Understanding Experiences of Architecture Students with Text-to-Image Generative AI

Şule Taşlı Pektaş[1]
[1]*OSTIM Technical University*
[1]*sule.taslipektas@ostimteknik.edu.tr*

This empirical study explores architecture students' experiences with text-to-image tools, addressing a critical gap in human-centered research on AI in design education. While students reported benefits such as accelerated production, enhanced creativity, the ability to generate visuals beyond their technical skills, and improved visual communication; they also highlighted challenges, including limited control, interpretability issues, inconsistent results, a lack of conceptual depth, and over-reliance on AI. Considering the limited body of research in this field, the findings provide valuable insights into the potentials and limitations of generative AI in architectural education and practice.

Keywords: *Generative AI, Text-to-Image Generators, Human-AI Interaction, User Experience (UX), Architectural Education.*

INTRODUCTION

Generative AI has been changing the creative sectors, including architecture (Steinfeld, 2023). However, most existing research on the subject have taken a "techno-centric perspective" (Aragon et al., 2016), with users' needs, perceptions, and experiences rarely being investigated. In order to alleviate the problem, this paper takes a human-centered approach to generative AI and presents an empirical investigation of architecture students' experiences with text-to-image tools.

This study was conceptualized on the premise that user experience evaluation of generative AI should be made with a strong focus on the context of use. Therefore, the survey was conducted in a well-defined framework in architectural education. In the research setting, a sample of architecture students worked on a domain-specific design problem using text-to-image generative AI as the design tool. The opinions of the participants of the whole process were then examined using semi-structured interviews. Interviews were recorded and transcribed. Response analysis was carried out in accordance with a well-established qualitative thematic analysis approach (Terry et al., 2017). Two trained coders aggregated the participants' responses and assessed them independently. Emerging topics were identified and discussed to reach an agreement. The thematic categories were discussed and refined iteratively until a complete consensus was attained. The resulting categories, their distributions, and illustrative statements from participants assigned to categories are presented and discussed in the paper.

The particular research questions of the study are presented below:

- What are architecture students' experiences with text-to-image generative AI in design processes?
- How do architecture students rate their preferences for AI-based, conventional, and hybrid design methods?

- What are the advantages and challenges of generative AI in design?

The structure of the paper is as follows: Section 2 provides a brief overview of text-to-image generative AI in the context of architectural design. Section 3 describes the study's research methodology, outlining the data collection and analysis procedures. Section 4 presents the key findings, and Section 5 offers a critical discussion of the results, concluding with broader implications and suggestions for future research.

TEXT-TO-IMAGE GENERATIVE AI IN ARCHITECTURE

Generative AI has seen significant advancements in recent years, particularly in machine learning applications such as text-to-image generation. These models transform textual descriptions into visuals using artificial neural networks. Text-to-image generation tools matured at an unprecedented rate during the last few years. Although their first generation emerged in the 2010s (Sohl-Dickstein et al., 2015), they attracted massive public attention after 2021 when the new tools became capable of generating complex and realistic outputs.

As in many other disciplines, text-to-image AI tools have gained increasing interest in architecture, where they are affecting both professional practice and educational approaches. As Steinfeld (2023) observed, the introduction of advanced text-to-image models in 2022 had an immediate and profound impact on "architectural visual culture, suddenly, severely, and seemingly out of nowhere." These tools are increasingly being adopted by professional architects for their ability to quickly transform textual descriptions into detailed visual representations (Autodesk, 2024). However, the scholarly discourse on their applications in architecture has not been conclusive, yet.

Emerging research has started to explore how generative AI enhances architectural design. For instance, Paananen, Oppenlaender and Visuri, (2024) examined how generative AI tools support creativity in the early stages of architectural design and found that participants considered them useful for generating design ideas and developing concepts more efficiently than traditional methods. The study's findings highlighted the importance of integrating such tools into the architectural workflow to promote innovation and facilitate the ideation process. In a related study, Horvath and Pouliou (2024) examined hybrid workflows involving text-to-text, text-to-image, and image-to-image generation in an architectural competition. Their process, structured around the stages of curation, automation, and re-curation, demonstrated that integrating multiple AI modalities enriches the creative process by expanding design possibilities.

Research on generative AI's role in architectural education has also attracted attention. Cao et al. (2024) explored the integration of AI-powered 2D-to-3D generation tools in architectural curricula, reporting strong student enthusiasm for AI, primarily due to its perceived future potential rather than its current technical capabilities. Similarly, Xu and Huang (2024) investigated the role of a text-to-image generator in architectural education, particularly its impact on design efficiency and creativity among architecture students. The authors concluded that while the use of text-to-image tool supports creativity, it has limitations in functionality which require students to integrate additional tools for a more comprehensive design approach.

Despite the rapid development of text-to-image tools and the growing interest in generative AI in architecture, research on the dynamics of human-AI interaction in architectural contexts remains limited. Understanding how designers engage with AI tools necessitates further empirical investigation. This study aims to address this gap by examining human-AI interaction in architectural education, with a focus on user experience. By analyzing how architecture students utilize generative AI in real-world design scenarios, this research seeks to provide critical insights into the opportunities and challenges posed by AI-enhanced creative processes.

RESEARCH DESIGN AND METHODOLOGICAL APPROACH

Study Setting and Sample

This study was conducted with students enrolled in the Information Technology in Architecture course at OSTIM Technical University. The research took place within the framework of a workshop integrated into the course curriculum. A total of 30 students participated in the workshop, and 26 students (15 females and 11 males) completed all assessments and their responses included in the final analysis. Participants' ages ranged from 21 to 23, with a mean age of 22 (SD = 0.89). All participants reported prior experience with text-to-image generation tools, having used such tools in at least one previous project.

Data Collection Procedures

Data were collected over the course of a three-week workshop designed to explore the application of generative AI in the early phases of the design process. The task required participants to create a mood board for design of a café specializing in a specific food or drink of their choice. A mood board is a two-dimensional visual composition, or "collage," that incorporates images, text, and sample materials to visually communicate design ideas and concepts. Mood boards are widely used across various design disciplines, including architectural design, interior design, fashion, graphic design, product design, web design, and advertising, due to their utility in supporting conceptual development and idea generation.

The Magic Media text-to-image generator within the Canva platform was utilized in the workshop. Canva is a widely used, user-friendly online graphic design tool familiar to all participants, as it had been previously used by all participants in at least one other project. Magic Media was specifically chosen because it operates within Canva's environment, allowing users to modify and refine AI-generated outputs directly within the platform. Canva's suite of customization and post-processing tools enables users to edit images by adjusting colors, applying filters, cropping, and layering visuals without exporting them to external software. This seamless integration allowed participants to either use the AI-generated outputs as they were or post-process and refine them using Canva's editing tools, thus providing the flexibility necessary for the study's investigation.

Semi-structured interviews were conducted in order to provide answers to the research questions. Before the interviews, the students were asked to answer questions on participant demographics and preferences for AI-based, conventional, and hybrid design methods. These interviews aimed to gather deeper insights into participants' perceptions of text-to-image generative AI tools. Specific focus was placed on the perceived advantages and challenges of using such tools in the design process. Responses from the 26 participants were complete and included in the quantitative analysis. All interviews were recorded, transcribed, and analyzed using thematic analysis, following the established procedure outlined by Terry et al. (2017). Two trained coders independently analyzed the interview data and identified emerging themes. The thematic categories were iteratively refined and discussed until full consensus was reached. The findings of this analysis are presented in the subsequent sections.

Figure 1
Example mood board designs produced in the workshop

FINDINGS

Architecture Students' Preferences for AI-based, Conventional, and Hybrid Design Methods

In order to understand students' design preferences, participants were asked to rank AI-based, conventional, and hybrid design methods according to their perceived effectiveness and suitability for design processes. The results, summarized in Table 1, reveal a clear preference for hybrid methods, which integrate AI-based tools with conventional design approaches. A detailed analysis of the frequency distribution showed that hybrid design methods were favored by 50% of respondents, making them the most preferred option. This suggests that students recognize the potential of generative AI to enhance creative workflows when used in conjunction with traditional techniques. Purely AI-based methods ranked second, with 34.6% of respondents expressing a preference for these approaches. In contrast, purely conventional design methods were the least favored, with 73.1% of participants ranking them as the least desirable option. This finding highlights a broader trend toward the adoption of AI-augmented design practices, reflecting a growing recognition of the benefits offered by hybrid approaches in balancing advantages and shortcomings of text-to-image tools.

	Most preferred		In-between		Least preferred	
	n	% of responses	n	% of responses	n	% of responses
Purely AI-based	9	34.6	13	50	4	15.4
Purely Conventional	4	15.4	3	11.5	19	73.1
Hybrid (AI-based and Conventional)	13	50	10	38.5	3	11.5

Table 1
Respondents' preferences for AI-based, conventional, and hybrid design methods

Architecture Students' Opinions on the Advantages of Text-to-Image Generative AI in Design

Semi-structured interviews provided insights into participants' perceptions of the advantages offered by text-to-image generative AI in design processes. The most frequently cited benefit was the tool's ability to accelerate production. Many participants highlighted that the speed with which generative AI produced visual content significantly enhanced their workflow efficiency by reducing the time required to generate initial design concepts.

The second most recognized advantage was the tool's role in supporting creativity and idea generation. Participants noted that AI-generated images served as valuable stimuli, enabling them to explore new ideas and broaden their conceptual boundaries. Some students also reported that the AI tool allowed them to produce high-quality visuals that exceeded their own technical visualization skills, thereby enhancing the aesthetic quality of their design outputs.

Additionally, several participants viewed the tool as beneficial for presentation and communication purposes. They found that AI-generated visuals facilitated the effective communication of design ideas to peers and instructors, thus improving feedback processes and facilitating collaborative discussions (Table 2).

Table 2
Respondents' opinions on the advantages of Generative AI in design

	n	% of responses	Illustrative Quotations
Speed of Production	17	65	"I can create multiple design ideas in minutes, which saves a lot of time. I appreciate this very much, because I have to complete several design projects in parallel and none of the design tools I use can beat it [the text-to-image generation tool] in terms of rapidness."
Creativity and Idea Generation Support	12	46	"The tool helped me visualize ideas I hadn't thought of, which inspired my design process."
Producing Visuals beyond Technical Skills	5	19	"The tool enabled me to create high-quality visualizations. I don't think I would be able to produce similar results otherwise, because I am not competent enough with the modelling and image editing software." "I can express my ideas visually without having to worry about my drawing skills."
Enhanced Presentation and Communication	4	15	"Having more visuals helped me present my concepts more effectively in critiques."
Total number of responses	26	100	

Architecture Students' Opinions on the Challenges of Text-to-Image Generative AI in Design

Despite the reported advantages, the interviews also revealed several challenges associated with the use of text-to-image generative AI in design. The most frequently acknowledged concern was the perceived lack of control over the generated outputs. Many participants expressed frustration that the AI-generated visuals did not always capture their intended design concepts, which disrupted the iterative exploration of the design alternatives.

The second major challenge identified was limited interpretability. Several participants reported difficulties in understanding how prompts influenced the outputs, as well as challenges in effectively structuring prompts to achieve desired results. This lack of transparency reduced their confidence in the tool's predictability and usability. Inconsistency in output quality was another widely acknowledged issue. Participants remarked that similar prompts often produced variable results in terms of quality and relevance, which reduced the overall efficiency of the design process.

Some respondents also expressed dissatisfaction with the conceptual depth and coherence of the AI-generated outputs. They felt that while the tool could generate aesthetically appealing images, the results often lacked the holistic integration and deeper conceptual underpinnings expected in design projects. Additionally, several participants raised concerns about the potential impact of AI-generated images on their creative development. Some feared that excessive reliance on generative AI might limit originality or lead to homogenized design outputs. Although ethical and copyright concerns are frequently emphasized in the literature on generative AI, only a small portion of participants in this study expressed such concerns. Those who did raised questions primarily about copyright issues and the authenticity of using AI-generated images within original design work (Table 3).

Table 3
Respondents' opinions on the challenges of Generative AI in design

	n	% of responses	Illustrative Quotations
Limited Control	11	42	"I often didn't get exactly what I wanted, and sometimes modifying prompts didn't help. This was frustrating, because I felt like I was proceeding randomly." "I wish the tool would have allowed editing the outputs. You can refine a design in a limited scope [with this tool], but I think that it is not enough."
Limited Interpretability	7	27	"It's hard to know what to type to get the right image." "I don't think I understand how this tool works. What reasoning does it use to produce an output? During the project, I gained some insights. For example, I learned that it puts more emphasis on the first words in a prompt, but in general I can say that I am clueless."
Inconsistency in Results	7	27	"Sometimes I used the same prompt, but the tool gave me a completely different image, this was really annoying."
Lack of Conceptual Depth and Wholeness	5	19	"There was no unifying concept in the mood boards [created by the text-to-image tool]. The images were appealing, that's all."
Over-dependence and Creativity Concerns	3	12	"I feel like I'm not creating as much on my own and becoming dependent on the tool's suggestions."
Ethical and Copyright Issues	2	8	"I'm worried about using the AI-generated output as it is, and whether these images are truly 'mine' to use in my projects."
Total number of responses	26	100	

DISCUSSSION AND CONCLUSION

The architectural profession, like other creative domains, is undergoing a profound transformation driven by recent advancements in generative AI (Amankwah-Amoah et al., 2024). Despite this rapid evolution, scholarly research on the dynamics of Human-AI interaction within generative design processes remains limited. To address this gap, the present study empirically investigated the experiences of architecture students with text-to-image generative AI tools. The findings offer critical insights into the strengths and limitations of these tools in design practice, as well as students'

preferences for AI-based, conventional, and hybrid design methods.

In particular, the study revealed that while participants expressed a preference for AI-based methods over traditional approaches, hybrid techniques that integrate AI with conventional design practices were most favorably received. This finding suggests that, although generative AI has been embraced within the design community, its current limitations hinder its potential as a standalone tool. Instead, designers frequently integrate AI-generated outputs with other methods to offset these shortcomings.

Qualitative interviews offered further insights into participants' perceptions. Respondents reported that a prominent benefit of text-to-image generative AI was its ability to rapidly visualize design concepts. Given that effective communication through visual representation is central to design practice (Goel, 1995; Goldschmidt, 1991), yet often labor-intensive, participants identified the instant generation of high-quality visuals as a particularly valuable functionality.

Another key advantage observed was the tool's ability to enhance creativity and support ideation, a benefit widely recognized in the literature (Dortheimer et al., 2023; Paananen, Oppenlaender and Visuri, 2024). Previous studies have demonstrated that AI-generated stimuli can enhance design outputs by providing a breadth of inspiration (Lee and Chiu, 2023). Participants similarly highlighted this advantage, emphasizing that text-to-image tools support creativity by offering a diverse range of visual inputs. Consistent with earlier findings in design cognition research, which show that abundant visual stimuli improve performance in terms of originality, practicality, and creativity (Goldschmidt and Smolkov, 2006), this study highlights the potential of AI tools to enrich creative exploration. Additionally, the immediate availability of AI-generated visuals was seen as beneficial in enhancing the communication of design ideas, facilitating more effective peer and instructor feedback. This finding is supported with previous research, which has indicated the positive impact of AI-generated images on collaborative learning and idea exchange, particularly for visual learners (MIT Sloan EdTech, 2024).

The accessibility of generative AI tools was another widely appreciated feature, since these technologies enable users with varying technical expertise to create sophisticated visuals. Our participants were novice design students who might have real or perceived doubts about their visualization skills. Therefore, they appreciated this functionality of generative AI. However, this democratization of design tools has both promising and problematic implications. On the one hand, it promotes inclusivity by enabling a broader range of students to engage with complex design tasks without extensive technical training. On the other hand, it raises concerns regarding skill degradation (Li et al., 2024) and over-reliance (Butler-Ulrich, Hughes and Morrison, 2025) on AI tools. In line with earlier findings, several participants in our study stated that excessive dependence on generative AI could undermine their personal creativity, potentially leading to homogenized design outputs and diminished originality.

Despite these advantages, several challenges were identified. Participants expressed frustration with the limited control and interpretability of AI-generated outputs, particularly when the results deviated from their intended design concepts. This unpredictability disrupts the iterative nature of design processes, where reflection (Schön, 1983) and refinement are essential. Although generative AI facilitates rapid ideation and exploration, it often lacks the precision required for reflective, in-depth design thinking. Inconsistency in output quality was another concern, as some participants found the variability in generated visuals inefficient and counterproductive. While previous research has acknowledged issues related to control and interpretability in text-to-image tools (Hong et al., 2023; Paananen, Oppenlaender and Visuri, 2024), additional research is necessary to investigate how these limitations affect different design workflows.

Another critique raised in the interviews was the perceived lack of conceptual depth in AI-generated outputs. Participants mentioned that effective design requires a holistic integration of aesthetic, functional, and conceptual dimensions, yet many AI-generated visuals lacked this level of sophistication. In some cases, mood board proposals produced by AI tools were described as inadequate from a conceptual perspective. This finding highlights a potential limitation in the capacity of generative AI to support deeper, more holistic design ideation.

Ethical considerations also emerged, although these were less frequently discussed. A minority of participants raised concerns about authenticity in the creative process and issues of ownership and copyright. While the ethical implications of AI use in design have been widely discussed in the literature (Lai, Chen and Yang, 2023), their limited prominence in participant responses suggests that these concerns, though significant, may be less immediately salient to design students.

Generative AI technologies are reshaping traditional workflows in architectural education and practice. However, much of the existing literature has centered on technical aspects of AI, with insufficient attention to human-centered design perspectives. This study, by contrast, emphasizes the importance of examining Human-AI interaction within real-world design contexts. Findings indicate that although text-to-image generative AI tools are perceived positively for their ability to accelerate processes, enhance ideation, improve accessibility, and facilitate communication, they also present challenges related to control, interpretability, consistency, creativity, and ethics. Since previous research has established a positive relationship between perceived usability and designers' intention to continue using generative AI tools (Liu and Huang, 2025), the issues identified in this study necessitate further examination. Addressing these concerns through improved tool designs and the development of strategies to integrate generative AI into architectural education and practice is essential to fully exploit its potential.

REFERENCES

Amankwah-Amoah, J., Abdalla, S., Mogaji, E., Elbanna, A. and Dwivedi, Y.K. (2024) 'The impending disruption of creative industries by generative AI: Opportunities, challenges, and research agenda', *International Journal of Information Management*, 79, 102759.

Aragon, C., Hutto, C., Echenique, A., Fiore-Gartland, B., Huang, Y., Kim, J., Neff, G., Xing, W. and Bayer, J. (2016) 'Developing a research agenda for human-centered data science', *Proceedings of the 19th ACM Conference on Computer Supported Cooperative Work and Social Computing Companion*, pp. 529–535.

Autodesk (2024) 'How generative AI for architecture is transforming design'. Available at: https://www.autodesk.com/design-make/articles/generative-ai-for-architecture.

Butler-Ulrich, T., Hughes, J. and Morrison, L. (2025) 'Creativity and Generative AI for Pre-service Teachers', in Barlach, L. (ed.) *Contemporaneous Issues about Creativity. IntechOpen*, pp. 23–52.

Cao, Y., Aziz, A.A., Arshard, W.N.R.M., Xu, C., Ab Gani, M.A.A.B. and Ismail, I.B. (2024, December) 'AI 2D-3D Generation in Architectural Design: A Divine Hand or a Pandora's Box', 2024 *IEEE 22nd Student Conference on Research and Development* (SCOReD), pp. 203–208. IEEE.

Dortheimer, J., Schubert, G., Dalach, A., Brenner, L., and Martelaro, N. (2023) 'Think AI-side the box! Exploring the usability of text-to-image generators for architecture students', *In Digital Design Reconsidered-Proceedings of the International Conference on Education and Research in Computer Aided Architectural Design in Europe (eCAADe 2023),* pp. 567-575.

Goel, V. (1995) *Sketches of thought*. Cambridge, MA: MIT Press.

Goldschmidt, G. (1991) 'The dialectics of sketching', *Creativity Research Journal*, 4(2), pp. 123–143.

Goldschmidt, G. and Smolkov, M. (2006) 'Variances in the impact of visual stimuli on design problem-solving performance', *Design Studies*,

27(5), pp. 549–569. Available at: https://doi.org/10.1016/j.destud.2006.01.002.

Hong, M.K., Hakimi, S., Chen, Y.Y., Toyoda, H., Wu, C. and Klenk, M. (2023) 'Generative AI for product design: Getting the right design and the design right', *arXiv preprint arXiv:2306.01217*. Available at: https://doi.org/10.48550/arXiv.2306.01217 (Accessed 20 February 2025)

Horvath, A.S. and Pouliou, P. (2024) 'AI for conceptual architecture: Reflections on designing with text-to-text, text-to-image, and image-to-image generators', *Frontiers of Architectural Research*, 13(3), pp. 593–612. Available at: https://doi.org/10.1016/j.foar.2024.02.006.

Lai, Y.R., Chen, H.J. and Yang, C.H. (2023) 'Exploring the impact of generative artificial intelligence on the design process: Opportunities, challenges, and insights', Artificial Intelligence, Social Computing and Wearable Technologies, 113, pp. 49–59. Available at: https://doi.org/10.54941/ahfe1004178.

Lee, Y.H. and Chiu, C.Y. (2023) 'The impact of AI text-to-image generator on product styling design', in Mori, H. and Asahi, Y. (eds.) *Lecture Notes in Computer Science, vol. 14015. Human Interface and the Management of Information*, pp. 502–515. Springer. Available at: https://doi.org/10.1007/978-3-031-35132-7_38

Li, J., Cao, H., Lin, L., Hou, Y., Zhu, R. and El Ali, A. (2024) 'User experience design professionals' perceptions of generative artificial intelligence', *Proceedings of the CHI Conference on Human Factors in Computing Systems*. Available at: https://doi.org/10.1145/3613904.3642114.

Liu, Y.L.E. and Huang, Y.M. (2025) 'Exploring the perceptions and continuance intention of AI-based text-to-image technology in supporting design ideation', *International Journal of Human–Computer Interaction*, 41(1), pp. 694–706. Available at: https://doi.org/10.1080/10447318.2024.2311975.

MIT Sloan EdTech (2024) *Supporting learning with AI-generated images: A research-backed guide*. Available at: https://mitsloanedtech.mit.edu/2024/03/06/supporting-learning-with-ai-generated-images-a-research-backed-guide/. (Accessed 4 January 2025)

Paananen, V., Oppenlaender, J. and Visuri, A. (2024) 'Using text-to-image generation for architectural design ideation', *International Journal of Architectural Computing*, 22(3), pp. 458–474. Available at: https://doi.org/10.1177/14780771231222783.

Schön, D.A. (1983) *The reflective practitioner: How professionals think in action.* New York: Basic Books.

Sohl-Dickstein, J., Weiss, E., Maheswaranathan, N. and Ganguli, S. (2015) 'Deep unsupervised learning using nonequilibrium thermodynamics', *in International Conference on Machine Learning*, pp. 2256–2265. PMLR.

Steinfeld, K. (2023) 'Clever little tricks: A socio-technical history of text-to-image generative models', *International Journal of Architectural Computing*, 21(2), pp. 211–241. Available at: https://doi.org/10.1177/14780771231168230.

Terry, G., Hayfield, N., Clarke, V. and Braun, V. (2017) 'Thematic analysis', in Willig, C. and Rogers, W. S. (eds.) *The SAGE Handbook of Qualitative Research in Psychology*. Sage, pp. 17–37.

Xu, C. and Huang, Y. (2024) 'Technological innovation in architectural design education: Empirical analysis and future directions of Midjourney intelligent drawing software', *Buildings*, 14(10), 3288. Available at: https://doi.org/10.3390/buildings14103288.