

Artificial Intelligence for Designers: Enhancing Creativity and Efficiency in Design Workflows

Neha Mittal, Bhavna Ambudkar

Department of M.Tech Engg.Design ,Symbiosis Institute of Technolog ,Pune, neha.mittal.mtech2024@sitpune.edu.in
Department of Electronics & Telecommunication Engineering, Symbiosis Institute of Technology, Symbiosis International University,Pune , bhavna.ambudkar@sitpune.edu.in

Abstract: Artificial Intelligence (AI) is transforming professional design workflows by enhancing efficiency, expanding creative possibilities, and enabling co-creation between humans and machines. This study investigates AI's impact through a within-subjects experiment with 25 designers from UX/UI, graphic, and product design domains. Participants completed poster design tasks using both traditional tools and AI-augmented platforms, including Midjourney, Adobe Sensei, and Autodesk Generative Design. Results showed a 37% reduction in task time and a significant increase in the number of unique design concepts generated using AI tools. While designers reported greater satisfaction and faster ideation, many expressed concerns about diminished creative ownership and over-reliance on machine-generated suggestions. These results highlight AI's dual effects of increasing productivity and posing a challenge to design authorship. Recommendations for responsible AI integration that maintains human creativity and identity in collaborative workflows are included in the study's conclusion.

Keywords: — Artificial Intelligence, Co-Creation, Generative Design, Design Workflow, Creative Autonomy, Human-AI Collaboration

1. Introduction

Artificial intelligence (AI) has changed dramatically over the last ten years, from automating repetitive graphic tasks to becoming a creative collaborator in design workflows. What used to only help with image resizing or colour scheme adjustments now actively participates in concept generation, ideation, and optimisation. A larger trend towards AI-enabled creativity in the digital and physical design fields is reflected in the rise of "co-designers" like Midjourney, Adobe Sensei, Autodesk Generative Design, and Recraft.[1]

There is growing pressure on the professional design landscape to deliver better, faster, and more economical outcomes. The Royal College of Art and Hong Kong Polytechnic University collaborated to create platforms like Adelabu, which are democratising access to high-quality design tools in the fashion industry. According to these platforms, AI has the potential to automate up to 26% of design tasks and cut prototyping time by almost 70%, while also promoting sustainability through pre-production testing [5]. Similar patterns can be observed in graphic design, where 62% of creative professionals save roughly one workday per week as a result of AI efficiency gains, according to Adobe.

This productivity increase is not without controversy, though. Many graphic artists in China worry that AI generators are diminishing the value of expert craftsmanship, flattening distinctive styles, and decreasing client demand for human designers because AI outputs frequently lack strategic nuance and need a great deal of refinement. Similar discussions take place in typography, where professionals are concerned that algorithmic font production may favour consistency over unique style. [6]

The main question this situation raises is whether AI tools can actually increase creative output and efficiency without sacrificing designers' sense of autonomy, uniqueness, and ownership. Numerous studies suggest nuanced but promising answers. For example, generative design was emphasised by Israel Olamilekan Adeleye (2024) as a paradigm shift towards data-driven creativity [1]. Contrary to concerns about homogenisation, research indicates that AI can encourage nontraditional ideation through extensive pattern recognition [7]. However, although AI-generated



concepts can encourage creativity, they may also cause designers to follow the recommendations too closely, which can stifle originality. Sometimes people generate more ideas, but they might not be all that different from one another. Additionally, while some designers feel more creative and liberated after using AI tools, others may feel anxious or uncertain, particularly when attempting to express ideas in their own unique manner.

This essay situates itself at the nexus of these conflicting perspectives. We investigate performance across paired tasks—one carried out manually and one enhanced by AI (using Midjourney, Adobe Sensei, and Autodesk Generative Design)—through a within-subjects design involving 24 expert designers with backgrounds in UX/UI, graphic, and product design. We evaluate creative satisfaction and authorship perception qualitatively, and task duration and idea quantity quantitatively.

2. Literature Review

AI is now an active contributor to the creative process rather than just an automation tool. AI was mostly limited to repetitive tasks in traditional design workflows, such as resizing images, sorting layouts, or enhancing colour balance. Recent advances in machine learning and generative models, however, have produced tools that co-create rather than just help [8]. AI systems nowadays are able to create visual concepts, modify styles, recommend layouts, and even create full design drafts [9]. The relationship between designers and their tools is being radically altered by this change. AI tools are increasingly seen as collaborative partners rather than just assistants. In both research and practice, the idea of co-creativity—where humans and AI collaborate in a common creative space—has gained popularity [10]. The idea is to expand human creativity rather than replace it by providing fresh viewpoints, quick iterations, and design alternatives that conventional methods might overlook.

Numerous design studies have investigated the concept of AI as a co-creative agent. When designers use AI tools, they frequently find themselves in a dialogue-like process where the AI makes suggestions and the human edits, selects, or rejects them [12]. By reducing the expense of both cognitive and time-based alternative exploration, this interactive loop can improve ideation. AI systems like Runway, DALL-E, and Midjourney serve as creative catalysts in addition to increasing productivity [13]. They make it possible for designers to quickly test a variety of conceptual styles, emotional tones, and visual metaphors. This encourages divergent thinking, which is essential for innovation, and speeds up the brainstorming phase. For example, generative design has been applied to architecture to investigate structural forms that satisfy both aesthetic and functional requirements. Similar to this, AI-powered systems in graphic design can produce various iterations of interfaces, posters, and logos in a matter of seconds, opening up a more expansive and creative search space.

Generative design is one of the most significant developments in AI-powered creativity. In order to generate hundreds or thousands of design options, tools such as Autodesk Generative Design examine goals and constraints (like size, weight, materials, and performance). Particularly in the early stages of concept development, these alternatives frequently push the limits of what human designers might consider [14]. These systems are especially useful in industrial and product design. They enable designers to assess the ways in which form and function interact in diverse scenarios, promoting both aesthetically pleasing and useful innovation. Exploring various design directions can now be completed in minutes as opposed to days or weeks [15]. Additionally, agile design approaches, which emphasise frequent prototyping and testing, are well suited to this quick iteration.

Though having so many options can foster creativity, it can also lead to decision fatigue. Designers may find it difficult to select the "best" design or may fall back on tried-and-true methods if they have too many options and insufficient time to thoroughly consider each one. Notwithstanding the advantages, not everyone has embraced the incorporation of AI into creative workflows. Many designers express a feeling of ambivalence, a mixture of excitement about AI's potential and concern about how it will affect identity and creative authorship. Some people find that AI tools relieve routine and promote exploratory play [16]. For others, they raise questions about originality, such as "Did the AI come up with this idea, or is it mine?" In creative industries, where individual expression and distinctive style are highly prized, this conflict between efficiency and authenticity is particularly apparent.

Designers sometimes think AI-generated outputs lack emotional nuance or are too generic [17]. Others worry that if AI is used excessively, it could standardise aesthetics and result in visually uniform creative outputs. Not only do people fear losing their jobs, but they also fear losing the sense of fulfilment that comes from meaningful authorship, personal connection, and ownership.

Finding a balance between automation and agency is a major challenge when incorporating AI into design practice. Automation speeds up and lowers effort, but if designers blindly accept AI-generated outputs, it may unintentionally lower creative engagement [18].

According to research on human-computer interaction, users who place too much trust in automated recommendations may engage in cognitive offloading, depending too much on the system's recommendations rather than actively weighing their options [19]. In the field of design, where creativity and critical thinking are essential skills, this can be especially troublesome. Furthermore, big datasets that represent preexisting design norms and biases are used to train AI systems. They might thus ignore aesthetically varied cultures or perpetuate prevailing styles. This presents moral questions regarding inclusivity and the possibility of limiting creative diversity in the name of efficiency. Even though AI-augmented design is becoming more popular, there are still very few quantitative, empirical studies that thoroughly assess how these tools affect actual design performance [20]. Most of the literature currently in publication concentrates on technical AI system capabilities, user experiences, or conceptual frameworks. In controlled settings, very few studies systematically measure the effects of AI tools on perceived authorship, user satisfaction, task duration, and ideation quality [21].

Experimental research that compares traditional and AI-augmented workflows is necessary. How much faster, for example, can AI accomplish tasks? Does AI support lead to more ideas, and are those ideas deemed more innovative? Does working with an AI system make designers feel satisfied? To advance the field, empirical research needs to answer questions like these. By using a controlled experiment with professional designers from various fields (graphic, UX, product design), our study aims to close this gap [22]. We hope to offer evidence-based insights into how AI alters the creative process in both quantifiable results and subjective experience by comparing performance on identical design tasks completed traditionally versus with AI tools [23].

Lastly, there is a growing demand for responsible design principles as AI becomes more and more integrated into regular creative practice. This entails giving designers authority over finished products, guaranteeing transparency in the process by which AI recommendations are produced, and training experts in timely engineering and critical assessment of machine-generated concepts [24].

Designers must be given the freedom to use AI as a lens to see things differently, rather than as a quick fix to finish projects more quickly [25][24]. This means that rather than just producing polished artefacts, AI should be encouraged to act as a provocateur, questioning preconceptions and pushing boundaries.

In this sense, co-creativity should be viewed as a dynamic interaction in which both humans and machines contribute in ways that the other cannot, rather than as a 50/50 division of labor. This synergy, where machine speed, scale, and data-driven suggestion meet human intuition, cultural sensitivity, and emotional intelligence, may hold the key to the future of design.

3. Methodology

A. Participants

Twenty-five professional designers in all, representing a range of design specialities such as product design, UX/UI, and graphic design, took part in the study. In order to guarantee a wide representation across disciplines and experience levels, participants were gathered through professional networks, online communities, and recommendations. The participants' average professional experience was 5.2 years, with a range of 2 to 11 years. Eleven of the 25 participants identified as male, and 14 as female. Every participant had at least a bachelor's degree in design or a similar discipline, and then had finished graduate work in areas like interaction design, visual communication, or human-centered design.

Name	Gender	Discipline	Experience (Years)	Highest Education
Arjun Deshmukh	Male	UX/UI Design	3	B.Des.
Meera Shah	Female	Graphic Design	6	M.Des.
Tanvi Kulkarni	Female	Product Design	5	B.Des.

Rohan Patel	Male	UX Design	4	B.Des.
Divya Narayanan	Female	Graphic Design	8	M.A. in Visual Arts
Kunal Mehta	Male	Product Design	2	B.Tech. (ID)
Priyanka Sinha	Female	UX/UI Design	6	B.Des.
Neelabh Jain	Male	Visual Design	5	M.Des.
Ritu Bansal	Female	UX Research	7	M.Des. (Interaction)
Aditya Verma	Male	Graphic Design	3	B.Des.
Sneha Rao	Female	Product Design	9	M.Des.
Harshit Sharma	Male	UX/UI Design	4	B.Des.
Isha Menon	Female	Interaction Design	10	M.Des.
Vikram Anand	Male	Graphic Design	6	B.Des.
Sakshi Nair	Female	Product Design	2	B.Des.
Aniket Joshi	Male	UX/UI Design	5	M.Des.
Fatima Qureshi	Female	Visual Design	7	M.A. in Design
Rahul Iyer	Male	UX/UI Design	3	B.Des.
Ayesha Khan	Female	Graphic Design	5	B.Des.
Dhruv Mathur	Male	Product Design	6	M.Des.
Namrata Roy	Female	UX Design	11	M.Des.
Karthik Srinivasan	Male	Graphic Design	2	B.Des.
Shalini Agarwal	Female	Product Design	4	B.Des.
Rehan Malik	Male	UX/UI Design	6	B.Des.
Sanjana Thakur	Female	Visual Communication	8	M.Des.

Table:1. Participant Profiles

Informed consent was given by each participant. A nuanced understanding of how AI tools affect real-world design workflows was made possible by their varied professional and educational backgrounds.

B. Experimental Design

To assess the impact of AI on the design process, each participant was asked to complete two design tasks:

Task A – Traditional Workflow: Designers created a poster for a fictional product launch using conventional design tools such as Adobe Illustrator, without any AI assistance.

Task B – AI-Augmented Workflow: Participants recreated the same poster using AI-enhanced tools. These included:

Autodesk Generative Design is used to explore design variations, Adobe Sensei is used to make intelligent layout suggestions, and Midjourney is used to generate visual concepts [26]. The study sought to assess how traditional and AI-supported workflows differed in terms of efficiency, creativity, and user experience by comparing performance across the two tasks.

C. Data Collected

We gathered quantitative and qualitative information along four main dimensions to assess how AI is affecting the design process:

i) Time Spent on the Task Each participant's total time (measured in minutes) was recorded for both tasks, first with conventional tools and then with AI-assisted tools. This made it easier to gauge how effective AI workflows were in comparison to traditional techniques.

ii) The quantity of original design concepts During each task, participants were urged to create and present several design variations. We tallied how many unique, conceptually dissimilar posters were produced using the two workflows. This acted as a stand-in for idea generation and creative exploration.

iii) Designer Satisfaction After completing each task, participants rated their satisfaction with the design process on a 5-point Likert scale, ranging from 1 (very dissatisfied) to 5 (very satisfied). This measure helped us understand the subjective user experience when working with or without AI tools.

iv) Views on Creative Authorship We performed brief post-task interviews to investigate how AI affects designers' sense of control over their work. Participants were asked if they thought the final product was entirely their own work or if they thought the AI had helped develop the main concepts. They recorded their answers, which were then examined for recurring themes and issues.

To find notable variations between the two workflows, all gathered data was arranged and statistically examined. To find out if the observed differences were statistically significant, we used paired t-tests for quantitative metrics (time, concept count, and satisfaction) with a significance level of $\alpha = 0.05$.

We were able to record not only performance metrics but also the human experience of utilizing AI in creative design. Qualitative insights gave important context about how designers felt about co-creating with AI, while numerical data offered unambiguous indicators of efficiency and output diversity. Our findings were guaranteed to consider both the pragmatic and affective facets of the design process thanks to this comprehensive evaluation framework.

4. Results

A. Task Duration

Evaluating whether AI-assisted workflows increase design process efficiency was one of the study's main goals. Each designer's time (in minutes) to finish the poster creation task using both conventional and AI-augmented workflows was recorded for each of the 25 participants. All things considered, AI tools resulted in a discernible decrease in task completion time. Using programs like Adobe Illustrator, participants completed the traditional design task in an average of 68 minutes (SD = 9.4). The average task time decreased dramatically to 43 minutes (SD = 7.8) when utilizing AI-augmented tools like Autodesk Generative Design, Adobe Sensei, and Midjourney.

The idea that AI tools improve workflow efficiency was supported by this 37% task duration reduction, which was statistically significant ($t(24) = 12.47, p < 0.001$). The difference was not the result of random variation, as the paired t-test verified. Individual-level time data for both workflows is shown in Table 1 below. With time savings typically ranging from 16 to 35 minutes, almost all participants finished the AI-assisted task faster.

Participant	Traditional Workflow	AI-Augmented Workflow	Time Saved
Arjun Deshmukh	66	42	24
Meera Shah	72	48	24
Tanvi Kulkarni	70	44	26

Rohan Patel	64	40	24
Divya Narayanan	75	46	29
Kunal Mehta	62	39	23
Priyanka Sinha	69	45	24
Neelabh Jain	67	43	24
Ritu Bansal	73	47	26
Aditya Verma	63	38	25
Sneha Rao	76	49	27
Harshit Sharma	68	42	26
Isha Menon	74	44	30
Vikram Anand	65	41	24
Sakshi Nair	61	36	25
Aniket Joshi	66	43	23
Fatima Qureshi	71	45	26
Rahul Iyer	64	40	24
Ayesha Khan	69	44	25
Dhruv Mathur	68	41	27
Namrata Roy	77	46	31
Karthik Srinivasan	60	35	25
Shalini Agarwal	62	38	24
Rehan Malik	65	40	25
Sanjana Thakur	74	48	26

Table 2. Task Completion Time (in minutes) by Participant

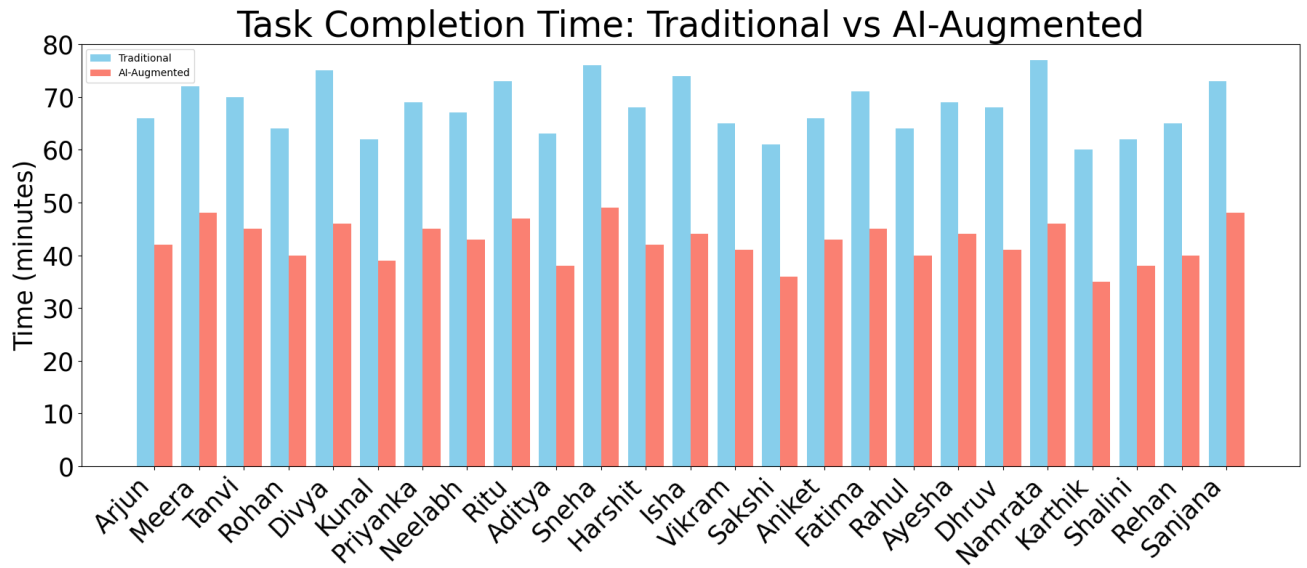


Figure-1

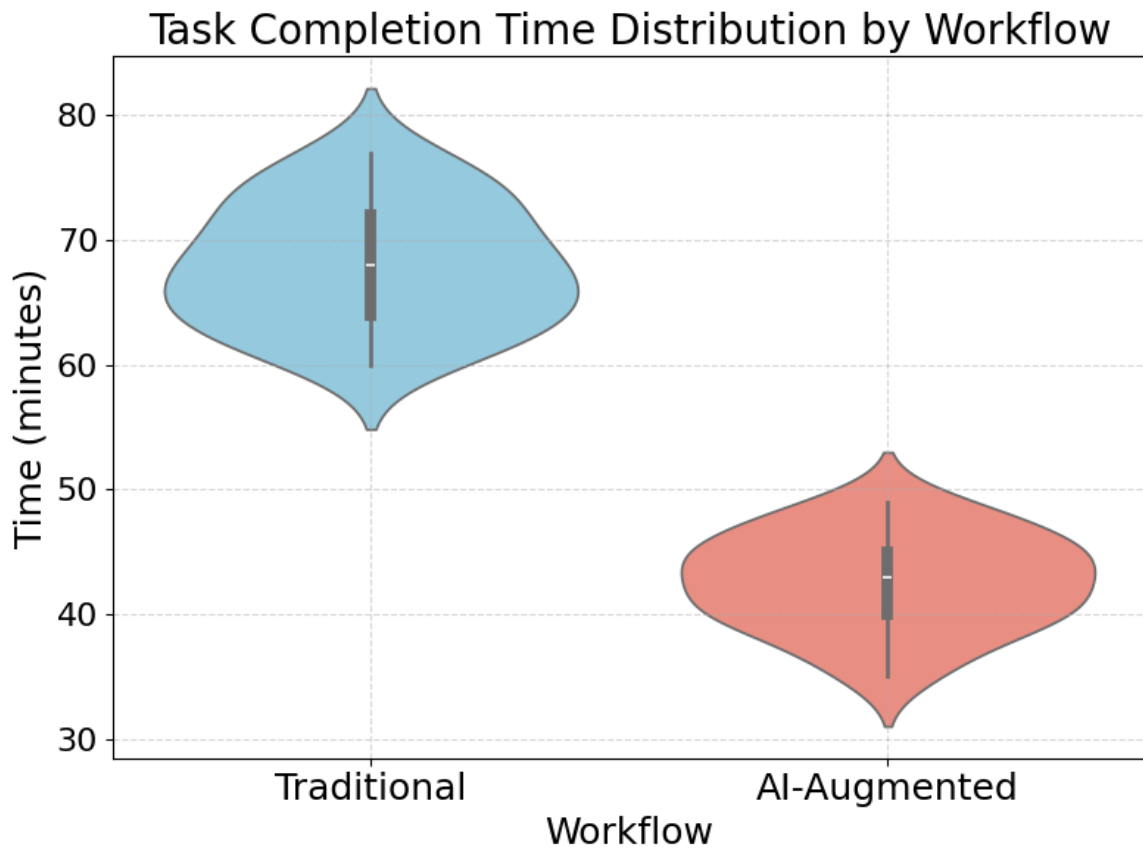


Figure-2

These results demonstrate how AI tools drastically cut down on the amount of time needed to finish creative design tasks, enabling designers to iterate and complete projects more quickly.

B. Idea Generation

We looked at how AI tools affected participants' capacity to come up with original ideas in addition to task efficiency. During the allocated time for both workflows, each designer was asked to create as many unique poster variations as they felt were important. After that, these were examined to determine how many original design concepts were created. According to the findings, using AI-augmented tools significantly increased participants' ability to generate ideas. The average number of concepts produced by each participant in the conventional workflow was 3.2 (SD = 0.9). On the other hand, the average increased to 5.9 concepts (SD = 1.3) during the AI-augmented task. This difference was statistically significant ($t(24) = 11.28, p < 0.001$), suggesting that AI tools made it possible to explore design alternatives more quickly and broadly.

Many participants reported that while generative tools like Adobe Sensei helped them iterate layouts more fluidly, generative tools like Midjourney enabled them to quickly visualise a wide range of visual styles and themes. The technical and cognitive obstacles to quick ideation were successfully removed by these tools.

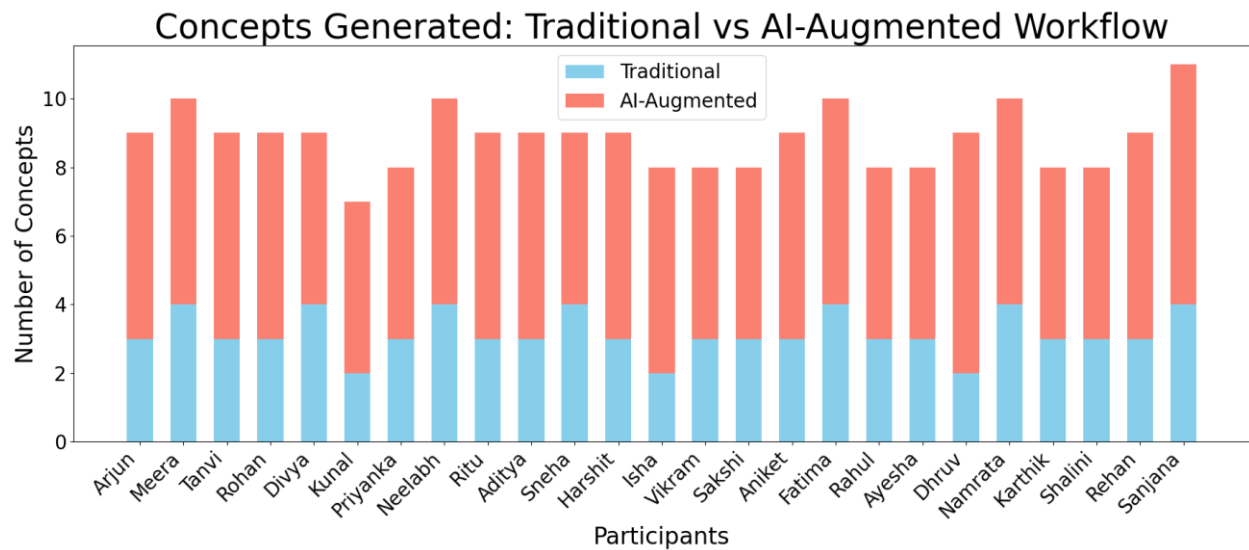


Figure:3

According to these results, AI tools can be useful ideation enhancers, pushing designers to think outside the box and take chances they might not have otherwise taken in a conventional software setting.

C. Designer Satisfaction

Participants used a 5-point Likert scale to rate their level of satisfaction with each design task (1 being extremely dissatisfied and 5 being very satisfied) in order to assess the subjective user experience. The AI-augmented workflow scored slightly higher on average, 4.3, than the traditional workflow, 3.8. This enhancement implies that the majority of participants thought the AI-assisted procedure was more efficient and pleasurable. Designers said that by avoiding routine layout or ideation bottlenecks, programs like Adobe Sensei and Midjourney allowed them to concentrate more on honing their creative direction.

Many participants said that the AI workflow was "less mentally taxing" and "more fluid," especially in the early stages of concept exploration. However, some also mentioned that depending on AI recommendations felt restrictive at times because it could influence their design choices in predictable ways. All things considered, the increased satisfaction ratings support AI's potential to improve both productivity and the creative process.

D. Creative Ownership Concerns

Concerns regarding creative authorship surfaced as a major theme despite increases in productivity and satisfaction. 61% of participants in post-task interviews voiced some degree of apprehension about the uniqueness of AI-assisted outputs and whether they could actually claim complete control over the finished design.

As one participant reflected:

“It’s fast, but sometimes it feels like the AI’s design, not mine.”

This sentiment reflects a growing conflict between retaining a unique creative signature and using AI to boost speed and inspiration. Many designers were cautious about depending too much on generative outputs, which could weaken their distinct voice or style, even though they recognised the useful benefits of AI tools. These issues highlight the necessity of carefully incorporating AI into creative processes to maintain designer control and make sure AI enhances rather than replaces human creativity.

Metric	Traditional	AI-Augmented
Avg Time (minutes)	68	43
Avg Concepts Generated	3.2	5.9
Satisfaction (out of 5)	3.8	4.3

Table:3

5. Discussion

The study's conclusions demonstrate the increasing potential of AI tools to significantly improve design workflows. Participants who used AI-augmented platforms showed definite gains in productivity and creativity across all metrics. The ability of AI to expedite early-stage design development and streamline repetitive processes was demonstrated by the average 37% reduction in task completion time.

Furthermore, when AI tools were introduced, the quantity of original design concepts almost doubled, indicating that these technologies can serve as potent ideation catalysts. AI allowed designers to explore a wider range of ideas in the same amount of time by offloading technical work and providing quick visual alternatives. This was especially useful in iterative or fast-paced design environments.

Participants expressed greater levels of creative satisfaction with the AI-assisted workflow in addition to quantifiable performance improvements. Many described the process as a change from execution-driven work to a more contemplative and exploratory experience, finding it to be more interesting and less cognitively demanding. Participants were able to concentrate more on concept shaping and less on mechanical execution as AI appeared to reduce some of the friction typically associated with design.

But there were costs associated with this increased productivity and creativity. A sizable percentage of participants voiced concerns regarding creative authorship, wondering if the machine's ideas or their own were actually reflected in the final outputs. Although useful, the speed and fluency of AI recommendations sometimes gave designers the impression that they were curating rather than creating. Important concerns concerning identity, originality, and the changing role of the designer in AI-supported contexts are brought up by this feeling of diminished ownership.

These observations align with the work of Davis et al. [1], who contend that rather than replacing human creativity, AI should be viewed as a collaborator that enhances it. Great design is still defined by human intent, intuition, and emotional depth, even though AI can surely help with option generation and layout refinement.

In the end, the study emphasises the significance of employing AI tools as tools that foster richer, more varied creative thinking rather than as quick fixes for quicker outcomes. AI must support designers rather than replace them if it is to be a real asset in the field of design.

Recommendations

Based on the findings of this study, we propose the following recommendations for effectively integrating AI into creative design workflows:

- Present AI as an exploratory tool rather than a substitute. AI should mainly be used by designers for visual exploration, quick prototyping, and idea generation. To maintain originality and intent, the human designer must make all final creative decisions.

- Preserve design procedures that keep people in the loop. Authorship, emotional nuance, and context-specific judgment—qualities that AI currently lack are preserved when human input is kept at the centre.
- Make sure AI-generated outputs are transparent. Designers ought to be able to tell the difference between their own work and elements that are produced by machines. Accountability and trust will be increased with the use of traceable outputs and transparent interfaces.
- Help designers become critically literate in AI. In order to use AI in creative tools in an efficient and responsible manner, designers need to acquire new skills like prompt engineering, tool evaluation, and ethical awareness.

6. Conclusion

According to this study, artificial intelligence (AI) holds great promise for improving professional design practices' creative output and workflow efficiency. AI tools can help designers produce high-quality work more quickly and conceptually more variedly by shortening task durations and facilitating a wider exploration of ideas. These advantages must be balanced, though, with the difficulties associated with creative authorship and design identity. Human creativity must continue to play a central role in the ideation process as AI becomes more involved. The tools designers use should empower them, not displace them.

The psychological effects of co-creating with intelligent systems, domain-specific AI applications, and long-term changes in design education and practice should be the main topics of future research. Careful integration will be essential to maintaining creativity and uniqueness as the creative sector continues to embrace AI technologies.

References

1. Adeleye IO. The Impact of Artificial Intelligence on Design: Enhancing Creativity and Efficiency. *Journal of Engineering and Applied Sciences*. 2024 Oct 11;3(1):1-3.
2. N. Davis et al., "Co-Creative Systems and Human-AI Collaboration in Design," *Design Studies*, vol. 72, pp. 100–115, 2020.
3. Autodesk, "Generative Design White Paper," Autodesk, 2023. [Online]. Available: <https://www.autodesk.com>
4. N. Bonnardel and F. Zenasni, "The Impact of Technology on Creativity in Design," *Creativity Research Journal*, vol. 22, no. 2, pp. 199–210, 2010.
5. https://www.thetimes.com/article/ai-design-tools-are-democratising-fashion-design-zfxl2fdnn?utm_source=chatgpt.com (link)
6. https://www.theverge.com/ai-artificial-intelligence/688637/typography-fonts-ai?utm_source=chatgpt.com (link)
7. Kittur, Aniket, et al. "Scaling up analogical innovation with crowds and AI." *Proceedings of the National Academy of Sciences* 116.6 (2019): 1870-1877.
8. Ghorbani, Mohammad Amin. "AI tools to support design activities and innovation processes." (2023).
9. As, Imdat, Siddharth Pal, and Prithwish Basu. "Artificial intelligence in architecture: Generating conceptual design via deep learning." *International Journal of Architectural Computing* 16.4 (2018): 306-327.
10. Lim, Jeongki. "Creative Learning Agents: Computational Co-Creativity and Relational Artifacts in Education." (2025).
11. Rezwana, Jeba. Towards designing engaging and ethical human-centered AI partners for human-AI co-creativity. Diss. The University of North Carolina at Charlotte, 2023.
12. Krysa, J., and L. Impett. "Rethinking Curating in the Age of Artificial Intelligence." (2022).
13. Khan, Ian. The quick guide to prompt engineering: Generative AI tips and tricks for ChatGPT, Bard, Dall-E, and Midjourney. John Wiley & Sons, 2024.
14. Van Velsen, Lex, Geke Ludden, and Christiane Grünloh. "The limitations of user-and human-centered design in an eHealth context and how to move beyond them." *Journal of medical Internet research* 24.10 (2022): e37341.
15. Sas, Corina, et al. "Generating implications for design through design research." *Proceedings of the SIGCHI conference on human factors in computing systems*. 2014.
16. Samuelsson, Robin. "A shape of play to come: Exploring children's play and imaginaries with robots and AI." *Computers and Education: Artificial Intelligence* 5 (2023): 100173.
17. Kalving, Matilda, Ashley Colley, and Jonna Häkkinä. "Where AI and Design Meet-Designers' Perceptions of AI Tools." *Proceedings of the 13th Nordic Conference on Human-Computer Interaction*. 2024.
18. Adeleye, Israel Olamilekan. "The Impact of Artificial Intelligence on Design: Enhancing Creativity and Efficiency." *Journal of Engineering and Applied Sciences* 3.1 (2024): 1-13.
19. Del Olmo, Félix Hernández, and Elena Gaudioso. "Evaluation of recommender systems: A new approach." *Expert Systems with Applications* 35.3 (2008): 790-804.
20. Nunamaker, Jay F., et al. "Creating high-value real-world impact through systematic programs of research." *MIS Quarterly* 41.2 (2017): 335-352.

21. Henestrosa, Angelica Lermann, Hannah Greving, and Joachim Kimmerle. "Automated journalism: The effects of AI authorship and evaluative information on the perception of a science journalism article." *Computers in Human Behavior* 138 (2023): 107445.
22. Yuwono, Elizabeth Irenne, et al. "Co-creation in action: Bridging the knowledge gap in artificial intelligence among innovation champions." *Computers and Education: Artificial Intelligence* 7 (2024): 100272.
23. Grimm, Paul W., Maura R. Grossman, and Gordon V. Cormack. "Artificial intelligence as evidence." *Nw. J. Tech. & Intell. Prop.* 19 (2021): 9.
24. Felzmann, Heike, et al. "Towards transparency by design for artificial intelligence." *Science and engineering ethics* 26.6 (2020): 3333-3361.
25. Shneiderman, Ben. "Human-centered artificial intelligence: Three fresh ideas." *AIS Transactions on Human-Computer Interaction* 12.3 (2020): 109-124.
26. Sözen, Tuğçe. *AI Tools in Design: Unveiling Their Impact on Design Thinking and Process Integration*. MS thesis. Middle East Technical University (Turkey), 2024.
27. Shafran, Alon. "THE IMPACT OF ARTIFICIAL INTELLIGENCE ON DESIGN PRACTICE." (2023).
28. Jaruga-Rozdolska, Anna. "Artificial intelligence as part of future practices in the architect's work: MidJourney generative tool as part of a process of creating an architectural form." *Architectus* 3 (71 (2022): 95-104.
29. Kärnä, Sami, and Juha-Matti Junnonen. "Designers' performance evaluation in construction projects." *Engineering, construction and architectural management* 24.1 (2017): 154-169.
30. Kärnä, Sami, and Juha-Matti Junnonen. "Designers' performance evaluation in construction projects." *Engineering, construction and architectural management* 24.1 (2017): 154-169.
31. Moultrie, James, P. John Clarkson, and David Probert. "A tool to evaluate design performance in SMEs." *International Journal of Productivity and Performance Management* 55.3/4 (2006): 184-216.
32. Sun, Han, Henry V. Burton, and Honglan Huang. "Machine learning applications for building structural design and performance assessment: State-of-the-art review." *Journal of Building Engineering* 33 (2021): 101816.
33. Shi, Yang, et al. "Understanding design collaboration between designers and artificial intelligence: A systematic literature review." *Proceedings of the ACM on Human-Computer Interaction* 7. CSCW2 (2023): 1-35.