

Merging Artificial and Human Creativity: Co-Creation Models in the AI-Assisted Product Design Process

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Introduction

Inspiration remains one of the main elements of creativity in design it is the key to bringing in innovative ideas. Designers have been using a wide variety of sources, such as other earlier designs, natural elements, and even abstract concepts, as inspirations for their creative work. (Eckert & Stacey, 2000). The process of inspiration to be effective, especially regarding design, depends on timing, modality, and contextual relevance. From here on out, AI tools that give designers access to inspirational stimuli during that sacred window of opportunity can only help. For instance, AI-enabled platforms have been shown to facilitate multimodal searches for inspirational stimuli, thus allowing more diverse and impactful ideation pathways to take place. (Kwon et al., 2023).

The history of human-AI relations goes back a long time to humanity's ancient past when they started developing tools for reducing labor and making it more productive. From the early automata of ancient Greece to the very first programmable computers in the mid-century 20th, humans have constantly looked for machines that will perform activities rather like those of their ability. The recent technological advancements in artificial intelligence (AI) initiated a new phase in the evolution of this aspiration, which was first known at the Dartmouth Conference as such in 1956 (McCarthy et al., 2006). Early AI focused primarily on solving logical problems and automated routines. Year after year advancements allowed AI to process large datasets, recognize patterns, and even simulate decision-making processes. (Heaton, 2018). Today AI will engage more in people's lives, usually as contact centers, factories, and design. (Shi et al., 2023). This continuum shows humanity's ambition not only to create tools but also to create intelligent systems. An individual can engage in actions that spur creativity and productivity and reshape workflows and the very nature of labor. (Nasir et al., 2024).

Integrating AI into product design processes can enable new ways to generate and implement ideas. Traditionally, product design refers to a process that starts with human creativity through iterative sketching, prototyping, and brainstorming. Yet today, there are AI tools, that can complement such processes through the analysis of complex data sets, generate solution suggestions under the guidance of a human designer, and therefore can suggest changes dynamically in design. These tools affect not only the efficiency of human designers but also show the collaborative potential between humans and machines. (Rezwana & Maher, 2023). For instance, ChatGPT gives its users advantages in brainstorming sessions for generating creative ideas and assisting in concept development through natural language interactions. Its ability to

facilitate early-stage ideation and support human creativity in structured design scenarios cannot be overlooked (Filippi, 2023).

Another noteworthy AI tool is Consensus, which focuses on accessing scientific research. By allowing designers and researchers to quickly locate relevant academic papers, Consensus is an academic research tool that is powered by AI that aims to help users find peer-reviewed academic studies to analyze, and synthesize insights. (*Review: Consensus AI - An Intelligent Literature Review Companion - The Effortless Academic*, n.d.). This tool enables users to derive evidence-based insights, saving time in the decision-making process.

Additionally, Vizcom lets designers quickly go from paper to pixel by quickly converting simple drawings into fully fleshed-out visuals rather than images. With its ability to instantly convert initial sketches into detailed renderings, Vizcom can accelerate communication and iteration within design teams. (*A Beginner's Guide to Vizcom AI*, n.d.).

The use of AI tools such as MidJourney, Stable Diffusion, and DALL-E allows designers to input descriptive text prompts to produce high-quality, diverse images, providing inspiration and accelerating the ideation process. (Chen et al., 2024). Prompt engineering plays a critical role in leveraging these tools effectively, as detailed and well-structured prompts refine AI outputs to meet specific aesthetic and functional requirements. (Witteveen & Andrews, 2022).

For example, DALL-E can be effectively integrated into workflows to inspire the design process by generating reference images and expanding creative possibilities. (Liu et al., 2022). MidJourney is recognized for producing visually striking, varied concepts, making it particularly valuable in early-stage brainstorming. (YILDIRIM, 2023).

The integration of such AI tools showcases the transformative impact of artificial intelligence on the field of design. These tools are now frequently utilized in both professional and educational contexts, enhancing traditional design practices for creativity and ideation. Features like multimodal search capabilities allow designers to explore text-based and visual stimuli simultaneously, broadening their creative horizons. (Kwon et al., 2023). Furthermore, AI supports analogical reasoning by enabling designers to draw inspiration from unrelated domains. Previous research underlines the importance of external stimuli in shaping design cognition. (Eckert & Stacey, 2000), while advancements in parametric and computational tools continue to push the boundaries of creative exploration (Oxman, 2017).

The research conducted by Zhang et al., 2022 Point out that the consumer preference for AI-designed products is increasing, especially for utilitarian categories, because such designs are perceived as novel and data-driven. Their research's outcomes show that AI can play a role in design that ranges from automating repetitive tasks to offering innovative solutions that work alongside human creativity. With the ability to tap into technologies like machine learning and natural language processing, an AI system can analyze user preferences, predict trends, and make propositions for design alternatives aligned with objectives.

However, these tools also have significant weaknesses and limitations. A major issue is a dependence on high-quality prompt engineering; vague or poorly crafted prompts often lead to

subpar results, requiring multiple iterations to achieve desired outcomes (Witteveen & Andrews, 2022). Another limitation is the bias in AI training data, which can result in culturally insensitive or inaccurate outputs (YILDIRIM, 2023). Additionally, while models like MidJourney excel in aesthetics, their exaggerated visual representations may lack practicality for real-world application. DALL-E and Stable Diffusion struggle with rendering fine details and complex interactions in images, often requiring post-processing (Chen et al., 2024).

Ethical concerns around copyright and ownership of AI-generated images also persist, raising questions about accountability and fair use. (Witteveen & Andrews, 2022). The research conducted by Bartlett & Camba, 2024. Highlights ethical and legal concerns surrounding generative AI in product design education, including biases, originality, artist rights, and ownership. Generative AI tools like DALL-E and Stable Diffusion often reflect societal and cultural biases, overrepresenting specific demographics and perpetuating Eurocentric designs. The originality of AI outputs is another concern, as they may replicate training data or produce non-unique outputs, leading to potential intellectual property disputes. Moreover, the use of artists' works without consent for AI training raises ethical issues, as seen in lawsuits like Getty Images vs. Stability AI. Annotators and hidden human labor in AI processes further complicate claims of automation.

The learning curve associated with adopting AI tools can be another barrier, highlighting the need for user-friendly interfaces and comprehensive training programs. (Song et al., 2024). Furthermore, consumer perceptions of AI-designed products vary based on factors such as product type and familiarity with AI, influencing how designers approach AI integration. (H. Zhang et al., 2022).

Designers may experience cognitive overload or difficulty in contextualizing AI-generated stimuli within their design frameworks. Addressing these challenges requires the development of intuitive and user-centric AI systems that align with the cognitive processes and workflows of human designers. (Oxman, 2017).

This study aims to deepen our understanding of this collaboration by exploring the co-creative dynamics of human-AI partnerships. By investigating how AI influences inspiration, workflows, and decision-making, this research contributes to the broader discourse on the future of design practices and education.

Literature Review

To develop a comprehensive picture of how artificial intelligence (AI) impacts creativity, collaboration, and product development, a literature search was performed across multiple databases, including ACM Digital Library, ASME Digital Collection, Taylor & Francis, Wiley Online Library, and MDPI open access journal. The keywords such as “prompt engineering,” “text-to-image AI,” “human–AI co-creation,” and “AI in design.” were used for this process. Initially, 64 relevant articles were identified. After screening for engineering-focused solutions, 17 were excluded. Another 23 were excluded for concentrating on market trends or software frameworks without delving into design-related user workflows. The final selection comprised 24

papers found useful for examining how AI-based tools transform ideation, collaboration, and user experiences in design processes. These papers were classified into two categories. The first one is Prompt Engineering and Text-to-Image Generative Models and the second one is Human–AI Collaborative Design and Creativity.

Prompt Engineering and Text-to-Image Generative Models

A significant part of the literature addresses how designers interact with text-based commands to drive AI-assisted image generation. It is an important process because the output of the AI tools is significantly dependent on the inputs that are given by the users. Liu et al., 2022, introducing 3DALL-E, emphasize the challenges of integrating text-to-image capabilities into 3D workflows. Their exploratory study with 13 designers shows not only the range of use cases from reference image generation to team collaboration but also the importance of carefully crafting prompts. Also, Witteveen & Andrews, 2022 Focus specifically on Stable Diffusion and the linguistic intricacies that influence AI outputs. They discovered that nouns led to more dramatic visual changes than adjectives. Their research suggests that designers who meticulously “engineer” prompts can achieve more predictable, relevant results.

Further examining the prompt engineering domain, the work on Chen et al., 2024 Proposes a structured approach for giving effective text inputs within Stable Diffusion. This research uncovers how adjusting parameters and carefully selecting descriptors can lead to improved user satisfaction in design tasks. Likewise, Wang et al., 2023 Introduce an automated approach called RePrompt that revises text inputs to generate images with improved emotional expressiveness. These studies highlight the importance of language accuracy and complexity, which can deeply impact the quality and predictability of AI-generated images.

In broader discussions on new artificial intelligence tools, YILDIRIM, 2023 Compares Leonardo AI, MidJourney, and DALL-E as competing visionaries for future cities and mentions the potential value added to early-stage ideation through the use of AI, while cautioning about potential biases in data-driven approaches. Indeed, several works have pointed to the same bias and interpretability issues, (Song et al., 2024), which argues for hybrid methods that combine AI outputs with user-centric or domain-specific insights.

Human–AI Collaborative Design and Creativity

A second critical focus area is how AI shifts the dynamics of design collaboration. Several authors examine scenarios in which human designers work side by side with AI “partners.” For example, Shi et al., 2023 Synthesized 93 papers in a systematic literature review, identifying three main collaboration modes: AI as an assistant providing suggestions, AI as a co-creator improvising together with the designer, and AI as a tool for generating new insights from data. Their findings indicate that successful collaboration often hinges on the transparency of AI’s decision-making processes.

Xu et al., 2023 studied hybrid teams of humans and AI addressing varying design constraints. Although the performance in some of these tasks was close to that of humans, performance under

"shocks" showed that there is a dire need for better communication between AI and its human counterparts within a team. In Contrast, Song et al., 2022 found that well-structured AI support increased team agility and allowed for deeper and more thoughtful exploration of the design space. Such a finding echoes the cautionary case of G. Zhang et al., 2021, where teams of higher performance sometimes fall in performance due to AI-driven cognitive overload or misplaced trust in machine-generated suggestions.

Examining idea generation at the individual level, Filippi, 2023 Investigated the impact of ChatGPT on the diversity of ideas. While users produced more novel ideas, their usefulness and variety remained unchanged. This suggests that while AI opens up creative spaces, it is still human judgment that is necessary to select and refine final solutions. Similar conclusions can be seen in the research conducted by (Rezwana & Maher, 2023), who introduced COFI as a framework for analyzing interactions in co-creative systems. Their review of 92 existing systems highlighted underutilized modalities of two-way communication, such as collecting gestures or eye gaze, to better integrate AI recommendations with designer intuition.

On the idea of synergy between AI and human insight, Bartlett & Camba, 2024 Raise the importance of educational and ethical components in product design classes. Students must be taught to responsibly use generative AI within their workflows: to ensure originality, while harnessing speed and efficiency from AI. This supports the broader argument of big data and automation of design by Quan et al., 2023, who believed that the use of state-of-the-art AI algorithms in conjunction with traditional, user-driven design methods yields solutions that are far more contextually rich.

In Conclusion, the literature review gave important insights into how human and AI co-creation can rapidly reshape design practice and how designers can obtain more useful and coherent outputs. Researchers converge on the idea that precision in the language of prompts can significantly affect AI-generated outcomes while warning against issues such as bias, interpretability, and cognitive overload. Effective human-AI collaboration requires open lines of communication, good structures through which ideas can be teased out, and ethical considerations that preserve the authenticity and user agency. As these evolving technologies become more sophisticated, future studies are likely to focus on refining collaborative protocols and integrating advanced prompt-engineering strategies, ensuring that AI-driven innovations translate into meaningful, user-aligned design solutions.

Aim and Scope

This research aims to investigate the collaborative relationship between AI and human designers in the product design process, focusing on co-creation models where both entities contribute to design outcomes. Understanding the current use of AI tools like frequency of use, the way it is used and the benefits this use brings to designers compared to the previous traditional design process is also in the scope of this paper. The study explores the impact of AI tools on the ideation process and AI-assisted approaches, particularly in professional design contexts and among industrial designers. Participants will include a wide variation in designers; data will be collected

to show patterns, challenges, and opportunities within AI-assisted design workflows. This study aims to add to the deepened understanding of how AI might be integrated into workflows in design for creative and efficient practices and what this means for future design practice and education.

The Research question is defined considering this exploration.

- How is AI currently being used to inspire and inform product designers in various industries?

Methodology

In terms of gaining a perspective on how AI integrates with human creativity and focusing on co-creation models in product design, the mixed-methods approach is used in this research. That is why both quantitative and qualitative methods are applied. The quantitative part relies on a survey designed to capture numerical data on AI usage frequency, satisfaction levels, and perceived ease of workflow. The qualitative analysis involves semi-structured interviews to acquire a personal perspective of experiences with AI tools professionally. This approach is more general and will be able to provide a holistic view of how designers use and perceive AI in their day-to-day practices.

A Google Forms survey was designed to examine the frequency of AI tool usage, trust in AI-generated ideas, and perceived benefits and limitations of AI in product design tasks.

The survey also explores demographic details such as age, gender, and educational background to identify any patterns related to personal or professional context.

Five professional product designers participated in semi-structured interviews, conducted via Zoom, video calls, and audio-recorded with participant permission.

These conversations focus on individual experiences, drawing out reflections on AI's role in design decision-making, creativity, and workflow.

Data collected using these two methods provides multiple perspectives, allowing us to obtain statistical trends from a larger group and detailed narratives from a smaller group of individuals. This approach is used to provide a more layered understanding by highlighting both commonalities and different personal experiences.

Survey

The survey includes closed-ended items, multiple-choice questions, and a 7-point Likert scale for specific statements. These statements measure attitudes toward AI's effect on workflow, creativity, trust, and perception of AI's growing importance in the field of product design. The focus is to gather clear data about how often AI tools are used and how participants rate their overall experience of working with such tools.

Process

Participation in the survey was open to individuals with professional experience in industrial design. A total of 20 professional industrial designers responded. In this research, participants were reached through informal networking channels, including personal acquaintances and “friends of friends,” which helped find specialists who already use AI in some capacity.

The survey was conducted through Google Forms. A link to participate in the survey invitation was shared with potential respondents, briefly explaining the research scope. Participants provided voluntary consent before completing the survey. Respondents were encouraged to answer honestly and given the option to skip any question they felt uncomfortable answering. The average completion time was approximately 10 minutes.

The survey comprises two sections. In Section 2, a 7-point Likert scale is used for each statement, where:

1 = Strongly Disagree

7 = Strongly Agree

AI-Assisted Co-Design Processes Survey

Section 1

1. What is your age?
2. What is your gender?
3. What is your current level of education?
4. What is your current profession?
5. Are you currently enrolled in any educational program?
6. Which of the following AI tools do you use? (You may select more than one)
7. During which stage of the design process do you utilize AI the most?

Section 2

Please read each statement carefully and, on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree), indicate your level of agreement:

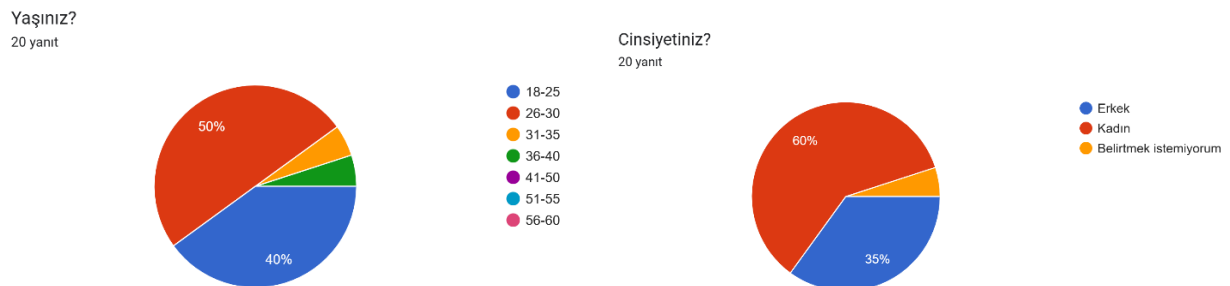
8. I use at least one AI tool in the projects I work on.
9. AI tools make my design workflow easier at multiple stages.
10. I have adapted my overall design process to better utilize AI-generated insights.
11. Ideas generated with AI regularly inspire new design concepts for me.
12. AI outputs often provide suitable and high-quality ideas.
13. AI-generated outputs are often confusing to me.
14. When comparing my ideas with AI outputs, AI often generates concepts I would not have considered.

15. I frequently use AI outputs when deciding which design concepts to develop.
16. I have produced a project based entirely on an AI-generated idea.
17. Working with AI tools expands my creativity.
18. Using AI increases the variety and originality of my design concepts.
19. Sometimes AI steers me toward specific styles or solutions, limiting my creative freedom.
20. Integrating AI has increased the speed at which I move from an idea to a finalized concept.
21. I trust the reliability and accuracy of AI-generated design suggestions.
22. Before finalizing a concept, I often validate AI-generated ideas through external research or hand sketches.
23. Using AI tools has shifted my role from being the sole creative to more of a curator of ideas.
24. Employing AI tools makes me feel more confident when presenting design concepts to colleagues or clients.
25. I believe AI will play an increasingly important role in product design in the coming years.
26. I recommend that other designers integrate AI tools into their workflows.
27. I would like to see more advanced features or improvements in AI tools to further enhance my creative process.

Outcomes

In this survey of 20 participants, 10 questions were asked to determine individuals' usage habits of AI tools and their perspectives on how these tools influence the design process. According to the responses (Figure 1), most participants are between the ages of 18–25 (40%, n=8) and 26–30 (50%, n=10), with smaller proportions in the 31–35 (5%, n=1) and 36–40 (5%, n=1) ranges. Meanwhile, 60% (n=12) identified as women, 35% (n=7) as men, and 5% (n=1) preferred not to specify their gender.

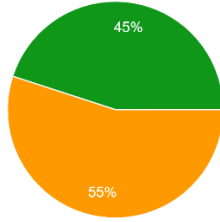
Additionally, the majority of respondents indicated a high level of educational engagement: 55% (n=11) have completed a bachelor's degree, 45% (n=9) a master's degree, and 80% (n=16) said they are currently enrolled in an educational program (Figure 2).



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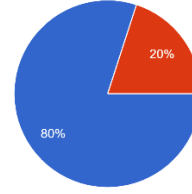
Mevcut Eğitim Durumunuz Nedir?

20 yanıt



Şu Anda Bir Eğitim Programına Devam Ediyor musunuz?

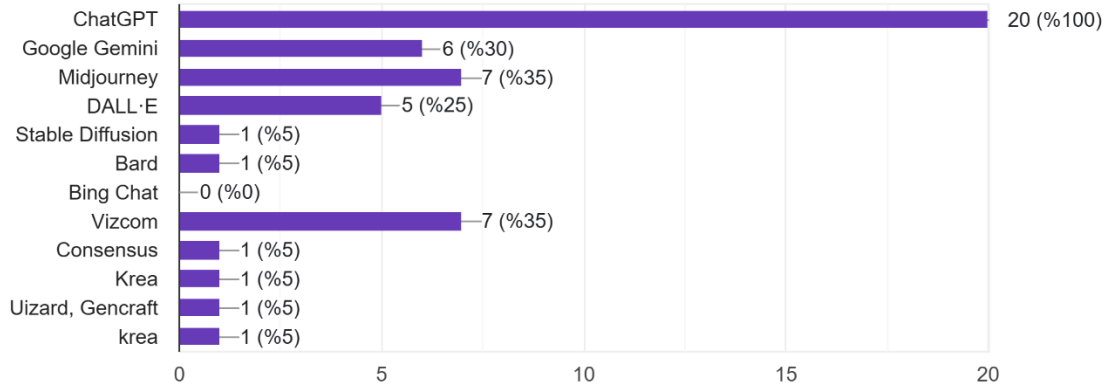
20 yanıt



When asked about the AI tools they use (Figure 3), ChatGPT was the only platform all 20 participants (100%) reported using. Other frequently mentioned applications include Midjourney (35%, n=7), Vizcom (35%, n=7), Google Gemini (30%, n=6), and DALL·E (25%, n=5). Less commonly referenced tools—each at 5% (n=1)—were Stable Diffusion, Bard, Krea, and Uizard/Gencraft, while none of the participants (0%) reported using Bing Chat.

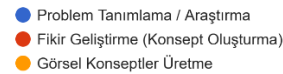
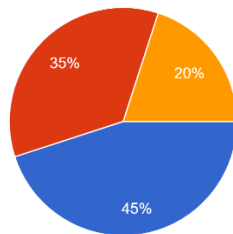
Aşağıdaki yapay zeka araçlarından hangilerini kullanıyorsunuz? Birden fazla seçenek işaretleyebilirsiniz:

20 yanıt



Tasarım sürecinde yapay zekâdan en çok bu aşamada faydalanırım.

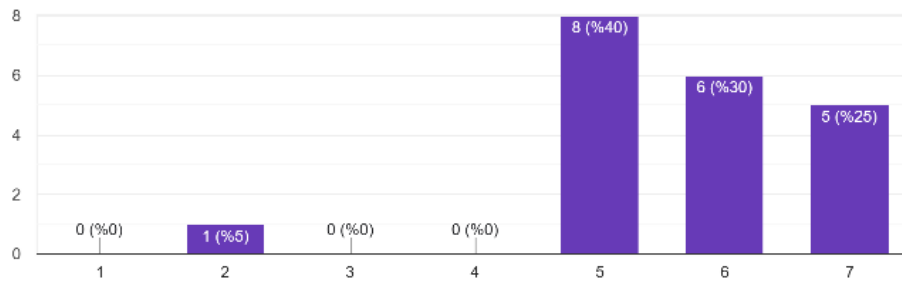
20 yanıt



Regarding the extent to which they integrate AI into their projects, most participants rated their usage between 5 and 7 on a 7-point scale: 40% (n=8) chose 5, 30% (n=6) chose 6, and 25% (n=5) chose 7.

Üzerinde çalıştığım projelerde yapay zeka araçlarından en az birini kullanırım.

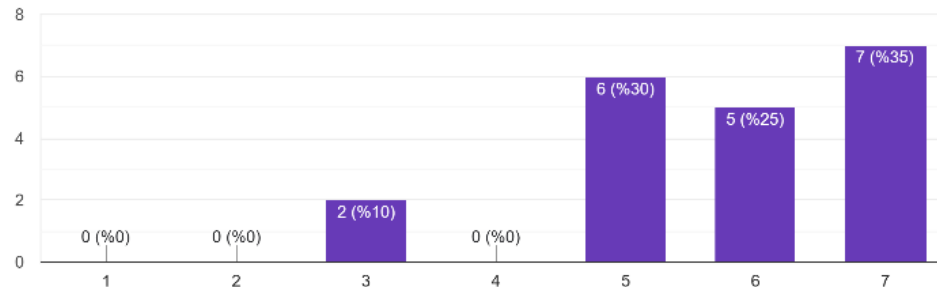
20 yanıt



A similar pattern emerged when asked if AI simplifies multiple stages of their design process, with 30% (n=6) selecting 5, 25% (n=5) selecting 6, and 35% (n=7) selecting 7.

Yapay zeka araçları, tasarım iş akışımın birden fazla aşamasında işimi kolaylaştırır.

20 yanıt

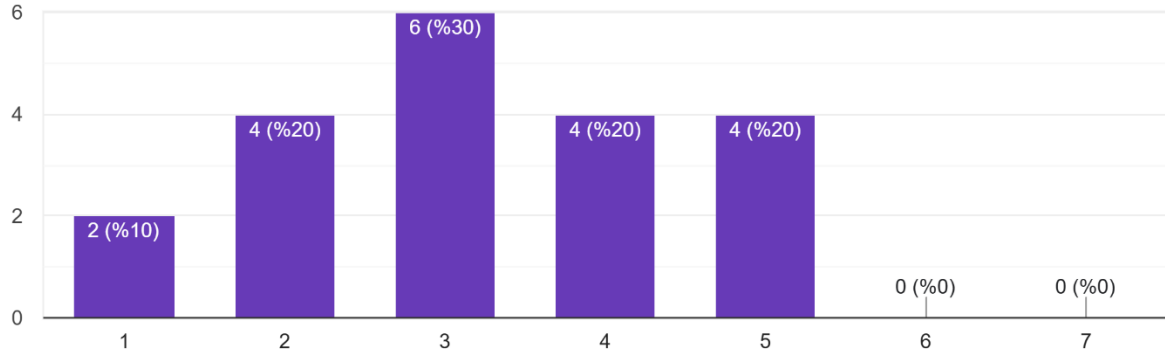


Opinions on the consistency and quality of AI outputs were more mixed (Figure 4). While some rated them favorably, 10% (n=2) gave the lowest score of 1, 20% (n=4) chose 2, and the largest share (30%, n=6) gave a moderate rating of 3. These findings suggest that although participants generally find AI tools to be useful and inspiring for their work, views on the overall quality and

reliability of AI-generated ideas vary.

Yapay zekâ çıktıları çoğu zaman uygun ve yüksek kaliteli fikirler sunar.

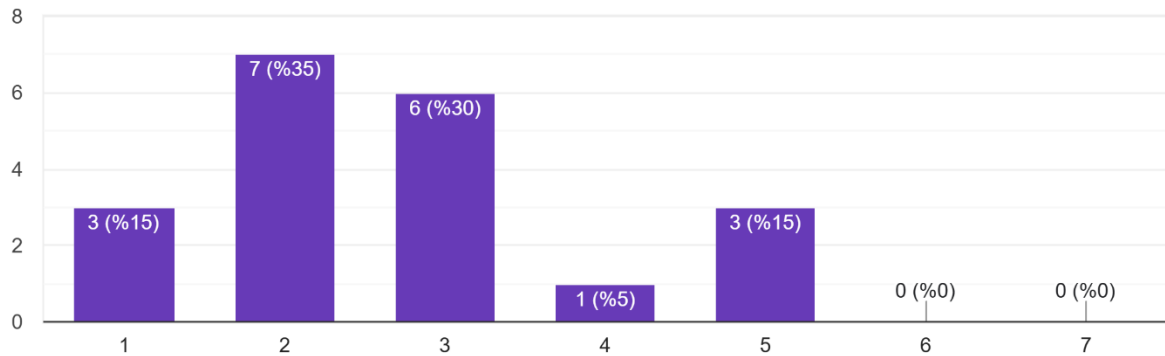
20 yanıt



According to the data, 15% (n=3) of respondents strongly disagreed that AI outputs are generally confusing, while 35% (n=7) indicated moderate disagreement. Another 30% (n=6) remained neutral, and a smaller proportion (20%, n=4) disagreed or strongly agreed (Figure 4).

Yapay zekâ tarafından üretilen çıktılar, çoğunlukla benim için kafa karıştırıcıdır.

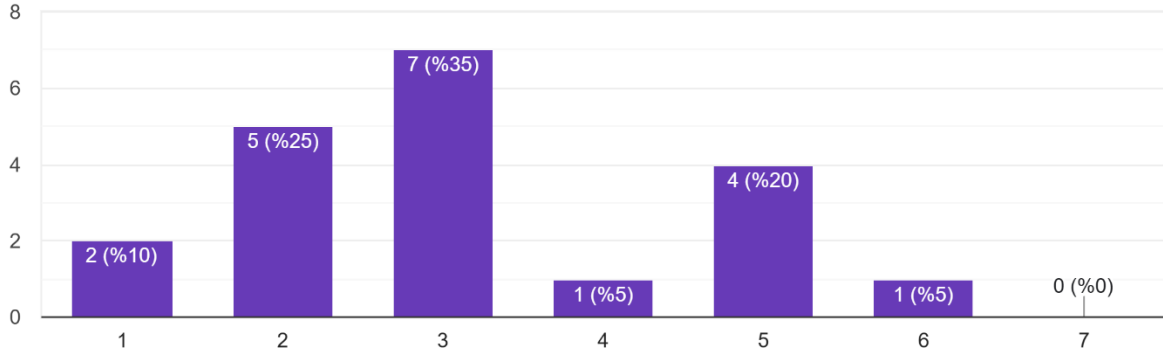
20 yanıt



It appears that many still do not consider AI an important source of novel ideas: when asked whether AI offers concepts they might not otherwise think about, 35% (n=7) leaned toward moderate disagreement, and 20% (n=4) expressed stronger disagreement (Figure 5).

Kendi fikirlerimle yapay zekâ tarafından sunulan fikirleri karşılaştırdığımda, yapay zekâ sıklıkla benim düşünmeyeceğim konseptler ortaya koyar.

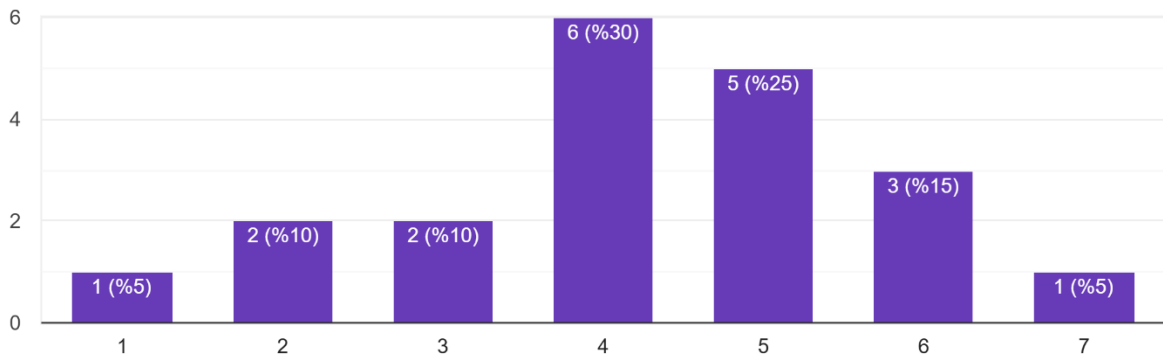
20 yanıt



Regarding the frequency of using AI outputs to shape developing design concepts, the largest share of participants rated themselves around the mid-to-high end of the scale (30%, n=6 at level 4; 25%, n=5 at level 5), suggesting that most do incorporate AI tools on a fairly regular basis (Figure 6).

Geliştireceğim tasarım konseptlerini belirlerken sıklıkla yapay zekâ çıktılarından yararlanırım.

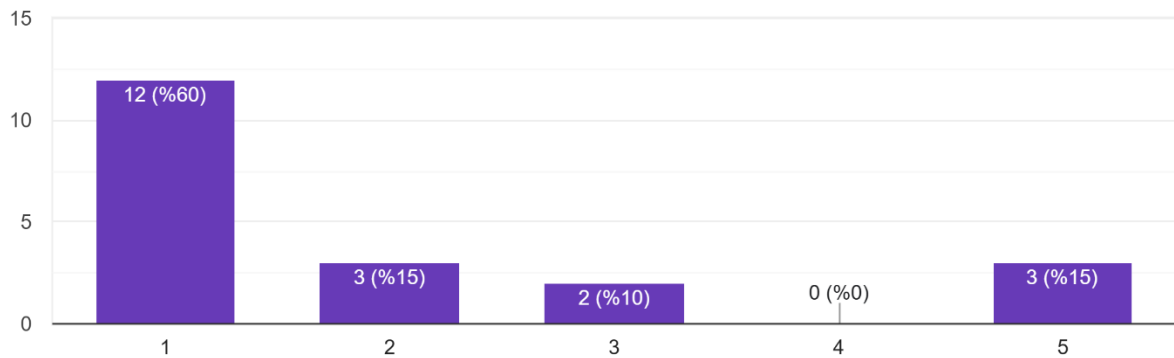
20 yanıt



However, when asked whether they had ever built a project entirely on an AI idea, 60% (n=12) strongly disagreed (Figure 7). This finding indicates that while AI is influential, it is seldom used as the sole source of inspiration.

Tamamen yapay zekâdan aldığım fikirle bir proje ortaya çıkardım.

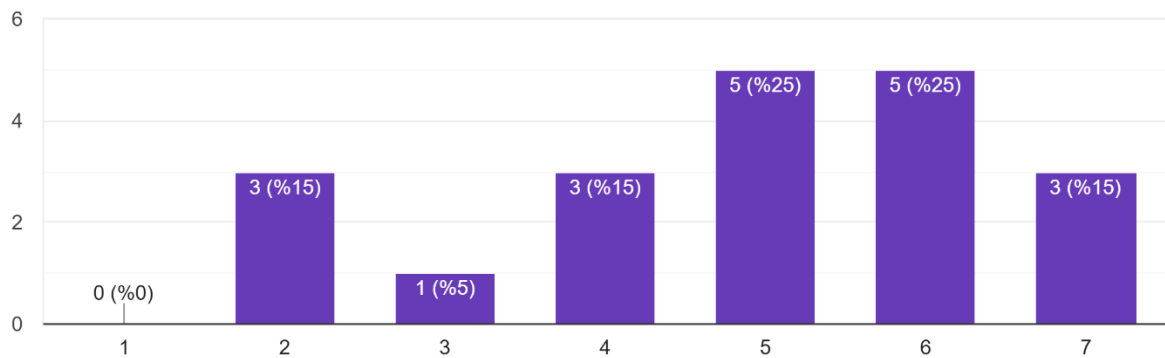
20 yanıt



Participants generally feel that AI can enhance their creativity: 25% (n=5) chose 5 and 25% (n=5) chose 6 on a 7-point scale (Figure 8), and half rated it a 5 or 6 when asked if AI increases the diversity of the concepts they produce (Figure 9).

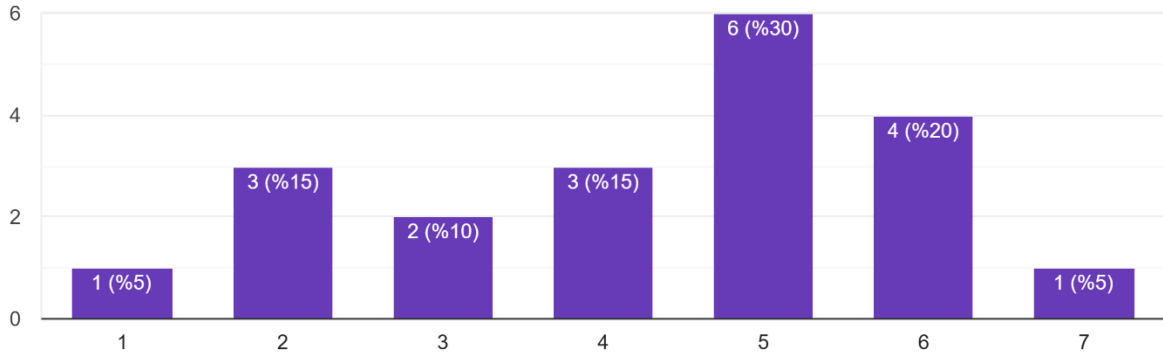
Yapay zekâ araçlarıyla çalışmak, yaratıcılığımı genişletiyor.

20 yanıt



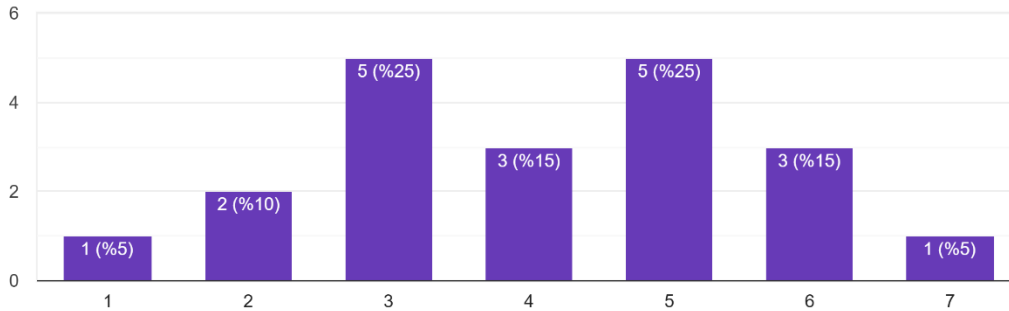
Even so, there is awareness that AI can steer designers toward certain styles or solutions: 25% (n=5) moderately agreed with this sentiment, and 15% (n=3) agreed more strongly (Figure 10).

Yapay zekâ kullanmak, ortaya çıkardığım tasarım konseptlerinin çeşitliliğini ve özgünlüğünü artırıyor.
20 yanıt



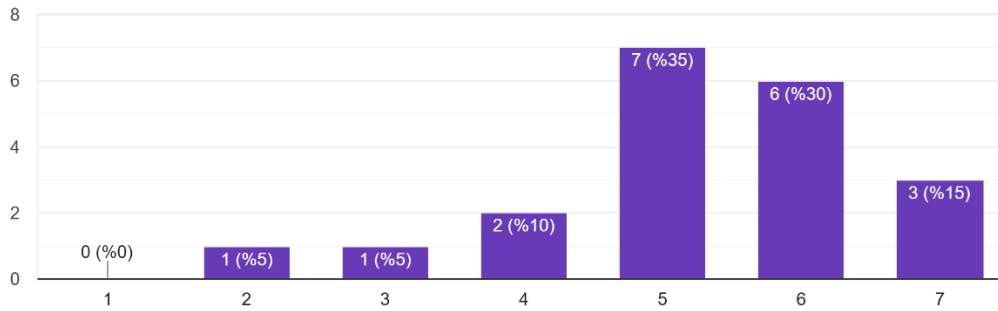
Most participants also reported that integrating AI accelerates their design workflow: 35% (n=7) indicated moderate agreement and 30% (n=6) slightly stronger agreement (Figure 11). However, trust in AI suggestions remains mixed. A quarter of respondents (25%, n=5) strongly disagreed that AI outputs are fully reliable, and another 20% (n=4) disagreed somewhat (Figure 12). Consequently, 40% (n=8) said they always validate AI concepts by external research or hand-sketching before finalizing (Figure 13), demonstrating a preference for balancing AI insights with personal expertise and additional verification steps.

Yapay zekâ bazen beni belirli stillere veya çözümlere yönlendirerek yaratıcı özgürlüğümü kısıtlıyor.
20 yanıt



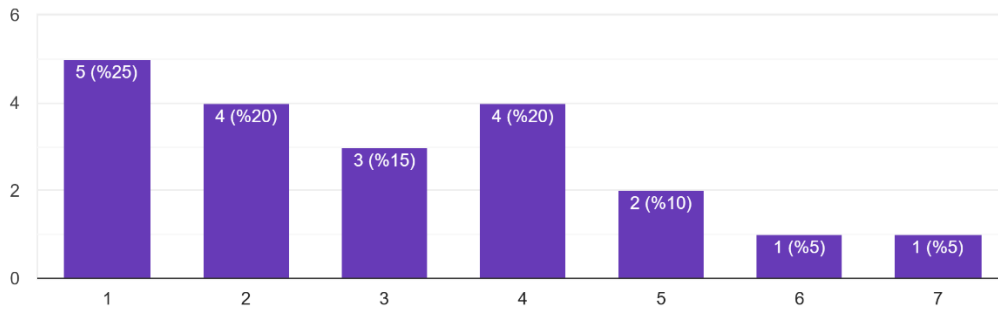
Yapay zekâyı entegre etmek, fikir aşamasından konseptte geçme hızımı artırdı.

20 yanıt



Yapay zekâ tarafından üretilen tasarım önerilerinin güvenilirliğine ve doğruluğuna inanıyorum.

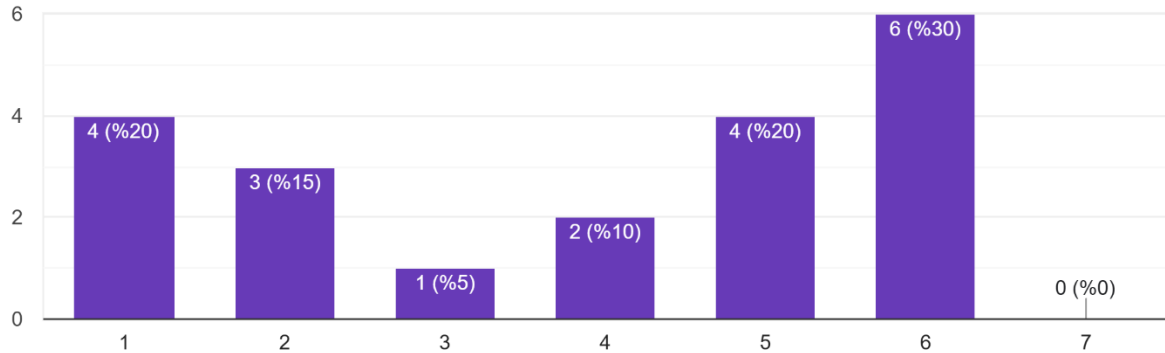
20 yanıt



According to the data, **30% (n=6)** strongly agreed that AI usage has shifted their role toward curating ideas rather than solely creating them, while **20% (n=4)** strongly disagreed (Figure 14). Another **20% (n=4)** offered moderate agreement, suggesting that views on this role change vary widely among respondents.

Yapay zekâ araçlarının kullanımı, rolümü tek başına yaratıcı olmaktan çok, fikirleri küratörlük eden birine doğru kaydırıldı.

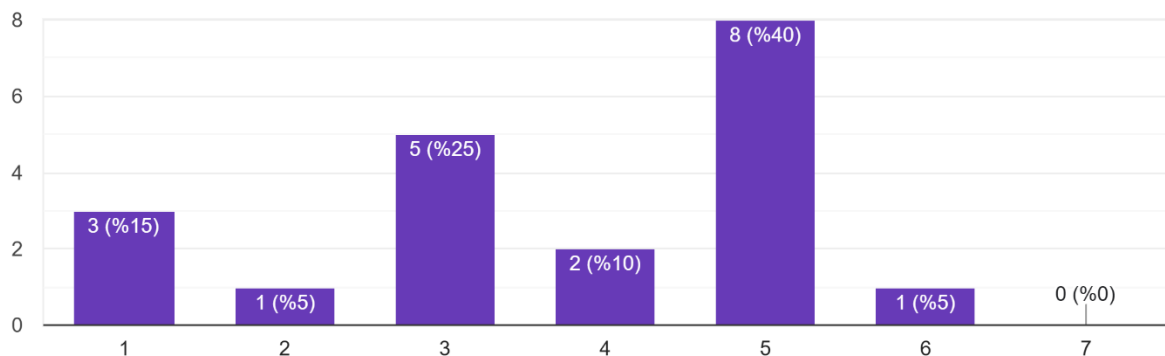
20 yanıt



When asked if using AI tools makes them feel more confident presenting design concepts to colleagues or clients, 40% (n=8) leaned toward moderate agreement, and 25% (n=5) chose a mid-range option (Figure 15). However, 15% (n=3) strongly disagreed, indicating that not everyone sees AI as a boost to their professional self-assurance.

Yapay zekâ araçlarını kullanmak, meslektaşlarıma veya müşterilerime tasarım konseptleri sunarken kendimi daha güvende hissetmemi sağlıyor.

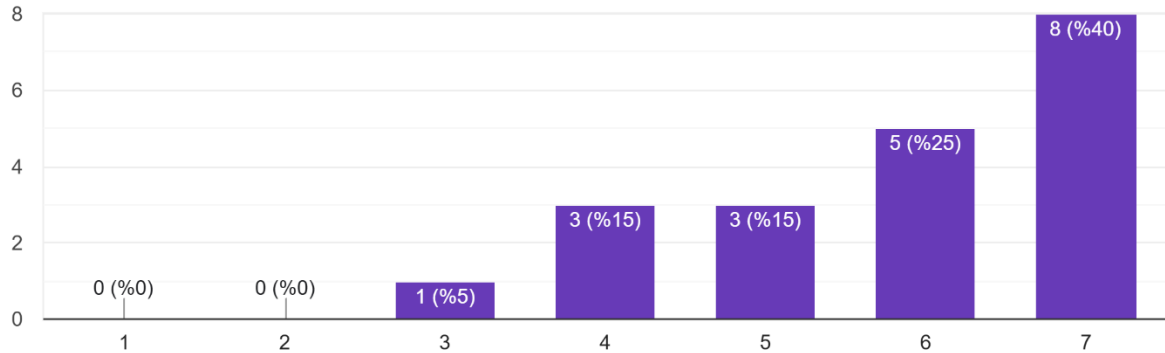
20 yanıt



Turning to the future, a majority of participants strongly believe AI will play an increasingly important role in product design. In fact, 65% (n=13) selected 6 or 7 on a 7-point scale (Figure 16). Notably, no respondents disagreed with this outlook, underscoring a widespread expectation that AI will remain a significant factor in design work.

Önümüzdeki yıllarda yapay zekânın ürün tasarımında giderek daha önemli bir rol oynayacağına inanıyorum.

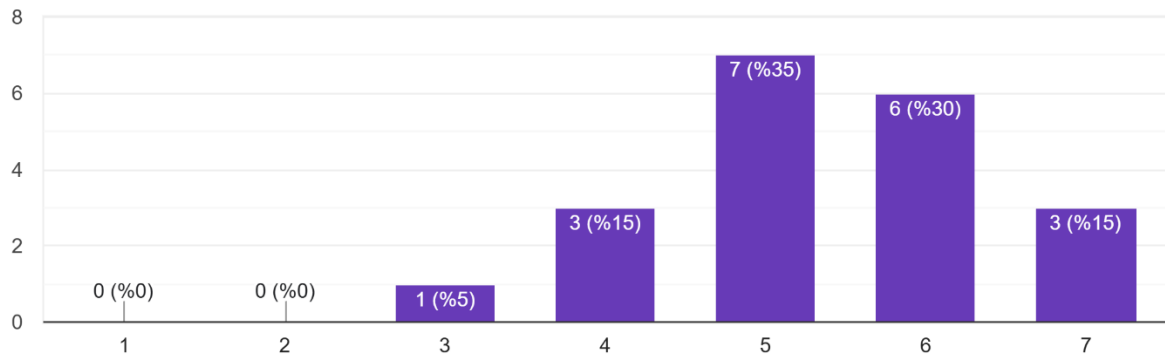
20 yanıt



Participants also showed a strong inclination to recommend AI tools to fellow designers, with 35% (n=7) selecting 5 and 30% (n=6) selecting 6 (Figure 17). Taken together, 80% rated this statement 5 or above, suggesting that the majority actively encourage others to incorporate AI into their creative workflows.

Diğer tasarımcılara da iş akışlarına yapay zekâ araçlarını dahil etmelerini öneririm.

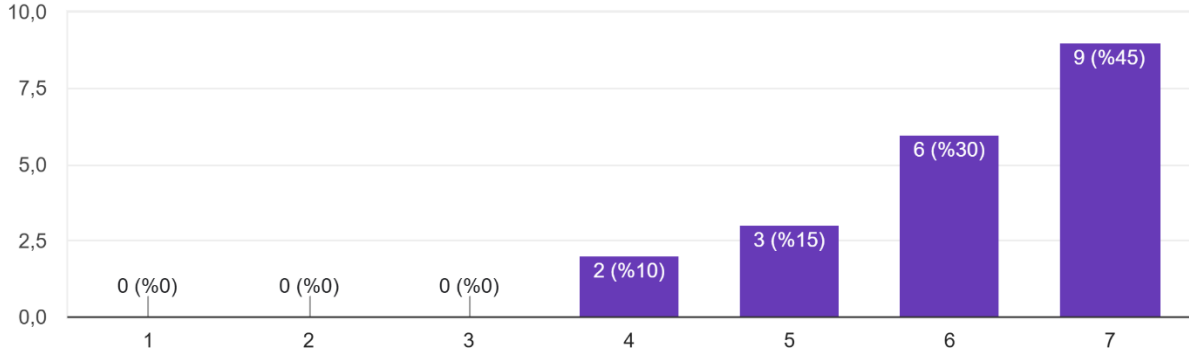
20 yanıt



Finally, when asked whether they would like to see further enhancements that support the creative process, 75% (n=15) chose 6 or 7, and no one rated below 4 (Figure 18). This finding highlights a clear desire for continued AI advancements that can more deeply aid ideation, collaboration, and overall innovation.

Yapay zekâ araçlarında yaratıcı sürecimi daha da geliştirecek daha gelişmiş özellikler veya iyileştirmeler görmek isterim.

20 yanıt



Semi-Structured Interviews

The semi-structured interview format is designed to capture personal reflections and practical accounts that might not be evident through standardized survey items. In this research, the interviews serve to unravel personal experiences.

Process

A total of five professional designers agreed to participate, recruited through personal connections and referrals. Selection criteria included a minimum of one year of experience applying AI tools within real-world product design projects. Participants were informed of the purpose of the study and provided consent before the interviews took place.

All interviews were carried out through Zoom video calls. Audio recording was done with explicit permission from each participant. In this research, a basic set of guiding questions was prepared to structure the conversation around key themes:

Perceived benefits and limitations of AI-based approaches.

How AI-generated outputs compare to traditional design methods.

Shifts in personal creative styles or workflows due to AI adoption.

Trust issues or verification steps for AI-suggested concepts.

The semi-structured nature allowed participants to expand on their thoughts, prompting follow-up questions whenever a significant point emerged. This flexibility led to a more organic discussion, while maintaining consistency across all interviews through the shared question set.

Outcomes

The outcomes of this study provide practical understanding of the current use of AI tools in the product design process, its benefits, and limitations, as reported by industrial design practitioners with diverse backgrounds and experiences.

Participants' Backgrounds

The participants in this study represented a range of professional experiences, from seasoned practitioners to those still pursuing academic education. For instance, Participant 5, a graduate student with a background in architecture and a minor in product design, emphasized their lack of professional experience, stating, “I’ve been studying in this field for five years but haven’t worked professionally.” Similarly, Participant 2, working in industrial design for a company providing mobile solutions for people with disabilities, reflected on the intersection of their academic and professional journey, noting the impact of AI on their efficiency in balancing both roles. Participant 1, on the other hand, shared their transition from academia to industry, having worked in project-based roles in various sectors, including caravans, office furniture, and white goods.

The rich backgrounds like these set a very strong foundation in analyzing the diverse applications of AI tools across both academic and professional settings. Participants’ experiences reflected the different challenges and opportunities encountered when integrating AI into design workflows at different career stages.

Integration and Utility of AI Tools in Design Process

The participants reported consistently that AI tools, such as ChatGPT and visual generation platforms like Viscom and Gencraft, are widely used for refining ideas, and accelerating workflows. For instance, one participant noted, “ChatGPT is very useful for preliminary concept research, design ideas, and detailed information” (Participant 5). Another participant commented, “I primarily use ChatGPT for generating ideas and expanding on them, or to ask questions like, ‘What do you think about this? How can it be improved?’” (Participant 1). These examples demonstrate that while AI tools are not directly replacing traditional methods, they are contributing significantly to the efficiency of specific design stages, especially in research and brainstorming.

However, the tools' limitations in creative and conceptual tasks were also discussed. Participant 4 expressed, “AI struggles significantly during idea generation and problem identification phases. It often fails to provide inspiration or meaningful insights.” This recurring observation suggests that AI is primarily perceived as a support mechanism rather than a source of original creative breakthroughs. Participant 3 further highlighted this point by saying, “AI helps me see ideas I might have missed, but its suggestions often remain surface-level and lack a holistic approach.” These responses suggest a cautious reliance on AI for inspiration, underlining its current role as a complement to human creativity rather than a substitute.

Time Efficiency and Workflow Acceleration

One of the most prominent benefits of AI tools identified by participants is their ability to save time in various design processes. Participant 4 shared, “Compared to traditional methods, the

process is much faster now... even when AI suggestions require validation, it speeds up idea filtering and offers many options quickly.” Similarly, Participant 2 noted that AI, “significantly accelerates project workflows by handling tedious and time-consuming tasks efficiently.” These reflections underscore how AI is reshaping the pace of the design process, enabling designers to focus more on iterative development and less on repetitive tasks.

Validation and Reliability Issues

The need to verify AI-generated outputs was emphasized across the interviews. Participant 5 remarked, “I always feel the need to validate AI outputs because not all online sources are reliable, and AI tools can sometimes present nonexistent sources.” Similarly, Participant 3 pointed out that “AI is not entirely reliable, and I cross-check its suggestions with other tools or manual research to ensure accuracy.” This reinforces the perception that while AI can accelerate workflows, it cannot yet replace the critical judgment of human designers, particularly in areas requiring accuracy and trustworthiness.

Impact on Professional Roles and Collaboration

While AI has not altered the role of designers, its integration has influenced how participants perceive their workflows. Participant 3 described AI as a supportive element: “I don’t feel like AI has replaced my role; I see it as an assistant that helps accelerate processes.” However, concerns about AI diminishing the perceived value of design work were noted. Participant 5 commented, “AI can make tasks appear easier than they are, leading to misconceptions that designers ‘don’t do much.’”

Future Directions

Participants expressed hope for improvements in AI tools, particularly in their ability to generate creative and original concepts. Participant 5 stated, “For AI to become more impactful in product design, its reliability needs to improve, and it should support deeper concept development.” Despite its current limitations, AI was seen as an essential tool for shaping future workflows, provided that designers continue to exercise critical oversight.

Conclusion

The integration of AI tools in the product design process represents an important evolution in how designers approach inspiration, ideation, and execution. Creativity in design often comes from diverse sources of inspiration, and AI tools offers new methods to improve this process by providing multimodal stimuli and facilitating complex searches. In tune with the evolution of human-AI interaction, the tools have grown from simple logic-based systems to sophisticated assistants where complex workflows can be handled. This research aimed to examine how human designers work together with AI by considering their uses, benefits, and limitations within professional design contexts.

The study investigated co-creation models of how AI tools are integrated into design workflows to inspire and inform designers. The research surveyed 20 professional industrial designers and

interviewed 5 participants from various educational and professional backgrounds to examine the patterns of AI use, perceived benefits, and challenges associated with such use. Tools like ChatGPT, MidJourney, Vizcom, and DALL-E were commonly used. The interviews brought depth to highlight some recurring themes: utility and its limitations, and how perceptions about the place of AI in design are shifting.

Key findings demonstrated that participants generally viewed AI tools as means of accelerating rather than replacing the designer's role in the design process. The majority of participants expressed that AI has not supplanted their roles but instead serves as an assistant that enhances efficiency and idea generation. As one participant noted, “I don’t feel like AI has replaced my role; I see it as an assistant that helps accelerate processes.” However, concerns about reliability and the depth of AI-generated outputs persist. Both survey and interview data indicate that participants often cross-check AI outputs with manual research or other sources to ensure accuracy and relevance.

Most of the participants said that the current AI tools give superficial answers and have to be engineered in terms of prompts to get more specific results. While these tools are very effective in creating initial ideas, they often lack the depth needed for detailed and holistic design solutions. Important ethical concerns, such as biases in training data and issues related to copyright and ownership, also remain.

Despite these challenges, the study found that AI tools significantly accelerate workflows by automating repetitive tasks and enabling rapid idea filtering. Trust in AI outputs remains mixed, but cautious optimism reflects an understanding of AI’s potential. This research highlights AI’s evolving role, emphasizing its use as a collaborative partner that complements human creativity rather than replacing it.

References:

1. *A Beginner’s Guide to Vizcom AI*. (n.d.). Retrieved January 12, 2025, from https://www.perplexity.ai/page/a-beginner-s-guide-to-vizcom-a-CUgDLS_oQp6vqv3CsX1qhg
2. Bartlett, K. A., & Camba, J. D. (2024). Generative Artificial Intelligence in Product Design Education: Navigating Concerns of Originality and Ethics. *International Journal of Interactive Multimedia and Artificial Intelligence*, 8(5), 55. <https://doi.org/10.9781/ijimai.2024.02.006>
3. Chen, T., Yuan, Y., & Yin, B. (2024). Application of Prompt Engineering in AIGC — Taking Stable Diffusion as an Example. *2024 4th International Conference on Machine Learning and Intelligent Systems Engineering (MLISE)*, 465–469. <https://doi.org/10.1109/MLISE62164.2024.10674412>
4. Eckert, C., & Stacey, M. (2000). Sources of inspiration: a language of design. *Design Studies*, 21(5), 523–538. [https://doi.org/10.1016/S0142-694X\(00\)00022-3](https://doi.org/10.1016/S0142-694X(00)00022-3)
5. Filippi, S. (2023). Measuring the Impact of ChatGPT on Fostering Concept Generation in Innovative Product Design. *Electronics*, 12(16), 3535. <https://doi.org/10.3390/electronics12163535>

6. Heaton, J. (2018). Ian Goodfellow, Yoshua Bengio, and Aaron Courville: Deep learning. *Genetic Programming and Evolvable Machines*, 19(1–2), 305–307. <https://doi.org/10.1007/s10710-017-9314-z>
7. Kwon, E., Rao, V., & Goucher-Lambert, K. (2023). Understanding inspiration: Insights into how designers discover inspirational stimuli using an AI-enabled platform. *Design Studies*, 88, 101202. <https://doi.org/10.1016/j.destud.2023.101202>
8. Liu, V., Vermeulen, J., Fitzmaurice, G., & Matejka, J. (2022). *3DALL-E: Integrating Text-to-Image AI in 3D Design Workflows*. 1955–1977. <https://doi.org/10.1145/3563657.3596098>
9. McCarthy, J., Minsky, M. L., Rochester, N., & Shannon, C. E. (2006). *A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence*. <https://doi.org/https://doi.org/10.1609/aimag.v27i4.1904>
10. Nasir, M. N. F., Jaapar, I., Effendi, W. M. S., Sharif, F. M., Mamat, K., & Nasir, N. F. (2024). Exploring the Role of Artificial Intelligence in the Design Industry: Client Satisfaction through Enhancing Quality while Preserving Human Creativity. *International Journal of Research and Innovation in Social Science*, VIII(IIS), 4538–4543. <https://doi.org/10.47772/IJRISS.2024.803331S>
11. Oxman, R. (2017). Thinking difference: Theories and models of parametric design thinking. *Design Studies*, 52, 4–39. <https://doi.org/10.1016/J.DESTUD.2017.06.001>
12. Quan, H., Li, S., Zeng, C., Wei, H., & Hu, J. (2023). Big Data and AI-Driven Product Design: A Survey. *Applied Sciences*, 13(16), 9433. <https://doi.org/10.3390/app13169433>
13. *Review: Consensus AI - An Intelligent Literature Review Companion - The Effortless Academic*. (n.d.). Retrieved January 12, 2025, from <https://effortlessacademic.com/consensus-ai-review-for-literature-reviews/>
14. Rezwana, J., & Maher, M. Lou. (2023). Designing Creative AI Partners with COFI: A Framework for Modeling Interaction in Human-AI Co-Creative Systems. *ACM Transactions on Computer-Human Interaction*, 30(5), 1–28. <https://doi.org/10.1145/3519026>
15. Shi, Y., Gao, T., Jiao, X., & Cao, N. (2023). Understanding Design Collaboration Between Designers and Artificial Intelligence: A Systematic Literature Review. *Proceedings of the ACM on Human-Computer Interaction*, 7(CSCW2), 1–35. <https://doi.org/10.1145/3610217>
16. Song, B., Soria Zurita, N. F., Gyory, J. T., Zhang, G., McComb, C., Cagan, J., Stump, G., Martin, J., Miller, S., Balon, C., & Yukish, M. (2022). Decoding the agility of artificial intelligence-assisted human design teams. *Design Studies*, 79, 101094. <https://doi.org/10.1016/J.DESTUD.2022.101094>
17. Song, B., Zhu, Q., & Luo, J. (2024). Human-AI collaboration by design. *Proceedings of the Design Society*, 4, 2247–2256. <https://doi.org/10.1017/pds.2024.227>
18. Wang, Y., Shen, S., & Lim, B. Y. (2023). RePrompt: Automatic Prompt Editing to Refine AI-Generative Art Towards Precise Expressions. *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*, 1–29. <https://doi.org/10.1145/3544548.3581402>
19. Witteveen, S., & Andrews, M. (2022). *Investigating Prompt Engineering in Diffusion Models*. <https://arxiv.org/abs/2211.15462v1>
20. Xu, Z., Hong, C., Soria Zurita, N. F., Gyory, J. T., Stump, G., Nolte, H., Cagan, J., & McComb, C. (2023, August 20). Adaptation and Challenges in Human-AI Partnership for the Design of Complex Engineering Systems. *Volume 3B: 49th Design Automation Conference (DAC)*. <https://doi.org/10.1115/DETC2023-115176>

21. YILDIRIM, E. (2023). COMPARATIVE ANALYSIS OF LEONARDO AI, MIDJOURNEY, AND DALL-E: AI'S PERSPECTIVE ON FUTURE CITIES. *Urbanizm*, 82–96. <https://doi.org/10.58225/urbanizm.2023-28-82-96>
22. Zhang, G., Raina, A., Cagan, J., & McComb, C. (2021). A cautionary tale about the impact of AI on human design teams. *Design Studies*, 72, 100990. <https://doi.org/10.1016/J.DESTUD.2021.100990>
23. Zhang, H., Bai, X., & Ma, Z. (2022). Consumer reactions to AI design: Exploring consumer willingness to pay for AI-designed products. *Psychology & Marketing*, 39(11), 2171–2183. <https://doi.org/10.1002/mar.21721>