the origins of innovative solutions are effectively documented (Skolos & Wedell, 2012).

Brainstorming and Conceptualizing

The ideal brainstorming phase is an open-ended search conducted to generate and refine design solutions to a problem (Lupton, 2011; Sherin, 2017). Here, most graphic designers think in visual and spatial terms. They generate ideas by researching, seeking nature, scanning their environment, and exploring different art forms. They also use sketches, text, diagrams, and prototypes to communicate those ideas and visualize their concepts (Grear, 1993). Malcolm Grear further elaborates on how visually designers think by saying that "A designer's ideas come from all over the place—music, sound, words, memories, a space, or object that you have seen a thousand times but suddenly see differently. It may be a leaf, a bug, a flower, tree, a sewer hole cover, or a letterform made by nature." (Grear, 1993). Paul Rand also commented on the source of creativity for designers saying that it often comes from "unromantic, even unlikely sources," and is based on how experience is gathered and reacted to (Heller, 2014). Going back to idea generation methods, thinking maps, decision tress, visual matrices, and diagramming also

provide excellent means for generating ideas and approaching design solutions (Bowers, 2011). Moreover, writing can be a powerful tool used in the conceptualization phase. It is an important component of the design process that allows designers articulate ideas, record their processes, and make assessments (Bowers, 2011).

Generally, this explorative process involves multiple iterations of thinking of and documenting ideas through sketches, images, writings, or even recordings. There is less emphasis on compositional details, drawing ability, and technical skills, but there is focus on generating a large quantity of ideas that can be reviewed and filtered based on how well each idea conveys the desired message (Sherin, 2017). It is also important to note that the brainstorming and sketching phases are iterative and interwoven, and their order may vary depending on the individual's creative process and preferences. Overall, the conceptualizing phase is deeply rooted in research and founded on visual explorations and experiences that inspire designers and ignite their creativity to develop innovative design solutions.

Using Colour

Colour is a critical component in a graphic designer's workflow and can be a powerful nonverbal communication tool. Typically, after preliminary research and during visual exploration phases, decisions on the use of colour are tested (K. Visocky O'Grady & J. Visocky O'Grady, 2017). The colour palette of a design can evoke strong emotions for an audience and can be associated with social, political, and spiritual attitudes (D. Ocepek, 2003). Designers need to also consider cultural interpretations related to colour when choosing the right colour palette in order to support their design concepts and avoid negative perceptions (K. Visocky O'Grady & J. Visocky O'Grady, 2017). In application, using colour requires attention to colour mode. Print projects use a subtractive colour model known as CMYK (cyan, magenta, yellow, and black), and electronic projects use an additive colour model known as RGB (red, green, and blue) In both models, a designer should pay attention to colour hues (its appearance, values (degree of lightness or darkness), and intensity (degree of saturation or purity). In this process, designers can use a colour wheel composed of primary, secondary, and intermediate colours to create colour combinations with varying levels of contrasts that can influence the emotional ambience of the work produced (D. Ocepek, 2003).

Prototyping

Prototyping is a process that involves transitioning a design from the ideation phase to the testing stage, providing a quick and tangible way to assess a designed idea, product, or systems to elicit responses from stakeholders. Prototypes do not need to be perfect. They can be small and inexpensive representations of the design. The goal at this stage is to generate feedback from stakeholders rapidly and tangibly, and to perform multiple iterations during the process to effectively evaluate the design's validity. Ideas can be prototyped through a variety of activities

such as mock-ups, paper presentations, models, and storyboards (Design Kit, n.d.).

Using mock-ups, graphic designers can test a design's look, feel, and interaction. They can be crafted using paper or digitally to help clients explore scale, shape, surface, and hierarchy. To produce a mock-up, designers first plan it by creating and adjusting a 2-D pattern for what they wish to create. Next, they focus on creating design components such as colour, typography, and brand marks while considering where they are placed when the mock-up is folded and built. Finally, the production phase of the mock-up begins where they carefully score lines that indicate folds and cut lines that define outer edges. At this stage, designers may tape or glue to stabilize and present the final product (Lupton, 2011).

Another commonly used prototyping technique in graphic design is paper prototyping, which offers an accessible means to test interactive design experiences before the development and programming stages. This approachable, quick, and affordable process involves presenting simple or detailed sketches and compositions to clients. Overall, paper prototyping can highly influence project development and finalization as it enables designers to refine and validate their design decisions by testing them with potential users once high-fidelity compositions are complete (K. Visocky O'Grady & J. Visocky O'Grady, 2017).

Iteration

Iteration refers to the process of continuously and repeatedly refining design concepts and components to achieve the desired outcome. During this phase, designers may review, revise, and evolve their designs by creating multiple iterations or versions. This integral part of the graphic design process also allows for feedback and new insights to be incorporated in the output.

Philippe Apeloig, a French graphic designer and typographer, embraces the computer's facility for quick iteration and works back and forth between the screen, printed works, drawings and sketching, annotating, and then refining. This feedback loop supports the development of his designs and allows him to create a final design he is satisfied with (Skolos & Wedell, 2012).

Production

The production phase, highly dependent on collaboration, involves creating the finished design before delivering it to the client (Skolos & Wedell, 2012). The design at this stage should reflect feedback and any changes agreed upon with the design team and/or client. Production of the finished design will vary in form depending on whether it is for electronic or print delivery. At this stage, some visual components such as photography, illustration, and custom lettering are outsourced or commissioned from specialists. (D. Ocepek, 2003). Whether or not the designer is responsible for the creation of these visual components from start to finish, they must

supervise the production and/or follow up with suppliers and print houses to ensure that the work is completed according to the design specifications, within the budget, and on schedule (D. Ocepek, 2003; Skolos & Wedell, 2012).

Delivery

The delivery stage immediately follows the production stage and involves delivering the final designs to the client according to the agreed upon specifications. The delivery of the designs may be "an original art, a conventional mechanical, or a digital file." Here, digital deliverables must be proofed and tested before getting delivered to the client and published online. Similarly, print projects need extensive press proofing during and after the production phase (D. Ocepek, 2003).

Conclusion

Based on this research, we have established an understanding of the current state of the graphic design field in terms of the design thinking models commonly used and processes followed. The deconstruction of the graphic design process allows us to understand the complex layers that shape the practice. It is important to note that not all graphic designers choose to follow all the thinking models and/or processes identified. Some may follow them in different orders, and some may skip a few steps based on their capabilities and needs. The amount of time spent on each stage of the design process also differs based on the context and scope of each project (Sherin, 2018).

The theoretical knowledge that this primer offers will serve as a foundational guide in conducting this Major Research Project (MRP). In the next stage of this research, graphic design practitioners and experts in the field will be invited to participle in a series of interviews aiming at revealing opinions, perspectives, and expert knowledge about the utilization of AI in graphic design. Ultimately, this primer will help design experts situate their design practices and establish a shared language between the participants and the student researcher.

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Appendix C: Interview Protocol

Interview Procedure

1. Invitation and Recruitment e-mail: Selected candidates will receive an introductory e-mail inviting them to participate in this study. The e-mail will highlight the purpose of the research, the expected outcome, the selection criteria, and the next steps.

2. Informed Consent: Once candidates have accepted the invitation and the selection criteria has been met, they will receive a consent form highlighting the terms of the study and will be asked to sign and return it as soon as possible.

3. Scheduling and Pre-Interview Preparation: As participants review their informed consent, interview schedules will be arranged based on their availability and preferences. Prior to the interviews, participants will receive a confirmation email with the date, time, and a Microsoft Teams link to join the virtual meeting.

4. Online Interview: On the scheduled date and time, the interviewer and the participant will join the Microsoft Teams meeting using the provided link to conduct the interview.

5. Introduction and Informed Consent: Prior to initiating the interviews, participants will receive a clear and comprehensive explanation of the study's purpose, objectives, and the nature of their involvement. The informed consent process will ensure that participants understand their rights, the voluntary nature of their participation, the confidentiality terms, and their right to withdraw from the study at any time without penalty. Participants will be required to give explicit consent before proceeding with the interview.

6. Interview Begins: After the introduction and the informed consent is achieved, the interview process will begin. During the process, the following steps will be followed:
   a. A semi-structure approach: The interview will use a semi-structured approach with open-ended questions to encourage a discussion centered around the participant's graphic design practices in relation to the research topic.
   b. Real-Time Transcription: During the interview, the Otter AI software will be activated to provide real-time transcription of the spoken words.
   c. Active Listening: Throughout the interview, the interviewer will actively listen to the participant's responses, seeking clarifications if needed and encouraging the participant to elaborate on their thoughts and experiences. In this process, the interviewer may be asking follow up questions such as: "Can you provide an example of when this has happened in the past?" or "Could you expand more on this point."
   d. Time Management: The interviewer will be mindful of time constraints and ensure that all questions are covered within the designated interview duration.
   e. Flexibility: The interviewer will remain flexible to adapt the conversation if unexpected insights or relevant themes emerge during the discussion.

7. Transcript approval request: After the interview has been conducted, the participant will receive a copy of the transcript via e-mail and asked to review and approve it as soon as

possible. Once approved, the participant will be asked to immediately dispose of the file as per data handling terms. At this stage, participants will have one week to fully withdraw from the study, after which the analysis stage will begin, and withdrawal will no longer be possible.

8. Analysis of interview data begins: After the transcript has been approved and no request of withdrawal has been received, the analysis stage will begin. In this stage, the transcribed data will be analyzed by the researcher to draw insights, identify patterns, and address the research objectives.

9. Debriefing and Follow-up: After the research is published, participants will receive an e-mail thanking them for participating and sharing a PDF copy of the research paper as well as a link to access it on OCAD University's online repository. At this stage, they will be informed that the project is officially complete.

Interview Protocol

Introduction

Hello, my name is Habiba Elgendy, and I am a Master's student in the Strategic Foresight and Innovation program at OCAD University. This interview is for my Major Research Project, referred to as an MRP, as part of the program requirement. The goal of this project is to investigate the impact of Artificial Intelligence (AI) technologies on graphic design processes, highlighting potential benefits, challenges, and ethical considerations. The interview will take approximately 1 hour and aims to and elicit valuable insights from esteemed graphic design experts and practitioners like you. These insights will help generate an understanding of how we can navigate the intersection of AI and graphic design.

Prior to the interview, you received a consent form that you signed and returned to me. Before we start, I would like to review that consent form and ensure that you fully agree to participate in this research. By participating in this interview and research, you agree to the following:

*   The interview will be conducted and recorded on Microsoft Teams and transcribed using Otter AI software.
*   The interview will be conducted in English language only, as the primary language for conducting this research.
*   The interview recording and the signed consent form will be secured in a private folder and will not be accessible by anyone except the principal investigator, Habiba Elgendy, and the faculty supervisor, Nancy Snow. However, the interview transcript will be analyzed for the research and may be published in part or in full in the research paper and presented in academic presentations, exhibitions, conferences, colloquia, and/or publications.
*   The participant will be able to review the interview's transcript after it is conducted and asked to approve it within 3-5 days. One week after approval, the analysis stage will begin

and withdrawal will no longer be possible.
- None of the data collected from this interview will be confidential nor anonymous.
- There is no incentive or reward for participating in this interview.
- You are under no obligation to participate, and can fully withdraw at any stage prior to the final review and publishing of the research paper.
- And finally, the research will be published online on OCAD's Open Research repository, which is a digital archive managed by the University Library to collect, preserve, and distribute scholarly and creative output generated by the OCAD U community.

Now that we reviewed the consent form, do you agree to the highlighted terms? Yes/No
If yes, proceed to interview questions.
If no, the interview will end, and all collected data associated with the individual will be destroyed.

Interview Questions

10. To get started, please share a bit about your design background, and your work.
11. Prior to conducting this interview, a primer on graphic design frameworks and processes was shared with you. Are you familiar with any of the design thinking frameworks identified in the primer? If yes, which ones? If no, what other frameworks are you familiar with?
12. Do you apply any of the frameworks or graphic design processes mentioned in the primer into your work? If yes, which ones? If no, what other processes do you use?
13. How familiar are you with AI technologies in the context of graphic design? Have you had any firsthand experience using AI-powered tools or applications in your design projects? If yes, could you please share an example of how AI has influenced your design process positively or negatively?
14. Do you see a future where AI can be integrated into the design frameworks and processes highlighted in the primer? If yes, which ones?
15. The integration of AI in design raises questions about originality and authenticity. What are your thoughts on maintaining a distinct artistic voice when utilizing AI tools?
16. Do you have any concerns or ethical considerations regarding the use of AI in Graphic Design? If yes, how might we address them?
17. As AI algorithms continue to evolve and improve, they can now mimic human design styles and generate creative outputs. In this context, how do you see AI's role and impact in the future of graphic design?
18. Do you envision AI being more of a collaborative partner or a potential competitor to human designers?
19. Before we end the interview, do you have anything else you would like to share regarding the use of AI in graphic design?

Appendix D: Table of AI Tools and Applications

Disclaimer: The contents of this table were compiled using publicly available information spanning from September 2023 to April 2024. The AI tools and applications listed below are subject to potential changes such as name alterations, adjustments to pricing/payment structures, acquisitions, changes in ownership, discontinuation, or expansion of operations and functionalities.

Name	Category	Purpose	Payment Structure	Release Date	Founder/CEO	Website
AdCreative.AI	Design Tool	A tool that leverages AI to allow you to generate both visual creatives and text-based assets for your ads.	Freemium	2021	Tufan Gok and Tarik Ince	https://www.adcreative.ai/
Adobe Firefly	Design Tool and Image Generator	A web-based AI tool that provides ways to ideate, create, and communicate (Text to Image, Generative Fill, Generative Re-colour, Text Effects, and 3D to Image) while improving creative workflows using generative AI.	Freemium	March 2023	Adobe	https://firefly.adobe.com/
Ameela	Design Tool	A free logo generator that uses AI to create abstract logo designs instantly.	Free	March 2023	N/A	https://www.amee.la/
Artbreeder	Image Generator	An online platform that uses generative adversarial networks (GANs) to generate and modify images of faces, landscapes, and paintings, among other categories.	Freemium	2018	Joel Simon	https://www.artbreeder.com/
ArtroomAI	Image Generator	A tool that allows users to create new images, edit existing ones, enhance them, and improve their quality with the assistance of AI algorithms.	Freemium	2022	Artur Mamedov	https://artroom.ai/
Artsio	Image Generator	A platform to help creators discover, get inspired, and turn their thoughts into AI-generated art.	Freemium	2023	N/A	https://artsio.xyz/
Autodraw	Drawing Tool	A drawing tool that pairs machine learning with drawings from talented artists to help everyone create visuals fast.	Free	2017	Google Creative Lab	https://www.autodraw.com/
Beautiful.ai	Presentation-Building Tool	A generative AI presentation software for the workplace.	Tiered-Pricing Subscription	February 2018	Mitch Grasso	https://www.beautiful.ai/
Bubble	App Development Tool	Design, develop, and launch production-grade applications without code.	Freemium	March 2023	Emmanuel Straschnov and Josh Haas	https://bubble.io/
CandyIcons	Design Tool	A tool that allows users to create their own app icons from text in three simple steps.	Freemium			Ann Nguyen	https://www.candyicons.com/

Name	Category	Purpose	Payment Structure	Release Date	Founder/CEO	Website
Canva AI Tools	Design Tool	A set of AI-powered tools integrated into Canva that include features such as an AI image generator, a design assistant, an animation tool, a presentation-building tool, and a text generator.	Freemium	September 2022	Melanie Perkins	https://www.canva.com/
Cascadeur	Design Tool	Create realistic 3D animations, access pre-built assets and tools, learn quickly with tutorials and a user-friendly help center.	Freemium	2021	Eugene Dyabin	https://cascadeur.com/
ChatGPT	Chat Bot	A language model that enables users to refine and steer a conversation towards a desired length, format, style, level of detail, and language.	Freemium	November 2022	OpenAI – Sam Altman	https://chat.openai.com/
Civitai	Image Generator	A platform for discovering, creating, and sharing generative art.	Free	November 2022	Justin Maier	https://civitai.com/
Cleanup Pictures by Clipdrop	Image Editor	Remove unwanted objects, defects, people, or text from photos.	Freemium	2022	Jasper – Dave Rogenmoser	https://cleanup.pictures/
Clickable	Business/Marking Tool	Create brand-consistent ads, customize them for any marketing channel, and track their performance with powerful analytics.	Beta	2021	LookSmart – Michael Onghai	https://www.clickable.so/
Clipdrop	Design Tool	Create logos instantly, streamline design process, and produce professional visuals with easy-to-use AI-powered technology.	Freemium	2020	Cyril Diagne, Damien Henry, and Jonathan Blanchet	https://clipdrop.co/
Cohesive	Business/Marketing Tool	A powerful AI tool that empowers writers and collaborators to create content using an AI writer, an AI image generator, and an AI voice generator.	Freemium	April 2023	Unacademy Inc – Gaurav Munjal, Hemesh Singh, and Roman Saini	https://cohesive.so/
Colormind	Colour Palette Generator	A colour palette generator that can learn colour styles from photographs, movies, and popular art.	Free	2014	Jack Qiao	http://colormind.io/
Contlo	Business/Marketing Tool	An AI-powered marketing tool that makes it easy to manage campaigns and get insights. It enables users to create subject lines, headers, and CTAs, create text copies for email, and schedule campaigns.	Tiered-Pricing Subscription	March 2023	Ishaan Bhola and Mukunda Srinivasagowda	https://contlo.com/
Coolors	Colour Palette Generator	Generate colour palettes for all your design needs.	Freemium	2014	Fabrizio Bianchi	https://coolors.co/
Copilot (Previously known as Bing)	Chat Bot	An AI large language model designed to assist users in various tasks.	Freemium	June 2021	Microsoft	https://copilot.microsoft.com/
Copy.AI	Copywriting Tool	An AI-powered writing tool that uses machine learning to create content like blog headlines, emails, social media posts, and web copy.	Freemium	October 2020	Paul Yacoubian	https://www.copy.ai/
Craftly.ai	Copywriting Tool	A web-based AI writing platform that leverages natural language processing and machine learning to research and write original content.	Tiered-Pricing Subscription	2021	Iman Bashir	https://www.craftly.ai/

Name	Category	Purpose	Payment Structure	Release Date	Founder/CEO	Website
Craiyon	Image Generator	An online AI image generator that creates unique art from text prompts using advanced in-house developed technology.	Free	2022	N/A	https://www.craiyon.com/
Creaitor AI	Business/ Marketing Tool	Made for content producers, Creaitor offers a suite of AI tools and integrated SEO features. Streamline your content creation process and optimize your online presence with our powerful platform.	Tiered-Pricing Subscription	2023	Simon Funk and Michael McCrae	https://www.creaitor.ai/
Dall-E	Image Generator	Generates images and graphics from text.	Subscription-Based	January 2021	OpenAI – Sam Altman	https://openai.com/dall-e-3
Decktopus	Presentation-Building Tool	A presentation-building tool that uses AI to generate content.	Tiered-Pricing Subscription	March 2019	Noyan Alperen and Ugur Yigit	https://www.decktopus.com/
Deep Dream Generator	Image Generator	A tool that uses neural networks to enhance and modify images in unique and artistic ways. It can turn ordinary images into surreal, dream-like creations.	Free	2015	N/A	https://deepdreamgenerator.com/
Descript	Video Generator & Editor	Write, record, transcribe, edit, collaborate, and share your videos and podcasts using AI.	Freemium	2017	Andrew Mason	https://www.descript.com/
Design Beast	Design Tool	A multi-purpose design app that includes 6 tools in one app: a logo creator, mock-up engine, background remover, image editor, object remover and live motion tool.	One-Time Purchase	August 2021	Paul Donna and Sid Diwar	https://designbeast.io/
Designify	Image Editor	Remove backgrounds, enhance colours, adjust smart shadows, and edit images with AI-powered assistance.	Free	2021	Alex O'Brian	https://www.designify.com/
Designs AI	Design Tool	Create logos, videos, banners, and mock-ups with AI in a few minutes.	Tiered-Pricing Subscription	December 2019	Inmagine Group – Andy Sitt	https://designs.ai/
Design-stripe	Design Tool		Subscription-Based	2020	Francois Arbour	https://designstripe.com/
Diagram	UX/UI Design Tool	A platform that powers UI design through generative AI.	Freemium	2022	Acquired by Figma in 2023	https://diagram.com/
Doodle Morph App	Image Generator	An application that transforms drawings or simple doodles into photo-realistic art.	Freemium	2023	Ellisapps Inc.	https://doodlemorphai.com/
Draftbit	App Development Tool	Build mobile apps, responsive web apps, and internal tools visually and collaboratively without coding.	Freemium	2021	Brian Luerssen	https://draftbit.com/
Dreamlike.art	Image Generator	Create stunning original art in seconds with the power of AI.	Freemium	2023	N/A	https://dreamlike.art/
DreamStudio	Image Generator	Generates images and graphics from text prompts (using Stable Diffusion AI model).	Freemium	August 2022	Stability AI – Emad Mostaque	https://dreamstudio.com/
Ebsynth	Animation Tool	A tool that allows you to bring paintings to animated life using AI.	Free Beta Version	July 2019	Šárka Sochorová	https://ebsynth.com/
Exactly	Image Generator	Create images in seconds using an AI-powered tool that understands your style.	Freemium	November 2022	Tonia Samsonova	https://exactly.ai/

Name	Category	Purpose	Payment Structure	Release Date	Founder/CEO	Website
Flair	Business/ Marking Tool	Drag & drop to generate product photoshoots in seconds.	Freemium	November 2022	Antonio Cao and Mickey Friedman	https://flair.ai/
Fliki	Video Generator & Editor	An easy to use text-to-video editor featuring lifelike voiceovers, dynamic AI video clips, and a wide range of AI-powered features.	Freemium	2021	Atul Yadav and Sabir Ahmed	https://fliki.ai/
FlutterFlow	App Development Tool	Create beautiful UI, generate clean code, and deploy to the app stores or web in one click.	Freemium	2020	Abel Mengistu and Alex Greaves	https://flutterflow.io/
Fontjoy	Design Tool	A font pairing tool that can systematically sift through styles and find fonts that share key characteristics to pick the right pair for your project.	Free	2017	Jack Qiao	https://fontjoy.com/
Framer	Web Design Tool	A tool that enables users to generate their own website in seconds by leveraging the power of AI and user inputs.	Freemium	June 2023	Koen Bok and Jorn van Dijk	https://www.framer.com/
Fronty	Web Design Tool	An innovative AI-powered tool that converts images like PNG, JPG, and screenshots to clean HTML and CSS code.	Free	2019	Tigran Vardanyan	https://fronty.com/
Galileo AI	Design Tool	A text-to-UI platform that allows users to create complex designs with natural language input, generate UI designs in minutes, and edit designs with an intuitive interface.	Tiered-Pricing Subscription	2022	Atindriyo Sanyal, Vikram Chatterji, and Yash Sheth	https://www.usegalileo.ai/
Gamma	Design Tool	working presentation, document, or webpage in under a minute.	Freemium	2020	Jon Noronha and Grant Lee	https://gamma.app/
Gemini (Previously known as Bard)	Chat Bot	A large language model that can communicate and generate human-like text in response to a wide range of questions. It can interpret and respond to various types of content, including text, video, audio, and code.	Free	December 2023	Google	https://gemini.google.com/
Generative Fill in Photoshop	Design Tool	A generative AI tool powered by Adobe Firefly in Adobe Photoshop that enables you to add and remove content from images non-destructively using simple text prompts to achieve realistic results.	Subscription-Based	2023	Adobe	https://www.adobe.com/ca/products/photoshop/generative-fill.html
Generative Recolor in Illustrator	Design Tool	Instantly switch the colour palette of vector graphics using AI.	Subscription-Based	2023	Adobe	https://www.adobe.com/ca/products/illustrator/generative-recolor.html
GFPGAN	Image Editor	A web-based AI tool that upscales all kinds of images, restoring their quality and detail.	Free	2022	N/A	https://huggingface.co/spaces/Xintao/GFPGAN
Graphy	Business/ Marketing Tool	A free chart-maker tool that allows users to create polished and interactive data visualizations.	Freemium	2018	Andrey Vinitsky, Roman Sîrbu	https://graphy.app/

Name	Category	Purpose	Payment Structure	Release Date	Founder/CEO	Website
Hey Photo	Image Editor	An online photo editor that uses AI to enhance portraits. It allows users to change various aspects of their face, such as gaze direction, nose shape, skin tone, age, hair style, and emotions.	Freemium	2023	Icons8 LLC – Ivan Braun	https://hey-photo.com/
Hiding Elephant	Design Tool	An AI-powered logo design tool for professional designers.	Beta	2024	N/A	https://www.hidingelephant.com/
Huemint	Colour Palette Generator	An online tool that uses machine learning to create unique colour schemes for brands, websites, or graphics.	Free	August 2021	N/A	https://huemint.com/
HyperWrite	Copywriting Tool	A content creation tool that uses artificial intelligence and machine learning to assist in various writing tasks.	Tiered-Pricing Subscription	2022	Matthew Shumer	https://www.hyperwriteai.com/
Iconify	Design Tool	Generate icons in seconds, customize with colours and shapes, and get AI-suggested design combinations for unique icons.	Tiered-Pricing Subscription	2020	N/A	https://www.iconifyai.com/
Illostration	Image Generator	Generate custom illustrations quickly and easily.	Pay-Per-Use	N/A	N/A	https://www.illostration.com/
Illustroke	Design Tool	Create website illustrations, logos and icons in seconds using AI.	Freemium	December 2022	Phill.AI	https://illustroke.com/
Imagica	App Development Tool	A tool that allows users to create AI applications without any coding experience by describing it in plain language.	Free	2021	Brain AI	https://www.imagica.ai/
Jasper	Copywriting Tool	An AI writing tool designed to aid content creation for bloggers, marketers, and businesses.	Tiered-Pricing Subscription	February 2021	Dave Rogenmoser	https://www.jasper.ai/
Jitter	Animation Tool	A tool that enables creators and teams to easily design animated content and interfaces.	Freemium	2020	Étienne Albert and Sébastien Robaszkiewicz	https://jitter.video/
Kaiber	Video Generator	A tool that uses AI to generate videos and animations based on text prompts.	Tiered-Pricing Subscription	2023	Victor Wang and Eric Gao	https://kaiber.ai/
Khorma	Colour Palette Generator	Create limitless colour palettes to discover, search, and save.	Free Beta Version	2018	George Hastings	https://www.khroma.co/
Lalaland	Business/ Marketing Tool	An AI-powered digital model studio that allows digital designers to create and customize unique avatars and lifelike models to enrich product designs.	Free Trial, Tiered-Pricing Subscription	2019	Michael Musandu and Ugnius Rimsa	https://lalaland.ai/
Leonardo	Image Generator	Generate production-quality visual assets for creative projects with AI-driven speed and style consistency.	Freemium	2022	Ethan Smith, JJ Fiasson, and Jachin Bhasme	https://leonardo.ai/
Let's Enhance	Image Editor	A versatile image enhancer and upscaler that instantly improves image resolution, quality, and clarity with just one click.	Freemium	2018	Sofiia Shvets and Vlad Pranskevičius	https://letsenhance.io/
Logolivery	Design Tool	An AI-powered SVG logo generator.	Beta	2023	Paul Rusyn	https://logolivery.ai/

Name	Category	Purpose	Payment Structure	Release Date	Founder/CEO	Website
Logomaster	Design Tool	Create and edit logos with ease using this AI-powered tool.	Tiered-Pricing Subscription	2018	N/A	https://logomaster.ai/
Looka	Design Tool	A tool that makes it easy for ursers to brand their business by using AI to create unique and distinctive logos that convey your company style and messaging.	Freemium	November 2016	Dawson Whitfield	https://looka.com/
Lumen5	Video Generator & Editor	Create engaging video content in minutes using AI.	Tiered-Pricing Subscription	2017	Michael Cheng	https://lumen5.com/
Luny AI	UX/UI Design Tool	Generate user interfaces using AI in a variety of formats including XD, Framer, Webflow and Figma.	Freemium	2024	Yamin Gherbi	https://www.luny-ai.com/
Magic Sketchpad	Drawing Tool	An AI tool that helps finish simple drawings and sketches.	Free	2023	N/A	https://magic-sketchpad.glitch.me/
MagicBrief	Copywriting Tool	An AI-powered writing assistant that streamlines content creation by generating high-quality, professional drafts in a matter of minutes.	Paid	2022	George Howes and Dan Nolan	https://magicbrief.com/
Make-aVideo	Video Generator & Editor	An AI tool that allows users to generate videos from text.	Beta	September 2022	Meta AI	https://makeavideo.studio/
Microsoft Designer	Design Tool	Create visuals, custom logos, graphics, and artwork with intuitive design tools and a streamlined workflow using text prompts.	Free With a Microsoft Account	October 2022	Microsoft	https://designer.microsoft.com/
Midjourney	Image Generator	A text-to-picture AI service that generates images from natural language descriptions.	Tiered-Pricing Subscription	July 2022	David Holz	https://www.midjourney.com/
Modyfi	Design Tool	An online design platform that incorporates intuitive vector tooling, team collaboration, AI-driven art direction, and motion graphics.	Free	August 2023	Joseph Burfitt and Piers Cowburn	https://www.modyfi.com/
Mokker	Design Tool	Create professional product photos instantly from a single product image.	Freemium	2023	Mirko Vodegel and Nikolaus Redl	https://mokker.ai/
Munch	Video Generator & Editor	Automatic video editing, auto-caption generating, post content and publishing - all in one convenient, intuitive tool.	Tiered-Pricing Subscription	2021	Oren Kandel and Peter Naftaliev	https://www.getmunch.com/
MyHeritage	Animation Tool	Colourize, enhance, and animate still photos using AI.	Freemium	2022	Francisco Partners	https://www.myheritage.com/deep-nostalgia
Notion AI	Copywriting Tool	An AI-powered writing assistant integrated into Notion software that aims to elevate your writing experience with helpful suggestions.	Subscription-Based Add-on	November 2022	Notion Labs Inc. - Ivan Zhao	https://www.notion.so/product/ai
Nova AI	Video Generator & Editor	A web-based video editor that automatically translates and adds subtitles to video content for any platform.	Freemium	2022	Michael Maximilian Moss and Tigran Mnatsakanyan	https://wearenova.ai/
Nvidia Canvas	Drawing Tool	A tool that uses AI to turn simple brushstrokes into realistic landscape images to allow users to speed up their concept exploration and spend more time visualizing ideas.	Beta	June 2021	Jensen Huang	https://www.nvidia.com/en-us/studio/canvas/

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OpenDream	Design Tool	An innovative AI tool that enables users to generate unique and personalized images quickly.	Freemium	December 2022	N/A	
Palette	Colour Palette Generator	A web-based platform that takes in image inputs of all kinds and intelligently adds colour to them.	Freemium	November 2018	Himanshu Upreti and Somsubhra GanChoudhuri	https://palette.fm/
Patterned AI	Design Tool	Search and create thousands of royalty-free patterns for every surface with this simple AI tool.	Freemium	2020	N/A	https://www.patterned.ai/
Pebblely	Design Tool	Create mock-ups and product photos in seconds using AI.	Freemium	January 2023	Alfred Lua	https://pebblely.com/
Pi	Chat Bot	A supportive, empathetic, and intelligent conversational AI that helps users explore and understand their world, with access to fresh and factual information.	Free	March 2023	Reid Hoffman, Mustafa Suleyman and Karén Simonyan	https://pi.ai/talk
Picsart	Image Generator	Generate images in diverse styles using AI.	Freemium	2022	Artavazd Mehrabyanand and Hovhannes Avoyan	https://picsart.com/
Picso	Image Generator	A text-to-image AI art generator app & online platform for creative digital art.	Freemium	2023	N/A	https://www.picso.ai/
Pictorial	Design Tool	Automatically generate visuals, customize website appearance, and create stunning visuals effortlessly.	Pay-per-use	N/A	N/A	https://www.pictorial.ai/
Pictory	Video Generator & Editor	Create engaging AI-generated videos by taking scripts, blogs, or recordings and pulling out the core insights and highlights from them.	Tiered-Pricing Subscription	2020	Vikram Chalana, Abid Mohammed, and Vishal Chalana	https://pictory.ai/
Pika	Animation Tool	An idea-to-video platform that brings creativity to motion.	Freemium	April 2023	Chris Manning, Ron Fedkiw, Stefano Ermon, and Alexander M. Rush	https://pika.art/
Pineapple	Design Tool	An AI-powered website builder designed to make it easy for busy business owners to create professional websites. It uses AI and automation to generate website copy, design layouts, and optimize for SEO - allowing users to build an effective online presence in just minutes.	Freemium	August 2022	Lisa Hayes	https://www.pineapplebuilder.com/
Playground AI	Image Generator and Editor	A tool that offers a unique blend of real and synthetic image editing, allowing users to craft stunning artworks and photorealistic images.	Freemium	2022	Suhail Doshi	https://playgroundai.com/
Pro Photos	Image Editor	An online tool that uses AI technology to transform casual photos into professional headshots.	Tiered-Pricing Subscription	N/A	N/A	https://prophotos.ai/
Promo	Business/ Marketing Tool	Generate, schedule, and publish professional videos across platforms.	Tiered-Pricing Subscription	2018	Adam Arbolino and Giles Butler	https://promo.com/

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Prompt Hunt	Image Generator	A tool that allows users to create art using generative AI. With advanced AI model, Chroma, and a library of verified styles and templates, Prompt Hunt makes creating art easy and accessible.	Tiered-Pricing Subscription	June 2023	N/A	https://www.prompthunt.com/
Recraft	Design Tool	Create vector art, icons, digital illustrations, and 3D graphics on a powerful canvas using AI.	Freemium	2022	Anna Veronika Dorogush	https://www.recraft.ai/
Reface	Image Editor	A face-swap application that allows users to swap their faces in images and videos using AI technology.	Subscription-Based	2018	Den Dmytrenko, Dima Shvets, Ivan Altsybieiev, Kyrylo Syhyda, Oles Petriv, Roman Mogylnyi, and Yaroslav Boiko	https://reface.ai/
Remove.bg	Image Editor	A tool that removes the background of any image and takes in all kinds of image formats.	Freemium	2018	Canva (Previously Kaleido)	https://www.remove.bg/
Runway ML	Video Generator	A text-to-video generation tool.	Freemium	2018	Cristóbal Valenzuela	https://runwayml.com/
Scribble Diffusion	Image Generator	A web-based tool that allows users to turn any hand sketches into near-perfect image generations.	Free	2023	Replicate – Ben Firshman	https://scribblediffusion.com/
Simplified	Design Tool	An all-in-one, AI-powered app to help teams with content creation and marketing. Users can design, create videos, write copy, and manage social media without switching tabs.	Tiered-Pricing Subscription	2020	Koustubha Deshpande	https://simplified.com/
Sivi	Design Tool	A generative AI solution that turns prompts and content into high-quality visual designs in over 72 languages.	Freemium	2023	Ram Ganesan and Sona Janakiram	https://sivi.ai/
Sketch by Playform	Image Generator	Turn drawn sketches into finished artworks using AI.	Freemium	2022	Ahmed Elgammal	https://www.playform.io/sketch
Sketch MetaDemoLab	Animation Tool	Bring children's drawings to life by animating characters to move around using AI.	Free	2021	Meta AI	https://sketch.metademolab.com/
Sketch To Image by Clipdrop	Image Generator	Transform doodles into real images in seconds using Jasper's Clipdrop platform.	Freemium	2023	Jasper – Dave Rogenmoser	https://clipdrop.co/sketch-to-image
Sora	Video Generator	Create realistic and imaginative scenes from text instructions.	Freemium	2024	Open AI – Sam Altman	https://openai.com/sora
Spline	Design Tool	A tool that allows users to generate objects, animations, and textures using prompts.	Freemium	2020	Alejandro León	https://spline.design/ai
Stable Diffusion	Image Generator	A tool that allows users to generate images and graphics from text.	Free for up to 5 graphic per day.	August 2022	Stability AI – Emad Mostaque	www.stablediffusionweb.com
Stockimg	Image Generator	An image generator with a simple interface that helps users create images for different formats: book cover, poster, wallpaper, logo, illustration, or web UI.	Freemium	2022	Ben Bugrahan	https://stockimg.ai/

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Studio AI	Design Tool	Quickly generate modern, responsive designs, get tailored suggestions, and automate complex tasks with one press of a button.	Freemium	2023	N/A	https://studio.design/
Stunning	Web Design Tool	Craft a completely customized website tailored to your unique business needs using AI.	Freemium	2023	N/A	https://stunning.so/
Stylar	Image Generator and Editor	Effortlessly stylize images with predefined styles, control composition, and generate high-quality visuals.	Freemium	2023	Ahmed Moussa and Basil Moftah	https://www.stylar.ai/
Synthesia	Video Generator & Editor	Generate and edit videos with human presenters by simply typing in text.	Tiered-Pricing Subscription	2017	Lourdes Agapito, Matthias Niessner, Victor Riparbelli, Steffen Tjerrild	https://www.synthesia.io/
Taskade	Copywriting Tool	A tool that suggests font combinations for your website using AI.	Freemium	2017	John Xie	https://www.taskade.com/
TinyWow	Design Tool	A suite of 150+ tools designed to help solve everyday problems by leveraging AI for the creation and editing of digital files and media content.	Free	2021	Evan Gower and Andrew Becks	https://tinywow.com/
TLDR This	Copywriting Tool	An online text-summarizing tool that automatically condenses long articles, documents, essays, or papers into key summary paragraphs using AI.	Freemium	2019	Samanyou Garg	https://www.tldrthis.com/
Tome	Presentation-Building Tool	A tool that uses generative AI to help creators construct stories, presentations, or outlines from scratch, with intelligent titles, layouts, text, and graphics.	Freemium	2020	Keith Peiris and Henri Liriani,	https://tome.app/
Topaz Video AI	Video Generator & Editor	A video enhancement software that uses AI technology to upscale video resolution and enhance video quality.	One-Time-Purchase	August 2023	Albert Yang and Eric Yang	https://www.topazlabs.com/topaz-video-ai
Typedream	Design Tool	Build and launch websites in minutes using AI.	Freemium	2019	Albert Putra Purnama, Anthony Christian, Kevin Chandra, and Putri Karunia	https://typedream.com/
UiMagic	Web Design Tool	An innovative AI-driven design tool that transforms written text into visually appealing, responsive landing pages and websites.	Tiered-Pricing Subscription	2023	N/A	https://www.uimagic.io/
Uizard	UX/UI Design Tool	Design wireframes, mobile apps, mock-ups, and prototypes in minutes.	Freemium	2017	Tony Beltramelli	https://uizard.io/
Unbound	Design Tool	Generate visuals, images, and copy quickly, automate content creation, and customize content to fit any brand style and tone.	Freemium	2021	Buu Nguyen	https://www.unboundml.com/
Unscreen	Video Generator & Editor	A tool that can remove background from video without a green screen.	Pay-per-use or Subscription-based	2020	Kaleido AI GmbH (Now acquired by Canva)	https://www.unscreen.com/
UXMagic	Web Design Tool	Create user interface from plain texts in seconds using AI.	Beta	2024	Ronak Daga	https://uxmagic.ai/

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Vidnoz	Video Generator	An online video generator that enables users to create professional videos in minutes. There are over 100 AI voices, 70 video templates, 50 realistic AI avatars, and a large stock library of prepared media materials.	Freemium	September 2023	N/A	https://www.vidnoz.com/
Visily	Design Tool	Create software wireframes & prototypes from hand-drawn sketches, app screenshots, built-in templates, and text prompts.	Free	2021	Buu Nguyen	https://www.visily.ai/
Visme	Design Tool	Create presentations, design data visualizations, and access premium images effortlessly using AI.	Freemium		Payman Taei	https://www.visme.co/
Visual Electric	Image Generator	An AI image generator designed for the creative process. It moves beyond traditional chat interfaces to offer a generative canvas, allowing users to explore and develop their ideas visually.	Freemium	2023	Sequoia Capital	https://visualelectric.com/
VREW	Video Editor	An AI-powered video editing tool that simplifies the video creation process by automatically generating subtitles, making quick cuts, and providing a variety of free stock resources.	Freemium	February 2022	N/A	https://vrew.voyagerx.com/en/
Whimsical	Business/ Marketing Tool	A tool that allows users to create flowcharts, mind maps, sticky notes, and sequence diagrams in seconds.	Freemium	2023	Martin Schindler	https://whimsical.com/
Wonder Dynamics	Animation Tool	An AI tool that animates, lights, and composes CG characters into a live-action scene.	Tiered-Pricing Subscription	2022	Nikola Todorovic and Tye Sheridan	https://wonderdynamics.com/
WordTune	Copywriting Tool	An AI powered reading and writing companion capable of fixing grammatical errors, understanding context, and meaning, suggesting paraphrases or alternative writing tones, and generating written text based on context.	Freemium	October 2020	AI21 Labs	https://www.wordtune.com/
Writer	Copywriting Tool	A tool that allows users to generate full blog posts, outlines, headlines, messaging ideas, and product descriptions using AI.	Subscription-Based	February 2023	May Habib and Waseem AlShikh	https://writer.com/
Yarnit	Business/ Marketing Tool	A generative AI-powered content creation platform helping businesses to ideate, write, design, and publish personalised content.	Freemium	2023	Akash Jain and Jyotirmoy Dutta	https://www.yarnit.app/
Zarla	Web Design Tool	A web design tool that uses AI to write, design, and build a completely finished website in minutes.	Free Trial, Subscription-Based	2023	Adam Seabrook	https://www.zarla.com/
Ziflow	Business/ Marketing Tool	An online proofing software designed to improve creative workflows and manage review and approval processes on a centralized platform.	Freemium	April 2023	Anthony Welgemoed	https://www.ziflow.com/ziflow-ai

Glossary

Glossary

- **Artificial Intelligence:** Artificial Intelligence (AI) is the intelligence displayed by machines, in particular computers. It refers to their ability to mimic human cognitive functions like learning, decision-making, and problem-solving. AI systems are designed to simulate human intelligence and perform tasks autonomously, without explicit programming for each individual task.

- **ChatGPT:** ChatGPT is a conversational artificial intelligence (AI) developed by OpenAI. It is based on the GPT (Generative Pre-trained Transformer) architecture and is designed to understand and generate human-like text based on the input it receives. It has been trained on vast amounts of text data and can handle a wide range of queries, discussions, and tasks, making it useful for various applications like answering questions, assisting with tasks, generating content, and engaging in natural language conversations with users.

- **Deepfakes:** A form of synthetic media produced through AI methodologies, particularly leveraging deep learning algorithms. These algorithms possess the capability to alter or substitute pre-existing visual content, thereby presenting an individual's likeness in situations or actions they did not actually engage in.

- **Futures Wheel:** The Futures Wheel is a method for identifying and packaging primary, secondary, and tertiary consequences of trends, events, emerging issues, and future possible decisions. It is used by futurists, teachers of futures courses, corporate planners, and public policy advisors throughout the world to help identify potential problems and opportunities, and new markets, products, and services; and to assess alternative tactics and strategies (Glenn, 2021).

- **Generative AI:** Generative AI (GenAI) refers to a class of artificial intelligence algorithms and models designed to generate new data that is similar to a given set of training data. These algorithms work by learning the underlying patterns and structures of the data they are trained on and then using that knowledge to create new data.

- **Graphic Design:** Graphic Design is the process of creating and combining visual elements to convey a specific concept or story in a visually appealing and effective manner. It is created as a direct response to the visual communication needs of a client and covers a wide range of areas of communication such as advertising, signage and environmental design, packaging, social and political communications, identity systems, publication design, business communication, and digital communications (Ocepek, 2003).

- **Intellectual Property:** Intellectual property (IP) refers to creations of the mind, such as inventions, literary and artistic works, designs, symbols, names, and images used in commerce. It is a category of property that includes intangible creations of human intellect. Intellectual property rights (IPRs) are legal rights that are granted to individuals or entities over their intellectual creations.

- **Large Language Model:** A Large Language Model (LLM) is a type of artificial intelligence (AI) model that has been trained on a large dataset of text to understand and generate human-like text. These models are based on deep learning architectures, and are capable of performing a variety of natural language processing tasks.

- **Machine Learning:** A computational method that is a subfield of artificial intelligence and that enables a computer to learn to perform tasks by analyzing a large dataset without being explicitly programmed.

- **Midjourney:** Midjourney is a generative AI tool that transforms text prompts into visual art. It is created and hosted by the independent research lab Midjourney Inc, based in San Francisco, USA.

- **User-Centered Design:** An approach that prioritizes the needs, preferences, and behaviors of the end-users throughout the design process. In a user-centered design approach, designers involve users in every stage of the design process, from initial research and ideation to prototyping and testing. The goal is to create products, systems, or services that are highly usable, accessible, and satisfying for the intended users.