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The Intersection of AI, Creativity, and Design Thinking: Implications for Artists, Artworks, and Museums

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***Abstract*: Innovation, the process by which new ideas are generated, is at the heart of human progress, changing how we create, solve problems, and express ourselves. New products, refined processes, or artistic advancements—creativity is an essential part of this evolution. Creativity generates new ideas, and design thinking serves as an approach to make those ideas come to life in tangible ways. But creativity is never a linear process, it comes from divergent thinking, from artists and innovators finding unconventional avenues. This dynamic has long been at the heart of artistic expression and creative problem-solving. As a result, artificial intelligence (AI) is increasingly influencing creative fields, leading to questions about its use in artistic and design processes. Many see AI as a powerful tool that expands creative potential, offering new ways for artists and designers to develop ideas and enrich their work. Others, however, worry that AI could sap originality, blur artistic identity, and impact the emotional bond between artists and their creations. These conversations have taken on heightened relevance in the art world, where AI is now influencing both the creation of artworks and the curation of museum and gallery experiences. AI has grown rapidly, but its true effects on creativity may still be emerging. Does AI support divergent thinking, or does it reinforce norms with little room for originality? Can AI serve as a collaborative partner to human artists, or does it generate works that lack depth and artistic purpose? We also need to explore the impact of integrating AI with design thinking in the innovation of museums, galleries, and other art institutions. This literature review explores the intersection of AI and creativity through the lens of design thinking and investigates what these elements mean for creativity and innovation in art. It examines AI's impact on artistic processes, creative industry problem-solving, and the changing role of art institutions.**
This research will help clarify whether AI is merely a tool, an active collaborator, or a disruptive force in the creative industries.

Keywords—Artificial Intelligence; Creativity; Divergent Thinking; Design Thinking; Artistic Innovation; Museums

I. INTRODUCTION

Discussions continue about whether creativity is genetic, talent, a symptom of a mental disorder, or shaped by environment and society. Creativity spans fields such as art, medicine, engineering, technology, and business.

Despite its broad significance, creativity research has historically developed in isolation across disciplines. However, it has become essential in education, art, academic studies, and practical applications [5].

In ancient Greek history, creativity was considered a divine gift. Plato's concept of "divine madness" was later embraced during the Renaissance as a cognitive process that could be cultivated. This view positioned creativity as a human-centered activity, allowing individual genius to flourish, as seen in figures like Leonardo da Vinci [6].

Creativity is generally defined as the ability to generate novel and useful ideas. Several theoretical models describe this process. One of the best-known is the Componential Theory of Creativity (Amabile), which attributes creativity to intrinsic motivation, domain-relevant skills, and cognitive processes.

Another influential framework is Rhodes' Four Ps of Creativity, which highlights process, person, product, and press (environment) as key factors shaping creativity. These theories emphasize both individual and environmental influences. Osborn's CPS model describes divergent thinking as an essential phase, where multiple ideas are explored before converging into actionable solutions.

To create original and meaningful artwork, an artist must channel passion, adventurousness, and boldness rather than imitating existing styles. Both human artists and AI-generated works face limitations in originality when relying on

replication. Darwin's theory suggests that innovation arises from exploring new ideas rather than following established patterns.

Seth Godin reinforces this idea, stating, "You can't be remarkable by doing what someone else did that was remarkable." Only those bold enough to challenge conventions and experiment can achieve breakthroughs [20].

However, Cheng and Yang (2019) argue that creativity is not solely about producing new products. The relationship between creativity and innovation is complex and multifaceted. AI-generated ideas, like human-created ones, require continuous adaptation and refinement to meet artistic and intellectual standards [10]. However, there is limited research on creativity as a term.

While artificial intelligence significantly influences innovation in artistic institutions, its impact on divergent thinking, artistic creativity, and museum organization remains less explored. Therefore, this study relied on multiple sources from different disciplines to bridge the gap. One of the potential gaps is the rapid advancement of artificial intelligence, which means that some emerging research may not yet be incorporated.

The effectiveness of the research depends on specific terms such as artificial intelligence, divergent thinking, design thinking, artificial intelligence in museum organization, and its impact on art and artists. Not all interdisciplinary studies may have been integrated into the research at this stage

II. INNOVATION

Innovation is the driving force behind human progress, shaping how we create, solve problems, and express ourselves. Whether through new products, refined processes, or artistic advancements, creativity plays a fundamental role in this process.

Innovation can be characterized as a specific function of entrepreneurship (Drucker,1985). One early definition of the terminology comes from Austrian economist and political scientist Schumpeter [2], who concluded that innovation is a process of introducing new products, services, methods of production, or market strategy through entrepreneurial activities.

Pratt and McLaughlin [3] concurred with this definition and stated that business innovation is an organization's process for workflows, methods, services/products, and/or introducing new ideas. Innovation and invention are frequently used interchangeably; however, this is erroneous. The two terms are closely linked but not interchangeable [3]. Drucker [1] established that innovation is not invention and that it issued a term of economics rather than technology.

Despite innovation having been expressed by researchers in several meaningful ways, Goswami and Mathew [4] believe that there is not a widely accepted consensus regarding how to define the term, thereby hindering a consistent form of measurement for innovation. The researchers believe this is one of the "greatest obstacles" in understanding innovation because there is a deficiency of meaningful measures [4].

III. HUMAN CREATIVITY

At its core, creativity sparks original ideas, while design thinking provides a structured way to turn those ideas into meaningful outcomes. However, creativity does not always follow a structured path - it thrives on divergent thinking, which allows artists and innovators to explore unconventional possibilities. (recognize design thinking, but make a statement that it is not the focus of this exercise)

Divergent thinking is one of the main elements in the creativity process, and intelligence is an important factor that enhances this process, in addition to effective instructions and leadership that focus on originality and promote collaboration among diverse teams. (Gerwig, Köhler, & Benedek, 2021).

Studies indicate that the role of digital tools is not significant in divergent thinking nor in overall productivity in terms of idea generation, as designers prefer analog tools for ideation, which allow for greater creativity. (Frich & Dalsgaard, 2021).

As for artificial intelligence, its impact on the creative process is varied, and Generative AI does not enhance it for designers but helps them in improving the sequencing and flexibility of ideas when they are well-trained in using it.

However, English-speaking designers and people with previous AI experience noted that they felt less comfortable using it, suggesting that its effect and impact varies depending on users' background and previous experience sand the context of its application. (Fu et al., 2024).

AI assists in the creative process, but it does not replace traditional design methods, which emphasizes the importance of achieving balance in design thinking.

Creative innovation relies on the use of AI tools that contribute to idea generation, modeling, and prototyping in a structured manner (Fu et al., 2024). AI also helps improve the brainstorming process by enabling designers to ask smarter questions and generate more ideas (Nguyen & Nguyen, 2024).

However, traditional design remains essential in the concept generation (divergent thinking) and concept selection (convergent thinking) phases. The effectiveness of brainstorming can be enhanced by combining it with other methods or by involving new team members (Seidel & Fixson, 2013).

Design thinking is an innovative process, which is the combination of divergent and convergent thinking processes.

Divergent thinking enables individuals to investigate ideas that are creative and might produce possible solutions, while convergent thinking helps analyze, refine, and choose the most appropriate solution among them (Carlgren et al., 2016).

The interplay of the divergent and convergent processes is a fundamental part of generating creativity through design thinking.

The divergent stage of design thinking involves a series of activities, including empathizing with the users, redefining problems by considering numerous perspectives, and brainstorming (Carlgren et al., 2016).

Following the divergent process, synthesis, evaluation, and selection happen at the next stage (Carlgren et al., 2016). Ideas are critiqued, prototyped, and tested so that the most worthy and valuable ideas can be taken further. Different phases normally result in more critical and analytical thinking to polish and improve the best solution concepts.

Some of the companies in Silicon Valley, like IDEO have made design thinking more popular, and it is now systematically embedded into their innovation processes as divergent or convergent cycles (Carlgren et al., 2016).

Kim et al. (2016) highlight how an IT company's innovation lab used "design road mapping" to advise it on its product planning which included balancing user needs with technological possibilities over time. This involved periods of divergent exploration of user needs/experiences mapped against potential solutions and convergent decision-making.

Klapwijk (2017) highlights how design education can foster "little c" creativity in children by alternating between divergent (imaginative idea generation) and convergent (evaluative prototyping and testing) thinking modes. Essentially, the use of imagination to make their ideas in real life allows learners to understand their importance in contributing novel, self-created solutions.

IV. AI ATTRIBUTES

Some consider AI a powerful tool that enhances creativity by offering artists and designers new ways to develop ideas and improve their work. Others, however, worry that AI might reduce originality, blur artistic identity, and weaken the emotional connection between artists and their creations.

As AI becomes more advanced, its presence in creative fields has sparked excitement and concern. This section explores how AI impacts artists, audiences, and institutions that facilitate the creation and exhibition of art.

This study draws from four academic disciplines—design, art, museum studies, and futurist studies—to provide a well-rounded perspective. The goal is to identify areas that artists, designers, and institutions should investigate to better understand and shape AI's role in creativity. Generative design AI serves as a primary case study in this analysis.

The aim of this research is not to predict the future or provide definitive solutions. Instead, it raises critical questions for artists and institutions to explore as they integrate AI into their creative processes. This inquiry helps ensure that AI supports rather than undermines artistic innovation.

The findings present possible future directions for art, contributing to a broader understanding of AI's role in shaping artistic identities. By envisioning AI's potential in galleries and museums, artists and institutions can take an active role in guiding this transformation.

Rampersad [10] notes that AI's rapid expansion threatens certain job markets, fueling concerns that machines may replace human workers. However, rather than eliminating jobs, AI demands that professionals—especially those in creative fields—develop new skills to adapt to these technological shifts.

New research suggests AI may already surpass human creativity in specific areas. While AI demonstrates high flexibility in generating creative outputs, human input remains crucial in defining artistic intent and emotional depth. In complex creative tasks, humans still outperform AI, but this may change as technology evolves, making adaptability even more essential.

AI tools are increasingly used in art production, spanning categories such as code-based generation, training-data-driven models, compositors, and digital-analog hybrids. Artists leverage these methods to explore new artistic possibilities while incorporating traditional practices.

Many contemporary artists work within the Techno-Art movement, using AI-based generative art tools that integrate machine learning. While these tools offer creative opportunities, they require skilled guidance. Some platforms provide flexible AI-driven design options, while others limit control over outputs, restricting originality.

A common criticism of AI-generated art is its perceived inauthenticity. Some argue that an AI-driven piece lacks the human touch necessary for artistic expression. While datasets and algorithms can influence outputs, true artistic interpretation often requires human intervention.

Despite AI's efficiency in generating art, its ability to foster deep creative expression remains debated. AI does not inherently teach artists to craft their narratives but can serve as a tool to enhance ideation. In certain cases, AI-assisted creation fosters new forms of artistic collaboration, as highlighted by Dwivedi et al. [7].

Generative AI tools offer unique advantages by addressing creative limitations in design processes. By merging human intuition with machine learning, artists can develop hybrid approaches that leverage both strengths. This interdisciplinary engagement can democratize design operations, making creative tools more accessible.

The evolution of design thinking may involve an expanded interplay between human and AI-driven methods. Mao et al. (2024) emphasize the importance of using AI to enhance, rather than replace, human imagination.

MidJourney, for example, demonstrates AI's potential to revolutionize design practices by accelerating ideation and prototyping. By generating diverse visual references, AI enables artists to explore ideas they might not have previously considered [22]. This shift encourages new forms of creative partnerships between AI and human designers.

Historically, technological advancements have reshaped artistic expression. Walter Benjamin (1936) argued that mechanical reproduction transformed the art world, altering notions of originality and authorship. Similar discussions arise with AI-generated art, as artists navigate new ethical and creative challenges.

The democratization of artistic tools, fueled by AI, allows broader participation in the creative process. However, this shift also prompts questions about artistic ownership, audience engagement, and the evolving role of human creativity in an AI-assisted world [17]. As AI continues to develop, institutions and artists must critically assess how it shapes the future of artistic practice and cultural production.

V. INTEGRATING CREATIVITY & AI

This dynamic approach has long been essential to artistic expression and creative problem-solving. In today's digital landscape, artificial intelligence (AI) is increasingly influencing creative fields, raising questions about its role in artistic and design processes.

Artificial intelligence affects artists and their artworks in various ways, creating new opportunities for artistic practices. One group of possibilities is that artificial intelligence enhances ways to do art. Historically, artists have used and incorporated technological advances to create new artworks, resulting in new forms of art [12].

Painting with oil colors, using photography, or projecting digital images were once outlandish ideas that reshaped understandings of art. Today, artists are playing with machine-learning algorithms and data to develop new multimedia forms of expression, augmenting their creativity and the creative process.

This implies that artificial intelligence generates new forms of art. audiovisual installations, immersive virtual worlds, experimental narratives, and much more. It can also take the creative process into new territories, create new inputs for human artists, or fully automate artistic output and artistic decision-making processes.

Examples in this group include an artwork printed by AI-generated poetry, and an ongoing collaboration between artist Anna Ridler and an A.I. system that explores the fragility of A.I. models trained on data from a human artist's balloon flower drawings. A photograph series of A. I.-generated artworks raises enough interest, effect, and controversy.

A critical discussion belongs to the second group, where artificial intelligence is used in art analysis, affecting the fate of traditional artistic practices. Contemporary art questions what art is and invokes discussions on the purpose of aesthetics.

So, if artificial intelligence generates artworks similar to a training dataset, a challenge to the definition of art arises. If a generative algorithm is trained on Van Gogh paintings and generates a new painting, Van Gogh is the creator, even though dead.

Similarly, input data denotes authorship for an AI-model trained on human-generated data. So, this group of questions deals with the art definition and authorship considerations in A.I.-generated art. There are implications that if artworks do not have an emotional bond with their authors or art does not mimic the state of mind, artificially generated art does not exist as such and cannot evoke empathy.

The third group of questions observes how artificial intelligence reshapes the relationship between artists and audience. On the one hand, it is argued that democratization shines in accessible tools for art generation, interpretation, and analysis, putting an artist in the role of a curator exploring and guiding the audience through algorithmically generated art.

On the other hand, generative art, as a fringe digital art form, has been under scrutiny for failing the vast audience and questions regarding ownership and control over creation processes. Generative experiments with artificial intelligence raise questions of authorship and originality in the art field, artists as generative art versus audience artists creating or curating art with artificial intelligence.

What are the opportunities and dilemmas artificial intelligence bringing to art? Do generated artworks question the definition of art? What challenges and critiques can art generated with artificial intelligence bring? What is the future trajectory of art under a technological influence?

VI. THE ART WORLD

These discussions have become particularly relevant in the art world, where AI is now shaping both the production of artworks

and the curation of museum and gallery experiences. Despite AI's rapid growth, its true impact on creativity remains uncertain.

When characterizing AI-embedded contemporary artists, which formulation we see actualized in the works of a Turkish-American artist, we could say that the artist utilizes large-scale machine learning methods based on his interest in urban city data and creates data paintings consisting of multiple canvases in a narrative perspective that blurs the boundaries between the artist, his audience, and the city.

Paraphrased another way, the artist created a series of AI-dreamt data paintings composed of algorithmically generated data sculptures reflecting the city that serves as an ever-changing data source. The system learns to reflect data in an aesthetic form where the artist, using self-generative machine learning algorithms, spends time in an endless feedback loop with the AI to bring his creation to life on a large-scale surface. Simply stated, his AI machine develops its own physical self-generated wheel of machine-imagined realities .

It is clear from any of these brief descriptions that, in all cases, art is central. Ultimately, it is art and art's meanings that are being modified or even transformed by AI technologies and the partnership between the human artist and the AI machine.

Fig. 1 Rafik Anadol, Melting Memories [26].

VII. RESEARCH QUESTIONS: CREATIVITY & AI

Does AI support divergent thinking, or does it reinforce patterns that limit originality? Can it act as a co-creator alongside human artists, or does it produce work that lacks depth and artistic intent? Additionally, how does integrating AI with design thinking influence innovation in museums, galleries, and other art institutions?

For future research, we will design a study using thematic analysis to measure the attributes within the questions above.

VIII. METHODOLOGY

In this research on AI, creativity, and design thinking, a systematic literature search was conducted using multiple academic databases such as Google Scholar, UB Library, peer-reviewed journal articles and books.

There is limited research on creativity. While artificial intelligence significantly influences innovation in artistic institutions, its impact on divergent thinking, artistic creativity, and museum organization remains less explored. Therefore, this study relied on multiple sources from different disciplines to bridge the gap.

One of the potential gaps is the rapid advancement of artificial intelligence, which means that some emerging research may not yet be incorporated. The effectiveness of the research depends on specific terms such as artificial intelligence, divergent thinking, design thinking, artificial intelligence in museum organization, and its impact on art and artists. Not all interdisciplinary studies may have been integrated into the research at this stage

IX. SUMMARY

This literature review examines the intersection of AI, creativity, and design thinking, focusing on how these elements interact to shape artistic innovation. It explores AI's influence on artistic workflows, problem-solving in creative industries, and the evolving role of art organizations. Ultimately, this study seeks to provide a clearer understanding of whether AI serves as a tool, a creative collaborator, or a disruptive force in the future of art and design.

Acknowledging potential bias, the authors of this paper will broaden the search for more sources, and other factors, which may affect AI, creativity, etc.

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