Art and Architecture Journal (2025) 6, (1) 183–212

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

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Keywords:
Value-driven back casting, sustainable interior design, creativity in design, United Nations Sustainable Development Goals (SDGs), AI in interior design.

Value-Driven Back casting Technique as a Methodology for designing the Future of Continuous Learning Center Interiors (AI as an Assistive Tool)

ABSTRACT:

Interior design today faces two significant challenges: a decline in creativity and originality due to an overreliance on digital tools, AI, and online platforms for inspiration, and a lack of alignment with sustainability and the United Nations Sustainable Development Goals (SDGs). This misalignment often occurs because these global visions are not adequately considered during the design process. One of the main reasons for these challenges is the pressure of time and efficiency, which frequently forces designers to prioritize convenience over creativity and innovation. As a result, designs often fail to address long-term societal and environmental impacts.

This paper explores various thinking approaches while designing, critically examining their potential to tackle these challenges. It introduces "value-driven back casting" technique as an innovative framework for interior design, emphasizing a future-focused and goal-oriented approach to overcoming these issues. This methodology empowers interior designers to actively shape and define their own future, rather than merely following trends or relying on existing tools and ideas. By developing out-of-the-box thinking and encouraging innovation, this approach enables designers to become leaders in creating forward-thinking and sustainable solutions. To demonstrate its application, the paper presents an experiment that uses this methodology to design a sustainable, future-oriented continuous learning center as an example. The experiment also incorporates AI as an assistive tool at various stages of the process, showcasing how technology can support and enhance being used as an assistive tool, yet making interior designers creativity shine through.

تقنية التخطيط العكسي المدفوع بالقيم كمنهجية لتصميم مستقبل المساحات الداخلية لمراكز التعليم المستمر (الذكاء الاصطناعي كأداة مساعدة)

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الملخص : يواجه التصميم الداخلي اليوم تحديين رئيسيين: أولًا، تراجع في الإبداع والأصالة نتيجة الإعتماد المفرط على الأدوات الرقمية، والذكاء الاصطناعي، والمنصات الإلكترونية كمصادر للإلهام. وثانيًا، ضعف التوافق مع الإستدامة وأهداف التنمية المستدامة للأمم المتحدة (SDGs) ، وذلك لأن هذه الرؤى العالمية لا تُؤخذ بعين الإعتبار بشكل كافٍ أثناء عملية التصميم. ومن أبرز أسباب هذه التحديات ضغط الوقت والسعي إلى الكفاءة، مما يضطر المصممين في كثير من الأحيان إلى تفضيل الحلول السهلة على حساب الإبداع والإبتكار. ونتيجة لذلك، غالبًا ما تفشل التصاميم في معالجة التأثيرات المجتمعية والبيئية على المدى الطويل.

تتناول هذه الورقة البحثية مجموعة من أساليب التفكير أثناء عملية التصميم، وتُحللها بشكل نقدي من حيث قدرتها على مواجهة هذه التحديات، وتقدم تقنية "التخطيط العكسي المدفوع بالقيم" كمنهجية تصميمية تركز على المستقبل وتستند إلى الأهداف، تمكّن مصممي العمارة الداخلية من صياغة مستقبلهم بأنفسهم، بدلًا من مجرد إتباع الإتجاهات الدارجة (الصيحات) أو الاعتماد على أدوات وأفكار جاهزة، وتُسهم في إستعادة زمام المبادرة والعودة إلى دورهم القيادي في عملية التصميم، بدلاً من أن يكونوا مجرد تابعين للإتجاهات السائدة أو الأدوات الجاهزة.

ومن خلال تعزيز التفكير غير النمطي وتشجيع الإبتكار، تساعد هذه الطريقة المصممين على أن يصبحوا روادًا في تقديم حلول مستقبلية ومستدامة. وتعرض الورقة تجربة عملية لتطبيق هذه المنهجية من خلال تصميم مركز تعلّم مستمر مستدام وموجّه نحو المستقبل كمثال تطبيقي، مع دمج الذكاء الاصطناعي كأداة مساعدة في مراحل مختلفة من العملية، لإظهار كيف يمكن للتكنولوجيا أن تعزز الإبداع دون أن تطغى عليه.

الكلمات المفتاحية : التخطيط العكسي المدفوع بالقيم ، التصميم الداخلي المستدام، الإبداع في التصميم، أهداف التنمية المستدامة(SDGs) ، الذكاء الإصطناعى في التصميم الداخلي .

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1.INTRODUCTION

Nowadays, interior designers are facing increasing criticism for what many perceive as a decline in creativity and originality**.** This is a trap that many designers—from students to seasoned professionals-fall into due to a mix of several factors, including time constraints, market pressures, and the easy availability of digital tools**.** These tools range from digital libraries, which serve as vast sources of inspiration, to AI-powered tools that can generate multiple design options within minutes, assisting designers in their long, tiring creative process. However, in the process, these tools risk limiting creativity by producing predefined, algorithm-based outputs (Kahraman et al., 2024). The danger starts at the very foundation of design education. According to Izadpanah (2021), 62% of interior design students rely exclusively on Pinterest for inspiration, demonstrating how digital platforms and AI tools are shaping their creative processes rather than encouraging independent thinking. After all, when easy tools are available, who would willingly take the harder route? This dependence extends beyond students to professional designers, who—faced with tight deadlines and budget constraints-often prioritize efficiency over originality (Author, 2025).

All these factors and more have led to many designers becoming followers rather than controllers of their creative process, shaping their work around pre-existing trends instead of defining new, original design directions. Additionally, most recycled designs fail to consider long-term environmental and social impacts, leading to a disconnect from global sustainability efforts, such as the United Nations Sustainable Development Goals (SDGs), which emphasize the importance of integrating sustainability into every aspect of life (UNEP, 2023). One of the reasons for this may be that many interior designers still lack a deep understanding of how to integrate sustainability into both the design process and the final outcome in a way that rightfully achieves the world's vision for sustainability. As a result, sustainability often remains in theory rather than practice, leading to designs that fail to truly "walk the talk", (Author, 2025).

All these factors served as the driving force that pushed the author to dig deeper and seek answers to some questions .Some of the most prominent: Are the current practiced thinking approaches used in the designing process leading to the decline in creativity, or is the issue solely caused by external factors? Are there more flexible methodologies/ thinking approaches that can help both junior and senior designers break free from restrictive frameworks, regain creative control, and rightfully achieve the world's vision for sustainability in interior design, as one of the world's major concerns?.

1.1RESEARCH PROBLEM:

-Interior design is facing growing challenges, particularly in creativity and originality, due to an increasing reliance on AI tools and online platforms, which result in repetitive design approaches and limit true innovation (Kahraman et al., 2024). As a result, designers are becoming followers and users rather than the creative controllers they are meant to be in shaping the built environment.

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
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- Designers struggle to implement sustainability beyond theoretical discussions, making it an inconsistent practice rather than a fundamental design principle (Gaziulusoy & Erdoğan, 2021).

1.2. RESEARCH HYPOTHESIS:

This study hypothesizes there can be other undiscovered or unpopular thinking approaches that can allow interior designers to reclaim creative control compared to traditional thinking approaches that may restrict innovation in the process while still integrating sustainability as a core principle which as a result empowers designers with the freedom to explore bold, original ideas while still aligning with global sustainability goals and shaping a more forward-thinking design approach.

1.3. RESEARCH AIM:

This paper aims to explore lesser-known thinking approaches in designing and evaluate their potential compared to commonly practiced methods especially in interior design**.** It seeks to reach a new thinking approach and steps to follow in order to help interior designers overcome creativity challenges, regain control over their creative process, and integrate AI as a supportive tool in a balanced and effective way**.**

1.4. RESEARCH IMPORTANCE:

-Encouraging innovation by introducing alternative thinking approaches that address creativity limitations in design.
- Empowers designers by providing methodologies/thinking approaches that enhance creativity rather than restricting it.
-Promotes responsible AI use, ensuring that technology serves as an assistive tool rather than a creativity-limiting factor.
-Supports sustainable design, aligning interior design practices with global environmental and social goals.

1.5. RESEARCH METHODOLOGY:

This study adopts a qualitative, analytical, comparative, and case study-based research approach to investigate and evaluate various commonly practiced way of thinking for design and their impact on creativity. The research begins with a literature review, analyzing existing data to assess the effectiveness of those in achieving high level of creativity. A comparative analysis is then conducted to systematically evaluate these methodologies, identifying the most suitable approach. Following this evaluation, the selected methodology is applied in a real case study, demonstrating its implementation process, practical application, and impact on interior design practice as an example.

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1.6. RESEARCH QUESTIONS:

-What are the factors that impact interior designer's creativity?
-How do commonly practiced thinking approaches in the design process influence creativity and originality in interior design?.
-Is reliance on AI and digital platforms the only reasons to limiting creativity?.
-Are there any alternative thinking methodologies that can ensure interior designers walk out of the trap and be more creative yet achieve the global sustainable vision?.
-Can a responsible use of AI be a very good assistive tool instead of a barrier?
These questions, among others, will be explored throughout this paper, beginning with a deep dive into the factors shaping and impacting creativity in interior design ending with a practical example of the best thinking approach in action.

1.7. PAPER STRUCTURE

The paper is structured into four main sections, excluding the introduction, conclusion, and recommendations. It begins by examining creativity in interior design, focusing on key influencing factors and highlighting various thinking approaches due to their significant impact. It then evaluates design thinking—commonly applied indirectly in interior design—while exploring whether other, less-utilized methods could offer better results. This leads to the introduction of back casting, selected after thorough analysis as the most suitable approach. The final section applies this method in practice through a case study of a continuous learning center's interior.

2. CREATIVITY IN INTERIOR DESIGN CONTEXT: EVALUATING DIFFERENT THINKING APPROACHES

Studies on creativity and the factors influencing it have been a field of interest for the longest time now. While other topics experienced periods of peaks and recessions , creativity and all factors impacting it and best approaches to achieve it continue to be a topic of interest with a myriad number of papers being produced staring from 1922 and till now . A recent significant study carried by Mejia et al. (2021) examined 98 years of creativity research, analyzing over 38,000 academic articles published only between 1922 and 2020 across diverse domains, including psychology, education, business, technology, and the arts.

In the creative field generally, there has been a noticeable increase in research from the 2000s onwards, especially from 2010 onwards (Author, 2025). Most of this research focuses on industrial design, followed by architectural and graphic design, with the least attention given to the interior and fashion domains. When it comes to interior design , A considerable portion of these studies most focus are scattered between investigating factors influencing the creativity of design students, particularly interior design students, as well as the role of interior design instructors in education (Dai et al., 2023). Given the growing body of research on creativity in interior design and given the huge problem already highlighted regarding the matter , the

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following section aims to identify the most commonly cited factors that impact creativity both negatively and positively , trying to dig more on the reasons that set us back to practice creativity given the importance of the topic . In this aspect, the author classified factors impacting creativity for interior designers into two main aspects controllable and uncontrollable aspects**,** with each group further divided into internal and external influences**.** A deep investigation in order to outline the fundamental characteristics of an effective creative mindset and the most effective thinking approach will take place based on the factors summarized by the author as shown in fig(1).

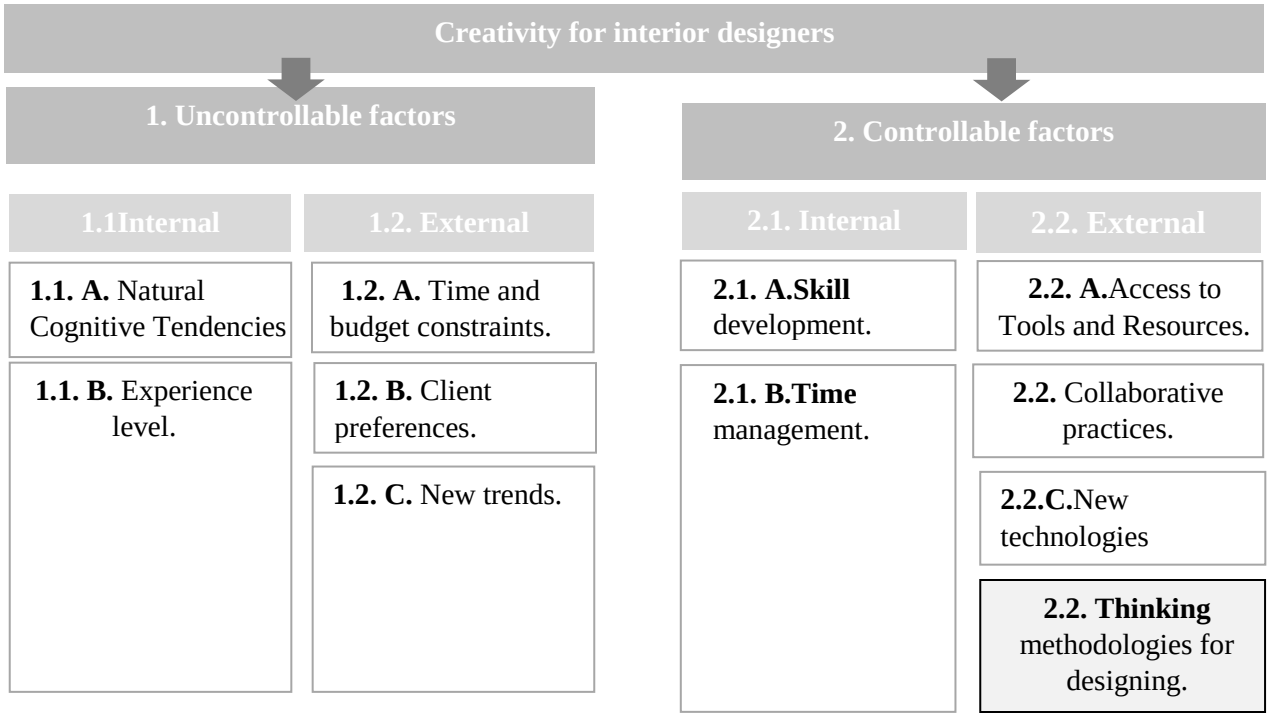

Figure (1) _ factors impacting interior designers' creativity (Author, 2025).

1. Uncontrollable factors: Those are the factors that cannot be controlled by the person and can be classified into internal factors mainly coming from inside the designer as well as external ones.

1.1. Internal factors:

1.1. A. Natural Cognitive Tendencies:

Human thinking patterns influence how we perceive, interpret, and respond to information, as they are directly tied to the way the brain processes information. These patterns naturally vary from person to person, including designers. Over the years, thinking patterns have been broadly classified into two main types: divergent thinking and convergent thinking with a myriad of papers tried to investigate the impact of each on levels of creativity which as well directly aligned with the person's personality and level of motivation as cleared in the table below :

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Table (1) _Personality's Impact on Thinking Preferences in Design (Author, 2025)

Aspect	Divergent Thinking	Convergent Thinking
Brief definition	A creative process that explores multiple solutions in a free-flowing manner, Finding out unexpected connections and encouraging innovative problem-solving (Ni et al., 2014).	A more logical process that narrows multiple ideas into a single, optimal solution that meets specific constraints (Lubart, 2016).
Designer's personality trait	Designers who are naturally open, willing to experiment, and take risks tend to lean toward this type of thinking.	Designers who prefer a more structured way, predictability, and clarity.
Motivation type	Intrinsically motivated designers (driven by internal satisfaction) often use this type of thinking	Designers primarily motivated by external factors like rewards or deadlines often favor convergent thinking. This is because they're focused on achieving specific goals within a set timeframe. As a result, they tend to prefer structured thinking processes that can lead to faster solutions.
Creativity contribution	Gives room to more creativity	Less creativity levels

While each of them has it pros, Studies suggest balancing both divergent and convergent thinking leads to the highest levels of creativity (Reiter-Palmon et al., 2023).

▪**Author's Conclusion 1:** A creative mindset should maintain a balance between divergent and convergent thinking.

1.1. B. Experience level:

Experience levels from both professionals as well as fresh students can definitely impact creativity levels and the effects can be both sides (positive as well as negative) . For professionals in specific it can be a double edged sword as their previous experiences provide them a wealth of knowledge and exposure to diverse design challenges that help in speeding up their design process and reach functional solutions in a timely manner (Cross, 2004) , yet this can lead to excessive reliance on past solutions leading to limited innovation , resulting into repetitive designs .On the other hand , limited experience can also limit creativity especially for junior designers , as they may struggle with conceptual thinking and problem-solving due to a lack of exposure to design processes which as a result takes a very long time .That aligns with findings by Kaya and Bilgiç (2020), who emphasize the need for structured design education to reach creativity.

▪ **Author's Conclusion2:** an effective creative approach should encourage both the utilization of prior knowledge and the development of fresh, innovative perspectives through structured learning and exploration.

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1.2. External factors:

1.2. A. Time and budget constraints**.**

Time management is a common challenge for both professionals and students, often impacting creativity. Research suggests that excessive time pressure restrict creative performance. Björklund et al. (2009) found that both too little and too much time negatively affect creativity, while moderate time pressure surprisingly leads to optimal results. Similarly, Zampetakis et al. (2010) highlight that effective time management, including long-term planning and control over time, enhances creativity by reducing stress and improving problem-solving.

Budget constraints is another major challenge, particularly for professionals. A designer's creative ambitions are often restricted by two key factors: the client's budget and their specific demands. Limited financial resources and rigid client expectations can narrow creative possibilities, making it difficult to push design boundaries.

- **Author's Conclusion3:** The optimum thinking approach for creativity should include balanced time management, ensuring moderate time pressure to enhance innovation while avoiding the negative effects of extreme constraints.

1.2. b. Client preferences:

Client preferences play a major role in interior design, often limiting a designer's ability to explore new ideas. While meeting client expectations is essential, strict demands and rigid preferences can stifle creativity and push designers toward safer, more conventional choices (Dorst, 2019). Research shows that many clients tend to favor familiar styles over bold, innovative approaches, making it challenging for designers to introduce fresh concepts (Verganti, 2020). Additionally, Brown and Katz (2021) highlight that when clients prioritize marketability and cost-effectiveness, designers may hesitate to take creative risks**.** This dynamic makes it crucial for designers to find ways to educate clients on the value of innovation while still delivering a design that aligns with their vision

- **Author's Conclusion4:** The optimum thinking approach for creativity should include strategic client engagement, where designers balance client expectations with innovative solutions by effectively communicating the value of creativity and pushing boundaries within given constraints.

1.2. C. New trends:

Global trends shape interior design, with sustainability being one of the most uncontrollable factors driving major industry transformations, including interior design. Recent research emphasizes eco-friendly materials, energy efficiency, and circular design strategies as essential elements in modern interiors (Lozano, 2023), making even the most risk-averse designers obligated to align with global shifts by integrating life cycle assessment methods and responsible material sourcing to achieve sustainability . Another powerful force shaping interior designers' creative approach under the sustainability umbrella is biophilic design, which enhances well-being, cognitive function, and indoor air quality through natural elements and adaptive lighting . Additionally, the growing demand for carbon-neutral interiors and net-zero buildings further cements sustainability as a defining and unavoidable influence in contemporary design (Zhao et al., 2023), and the list of alternative approaches emerging from this major trend goes on ….

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
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▪ **Author's Conclusion5:** The optimum creative mindset in interior design embraces adaptability, innovation, and sustainability, allowing designers to transform global trends into meaningful, forward-thinking spaces that can last the longest time possible.

2. **Controllable factors:**

2.1. Internal factors

In addition to the external factors already mentioned, there are also internal factors, some of which can be controlled, while others cannot.

2.1. A. Skill development.

Skill development, particularly in technical areas, is essential for boosting creativity in interior designers. As mentioned earlier, lacking proficiency in up-to-date design software can significantly limit a designer's ability to bring their ideas to life. Without the right tools to visualize their concepts, designers may find it challenging to fully explore and express their creative potential, same goes with interior design students, something that the author witnessed herself with her students many of whom resort to using ready-made 3D Max models or making minor adjustments to pre-existing scenes .This avoidance of original design stemmed from their inability to effectively visualize and translate their ideas (Author, 2025) . This observation supports the theory put forth by Mozaffar and Khakzand (2009) that design is a two-pronged process: it necessitates creativity and is inextricably linked to the ability to visually represent those ideas , This is further supported by another study that identified a group of factors impacting architecture students, their ability to visualize and draw their idea being two of the five other points mentioned (including the tools used to draw) along with individual's experience ,teachers , the learning environment as well as the visual reference (Baghaei Daemei & Safari ,2017) which can actually have positive as well as more negative weighed impact (author ,2025).

▪ **Author's Conclusion 6:** Optimal design thinking balances creativity and technical skills, enabling effective idea visualization which is no less important than the idea itself, which raises another important question, what if there are easier tools that can help us save time and visualize whatever idea we have in mind, to give more time to more in deep design aspect details?. Won't this increase creativity levels?

2.1. B. Time management.

Time management is a vital skill for interior designers, as it directly impacts their efficiency and the success of their projects. Sari (2019) highlights three key layers of time management challenges faced by design practitioners. The first is internal factors, such as perfectionism, which often comes from personality traits that vary from one individual to another. The second involves general issues like procrastination, which may result from a lack of motivation, the complexity of tasks, or the perception that a task will take too long, leading to its avoidance. Finally, external challenges include unclear project briefs and tight deadlines, which can pressure designers to prioritize completion over creativity and innovation. All in all, trying to master time management skills is a must to interior designers to get the best results which is being recognized by a lot of designers lately that people start taking it as courses. A study by El-Sayed and El-Sayed (2016) emphasizes the importance of integrating time management systems within interior

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
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design practices to enhance work quality and efficiency. Implementing effective time management strategies enables designers to balance creativity with project deadlines, leading to improved performance and this aligns with the previous author conclusion about time and budget constraints .

2.2. External

2.2. A. Access to Tools and Resources.

There is no doubt that access to tools and resources can greatly assist both professionals and students throughout various phases of the design process. By tools and resources, it is meant search engines and other technical tools that can help when used appropriately. In modern times, accessing such tools has become significantly easier compared to the past. For instance, during the research phase, tools can serve as a valuable aid, enabling designers to gather insights and inspiration effectively. However, while tools can have a positive impact, there are aspects where their misuse or over-reliance might hinder the creative process (Ahmed, 2024) which is the main problem mentioned in this paper.

2.2. **B.** Collaborative practices.

Collaborative practices, now widely recognized as interdisciplinary work, involve examining a subject from various perspectives, which ultimately enhances creativity across all disciplines, including interior design, and highlights its importance even at the educational level (Author, 2025).

2.2. C. New technologies

One of the major evolving megatrends today is artificial intelligence (AI). While AI is not a new concept, it has recently regained significant attention due to its growing influence across various industries, including interior design. This renewed interest has prompted researchers and educators to investigate the impact of AI tools, particularly on the creativity of junior designers, such as university students. Questions have arisen about how to effectively use these tools and in which design phases they are most beneficial?. Research in this area mostly focused on evaluating the pros or the cons of its usage in the design process generally or specifically in the design education process (author, 2025).

A recent systematic literature review by Kahraman et al. (2024) analyzed the integration of AI in interior design, focusing on its impact on creativity, efficiency, and innovation. The study found that AI can automate repetitive tasks, allowing designers to focus on more creative aspects of their work. Similarly, Hussein (2023) highlighted AI's role in supporting brainstorming and improving efficiency without replacing designers. Zhou and Wang (2024) demonstrated how AI models like Stable Diffusion enable personalized interior design, enhancing customization and workflow. On the other hand, some other studies oppose this idea (Boden ,2016) and the debate goes on …

- **Author's Conclusion 7:** A creative mindset grows when we use the right tools wisely and collaborate with others, bringing in fresh ideas and new perspectives.

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2.2.D. Thinking methodologies for designing

The design process can undoubtedly be carried out using various thinking approaches. Some of these approaches focus on placing the user at the heart of the design process to address current challenges, solve immediate design problems, or create solutions for the near future. In contrast, other methods adopt a more future-oriented perspective, exploring potential scenarios, anticipating upcoming challenges, and driving long-term innovation. Those thinking methodologies cover different domains and industries .In this regards, thinking methodologies for design can be generally classified into 5 main umbrellas as follow (Figure 2) .

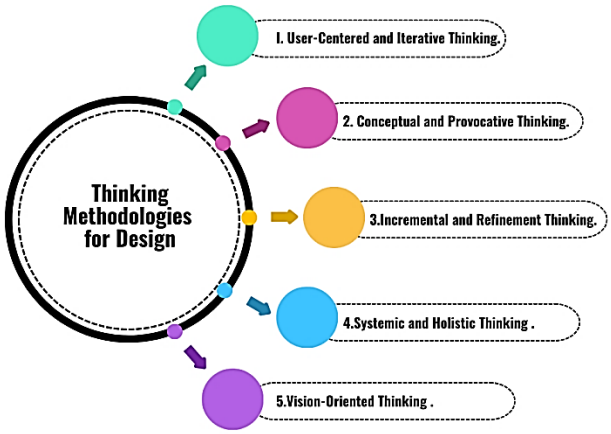

Figure (2)_ way of thinking for design categorization (Author , 2025)

1.User-Centered and Iterative Thinking: In other simple words , it is thinking with people in mind ,solving real problems and making things better by listening to feedback and improving along the way mostly current and near future problem .
2.Conceptual and Provocative Thinking: It is all about thinking out of the box , not necessarily keeping any needs in mind Pushes boundaries by using challenging assumptions and exploring bold, creative ideas for the future .
3.Incremental and Refinement Thinking: In other words , making small but steady improvements .Instead of big, drastic changes, this approach focuses on refining and improving things little by little to make them better over time.
4.Systemic and Holistic Thinking: It is seeing the whole picture and understanding how different parts work together to solve bigger, more complex problems rather than just focusing on one small detail.
5. Vision-Oriented Thinking: Imagines future possibilities and creates strategies to achieve long-term goals.

From this, it can be concluded that User-Centered and Iterative Thinking**,** Incremental and Refinement Thinking**,** and Systemic and Holistic Thinking with all the sub categories that serve this type of thinking are mostly used to address current or near future challenges . On the other hand Conceptual and Provocative Thinking and Vision-Oriented Thinking take a more futuristic

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approach with sub categories varying from Either frameworks or theories, where some are even more structured than others.

But the question now is: which of those thinking approaches can result in the highest levels of creativity? .The more structured or the less structured? The more futuristic approach? or the now solve problem approach . To answer those questions and with the pool of thinking approaches and related frameworks and theories , trying to narrow up the ones that are mostly used in interior design is an important step as there is a big question mark on the level of creativity achieved by interior designers nowadays . The figure below summarize the sub categories under different thinking methodologies (Fig.3):

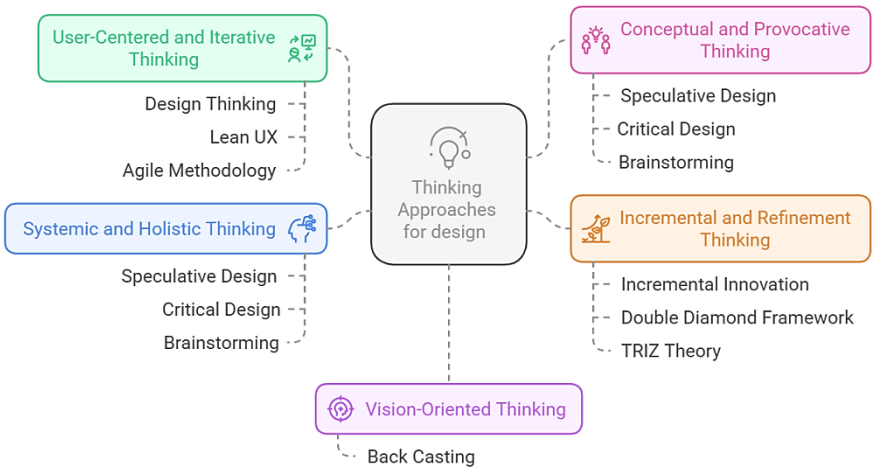

Figure (3)_ Sub categories to thinking approaches

The table below summarize each of those sub categories and to what it belongs:

Table (2)_Sub categories under thinking methodologies and related fields (Author , 2025)

Category	Sub category (Frameworks and theories)	Brief description	Field of use
User-Centered and Iterative Thinking	Design Thinking	A human-centered approach to problem-solving that passes through main 5 stages staring with emphasizing with the user , specifying a problem moving on to ideation phase till prototyping and testing	Product Design, UX/UI
	Lean ux	A human-centered approach to problem-solving that passes through main 5 stages staring with emphasizing with the user , specifying a problem moving on to ideation phase till prototyping and testing	Software Development
	Agile	It breaks down big tasks into smaller ones,	Software

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		getting timely feedback from stakeholders .It works mostly in teams which helps them deliver high-quality results faster while working together effectively.	Development, Engineering
Conceptual and Provocative Thinking	Speculative Design	Explores future possibilities through hypothetical designs to provoke thought and inspire innovation in art and technology."	Art, Innovation
	Critical design	Challenges assumptions and encourages critical thinking by questioning norms and expectations.	Social Design, Policy Making
	Brainstorming	A group ideation technique aimed at generating a wide variety of ideas and solutions.	All fields
Incremental and Refinement Thinking	Incremental Innovation	Gradual improvement of existing products, services, or processes.	Business Strategy, Manufacturing
	Double Diamond Framework	a simple, structured way of solving problems and creating designs. It has four stages, divided into two diamonds. First diamond includes (discover and defining) and second diamond includes (develop and deliver) , while in the middle defining .	Design Thinking, UX/UI
	TRIZ Theory	a systematic method for creative problem-solving that helps you find innovative solutions by identifying patterns in past inventions and applying 40 inventive principles.	Engineering, Product Development
Systemic and Holistic Thinking	Speculative Design	"Utilizes imaginative scenarios to examine long-term implications, fostering systemic change in environmental and social contexts."	Environmental Design, Social Policy
	Critical Design	Challenges existing systems by encouraging new ways of thinking about societal issues.	Public Policy, Advocacy
	Brainstorming	Encourages collaboration to generate a broad set of ideas, ensuring all viewpoints are heard.	Corporate Strategy, Teamwork
Vision-Oriented Thinking	Back casting	A planning technique that works backward from a desirable future to identify steps needed to reach it.	Sustainability, Urban Planning

By analyzing the various thinking methodologies, it becomes clear that some subcategories, such as Brainstorming and Speculative Design, are highly adaptable and can be applied across different fields. While these methodologies are commonly associated with disciplines like product design, policy-making, and technology, their principles can also be valuable in interior design. Although none of them are labeled as interior design methodologies in specific, many align with how interior designers approach their work. For instance, Design Thinking and the Double Diamond Framework emphasize user-centered problem-solving and structured

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creativity—both of which are fundamental in designing functional and aesthetically pleasing spaces. Speculative Design, while often linked to innovation and the arts, can inspire forward-thinking interior concepts that push creative boundaries. Accordingly the author concluded the most relevant approaches to interior design are the following (Fig 4)

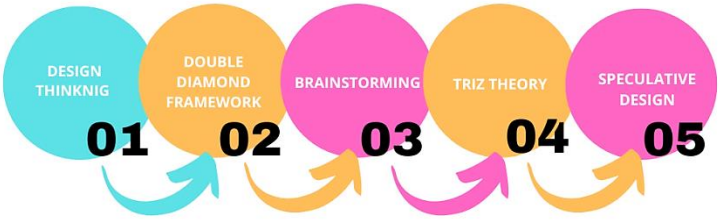

Figure (4)_ Most related approaches aligned with interior designing process (author , 2025)

After looking deeper into the topic, it's clear that Design Thinking stands out as the most popular and widely discussed approach in research, particularly for its impact on the design process as a whole (not specifically for interior design). Its human-centered nature makes it highly relevant to interior design, where everything revolves around understanding and meeting client needs.
The Double Diamond framework is quite similar to Design Thinking but offers a more structured methodology, making it equally applicable. Brainstorming, on the other hand, isn't a standalone approach but can be incorporated into frameworks like Design Thinking during the ideation phase to drive creativity. TRIZ theory, while less commonly discussed in creative design, is more technical and can be useful for testing specific aspects of interior design, such as lighting or material performance. At the same time, many interior designers tend to explore concepts in an unstructured way, which isn't always the most effective approach for solving problems, especially under time constraints. Since interior designers often address immediate challenges within tight deadlines, structured, human-centered methods like Design Thinking feel like the most logical choice for the field. But this raises an important question—what if designers want to go beyond solving current problems? What if we aim to create solutions that are not only sustainable and aligned with the world's future vision but also provide the freedom to shape the future we truly want to design? Can Design Thinking be the optimal approach to achieve this?. To answer this question, a deeper investigation into Design Thinking applications and feedback was required for evaluation.

3. DESIGN THINKING AND CREATIVITY: A CRITICAL ASSESSMENT

By scanning different online data bases and journals, it was concluded that researches available discussing design thinking and its impact on design generally classified as well from the most discussed to the least as follow:

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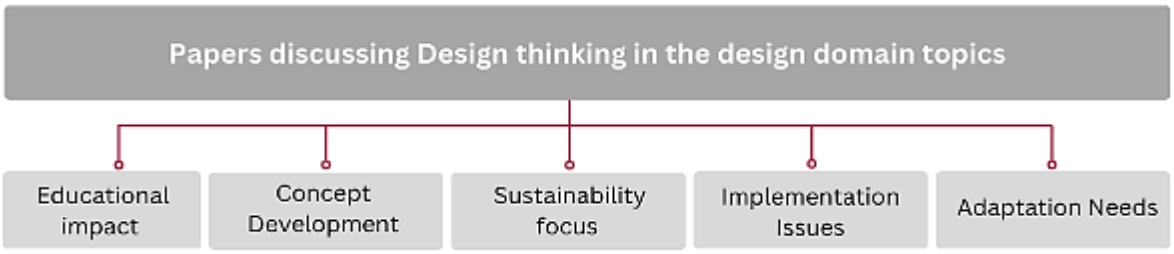

Figure (5) _ Research Classification on Design Thinking in Design from the most to the least discussed (Author, 2025)

With most papers following into the educational impact as well as conceptual development followed by sustainability focus then implementation issues and adaptation needs to be the least investigated making it a research gap area itself (Author 2025). Now the question is, whatever most investigated or least investigated, now the question is: whether most or least investigated, is the feedback about the methodology positive?" Starting with the most investigated "Educational impact". There are myriad of papers that concluded a positive impact yet with reservations. A recent meta-analysis study done in 2024 investigated 25 papers (from the year 2015-2023) related to design thinking and its impact on students' designing process, the study concluded a general positive impact of following the methodology on students' performance **(**Yu, Yu, and Lin ,2024**).**". As part of the paper, design thinking models were classified into several types, and the study concluded that some sub-models exhibited better performance than others, with three top-performing types identified out of the nine models to be :

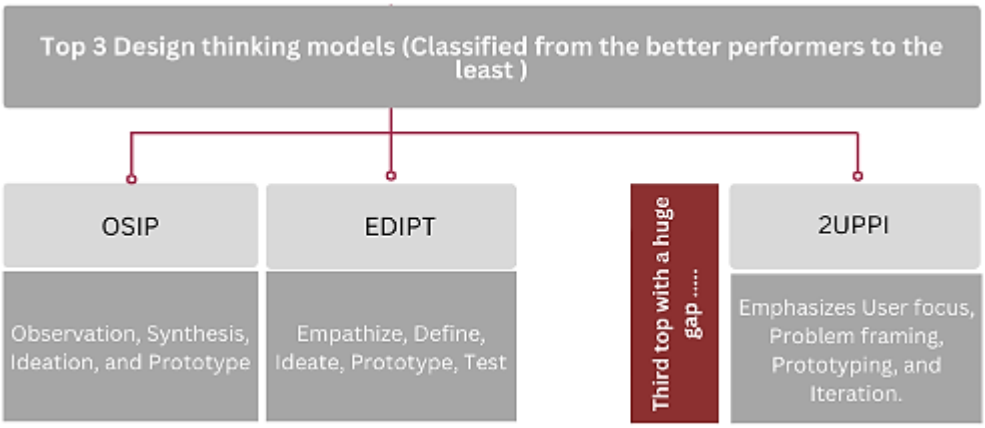

Figure (6) _ Top 3 successful design thinking models with university students (Author, 2025)

The first two models effectively balance research and observation while addressing user needs, unlike the third model (2UPPI), which lacks a strong research foundation despite its user focus that still helped it making it to the top 3 (despite it being a distant one). And by Comparisons with the six other models discussed in the same, the author concluded that structured approaches

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are generally more effective, offering clearer guidance (Author, 2025). This advantage extends to conceptual development, where structured design thinking methodologies promote iteration and problem-solving (Lehrer & Schauble, 2021). While these structured methods reduce cognitive overload which can be considered another positive point (Bartholomew et al., 2018), excessive rigidity can restrict creativity (Firnanda, 2021). 2UPPI's weak research foundation and poor implementation further limit its innovation, echoing the need for balance between structure and creative freedom (Johansson- Sköldberg et al., 2020). Similarly, while design thinking supports sustainability efforts, these often focus on isolated improvements rather than systemic change, limiting long-term impact as pointed out in papers discussing the matter (Gaziulusoy, 2015). Creativity in design thinking is further constrained by strict educational rules (Panke, 2019), organizational resistance to change (Carlgren, 2018), and rigid requirements (Mohanani et al., 2019). Last but not least many designers fail to integrate emerging technologies into their methodologies. To try and get a closer evaluation to accuracy due to the mixed reviews on the topic the author followed two steps as shown in fig.(7) as follow :

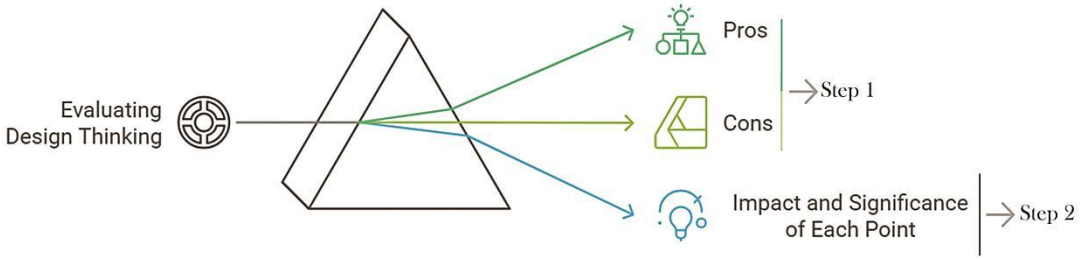

figure (7) _ Design thinking evaluation strategy (Author, 2025)

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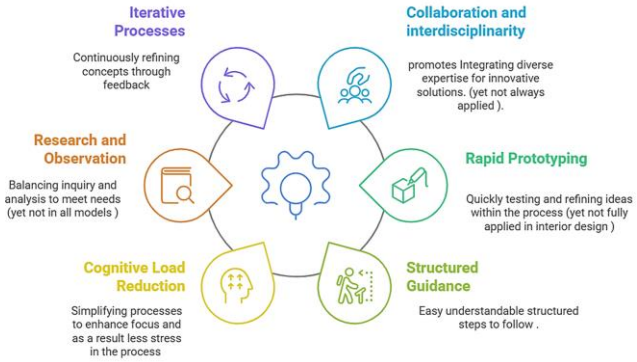

Figure (8) _ Summarizing design thinking pros (Author, 2025)

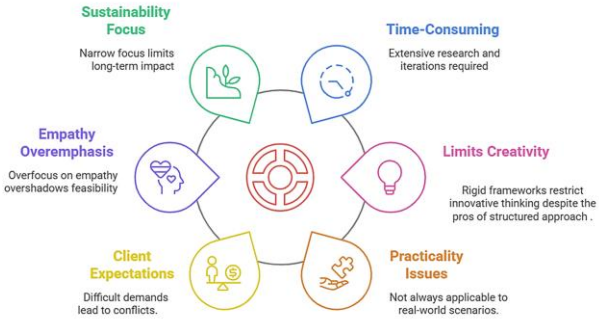

Figure (9) _ Summarizing design thinking cons (Author, 2025)

Step 1 : Briefing pros and cons which can be summarized into the following figures (8,9)

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While there are six main points mentioned under each of the pros and cons umbrella , they are not equally impactful. They represent key themes, but each theme encompasses a range of more specific issues. Furthermore, certain "Cons" directly counteract or undermine the intended "Pros." For example, while "Structured Guidance" is listed as a pro, "Limits Creativity" as a con highlights that overly structured approaches can be detrimental…etc . The fact that requires even more investigation by trying and evaluating the impact and significance of each point moving us to (step 2).

-Step 2: Evaluating the impact and significance of each point.

To assess the impact and significance of each point, the author tries to categorize them into four main categories high or low impact, paired with either high or low negatives. If most of the points fell in the High Impact with Low Negatives" or "Low Impact with Low Negatives" then design thinking is more of a positive approach than negative and if most of the points fell in the "Low Impact with High Negatives" or "High Impact with High Negatives" then it's the opposite by scanning the previous mentioned pros and cons, they be categorized as follow (Author, 2025) :

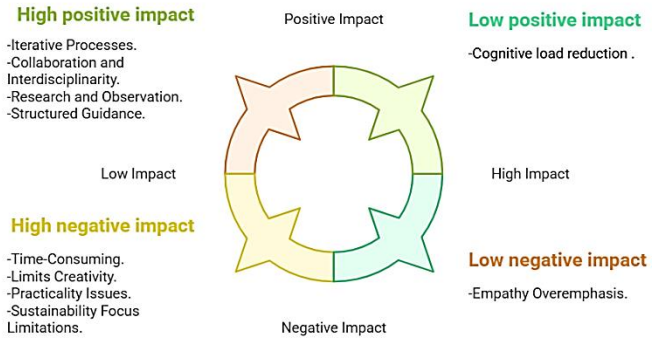

Figure (10) _ Categorizing pros and cons based on impact (Author, 2025)

The factors are classified based on their impact in interior designing process in specific. Now to reach a final decision a comparison between the impact and weight of high positive impact vs high negative impact should take place. by the scene of it the low positive and negative impact are not the strongest point , so the decision should be taken based on the weight and impact of the points mentioned under both the high positive and high negative point which are equal . By deeper scanning the results show that generally design thinking can be a positive thinking approach in the design field generally , while it can be the complete opposite when it comes to interior design field in specific (Author , 2025) . By deeper investigation, it is concluded that design thinking can be particularly successful in fields such as product and digital design, where prototypes can be rapidly developed, tested, and refined without significant resource constraints. The adaptability and experimental nature of Design Thinking enable these disciplines to continuously enhance user experiences and product functionality and that justifies the observation mentioned at the start of the paper to which domains is this approach mostly used . In interior design, however, the approach presents unique challenges. The time-intensive nature of iterative processes and the potential constraints on creativity clash with the industry's need for

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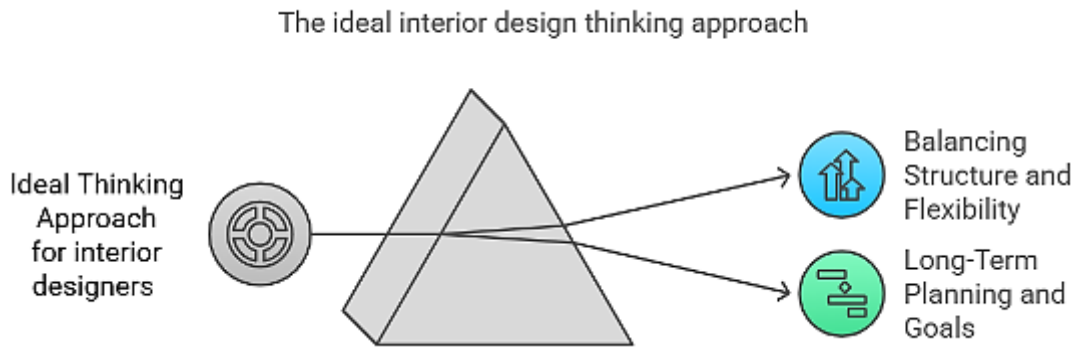
efficient, cost-conscious project delivery. Moreover, the limited focus on sustainability within Design Thinking poses a significant drawback, as interior design increasingly emphasizes eco-friendly practices to meet environmental goals and reduce material waste. Unlike product and digital design, where adjustments are relatively simple and inexpensive, interior design demands careful resource management and long-lasting solutions (means long term planning).

Final Author conclusion : based on this and the previous conclusions concluded by the author in the previous sections ,it was concluded that the ideal thinking approach for interior designers should inclusive mainly the following as summarized in figure (11):



Fig(11)_ The ideal interior design thinking approach concluded (Author , 2025)

And By rescanning table (2) , p.11 , it is clear Speculative Design as well as back casting which are both future thinking approaches can help in the flexibility aspect and by searching for a more structured approach the optimum choice will be back casting technique (Author 2025). And by investigating more, It is evident that the 3 conditions mentioned in figure (11) apply as well .
Back casting is a way of planning that starts with a clear goal for the future and then works backward to figure out the steps needed to reach it. Even though it follows a structured process, it still gives designers the freedom to shape their own path and take action without worrying too much about limitations. The set milestones help keep things on track and in a time frame (given the previous mentioned challenges interior designers face) while allowing flexibility.
This method is best for long-term planning because it focuses on the future. While interior design is usually a short-term process compared to big future visions, using back casting in specific projects can still encourage more sustainable thinking, even for short-term goals. Now the question is , should we use back casting as it is or can it be an edited version of it ? .

4. BACKCASTING IN DESIGN: A CLOSER EVALUATION OF ITS STRATEGIC BENEFITS AND LIMITATIONS.

In this section, a review on back casting, origins and technique format evolutions as well as actual application case studies analysis to conclude benefits and limitations of using it and conclude an optimum usage strategy will take place.

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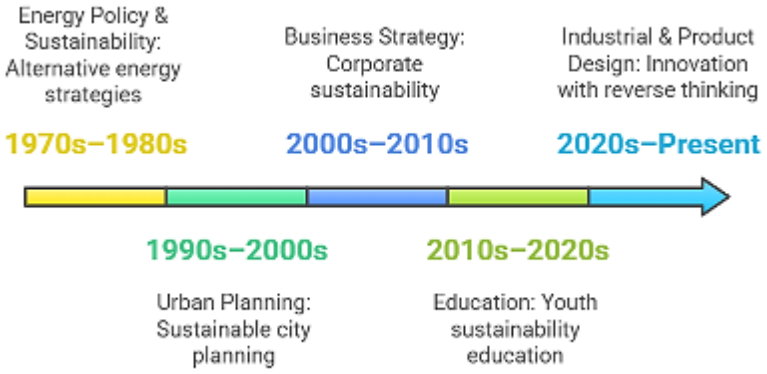
4.1. BACKCASTING ORIGINS

It is worth mentioning that the technique is not new at all. It was first introduced as a corrective action to a technique that was already famous back then "Forecasting technique" .The drawback of this technique was that it often relied on historical trends and assumptions which potentially impacted the innovation level (Robinson , 1990) . On the hand, back casting enables decision-makers to design strategies for achieving preferable futures. This if proves something, it further proves the potential of back casting.

4.2. APPLICATIONS OF BACKCASTING ACROSS DOMAINS

Back casting has been around since the 1970s, mainly used for big projects and long-term planning. Over time, it has evolved and found its way into different fields, helping tackle complex future challenges. The timeline below (fig.12) explores how its applications have developed over the years in solving complex, future-oriented challenges mainly related to sustainability.



Fig(12)_ Back casting fields of application through out the years (Author , 2025)

The earliest known use of back casting was in energy policy and sustainability during the 1970s–1980s, where it was applied to explore alternative energy strategies and long-term environmental planning (Robinson, 1982). As concerns over climate change grew, the 1990s–2000s saw its expansion into urban planning, where it helped design sustainable cities and infrastructure, such as in the Gothenburg 2050 Project in Sweden (Bibri, 2018). Moving into the 2000s–2010s, businesses adopted back casting for corporate sustainability, using it to develop long-term strategies for achieving net-zero emissions and integrating sustainable business models (Quist & Vergragt, 2006). The 2010s–2020s marked its entry into education, particularly in sustainability curricula, where students engaged in scenario-building exercises to envision and plan for future challenges but mainly school phase (Matos et al., 2024). In recent years (2020s–Present), back casting has been integrated into industrial and product design, combining reverse thinking to drive innovation and sustainable material use (Li, Li, & Geng, 2021). The fact that raises a

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question, is the optimum usage of back casting as it is, or is there a need to an updated format for the best results?.

4.3. BACK CASTING DIFFERENT FORMATS

*Table (3) _Summarizing back casting formats and related critical data (*Author , 2025)

Back casting formats	Brief definition	Pros	Cons	Uses
Goal oriented back casting	Focuses on a specific, well-defined long-term goal, then works backward to identify the necessary steps **(**Robinson, 1990**).**	▪Provides a clear vision for decision-makers. ▪Ensures a structured planning approach.	Can be too rigid if future circumstances change.	Policy-making, energy transitions, corporate sustainability (Quist & Vergragt, 2006).
Path-Oriented back casting	Identifies multiple possible pathways to reach a desired future, allowing for flexibility (Quist & Vergragt, 2011).	▪Encourages alternative solutions rather than a single path. ▪More adaptable to uncertainties.	▪Requires extensive scenario planning. ▪Decision-making can be slow due to too many options.	Urban planning, mobility solutions, circular economy (Gaziulusoy & Brezet, 2015).
Participatory Backcasting	Involves stakeholders, experts, and communities in defining goals and strategies (Kishita et al., 2024).	Promotes social inclusivity in decision-making.	▪Time-consuming due to extensive discussions. ▪May face conflicts of interest among stakeholders.	Smart cities, community planning, education (Bibri, 2018).
Normative Backcasting	Defines a desirable and ethically driven future vision, then determines how to achieve it (Dreborg, 1996).	▪Helps align policies with sustainability and ethics. ▪Encourages long-term responsible planning.	▪Can face political resistance. ▪Hard to translate into specific, actionable steps.	Climate policy, sustainability transitions, food security (Gaziulusoy & Brezet, 2015).
Exploratory Backcasting	Used for uncertain environments, where goals are flexible and based on emerging trends (Robinson, 2003).	Encourages adaptive and flexible strategies. Helps prepare for unexpected challenges.	▪Lacks a fixed direction, making it hard to track progress. ▪Can lead to unclear decision-making.	Technology foresight, AI impact, disaster preparedness (Quist et al., 2011).

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Value-Based back casting	Focuses on cultural, ethical, and social values rather than economic priorities (Gaziulusoy, 2015).	▪Ensures social responsibility in future planning. ▪Encourages inclusive decision-making.	▪Hard to quantify and measure outcomes. ▪May clash with economic and political goals.	Social justice, gender equity, cultural preservation (Vergragt & Quist, 2011).
Action-Oriented back casting	Focuses on immediate, practical steps rather than long-term vision (Vergragt & Quist, 2011).	▪ Delivers quick, measurable results. ▪ Aligns with short-term planning needs.	▪Can lack long-term vision. ▪Might miss larger systemic changes.	Corporate strategy, city governance, policy implementation.
Systemic Backcasting	Looks at entire systems rather than isolated solutions (Kishita et al., 2024).	▪Provides holistic solutions that consider interdependencies. ▪Prevents unintended consequences in planning.	▪Requires multi-sector collaboration, which can be challenging. ▪Can be too complex for short-term planning.	Climate action, energy transitions, ecosystem management.

Interior design is not just about aesthetics—it's about creating functional, meaningful, and sustainable spaces that adapt to users' needs over time. Accordingly, the author concluded that Value-driven back casting is the strongest approach because it strikes the right balance between having a clear structure and staying flexible for future changes. It focuses on long-term goals that are grounded in cultural, ethical, and social values, making sure that decisions are both meaningful and inclusive. This method also shines in long-term planning, helping us work toward big-picture goals without losing sight of social responsibility. Unlike quick, short-term approaches, it keeps us focused on what truly matters for the future. Even though it can be hard to measure outcomes, its focus on people, values, and lasting impact makes it the smartest and most responsible way forward.

4.4. PERSONAL EXPERIENCES WITH APPLYING BACKCASTING TECHNIQUE IN TEACHING PRACTICES

While back casting hasn't typically been used in interior design as previously mentioned, the author had an initiative to explore its potential through an elective course called Design Future. Though originally part of the graphic design program, this course was adapted and offered to interior design students—not as a core requirement, but as an elective. According to the UIF of this course, the main aim was to encourage future thinking. Yet what was practiced was the complete opposite. In practice, it tended to concentrate on current tools and trends, with students expected to apply existing technologies in their design proposals as summarized in (fig.13)

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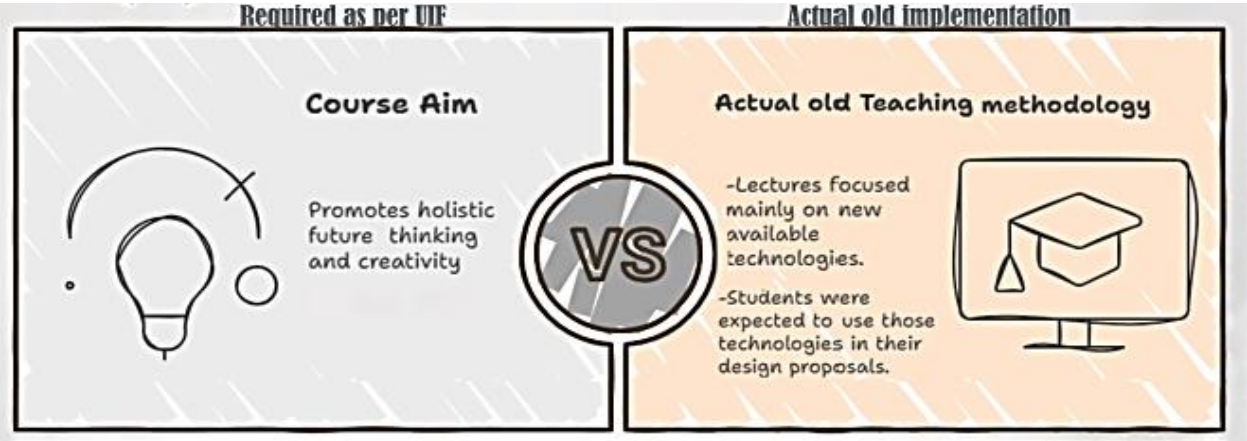

Fig (13)_Design future course aim vs actual implementation of content

This short-term approach conflicted with the course's original purpose, which was to inspire long-term, visionary thinking. To bridge this gap, the author restructured the course—updating both the lectures and assignments—to better reflect the intended learning outcomes, as outlined in the summary table below.

Table (4)_ "Redesigned Course Structure and Assignments

Lecture topic	Lecture target	Assignments
Being a futurist	Understand the role and mindset of a futurist.	Assignment 1: Research & Storyboard — Investigate the historical evolution of a selected interior design item, analyzing what aspects continued and what disappeared, analyzing the factors behind it. Assignment 2: Design Thinking Methodology — Use a structured design thinking process to solve an existing problem related to the chosen item. Assignment 3: Future Thinking Methodology Application — Reimagine the same item using the back casting approach.
Design thinking	Exploring the design thinking process and the difference between it and future thinking.	
Types of future thinking	Learning about the 4 learning types.	
Future tools	Discover commonly used tools to future planning.	

Through this process, students engaged in reflective and comparative learning by examining the outcomes of Assignment 2 and Assignment 3. This comparison helped them distinguish between addressing problems with current technologies and envisioning future-oriented ideas with no limitations, thereby enhancing their ability to think like futurists. Based on the results, the experiment was largely successful, as many students moved beyond conventional solutions and

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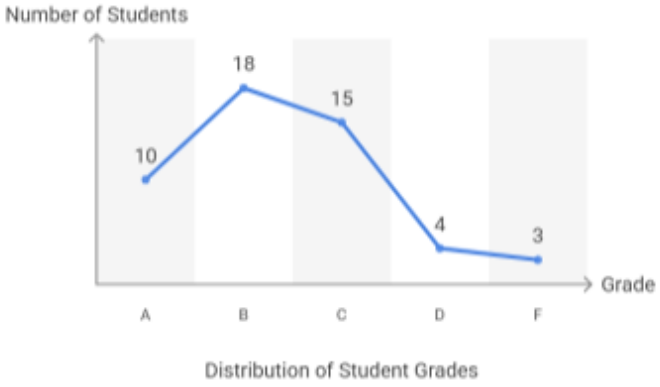
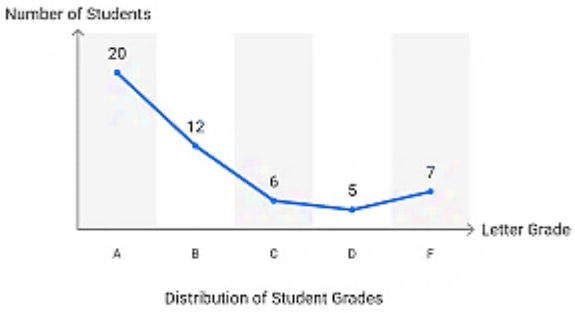
explored more imaginative, forward-thinking approaches. While some faced challenges in clearly articulating how they applied the back casting technique in detail, the overall outcome was still considered a success by numbers in course results.



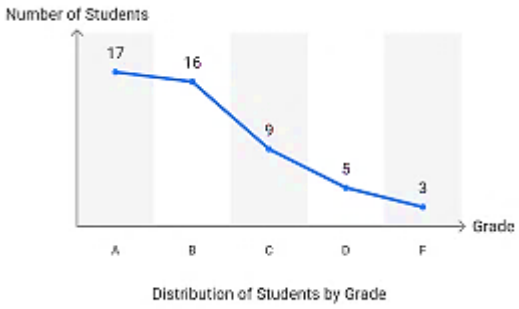
Fig(14)_A graph Summarizing total Course results

In total the final results of this course (including the 3 assignments) show a huge success with more than half of the students falling in the A and B category with a total percentage of 56% and a good percentage of 30% falling in category C where the graph forms the perfect and logical bell shape which as per quality standard, indicating achieving the real required Learning out comes.

And when deeper digging in results of Ass.2 and Ass.3 individually as shown in fig(15) , fig(16)



Fig(15)_A graph Summarizing Ass.2 results.



Fig(16)_A graph Summarizing Ass.3 results.

It demonstrated solid learning outcomes, but Assignment 3—where students applied the back casting technique to design an interior product—showed more consistent success and fewer failures, reinforcing the effectiveness of this approach. The outcomes could have been even stronger, though, if not for a few challenges observed by the author. One was the limited time

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available during the semester. Another ongoing issue was that many students lacked the technical and software skills needed to clearly visualize and communicate their ideas, which limited their ability to fully express their concepts (Authur, 2025). Additionally, while students put strong effort into presenting the final result they aimed to achieve, many did not clearly explain how each step of the back casting process was followed. This weakened the overall application of the technique, as understanding and demonstrating each stage is essential to its full implementation. And now comes the question is: what are the right steps to follow when it comes to applying this strategy in the core of interior design field?. To demonstrate this the author chose continuous learning centers for the experiment as a demonstration example.

5. EXPERIMENTAL APPLICATION OF VALUE-DRIVEN BACK-CASTING IN INTERIOR SPACE DESIGN

5.1. REASON FOR CHOICE OF CONTINUES LEARNING CENTERS

Continuous learning centers were chosen for this experiment given the crucial role they play in shaping industries, supporting lifelong education, and driving business growth. They are more than just classrooms; they serve different categories of users—sometimes even simultaneously—ranging from students to professionals seeking growth across various fields (Matos et al., 2024). Additionally, they have a direct impact on the skill development of individuals in different industries (Bibri, 2018). Beyond their educational significance, continuous learning centers are a major part of a growing global business sector, generating billions of dollars and continuing to expand, with an expected market size of $487.3 billion by 2030 (MarketsandMarkets, 2023).

From an interior designer's perspective, these spaces present unique challenges, as they must accommodate various users with diverse needs simultaneously. Furthermore, they need to remain up-to-date to be functional, making sustainability, adaptability, and inclusivity core values that must be achieved—both for a broader global vision and for the efficient operation of these centers.

Designing continuous learning centers the right way will contribute to achieving several Sustainable Development Goals (SDGs), which we argue are often overlooked in contemporary design. At the very least, these spaces align with Quality Education (SDG 4), Gender Equality (SDG 5), Reduced Inequalities (SDG 10)**,** and Sustainable Cities and Communities (SDG 11) and that's just from a surface-level analysis. A deeper exploration would likely reveal even more ways in which these spaces can support sustainable development, making them an area worth experimenting with.

5.2. STEPS TO FOLLOW IN VALUE DRIVEN BACK CASTING

The figure below (fig.17) summarize the most important steps to follow into 6 main steps starting with defining the vision**,** imagining the ideal outcome and talking to stakeholders to understand what's needed, setting key values and principles to make sure everything stays aligned with what truly matters. Moving on to assessing where things stand today, spotting the gaps between the present and the goal. From there, we identify barriers and opportunities,

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figuring out what might slow us down and what can help us move forward. Once we have that insight, we map out a step-by-step plan**,** working backward from the goal to create a clear path. Finally, we put the plan into action, monitor progress, and adjust as needed.

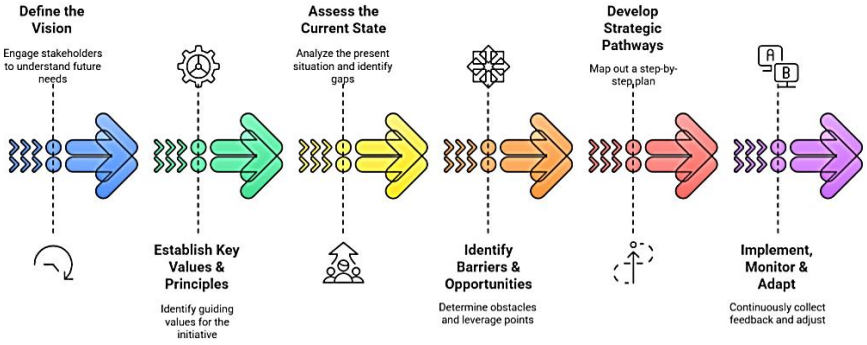

fig.(17) – Steps of value driven back casting technique

5.3. REAL IMPLEMENTATION ON CONTINUES LEARNING CENTER

To demonstrate the practical application of the value-driven back-casting approach, the author applied the six-step process in redesigning the Continuous Learning Center at her home university focusing on 2 training rooms of different proportions and an outer area to the center unutilized, Stakeholders were engaged through a detailed survey to establish a shared vision, leading to the identification of core values: innovation, adaptability, sustainability, inclusivity, and engagement. The current state of the center was then assessed through the same survey, alongside a historical analysis of similar interior spaces to identify enduring and fading features and personal observations which were summarized as per the following figures (18,19)

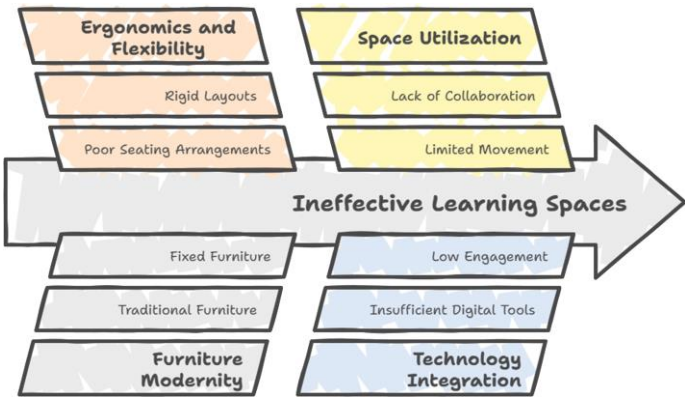

fig.(18) – issues as per analysis of continuous learning centers throughout the years.

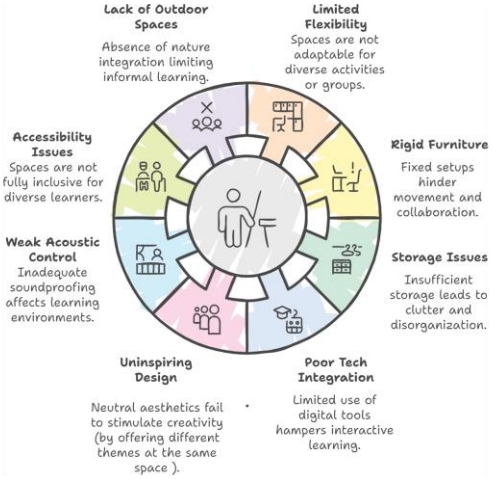

fig.(19) – personal observation of missing practices

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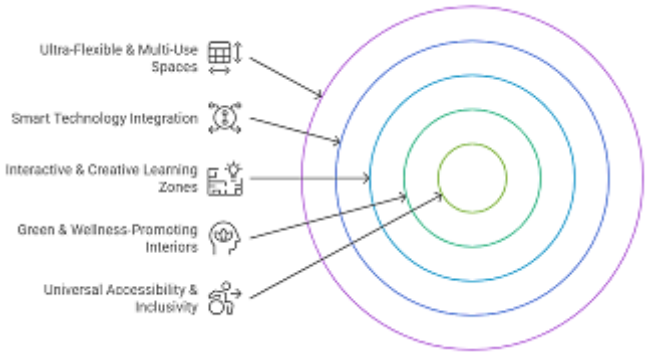

fig.(20) – Vision translated into interior design elements

This informed a future vision as: a versatile, inclusive, and tech-enhanced environment that fosters creativity, collaboration, and engagement across diverse age groups and learning styles, Designed for adaptability and sustainability, it blends flexible layouts, eco-conscious strategies, and advanced digital tools to ensure long-term relevance in education—realized through specific interior design elements that can be summarized as follow:

The vision was translated into prompts that allowed AI to assist the author in visualizing her previously defined concept, helping assess AI's potential to simplify the typically time-consuming visualization process. This resulted in a variety of design options for the rooms and outdoor area which had an initial vision decided by the author for incorporating features such as multi-purpose zones, extended training rooms, and adaptable capsule-like break areas with flexible sizing. These designs offer inspiration for future-oriented training spaces, where same are shown as follow:

Focusing on the real case study with detailed implementation of Back casting as an example step by step will be as follow



fig.(21,22,23)_AI generated shots of training room based on designer's vision

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fig.(24,25,26)_AI generated shots of outer area based on designer's vision

1.Defining the vision
In 2050: A multi-functional, interactive training and brainstorming room that dynamically responds to users' needs through emotional sensing, spatial flexibility to different training formats, and technology-integrated design.

2. Establishing key values and principles
A sustainable, inclusive, and long-lasting design prioritizing user well-being, flexibility, and

fig.(27)_A longitudinal proportion training room

fig.(28)_A more squarish proportion training room

The core design concept in both layouts is to make the training room adaptable to various spatial configurations and theme changes, depending on the type of training being conducted. This adaptability is achieved through the use of interactive surfaces and retractable furniture integrated into both the walls and floor, allowing for efficient space-saving and versatile reuse. For instance, retractable floor chairs can transform back into interactive tiles. Additionally, sofas are designed to sense users' emotions and emit scents accordingly, enhancing the overall sensory experience…etc accordingly the next steps will take place..

adaptive use for all individuals, across diverse functions and over time. Based on this a shot was Based on this a shot was generate for each of the 2 rooms of different proportions as follow :

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3.Assessing the Current State
Identify existing technologies that support immediate implementation in a basic form, such as OLED lighting, modular furniture, interactive touchscreens, biophilic elements, and manual control systems and what are the technologies that aren't there and that need to be developed through mile stones so as to achieved the required design at the end backwards.

4.Identifying Barriers and Opportunities
Highlight limitations (e.g., underdeveloped AI mood recognition, lack of advanced retractable furniture, limited adaptive wall surfaces) and emerging opportunities (e.g., smart interior demand, AI-driven environmental systems, and sensorial design trends).

5 Developing Strategic Pathways (2025–2050)
For both the space vision as well the technologies used where the attached below is a sample for whole space. Then step 6 as implementation and monitoring .

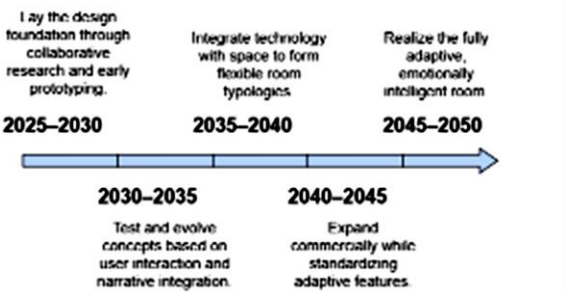

fig.(29)_Sample for applying strategic pathway on interior space vision among the years.

6.FINAL CONCLUSION AND RECOMMENDATIONS

6.1.CONCLUSION

-The interior design field faces significant challenges in creativity and sustainability due to overreliance on digital tools and limited methodological diversity.
-Traditional approaches, especially overly structured ones like Design Thinking indirectly practiced in interior design, often restrict innovation and fail to support long-term sustainability goals.
-Value-Driven Back casting offers a balanced methodology—structured yet flexible—allowing designers to define long-term goals based on cultural and social values.
- The responsible integration of artificial intelligence can offer support to interior designers in the often protracted process of design by facilitating the visualization of design concepts to a significant extent and save a lot of time regarding the long tiring process of designing. yet, ,designers must refine the generated outputs, which may not always be precise, this technology has the potential to yield substantial time savings.". Another important role for usage of AI as an assistive tool is in the process of applying back casting by helping designer identify and asses the

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current state of what is available and what is not available and define specific mile stones towards the required future.

6.2.RECOMENDATIONS

-Promote Value-Driven Back casting as a core methodology in interior design education and professional practice to regain control to designers to decide their future and consequently, conduct workshops to prepare staff for its implementation.
-Encourage the thoughtful and responsible integration of AI as a supportive tool for visualization, ensuring the active participation of designers in refining outcomes to meet desired specifications.
-Encourage interdisciplinary collaboration as an essential component of future-oriented thinking approaches.

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