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M M G A R O N

Article

Text-to-image artificial intelligence in interior architecture design: A multi-criteria decision-making approach

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ABSTRACT

This study comprehensively evaluates the contributions of text-to-image artificial intelligence (AI) systems to interior architectural design using multi-criteria decision-making (MCDM) methods. Six platforms, DreamStudio, MidJourney, Leonardo AI, Artbreeder, Craiyon and DALL-E, were examined by an expert panel of interior designers and architects and analyzed using MCDM techniques including TOPSIS, AHP, VIKOR, ELECTRE, and PROMETHEE. The analyses revealed DreamStudio's strengths in spatial organization and material harmony, while MidJourney stood out for its ability to generate dynamic, balanced, and visually diverse compositions. Correlation analysis among the MCDM methods enhanced the reliability of the findings, particularly highlighting a strong alignment between TOPSIS and AHP ($r=0.997$). The study demonstrates the strong aesthetic potential of current AI systems but underscores their limitations in fundamental design elements like spatial logic and cultural relevance. Aesthetic biases and ethical considerations are also addressed. Future research should integrate user experience and designer perspectives to explore a more meaningful and holistic integration of AI into interior design processes.

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INTRODUCTION

Artificial intelligence (AI) is rapidly transforming creative and design-oriented disciplines, fostering new possibilities across architecture, interior design, and other visually driven fields (Boden, 2018; Russell & Norvig, 2016). Interior design stands at the intersection of aesthetics and functionality, making it especially sensitive to innovations that streamline and enrich the design process. AI enables more efficient use of fundamental design elements such as spatial planning, color harmony, material selection, and form (Kalay, 2004), allowing designers to accelerate workflows and generate innovative solutions. With the growing integration of natural language processing (NLP) and deep learning technologies, AI has begun to act not only as a productivity tool but also as a partner in creative ideation. One notable advancement in this context is the emergence of text-to-image AI systems, which convert verbal expressions into visual outputs. These systems, such as MidJourney, DreamStudio, and Leonardo AI, allow designers to explore and materialize design concepts rapidly using natural language prompts (Wang et al., 2023). They enhance creativity and communication in the conceptual phase by providing real-time, high-resolution visualizations of interior spaces.

While the application of text-to-image AI tools has been studied in graphic design, fashion, and product design, their use in interior architectural design remains largely unexplored, particularly with respect to both functional and aesthetic criteria. Existing literature has largely focused on presenting individual tools, with limited research offering systematic, comparative evaluations. Crucially, there is a significant lack of studies that employ rigorous, multi-faceted decision-making frameworks to benchmark these AI systems against the core components (e.g., space, light, material) and fundamental principles (e.g., balance, harmony, hierarchy) that define professional interior architecture practice. This gap makes it difficult for designers to make informed choices about which AI tool is best suited for specific design tasks and conceptual phases. Addressing this gap, the present study aims to analyze the performance of six prominent text-to-image AI systems, DreamStudio, MidJourney, Leonardo AI, Artbreeder, Craiyon and DALL-E, in the context of interior architectural design. The study adopts a multi-criteria decision-making (MCDM) framework to evaluate these systems across key interior design components (e.g., space utilization, lighting, texture, furniture arrangement) and fundamental design principles (e.g., balance, contrast, hierarchy, rhythm) (Artbreeder, 2024; Midjourney, 2022; Blockchain Council, 2024; Craiyon, 2024). It also examines the consistency of different decision-making methods through correlation analysis. By identifying the strengths and limitations of each system, this study contributes to the evolving discourse on AI-assisted design, offering practical and theoretical insights into

how these technologies can be integrated into future interior design workflows. In this context, the study seeks to address the following research questions:

- To what extent are current text-to-image AI systems capable of producing effective visuals in alignment with interior architectural design criteria and fundamental design principles?
- When the performances of different AI systems are compared using multi-criteria decision-making (MCDM) methods, which systems stand out, and what factors account for these differences?
- How do text-to-image AI systems contribute to, or fall short in, supporting the creative process within the field of interior architecture?

Research Design and Evaluation Framework

This study employed a structured, multi-phase methodology to evaluate the performance of leading text-to-image artificial intelligence systems in interior architectural design. The research consisted of three primary stages: (1) Scenario-based visual generation using AI prompts; (2) expert-based evaluation of generated visuals using interior design components and fundamental design principles; and (3) comparative performance analysis using multi-criteria decision-making (MCDM) methods.

In the first phase, six widely used text-to-image AI platforms were selected for evaluation: DreamStudio, MidJourney, Leonardo AI, Artbreeder, Craiyon and DALL-E. These systems were chosen based on their accessibility, popularity in design communities, and capabilities to generate photo-realistic or stylized interior scenes using natural language prompts. MidJourney and Leonardo AI were used via prompt engineering plugins integrated with ChatGPT, allowing for the generation of detailed and semantically rich prompts in English. These prompts were designed to reflect five distinct interior scenarios, each representing a unique spatial theme such as sustainability, creativity, luxury, playfulness, and rustic aesthetics. ChatGPT was not fine-tuned with custom training data; instead, its general capabilities were utilized through targeted prompt engineering informed by interior design literature. Scenario-based prompts were created using both the Midjourney Prompt Generator (V6) and the Leonardo AI Prompt Maker to generate a diverse and rich initial pool of prompt text. For the final image generation and subsequent expert evaluation, the more detailed and contextually rich prompts from the Leonardo AI generator were consistently used across all five scenarios to ensure comparability.

In the second phase, the generated visuals were evaluated by a panel of professional experts from interior design and architecture disciplines. The evaluation criteria were derived from established design theory (Ching, 2007; Pile, 2007; Hill & Matthews, 2007), and included key interior ar-

chitecture components (e.g., space utilization, light, color, material, furniture) and design principles (e.g., harmony, balance, contrast, hierarchy, rhythm). Each expert scored the visuals on a 100-point scale across each criterion, and the average of these scores was calculated to represent each system's overall performance per scenario. To ensure a balanced and reliable evaluation process, the expert panel consisted of 30 professionals, 15 architects and 15 interior architects, each with over 10 years of experience in their respective fields. The group was assembled with attention to disciplinary diversity and gender balance to ensure fair and informed assessments of spatial and aesthetic quality in AI-generated designs. The panel comprised practitioners who actively and routinely integrate AI-powered tools into their daily professional practice, providing them with a critical, user-informed perspective essential for evaluating AI-generated design outputs.

In the third phase, five MCDM techniques were applied to synthesize the evaluation data and compare the performance of AI systems from multiple decision perspectives: TOPSIS (Technique for Order Preference by Similarity to Ideal Solution), AHP (Analytic Hierarchy Process), VIKOR (VlseKriterijumska Osteomalacia I Kompromisno Resenje), ELECTRE (Elimination and Choice Expressing Reality), and PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluation). These five methods were selected for their complementarity in addressing different decision-making perspectives common in design evaluation: TOPSIS ranks alternatives by their geometric distance from an ideal solution, providing a clear performance benchmark (Chakraborty, 2022). AHP decomposes the problem into a hierarchy and uses pairwise comparisons to derive priority weights, effectively capturing expert judgment (Lin et al., 2024). VIKOR focuses on identifying a compromise solution that minimizes individual regret, useful for scenarios with conflicting criteria (Ceballos et al., 2018). ELECTRE employs outranking relations to establish dominance between alternatives, handling non-compensa-

tory decisions effectively (Chakraborty et al., 2023). Finally, PROMETHEE ranks alternatives based on the net flow of preferences between them, offering a nuanced view of relative strengths and weaknesses (Deshmukh, 2013). Applying this suite of methods ensured a robust, multi-faceted evaluation less susceptible to the bias of any single algorithmic approach.

To assess the methodological robustness of the MCDM process, a correlation analysis was conducted comparing the rankings generated by each method. A Spearman rank correlation matrix was constructed to examine the degree of consistency between the decision-making models and to determine whether similar trends emerged across methods. This analysis aimed to validate the reliability of the overall ranking results and reveal how congruent the outcomes were across different algorithmic perspectives. This integrative approach allowed for both a qualitative and quantitative assessment of the AI systems, providing insights not only into which tools performed best under specific design conditions, but also into the methodological coherence of the evaluation framework itself.

Prompt Engineering and ChatGPT Plugins (GPTs)

Prompt engineering is a technique aimed at optimizing user inputs in interactions with artificial intelligence models to obtain the best responses (Liu et al., 2023). It emphasizes the importance of creating inputs in the correct structure to achieve the desired output when interacting with models like GPT-4 and BERT (Brown et al., 2020; Reynolds & McDonnell, 2021). This technique maximizes the model's understanding and response capabilities, thereby providing more accurate and creative solutions (Gao et al., 2020; Radford et al., 2019) (Figure 1). GPTs are large-scale language models whose functionality is enhanced through plugins (Brown et al., 2020; Radford et al., 2019). Plugins add capabilities such as real-time data access, translation, and generating output in a specific format.

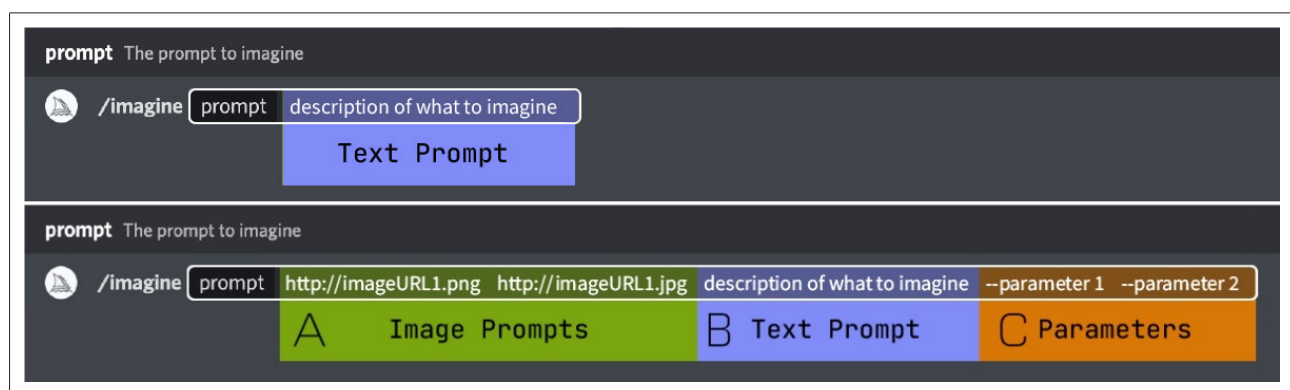


Figure 1. A basic prompt can consist of a single word, a single expression, or an emoji. In prompt texts, (A) visual URLs affect style and content, (B) the text description determines image quality, and (C) parameters control aspect ratio and model changes (Midjourney, 2024).

Midjourney Prompt Generator (V6): Artificial intelligence-based tools are becoming increasingly important in digital art and design. Platforms like the Midjourney Prompt Generator (V6) optimize visual production by materializing users' creative visions. This model transforms vague requests into aesthetic commands and offers various options. Users elaborate their visual ideas with elements like subject, style, or theme, and the model generates five customized prompts. The visual is created using the selected prompt, and the process is refined with feedback to produce impressive visual content. For example, when a user requests a depiction of a modern and minimalist living room, the model produces a prompt like the following:

Prompt Example: "A photorealistic image of a modern, minimalist living room featuring an open floor plan, large floor-to-ceiling windows, a neutral color palette, sleek furniture, and elegant textures. Natural lighting enhances the simplicity of the space. Created using high-resolution photography, minimalist design, clean lines, modern furniture, soft textures, emphasis on natural light --ar 16:9 --v 6.0"

When this prompt is used in Midjourney V6 to generate an image, it provides the user with an output that includes the desired aesthetics and details.

Leonardo AI Prompt Generator (Leonardo AI Prompt Maker): The Leonardo AI Prompt Generator is a ChatGPT-based plugin for text-to-image artificial intelligence systems. It prepares prompts that include details like the image's subject, style, type, and camera angle, producing various visuals. While it operates in English, it can detect Turkish inputs and automatically create English prompts. Supporting creative potential in digital art and design projects with its user-friendly interface, it is quite simple to use: The user specifies the features of the visual, the system generates four prompts, and the desired visual is created with the selected prompt.

Prompt Example: "Create a photorealistic image of a living room designed to meet interior design standards. The room has a modern and minimalist style with neutral colors and natural light. It includes a large, comfortable gray sofa, a glass coffee table, and a cream-colored textured rug. Large windows offer a view of the tranquil garden outside. The space is accented with subtle artworks and indoor plants. Lighting should be soft and natural to highlight the clean lines and open space. Use a wide-angle lens effect to capture the entire room."

When this prompt is entered into Leonardo AI, visuals with the desired features are produced. These two plugin systems can also be used in other text-to-image AI applications, allowing users to generate visuals with similar prompts on different platforms. The Leonardo AI Prompt Generator makes it easy for users to prepare detailed and customized prompts in text-to-image AI systems, enabling them to produce the visuals they want. This ChatGPT-based plugin offers a practical and functional solution for users by detecting Turkish inputs and creating English prompts.

Components and Basic Design Principles of Interior Architecture

Interior architecture is a scientific art that improves people's interactions with spaces by balancing aesthetics and functionality. Its fundamental components are space, light, color, material, texture, and furniture, and these elements determine the atmosphere of the space and the user experience. Interior architecture not only enhances visual appeal but also optimizes users' interactions with space (Ching, 2007).

Components of Interior Architecture: Interior architecture prioritizes the user experience by addressing factors such as space planning, lighting, color and material selection, furniture, and accessories. Good space planning ensures efficient use and flow of areas, while lighting directly affects the atmosphere of space (Hill & Matthews, 2007). Color and material choices determine the aesthetics of the space, while furniture selection defines functionality and comfort.

- **Space Utilization:** Space lies at the core of interior architecture. It directly influences how users move within and experience space. Balancing functionality and aesthetics is critical for successful space design. The psychological and emotional needs of users should also be considered in space planning (Ching, 2007; Königk, 2011).
- **Light:** Light has a significant impact on the perception and atmosphere of space. Natural and artificial light sources shape the functionality and aesthetics of the environment. Proper lighting improves the mood of space while also enhancing energy efficiency (Heerwagen & Leah Zagreus, 2005).
- **Color:** Colors directly affect the atmosphere of the space and the mood of the users. Color selection should align with the purpose of the space and support its aesthetic value. Color contrast and harmony enhance the visual appeal and influence the emotional responses of users (Albers, 1963).
- **Material and Texture:** Materials and textures determine the aesthetic and functional characteristics of space. Natural materials evoke feelings of warmth and naturalness, while modern materials offer a contemporary look. Textures enrich the user experience by adding depth and character to space (Ashihara, 1986).
- **Form:** Form defines the physical structure and visual perception of space. Geometric and organic forms shape the atmosphere and aesthetic qualities. The interaction of form with material, texture, and color strengthens the overall aesthetics of space (Ching, 2007).
- **Void:** Void defines the physical boundaries of the space and affects visual perception. Closed and open areas

serve different functions in terms of social interaction and spatial flexibility. Effective use of void increases the sense of openness and usage efficiency in space (Wright, 1975).

- **Furnishings:** Furnishings directly impact the functionality and aesthetics of the space. Elements like lighting fixtures, door handles, and furniture reflect the character and intended use of the space. Properly selected furnishings should align with the overall design concept (Pile, 2007).
- **Sustainability:** Sustainability in interior design aims to reduce environmental impact and increase energy efficiency. Materials obtained from renewable sources and energy-efficient lighting solutions play a significant role in sustainable space design (Kibert, 2016).
- **Design Principles:** Architecture and interior design rely on specific design principles to ensure aesthetics and functionality. These principles determine the perception, use, and interaction within space. Basic design elements include visual components like point, line, form, and color, as well as principles like repetition, balance, contrast, hierarchy, and proportion. These principles help achieve aesthetic and functional goals in the design process (Balaban Varol & Varol, 2023; Lupton & Phillips, 2008).

While these components define the fundamental physical and sensory dimensions of interior architectural space, their effective integration and spatial coherence are achieved through the application of basic design principles, which structure how these elements are perceived, organized, and experienced within the interior environment.

Basic Design Principles in Interior Architecture:

Balancing functionality and aesthetics are crucial in interior space design. Spatial unity refers to the harmonious functioning of different parts of space. Designers guide the perception and usage of space according to principles like harmony, balance, contrast, and hierarchy (Spence, 2020).

- **Harmony and Unity:** Harmony provides visual comfort through the cohesive use of elements like color, texture, and form. Unity is achieved when various parts of space come together around a consistent theme or idea. These principles ensure that users perceive the space as a single composition (Ching, 2007; Pallasmaa, 2024).
- **Balance:** Balance is divided into symmetrical and asymmetrical types. Symmetrical balance consists of equal elements mirrored around a central axis, giving an impression of order. Asymmetrical balance is created by placing elements of different sizes in a balanced manner, providing a more dynamic composition (Çeklen et al., 2018).

- **Contrast and Emphasis:** Contrast provides visual diversity by creating opposition among elements like color, texture, and form. Emphasis is used to highlight a specific part of the design. These strategies tell the story of space and direct the user's attention (Shi & Sun, 2019).
- **Hierarchy:** Hierarchy arranges design elements according to their visual importance. It determines the flow of the space and the orientation of users within it. An effective hierarchy makes the space more organized and accessible (Samara, 2008).
- **Proportion and Scale:** Proportion and scale establish the dimensional relationships between elements in the space. Correct use of proportion and scale can make the space feel more expansive, spacious, intimate, or cozy (Ching, 2007).
- **Repetition and Rhythm:** Rhythm is created by the regular repetition of specific forms, colors, and textures. Repetition and rhythm provide visual flow and enhance consistency in space (Rodop, 2017).
- **Movement:** Movement creates a sense of dynamism and flow within space. Transitions between lines and colors offer a visual journey and add energy to the composition (Itten & Van Haagen, 1973).
- **Space and Void:** Space and void determine the aesthetics and functionality of the environment. Empty spaces make the area feel comfortable and open, while filled spaces establish functional arrangement. Proper use of void ensures space is perceived as spacious and balanced (Arnheim, 1954).

These fundamental design principles provide the conceptual and analytical basis for evaluating the quality of AI-generated interior visuals; accordingly, the following section applies these principles as structured evaluation criteria to assess the performance of text-to-image systems in producing coherent, functional, and aesthetically grounded interior architectural representations.

Evaluation of Text-to-Image Systems

In this section, the components of interior architecture and basic design principles discussed in previous studies are evaluated alongside ChatGPT prompts and text-to-image systems. ChatGPT taught interior design criteria and design principles, and based on this information, five draft texts were created to visualize specific interior spaces.

Artificial Intelligence Data Feeding Stage: The most critical stage for the effective functioning of artificial intelligence is data feeding. In this phase, processes such as data collection, cleaning, and labeling ensure that AI algorithms are trained correctly. ChatGPT created visual drafts suitable for the given scenarios by learning interior design criteria (Figure 2).

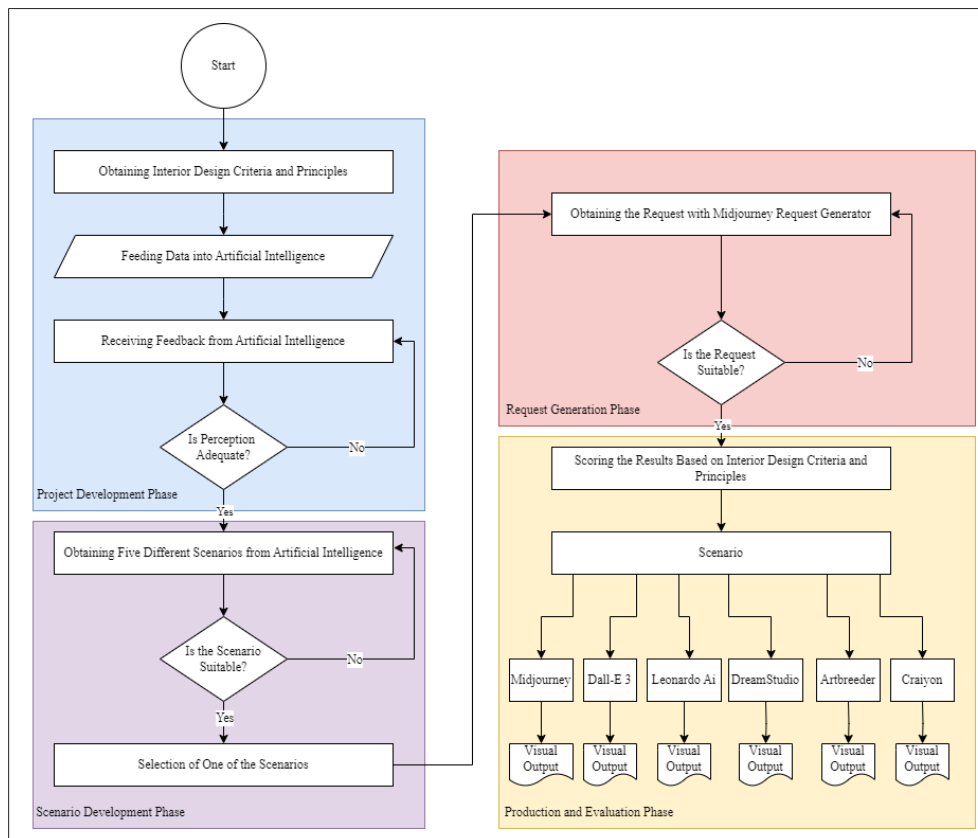


Figure 2. Flowchart of the process (Design by the Authors).

As a result of the evaluation between two different text generators, the Midjourney Prompt Generator was selected, and the drafts created were transferred to this platform. Various prompts were generated via Midjourney, and the desired visual content was produced (Midjourney, 2024) (Figure 3).

Draft Scenario Reviews: Some visuals provided by text-to-image artificial intelligence were excluded from the review because they offered limited views. It was anticipated that visuals showing the full spatial setup are needed to comprehensively compare all criteria.

Draft Scenario 1: A modern living room designed according to sustainability principles. The furniture is made from recycled materials, and natural light is utilized to the maximum extent. The walls are covered with thermal insulation materials with high energy efficiency, and natural landscapes are showcased through large windows. The color palette consists of light pastel tones, creating a spacious and peaceful atmosphere. After applying the procedures described above to this draft scenario, **Prompt 1** emerges.

Prompt 1: A modern living room designed with sustainability principles. Furniture made from recycled materials, walls covered with high energy-efficient insulation materials, large windows showcasing natural scenery. The color palette is composed of soft pastel tones that create a calming

atmosphere. Created using photorealistic, natural lighting, soft textures, a tranquil mood, wide-angle view, HD quality, natural appearance --ar 16:9 --v 6.0

The visuals produced with this prompt were evaluated by expert architects and interior designers according to interior architectural design criteria. In the table containing separate columns for each criterion, the compliance percentage of each visual with the criteria was examined in detail. The survey results were formed with the participation of seven architects and seven interior designers, and each component was scored out of 100 (Table 1). Midjourney, DALL-E 3, and DreamStudio AI systems have demonstrated impressive performances by generally receiving high scores in various design principles within interior design and architectural projects. These systems particularly stand out in space utilization, use of light, and color usage. DreamStudio has attracted attention with high marks in space and light utilization, achieving good results especially in criteria such as harmony and unity, balance, and hierarchy. On the other hand, Artbreeder, showing below-average scores, indicates a need for improvement in some areas while receiving more positive evaluations in material and texture. Artbreeder and Craiyon emerge as systems that need development due to their low performance in applying design principles. These evaluations help determine which AI tool might be more suitable for specific design needs and provide important

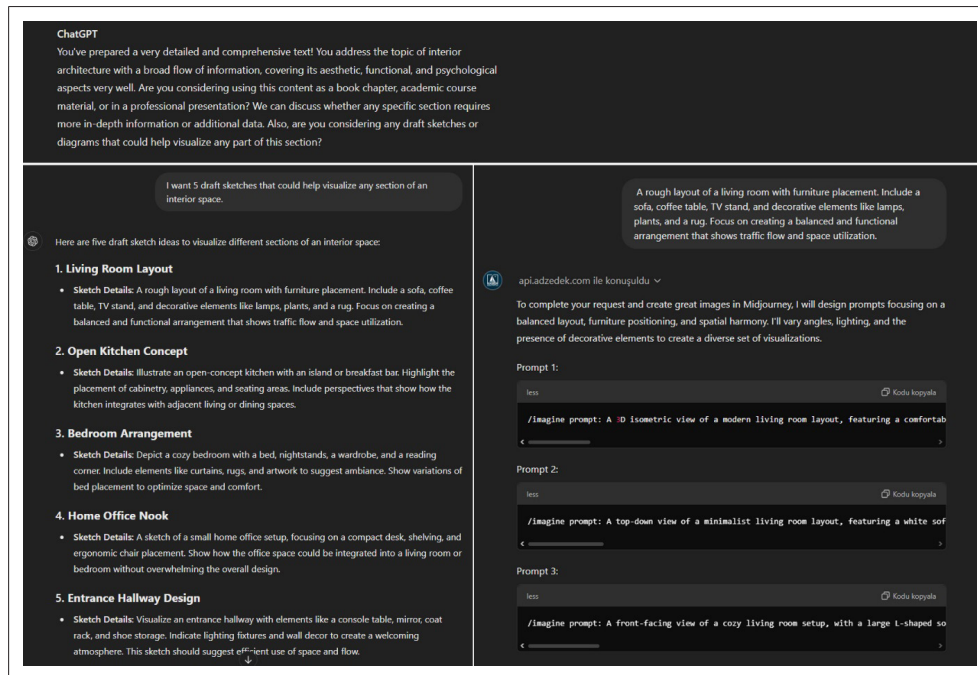


Figure 3. The interfaces of ChatGPT and Midjourney display the appearances of interior architectural components, basic design principles, sample scenarios, and the visual outputs of prompts (OpenAI, 2024).

insights on how these systems can be optimized in design processes (Table 1).

Draft Scenario 2: A workspace is designed with dynamic elements to promote creativity and productivity. The walls are painted vibrant colors and are adorned with artworks containing motivational quotes at certain points. The furniture is ergonomic and modern, including a large desk and a comfortable office chair. The room's layout can be adjusted to offer flexible use for both individual work and small group meetings. After applying the procedures described above to this draft scenario, Prompt 2 emerges.

Prompt 2: A workspace designed with dynamic elements to promote creativity and productivity. Walls painted in vibrant colors, decorated with motivational artwork, ergonomic modern furniture including a large work desk and a comfortable chair. The room layout is adjustable for individual work and small group meetings. Created using photorealistic, vivid style, motivational quotes, vibrant lighting, creative atmosphere, wide-angle view, HD quality, natural appearance --ar 16:9 --v 6.0.

Midjourney, Leonardo AI, and DreamStudio artificial intelligence systems have demonstrated high performance in various design criteria in interior design and architectural projects. Particularly, Midjourney and Leonardo AI have achieved noteworthy results in areas like space utilization, lighting, and color usage. Leonardo AI has also stood out by receiving high scores from interior designers and architects. DreamStudio has generally shown good performance,

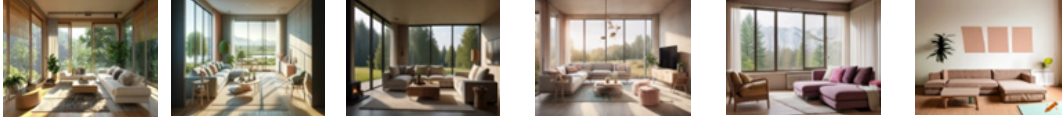
receiving high marks especially in material and texture usage and form. Conversely, although DALL-E 3 has shown above-average performance in some areas, it has generally received lower scores. Artbreeder and Craiyon have performed poorly in most criteria, falling short in applying design principles. These results help determine which AI tool might be suitable for specific design needs and provide important insights into how these systems can be optimized in design processes (Table 2).

Draft Scenario 3: The bathroom has been redesigned in a luxurious and modern style. Marble countertops and stylish fixtures provide a rich touch. High-gloss ceramic tiles that are water-resistant have been used on the walls. Lighting has been carefully selected to create both functional and atmospheric effects, and the sense of spaciousness has been enhanced with floor-to-ceiling mirrors.

Prompt 3: A bathroom redesigned in a luxurious and modern style. Marble countertops, stylish accessories, glossy ceramic tiles on the walls, carefully selected lighting for functional and atmospheric effects, and floor-to-ceiling mirrors that enhance the sense of space. Created using photorealistic, high-quality lighting, elegant textures, glossy surfaces, wide-angle view, HD quality, natural appearance --ar 16:9 --v 6.0

Midjourney, Leonardo AI, DreamStudio, DALL-E 3, Artbreeder, and Craiyon have been evaluated according to various design criteria in interior design and architectural projects. Leonardo AI and DreamStudio have shown high performance in most areas, while Midjourney has achieved

Table 1. (Draft Scenario 1) Evaluation of text-to-image artificial intelligence systems according to interior architecture components and basic design principles (%)

		MIDJOURNEY			DALL-E 3			LEONARDO AI			DREAMSTUDIO			ARTBREEDER			CRAIYON		
Job		Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average
																			
Interior Architecture Components	Space Utilization	74	81	78	69	59	64	61	54	58	80	81	81	46	56	51	27	60	44
	Light	77	76	77	70	69	70	41	56	49	73	81	77	63	69	66	40	57	49
	Color	76	80	78	59	63	61	57	63	60	74	71	73	57	54	56	33	50	42
	Material and Texture	63	81	72	61	63	62	57	69	63	69	74	72	59	67	63	24	46	35
	Form	70	83	77	66	67	67	63	66	65	69	80	75	44	57	51	21	50	36
	Void	63	67	65	59	51	55	60	63	62	69	74	72	47	49	48	24	50	37
	Furnishings	57	73	65	53	54	54	63	63	63	76	80	78	39	47	43	17	39	28
	Sustainability	59	74	67	49	56	53	47	63	55	56	70	63	37	41	39	17	46	32
Basic Design Principles	Harmony and Unity	74	80	77	60	57	59	60	63	62	74	80	77	37	50	44	24	51	38
	Balance	70	76	73	61	61	61	57	70	64	73	80	77	36	53	45	21	50	36
	Contrast and Emphasis	50	71	61	47	59	53	54	60	57	66	66	66	47	59	53	30	51	41
	Hierarchy	57	76	67	63	59	61	60	63	62	71	76	74	39	54	47	23	59	41
	Proportion and Scale	66	86	76	66	76	71	66	73	70	81	83	82	51	64	58	24	57	41
	Repetition and Rhythm	53	74	64	67	69	68	57	63	60	71	74	73	46	47	47	23	50	37
	Movement	54	71	63	60	66	63	60	64	62	71	70	71	34	54	44	26	53	40
	Space and Void	64	77	71	63	67	65	64	67	66	71	76	74	41	49	45	26	54	40

good results particularly in space utilization, lighting, and material usage. On the other hand, DALL-E 3 has exhibited above-average performance but received low scores in some areas. Artbreeder and Craiyon have generally shown low performances, indicating that they need improvement. These evaluations reveal how each AI system can adapt to specific design needs and highlight their strengths and weaknesses. This information can be an important guide when deciding which tools to use in design processes (Table 3).

Draft Scenario 4: The playroom is designed to encourage children's creativity and learning abilities. The walls are decorated with interactive and educational murals. The floor is covered with soft and washable rugs. The furniture is sized appropriately for children and has rounded corners to ensure safety against bumps and falls.

Prompt 4: A playroom designed to enhance children's creativity and learning abilities. Walls adorned with interactive and educational murals, soft washable rugs on the floor, and furniture suitable for children's sizes with rounded edges for safety. Created using photorealistic, vibrant colors, fun atmosphere, HD quality, wide-angle view, natural lighting, child-friendly design --ar 16:9 --v 6.0

Midjourney, Leonardo AI, and DreamStudio artificial intelligence systems have drawn attention by receiving high scores across various criteria in interior design and architectural projects. Particularly, Leonardo AI has stood out with very high scores in space utilization, lighting, and color usage. DreamStudio similarly demonstrated good performances but lagged Leonardo AI in some areas. Midjourney generally performed well, notably receiving high scores in lighting usage. On the

Table 2. (Draft Scenario 2) Evaluation of text-to-image artificial intelligence systems according to interior architecture components and basic design principles (%)

		MIDJOURNEY			DALL-E 3			LEONARDO AI			DREAMSTUDIO			ARTBREEDER			CRAIYON		
Job	Interior Architecture Components	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average
		Space Utilization	57	84	71	56	77	67	83	81	82	69	79	74	34	61	48	26	51
Light	69	77	73	44	63	54	80	71	76	77	83	80	33	47	40	23	49	36	
Color	90	83	87	47	70	59	71	77	74	80	86	83	50	59	55	43	49	46	
Material and Texture	66	80	73	49	71	60	69	80	75	54	79	67	37	47	42	21	40	31	
Form	67	84	76	46	71	59	76	84	80	73	81	77	30	40	35	26	41	34	
Void	53	76	65	46	73	60	71	83	77	64	80	72	21	43	32	25	39	32	
Furnishings	63	79	71	51	70	61	74	74	74	59	73	66	29	44	37	26	40	33	
Sustainability	51	66	59	31	54	43	51	54	53	54	61	58	27	34	31	17	30	24	
Basic Design Principles	Harmony and Unity	59	81	70	43	74	59	70	74	72	71	74	73	33	44	39	29	36	33
	Balance	59	74	67	47	73	60	61	73	67	67	70	69	27	43	35	20	40	30
	Contrast and Emphasis	69	83	76	56	76	66	81	80	81	66	8	37	47	49	48	34	40	37
	Hierarchy	64	73	69	51	76	64	69	74	72	70	79	75	34	46	40	27	47	37
	Proportion and Scale	67	79	73	63	74	69	80	76	78	73	73	73	47	50	49	33	44	39
	Repetition and Rhythm	66	74	70	56	73	65	76	76	76	67	74	71	41	53	47	34	40	37
	Movement	71	83	77	54	69	62	71	80	76	61	77	69	30	49	40	30	40	35
	Space and Void	54	74	64	56	70	63	76	80	78	69	73	71	26	50	38	26	46	36

other hand, DALL-E 3 received above-average scores in some criteria but showed lower performance in others, presenting an overall mixed picture. Artbreeder and Craiyon exhibited generally low performances, indicating a need for improvement in applying design principles (Table 4).

Draft Scenario 5: The kitchen has an industrial and rustic style. Countertops are made of raw concrete and metal components, and the cabinets are designed from recycled wood. Open shelves are filled with copper pots and pans. Lighting is provided by large metal pendant lamps and wall sconces. The floor is covered with a mixture of natural stone and metal, adding a rustic touch to the space.

Prompt 5: An industrial and rustic-style kitchen. Countertops made from raw concrete and metal components,

cabinets made from recycled wood, open shelves filled with copper pots and pans, lighting provided by large metal pendant lamps and wall sconces. Flooring covered with a mixture of natural stone and metal for a rustic touch. Created using photorealistic, industrial design, rustic elements, HD quality, wide-angle view, natural lighting, warm tones, vintage style --ar 16:9 --v 6.0

Midjourney, Leonardo AI, and DreamStudio generally exhibit high performance in design criteria within interior design and architectural projects. Midjourney particularly stands out in space utilization and balance, while Leonardo AI offers superior results in material, texture, and aesthetic harmony. DreamStudio is successful in spatial arrangement and use of void. DALL-E 3 and Craiyon provide above-average results in some areas but have shown lower perfor-

Table 3. (Draft Scenario 3) Evaluation of text-to-image artificial intelligence systems according to interior architecture components and basic design principles (%)

		MIDJOURNEY			DALL-E 3			LEONARDO AI			DREAMSTUDIO			ARTBREEDER			CRAIYON		
		Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average
Interior Architecture Components	Space Utilization	69	77	73	79	79	79	79	81	80	83	74	79	54	70	62	37	49	43
	Light	64	77	71	76	79	78	79	83	81	87	74	81	66	64	65	54	47	51
	Color	60	74	67	74	86	80	80	86	83	86	77	82	44	54	49	43	46	45
	Material and Texture	74	76	75	76	81	79	77	84	81	81	71	76	57	66	62	33	43	38
	Form	74	81	78	71	81	76	76	72	74	77	81	79	50	67	59	31	46	39
	Void	50	74	62	69	76	73	64	73	69	66	67	67	51	54	53	43	40	42
	Furnishings	66	81	74	61	74	68	71	76	74	70	76	73	53	59	56	37	39	38
	Sustainability	50	59	55	49	57	53	56	52	54	63	61	62	37	44	41	24	43	34
Basic Design Principles	Harmony and Unity	73	79	76	74	73	74	84	81	83	83	77	80	54	60	57	34	40	37
	Balance	64	77	71	64	80	72	76	74	75	79	76	78	53	64	59	34	40	37
	Contrast and Emphasis	61	76	69	63	74	69	73	73	73	79	79	79	43	60	52	36	50	43
	Hierarchy	76	80	78	66	73	70	74	80	77	79	80	80	57	67	62	31	41	36
	Proportion and Scale	80	74	77	71	76	74	80	86	83	76	80	78	59	70	65	29	41	35
	Repetition and Rhythm	71	83	77	70	76	73	79	84	82	69	74	72	56	64	60	30	49	40
	Movement	70	81	76	69	74	72	74	81	78	70	79	75	51	67	59	36	46	41
Space and Void	60	79	70	72	77	75	64	80	72	59	69	64	53	64	59	41	46	44	

mance in certain criteria. Artbreeder generally displayed weak performance, being found less successful compared to other systems. Overall, Midjourney and Leonardo AI are the systems demonstrating the highest performance (Table 5).


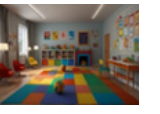
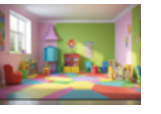
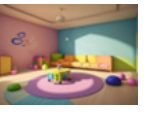

EVALUATION

To evaluate the overall performance of the selected text-to-image AI systems in interior design applications, five widely recognized multi-criteria decision-making (MCDM) methods were applied: TOPSIS, AHP, VIKOR, ELECTRE, and PROMETHEE (Figure 4). Each method enabled the identification of strengths and weaknesses of the systems from different analytical perspectives, and the results were integrated to support a robust comparative evaluation.

The analysis based on the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method, which ranks alternatives according to their proximity to the ideal solution (Chakraborty, 2022), revealed that DreamStudio (0.78) and Midjourney (0.75) performed closest to the ideal solution. Similarly, the AHP (Analytic Hierarchy Process) method, which utilizes pairwise comparisons in a hierarchical structure (Lin et al., 2008), indicated DreamStudio (0.85) and Midjourney (0.82) as the most favorable alternatives. These two methods produced highly consistent results, with a strong positive correlation ($r=0.997$, $p=0.00023$), as shown in the correlation matrix analysis.

According to VIKOR (Vlsekriterijumska Optimizacija I Kompromisno Resenje), which emphasizes compromise solutions under conflicting criteria (Ceballos et al., 2018),

Table 4. (Draft Scenario 4) Evaluation of text-to-image artificial intelligence systems according to interior architecture components and basic design principles

																			
		MIDJOURNEY			DALL-E 3			LEONARDO AI			DREAMSTUDIO			ARTBREEDER			CRAIYON		
Job		Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average
		Interior Architecture Components	Space Utilization	73	77	75	91	87	89	56	71	64	41	64	53	37	50	44	31
Light	76		73	75	90	89	90	47	71	59	53	64	59	37	47	42	43	56	50
Color	84		86	85	90	84	87	60	76	68	54	66	60	53	57	55	41	56	49
Material and Texture	77		77	77	89	84	87	57	77	67	34	56	45	36	43	40	37	51	44
Form	76		81	79	89	80	85	57	74	66	40	60	50	34	50	42	33	50	42
Void	66		79	73	77	84	81	56	67	62	36	54	45	46	51	49	31	53	42
Furnishings	71		74	73	87	83	85	54	70	62	33	56	45	33	53	43	31	47	39
Sustainability	64		60	62	73	73	73	40	64	52	24	44	34	24	46	35	27	47	37
Basic Design Principles	Harmony and Unity	74	77	76	87	81	84	51	69	60	39	54	47	36	47	42	29	44	37
	Balance	69	79	74	89	81	85	56	69	63	31	51	41	30	47	39	27	49	38
	Contrast and Emphasis	74	80	77	83	83	83	51	76	64	37	54	46	34	49	42	36	51	44
	Hierarchy	71	80	76	86	83	85	59	67	63	36	54	45	39	44	42	31	47	39
	Proportion and Scale	73	79	76	86	81	84	51	70	61	39	54	47	41	53	47	39	50	45
	Repetition and Rhythm	73	79	76	86	84	85	56	71	64	40	53	47	40	46	43	33	46	40
	Movement	67	83	75	81	83	82	59	67	63	39	56	48	37	44	41	37	50	44
	Space and Void	63	80	72	74	84	79	51	66	59	34	51	43	37	47	42	37	50	44







DreamStudio was found to be the most balanced choice with a Q value of 0.12. ELECTRE (Elimination and Choice Expressing Reality), which compares alternatives through dominance relations (Chakraborty, et al., 2023), also confirmed the superiority of DreamStudio (*dominance score=3*) and MidJourney (*dominance score=2*).

A significant positive correlation ($r=0.989, p=0.00146$) was observed between ELECTRE dominance scores and overall system performance. PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluation) results, which ranks alternatives according to their positive and negative flows (Deshmukh, 2013), were consistent with previous findings, showing DreamStudio as the top performer based on its net flow value (0.42). However, the PROMETHEE and VIKOR methods presented

an inverse relationship, with a strong negative correlation ($r=-1.000, p=1.4e-24$), suggesting divergent evaluative tendencies. These variances highlight how different MCDM methods can prioritize distinct aspects of system performance.

To examine the consistency among the five MCDM approaches, a Spearman rank correlation analysis was conducted (Sedgwick, 2014). The results are presented in Figure 5 which show that while TOPSIS, AHP, and ELECTRE tend to align closely, VIKOR and PROMETHEE exhibit opposing trends in ranking outcomes. This analysis contributes to the methodological transparency of the study and provides insight into how the choice of decision-making method may affect evaluation results.

Table 5. (Draft Scenario 5) Evaluation of text-to-image artificial intelligence systems according to interior architecture components and basic design principles (%)

																			
		MIDJOURNEY			DALL-E 3			LEONARDO AI			DREAMSTUDIO			ARTBREEDER			CRAIYON		
Job		Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average	Interior Architect	Architect	Average
		Interior Architecture Components	Space Utilization	80	80	80	79	80	80	81	77	79	76	67	72	77	56	67	73
	Light	74	71	73	80	74	77	56	59	58	66	63	65	60	50	55	73	70	72
	Color	71	69	70	76	73	75	64	64	64	70	61	66	66	57	62	69	69	69
	Material and Texture	76	70	73	81	73	77	70	71	71	64	59	62	74	61	68	60	59	60
	Form	79	79	79	83	80	82	73	76	75	70	66	68	74	54	64	69	64	67
	Void	64	80	72	71	77	74	63	71	67	69	61	65	66	56	61	54	66	60
	Furnishings	71	74	73	81	79	80	67	79	73	66	64	65	69	54	62	70	64	67
	Sustainability	64	57	61	66	60	63	56	60	58	57	59	58	56	49	53	59	60	60
Basic Design Principles	Harmony and Unity	81	79	80	83	74	79	77	71	74	69	64	67	71	63	67	59	59	59
	Balance	77	79	78	79	76	78	73	71	72	69	64	67	73	59	66	59	66	63
	Contrast and Emphasis	79	76	78	77	71	74	70	69	70	64	60	62	69	60	65	67	64	66
	Hierarchy	81	79	80	79	76	78	76	64	70	71	56	64	70	61	66	64	67	66
	Proportion and Scale	79	74	77	83	77	80	76	71	74	67	74	71	69	69	69	69	66	68
	Repetition and Rhythm	83	73	78	81	77	79	77	70	74	69	69	69	71	66	69	59	63	61
	Movement	77	73	75	80	76	78	76	64	70	70	67	69	70	64	67	63	66	65
	Space and Void	67	74	71	73	70	72	77	66	72	67	67	67	67	60	64	53	61	57

Figures 6 and 7 synthesize the comparative performance of the evaluated text-to-image AI systems. Figure 6 presents the system rankings derived from individual MCDM methods, while Figure 7 illustrates the aggregated success scores obtained through the integration of all evaluation techniques. Together, these visualizations offer a consolidated assessment of system performance and facilitate the identification of AI tools that are more suitable for specific interior design requirements. The results indicate that DreamStudio and MidJourney consistently outperform the other systems across the majority of evaluation methods, particularly with respect to material–texture coherence, compositional balance, spatial organization, and lighting quality—criteria that are critical to interior architectural design. In contrast, Artbreeder and Craiyon exhibit comparatively lower

performance, highlighting their limitations in addressing complex spatial and material relationships. Overall, these findings delineate the current capabilities and constraints of text-to-image AI tools and provide a grounded analytical basis for their more informed and selective integration into future interior design workflows.

DISCUSSION

This study provides one of the first systematic, multi-criteria evaluations of text-to-image AI systems within the specific domain of interior architecture. The consistent out-performance of DreamStudio (Stable Diffusion) and MidJourney across multiple MCDM methods confirms that not all generative AI platforms are equally adept at meet-

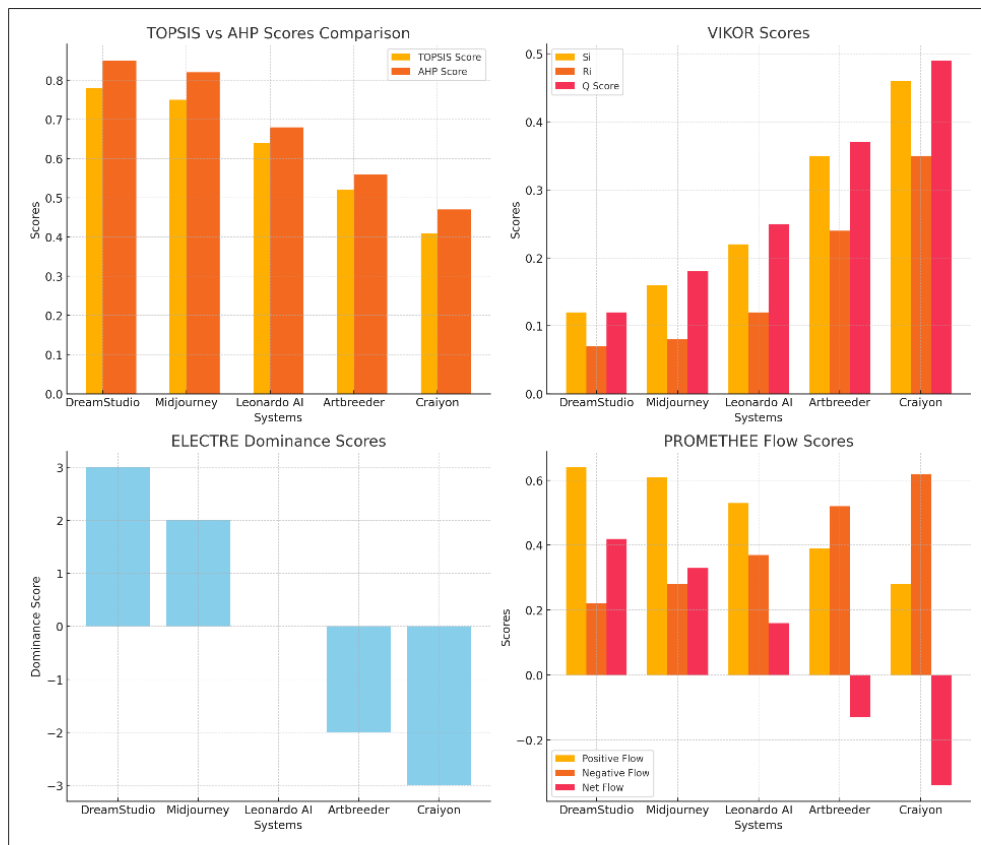


Figure 4. TOPSIS vs AHP Scores, VIKOR Scores, ELECTRE Dominance Scores, and PROMETHEE Flow Scores.

ing the nuanced demands of spatial design. DreamStudio’s strength in spatial organization and material-texture coherence can be attributed to its open-source, Latent Diffusion Model (LDM) architecture, which allows for fine-grained control and predictable, high-fidelity output—a key advantage for technical design phases (Rombach et al., 2022). In contrast, Midjourney’s proficiency in generating dynamic,

balanced, and visually diverse compositions stems from its proprietary model, which is explicitly optimized for artistic expression and creative exploration, making it ideal for initial concept ideation and mood-setting (Holmes, 2023; Oppenlaender, 2023).

The strong alignment between TOPSIS, AHP, and ELECTRE rankings ($r > 0.989$) underscores the methodological

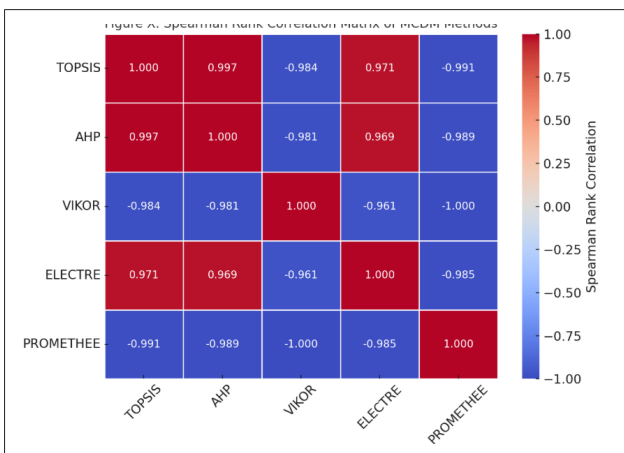


Figure 5. Spearman rank correlation matrix of MCDM methods.

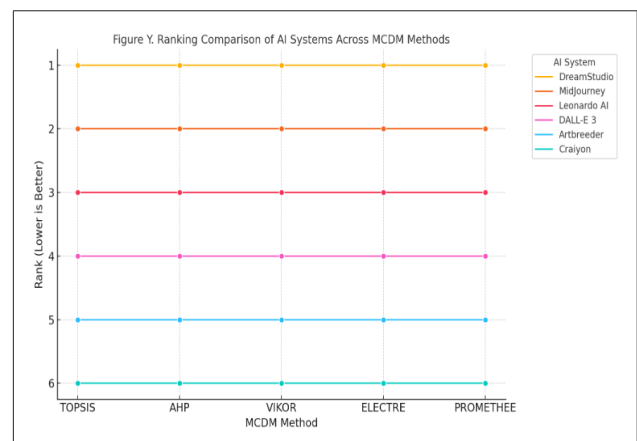


Figure 6. Ranking comparison of AI systems across MCDM methods.

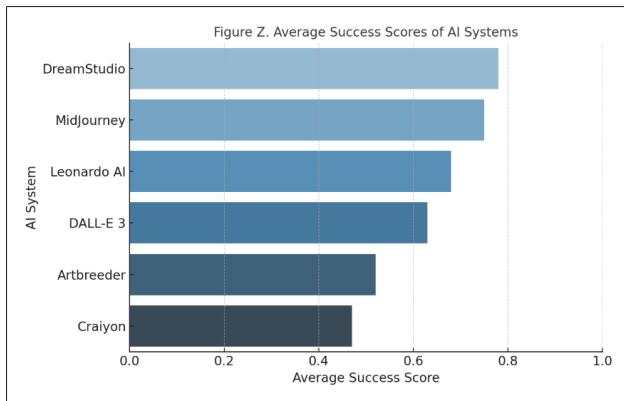


Figure 7. Average success scores of AI systems.

robustness of our findings. However, the inverse relationship observed between VIKOR and PROMETHEE ($*r=-1.000*$) highlights a critical methodological insight: Different MCDM algorithms can prioritize different aspects of performance (e.g., minimizing regret vs. maximizing net preference flow). This divergence reinforces the value of employing a complementary suite of MCDM methods, as done in this study, to avoid the bias inherent in any single technique and to obtain a more holistic performance profile. A recognized challenge in evaluating commercial generative AI systems is their inherent “black box” nature, which obscures the specific algorithmic processes and training data that underlie image synthesis. While this opacity limits technical interpretability, the output-based, multi-criteria framework employed in this study demonstrates significant practical utility for the design community. By systematically benchmarking AI-generated visuals against established professional standards, the research provides practitioners with an evidence-based rationale for tool selection tailored to specific project requirements. For example, a design phase demanding precise material representation and rigorous spatial logic might benefit more from DreamStudio’s controllable, detail-oriented output, whereas a concept development stage seeking inspirational breadth and stylistic flair could leverage MidJourney’s compositional strength and aesthetic versatility. Consequently, this approach advances the discourse from general speculation on AI’s potential to a nuanced, criterion-driven understanding of its current applicable value in interior architectural workflows. Despite this practical contribution, the study’s findings must be considered within its inherent methodological boundaries. This study has several limitations that chart a course for future inquiry. First, the evaluation was inherently static and visual, focusing on image outputs. Critical dimensions of interior architecture—such as user experience, spatial ergonomics, tactile material qualities, acoustics, and the functionality of dynamic elements—were beyond its scope. Second, while the expert panel was professionally diverse, the evaluation may reflect certain demographic (e.g., age range, cultural background)

and experiential biases. Factors such as the specific sub-fields of expertise or individual familiarity with different AI platforms were not controlled for and could influence the scoring, potentially skewing towards aesthetic and cultural biases prevalent in the training data of the AI systems themselves. This underscores a pressing ethical need for more diverse and globally representative datasets.

Future research should therefore pivot towards human-centric and participatory methodologies. Integrating post-occupancy evaluations and sensory feedback could bridge the gap between AI-generated visuals and lived experience. Furthermore, investigating the technical architectures of open-source models (like Stable Diffusion) to develop fine-tuned, domain-specific models for interior architecture presents a promising avenue to move beyond the “black box” and create more transparent, accountable, and culturally sensitive design tools.

CONCLUSION AND IMPLICATIONS

This study presents a comprehensive evaluation of the contributions of text-to-image artificial intelligence (AI) systems to interior architectural design, employing multi-criteria decision-making (MCDM) methods. Among the six analyzed platforms (DreamStudio, MidJourney, Leonardo AI, Artbreeder, Craiyon and DALL-E), DreamStudio and MidJourney emerged as leading performers based on both quantitative analyses and expert assessments. DreamStudio demonstrated superior capabilities in spatial organization, material-texture harmony, and overall compositional coherence. Conversely, MidJourney excelled in generating dynamic and diverse spatial layouts, exhibiting a notable aptitude for visual balance and the skillful application of rich color palettes.

The methodological rigor of the study was enhanced through the application of five distinct and complementary MCDM techniques (TOPSIS, AHP, VIKOR, ELECTRE, and PROMETHEE). The results obtained across these methods generally corroborated the superior performance of DreamStudio and MidJourney. The high positive correlation observed between TOPSIS and AHP ($r=0.997$) indicates a consistent alignment in their evaluation criteria and resulting rankings. Similarly, a strong positive correlation ($r=0.989$) was found between the dominance scores from ELECTRE and the overall system performance as perceived by the experts. Notably, the strong negative correlation ($r=-1.0$) identified between the VIKOR Q-value and the PROMETHEE net flow highlights the divergent analytical frameworks inherent in these methods, underscoring the importance of methodological diversity in such evaluations. Nevertheless, the overarching trend suggests that DreamStudio and MidJourney currently possess a performance edge over the other systems. The reliability and depth of the study were further augmented by the evaluations provided by an experienced panel compris-

ing 15 architects and 15 interior architects, each with over a decade of professional practice. These seasoned professionals meticulously assessed the AI-generated visuals for their adherence to fundamental interior architectural principles and the components of design. The diverse disciplinary backgrounds of the experts provided a balanced, multifaceted, and comprehensive perspective on how AI tools are perceived and evaluated within the professional design community. However, this study acknowledges certain inherent limitations that offer valuable avenues for future research. The current evaluation process primarily concentrated on the static visual analysis of the AI-generated outputs. Crucial human-centered and functional dimensions of design, such as user experience, spatial ergonomics, the tactile and auditory qualities of materials, or the potential for interactive and dynamic elements within a space, fell outside the scope of this investigation. Furthermore, the emotional resonance, subjective preferences, cultural contexts, and overall personal experiences of end-users in response to these visuals were not incorporated into the analysis. These limitations underscore that the potential contributions of AI to interior architectural design extend beyond mere visual aesthetics, and future research endeavors should invariably address these deeper, multifaceted, and human-centric aspects. Based on the salient findings of this study, several significant and strategic implications for the fields of interior architecture and AI can be articulated.

Firstly, the variable success of AI systems across different design scenarios and evaluation criteria is substantially influenced by the underlying technological infrastructure, the core algorithms employed, the characteristics of the training datasets utilized, and the design of their user interfaces. For instance, the open-source Stable Diffusion architecture underpinning DreamStudio, supported by a broad user base, affords users an unparalleled degree of detailed and precise control over visual outputs, facilitating technically consistent, predictable, and highly customizable results (Rombach et al., 2022). Conversely, MidJourney, with its more proprietary and closed structure, demonstrates a remarkable aptitude for generating creative and original spatial arrangements, achieving striking and harmonious color palettes, and crafting an overall artistic, dynamic, and often surprising visual language (Holmes, 2023). Such fundamental distinctions arise not only from the algorithmic approaches and technical choices of these systems but also from the modes of interaction users engage in, their prompt engineering strategies, and the stylistic preferences inherent in the systems' visual synthesis processes (Oppenlaender, 2023).

Secondly, the inclusion of a correlation matrix among the MCDM methods significantly enhances the methodological robustness and transparency of the evaluation process. Understanding the extent to which different decision-making approaches align, where they yield similar or divergent outcomes, and the underlying assumptions that inform

them provides a valuable and solid methodological foundation for future comparative studies in the evaluation of design-oriented AI systems. Such meta-analytical approaches can aid in a better understanding of the strengths and weaknesses of various evaluation frameworks and contribute to the development of more integrated, reliable, and comprehensive assessment models.

Thirdly, and perhaps most critically, despite their creative visualization capabilities, current AI systems exhibit notable limitations in addressing core tenets of interior architectural design, such as spatial logic, structural feasibility, and cultural relevance. Moreover, the risk of aesthetic bias, particularly favoring Western-centric visual norms and aesthetic sensibilities, underscores the urgent need for more diverse, global, and inclusive training datasets. Ethical concerns surrounding originality, intellectual property rights, and the potential displacement of human creativity also necessitate more in-depth and interdisciplinary investigation.

Looking ahead, AI-generated visuals should be positioned as collaborative instruments that extend architectural thinking rather than autonomous design solutions. Future research should move beyond static visual assessment and incorporate user-centered and participatory evaluation frameworks to better capture spatial experience, cultural context, and design intent. Integrating the perspectives of both designers and end users will enable a more comprehensive understanding of how AI tools influence spatial decision-making and design communication. From an interior architectural standpoint, the transformation of AI systems into interactive platforms, capable of testing design alternatives, supporting scenario-based exploration, and facilitating dialogue with clients, represents a critical next step. Overall, the findings indicate that when thoughtfully integrated within architectural workflows and guided by ethical awareness and contextual sensitivity, text-to-image AI systems can meaningfully support creativity, efficiency, and informed design exploration.

ETHICS: This study did not require approval from an institutional ethics committee because it involved no clinical procedures, personal data collection, or intervention with human participants. Participation in the survey was voluntary, based solely on professional expertise evaluations, and did not involve any sensitive or identifying information. All participants contributed anonymously and knowingly to the study.

PEER-REVIEW: Externally peer-reviewed.

CONFLICT OF INTEREST: The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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