Printed Hanging Textile Designs between the Designer's Subjectivity and AI Technologies

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Abstract:

Subjectivity is an essential aspect of design as an artwork. It expresses the designer's authentic style, which involves his/her paths and engagement throughout the design process. Printed hanging textile design in particular requires a high degree of uniqueness, personality, and artistic sense that are mainly reflected through the designer's subjective vision and interaction with the textile material. Traditional textile printing techniques provide vast potential to enable this interaction and enhance the emergence of the designer's authentic perspective. On the other hand, AI technologies have revolutionized the art and design fields by facilitating complex processes and improving productivity and efficiency. The textile designer needs to keep pace with technological advancements and achieve maximum benefits from them. Thus, the current study discusses the integration of the designer's subjective and creative perspective with the wide potential of AI technologies. The researcher establishes an approach in this regard in the printed hanging textile design field. It is based on creating original designs using traditional textile printing techniques and utilizing AI technologies to generate various possibilities for these source designs. Ultimately, the applied approach allows for maintaining the designer's subjective vision and utilizing AI potential to save time and effort while improving productivity in the printed hanging textile design.

1. Introduction:

Textile printing design in general is one of the richest and most complex design fields. It is highly associated with not only aesthetic and functional considerations but also keeping pace with modern changes and technological advancements. Printed hanging textiles in particular are seen as a bridge connecting textile printing design and the fine arts, requiring a design style that is primarily authentic and artistic. The process of creating printed hanging textiles is a unique and creative endeavor that requires a designer to possess extensive knowledge, broaden their mental boundaries, and have a true artistic sense. This expertise could only be conveyed to recipients through the emergence of the designer's subjective vision. Expressing the designer's subjectivity and experience is the main factor that influences the product's originality. The original thing is just like itself; it is not like anything else; it is closely associated with its creator. Therefore, the more a design reflects its creator, the more original it appears [Mandour, 2022]. Traditional textile printing techniques enable experimenting with and exploring the wide potential of dyes, printing pastes, and textile materials. These techniques involve a higher level of communication or interaction between the designer and the textile material. Thus, they represent the optimum means to express the designer's subjectivity and create unique designs.

On the other hand, the advancement of technology, including artificial intelligence (AI), has become an essential sector and a driving force behind growth in various fields of life [Irbite & Strode, 2021].

Artificial intelligence is widely applied in several industries, including healthcare, transportation, economics, production, education, travel, and media. Practically all industries employ AI to some extent as it streamlines procedures, boosts productivity, and helps in decision-making, saving time and effort. In the art and design fields, AI technologies have caused a real revolution. Designs and artworks can be generated in a few minutes, raising questions about whether anyone could be an artist or designer, or if AI technologies are going to replace designers. However, human creative abilities in design fields are hard to replace by AI as it is capable of conceptualizing and organizing ideas more reasonably, and creativity in arts and designs goes beyond traditional thinking [Pchelnikova, 2020]. In a complementarity-based partnership, human creativity and machine intelligence complement each other's weaknesses to improve the overall quality of the output [Figoli, Mattioli, & Rampino, 2022]. Therefore, designers need to explore approaches to express their creativity and utilize the potential of AI technologies to improve performance and productivity throughout the design process.

The focus of the current study is to explore how designers can strike a balance between their subjective vision and the use of AI technologies for printed hanging textile design. The main goal is to use AI technologies to edit the original or source designs created based on the designer's subjective vision while taking into account privacy considerations. Thus, the study emphasizes the importance of traditional textile printing

techniques, such as tie and dye, silk screen printing, and direct painting on fabric, to achieve the maximum degree of interaction with the textile material and the consequent expression of the designer's subjectivity. The dependence on AI editing tools like Leonardo AI and the Picsart application enables the researcher to generate many ideas with various structures, modes, and effects from the original/source design. This proposed approach enables the designer in the textile printing field to express his/her subjective vision while maintaining a unique personal style and, at the same time, utilizing AI editing tools to increase productivity and save time and effort compared to other traditional editing programs.

The research problem:

The advancement of AI applications and technologies has had a significant impact on art practice, pedagogy, and subjectivity in general, albeit indirectly. Technological innovations are likely to influence how subjectivity is produced in the art fields [O'Sullivan, 2008]. AI technologies offer numerous advantages such as saving time and energy while increasing efficiency in various tasks. However, they may lack the same level of originality and subjectivity as human designers [Fatima, 2023, P. 2]. In the hanging textile design field, which requires a higher degree of authenticity, there is a conflict between the need for the emergence of designer subjectivity and the use of AI technologies to improve performance. As a result, the following questions form the basis of the study's problem:

1- What is the role of the designer's subjectivity in printed hanging textile design?
2- What are the possibilities of using AI technologies in textile design in general?
3- How can the designer balance subjectivity and the use of AI technologies in printed hanging textile design?

The research objectives:

1- Describing the role of subjectivity in design as an artwork and the wide potential of AI technologies in the textile design field
2- Interpreting the tension between subjectivity and AI technologies in the art and design creation process.
3- Predicting what might result from the descriptive and interpretive perspectives to propose and apply an approach for balancing the designer's subjectivity with the utilization of AI technologies in printed hanging textile design.

The research significance:

Highlighting the role of traditional textile printing techniques in enhancing the interaction between the designer and textile material leads to a greater emergence of the textile designer's subjectivity.

Emphasizing the textile designer's crucial position as the cornerstone of the creative design process and how he/she may utilize AI technologies to their fullest potential while preserving subjectivity and true authentic sense.

The research hypothesis:

Through the questions posed in the research problem, the researcher hypothesizes the following:

1- The designer's subjectivity represents the key aspect in printed hanging textile design, and it could be effectively conveyed through traditional textile printing techniques.
2- The balance between designer subjectivity and AI technologies in printed hanging textile design could be achieved through the utilization of AI tools in providing various possibilities for original designs printed by traditional techniques.

The research methodology:

The current study followed a qualitative methodology in its two main parts:

1- The theoretical framework: the researcher followed the retrospective approach in reviewing the role of subjectivity in design as an artwork and the descriptive analytical approach in discussing the relationship between AI technologies and the designer's subjectivity
2- The experimental framework: the researcher followed the experimental approach to apply the proposed method for balancing designer subjectivity and the use of AI technologies in printed hanging textile design.

1. The theoretical framework:

1.1. Subjectivity as a key for practicing design as an artwork:

Subjectivity means the characteristic of being founded on or impacted by individual preferences, sentiments, or viewpoints. It can be defined as a human creation that can go beyond the apparent, objective bounds of human existence. It is also described as the integration between human emotions and different processes [González Rey, 2021].

Subjectivity plays a major role in making decisions or following a specific path throughout the design process [Lu & Liu, 2011]. Most design fields are highly subjective, as they are affected by the designers' experiences, preferences, and applied design style [Jang & Lee, 2024]. The design process aims mainly at achieving aesthetic considerations and the satisfaction of recipients [Soonsan, 2017, p. 259]. The recipients' satisfaction as a main pillar of the design/product is highly attributed to its originality, which in turn depends

on the extent to which it expresses the designer's experience and feelings. Limited-edition items, for example, are viewed as more original as they are closer to their designers' personalities and emotions [Mandour, 2022]. Thus, the design process is like the creation of an artwork, which mainly depends on the designer's subjectivity.

Subjectivity shapes the artwork and represents the inner world of the artist. It creates mental images, which are considered the primary inspiration source for any designer/artist. Designers' mental images generated by their experiences and recalls are valuable sources of inspiration [Stacey & Eckert, 2000]. Subjectivity enables the creator to see things on his or her own account. The artist/designer has the right to display his/her emotions and ideas without any repression, no matter how strange they are. The actual creative aspect of art is undoubtedly quite subjective. Considering subjectivity is relatively recent in the history of art. The medieval artists completely ignored their personalities and sometimes did not sign their own artworks; thus, we know little or nothing about them [Stolentz, 1960] as the subjective experience cannot be captured by representational art [Park, 2013]. The work of art is inseparable from the artist's self. The true artist is deeply attached to everything that expresses his/her feelings and thoughts. That causes the constant emergence of art movements. For instance, the violin seems very different when depicted from the perspective of a cubist, as in Figure (1). It no longer exists as the true objective "thing," shifting from objective to subjective perception [Malevich, 1959]. Also, Wassily Kandinsky (1866 – 1944) moved from natural imitation to expressing his imagination and developed a more mature style in his art. According to Yampolskaya [2018], Kandinsky's paintings are founded on "counter-perception" opposing the Impressionists, who attempted to replicate the experience in every detail on the canvas. In Kandinsky's paintings, the instantaneous, sensual experience of forms and colors is "awakening in the subjectivity of the artist or the recipients", as in the Untitled Improvisation 5 painting in Figure (2) [Park, 2013]. Piet Mondrian (1872 – 1944) established the DeStijl movement at the beginning of the 20th century, which was based on Neoplasticism theory, through which he expresses his vision of the purest and simplest form of art [Fallahzadeh & Rahbarnia 2023], as shown in Composition no. III painting in Figure (3). The emergence of suprematism, as Kazmir Malevich (1879 – 1935) expresses his vision of the pure artistic forms in which "feelings were revealed and art manifested itself" [Drutt, 2004, p.17], as shown in Supremus No.50 painting in Figure (4). On the other hand, Jackson Pollock (1912 – 1956) was more inclined toward expressionism, as he tended to express emotions instead of articulate them. In expressing his subjective perspective, Pollock discovered a novel and revolutionary approach to creating his abstract paintings, which he called the drip method. Pollock's defiance of conventional techniques, such as making rough sketches, arranging the canvas vertically, and applying paint with brushes, marked the start of a journey that elevated Pollock to prominence as an important and well-respected abstract painter [Lacko, 2013], as shown in the Blue Poles painting in Figure (5). This art style was known as "action painting" as it embodies the artist's spontaneous engagement with canvas. Thus, it is more reflective of the artist's uniqueness as it conveys his/her communication, emotions, and subjective interaction with the medium during the creation process. Also, Franz Kline (1910–1962) practiced action painting in his own way, as his art reflects his emotional and energetic unique interaction with canvas, as in the Abstract in Black, Blue, Pink, and Yellow painting in Figure (6). Subjectivity is what distinguishes the artist's work, even if they follow the same art style. For instance, both Mondrian and Malevich depended on geometric abstraction, yet we can distinguish each artist's creation as it reflects each artist's unique subjective vision. Every authentic artwork expresses the inspiration that is integral to the entire artist's personality. The design as an artwork reflects the designer's personal response to a specific incident or topic. This response is not only emotional but may expand to include the designer's subjective opinions, thoughts, and feelings, as the more creativity the artist has, the more energy and individuality he/she reveals [Haggag, 2006].

Figure 1. Pablo Picasso, Violin and Grapes, 1912, oil on canvas, 61× 50.8 cm [Alexandrov, et al. 2018, p. 42].

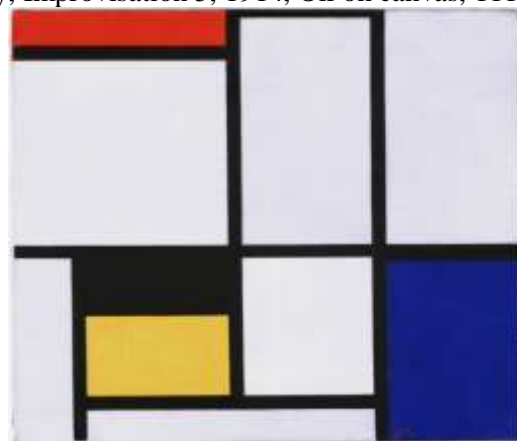Figure 2. Wassily Kandinsky, Improvisation 5, 1914, Oil on canvas, 111 × 111 cm [Park, 2013, p. 84]

Figure 3. Piet Mondrian, Composition no. III, 1921, Oil on canvas, 49.2125 x 49.2125 cm [Fallahzadeh & Rahbarnia 2023, p.5].

Figure 4. Kazmir Malevich, Supremus No.50, 1915, Oil on canvas, 66 x 97 cm [Drutt, 2004, p. 20].
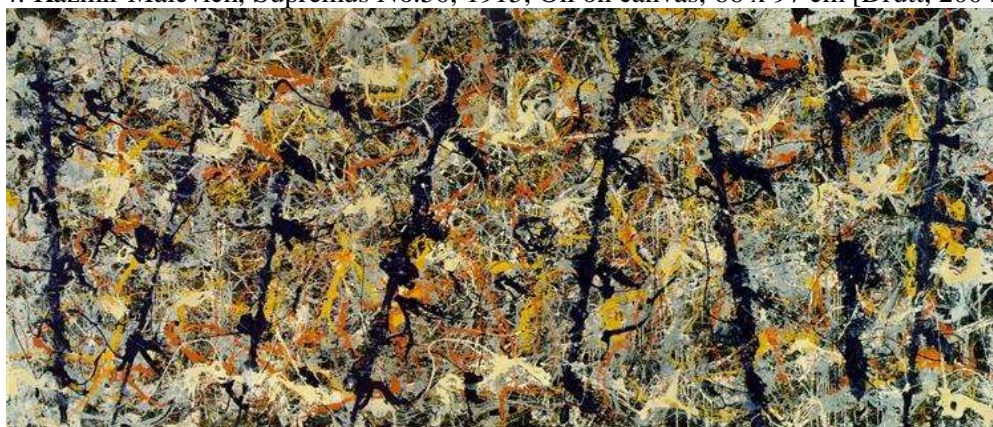

Figure 5. Jackson Pollock, Blue Poles: Number 11, 1952, Aluminium and enamel paint on canvas, 210×486.8 cm [Taylor, 2002, p. 117].

Figure 6. Franz Kline, Abstract in Black, Blue, Pink and Yellow, 1948, Oil on canvas, 38.1 x 45.72 cm [Mattison, 2013, p. 74].

1.2. Artificial intelligence as a modern approach to design:

The concept of "artificial intelligence" was initially used in 1995 by John McCarthy, a professor at Dartmouth [Haenlein & Kaplan, 2019, p. 3]. Artificial intelligence (AI) has revolutionized our lives by altering the way we operate, interact, and use technology. According to Marr (2019), AI represents the capacity of systems or machines to exhibit intelligent actions that enable them to operate and develop on their own. This is achieved through the use of computer programming that mimics human thinking and decision-making by analyzing data and circumstances, solving problems, and adapting to various tasks [Pchelnikova, 2020]. AI enables automation to grow and use human abilities outside of their bodies [Fatima, 2023, p. 2]. It has permeated every aspect of our everyday lives. AI's capacity to increase productivity and simplify processes is one of its major effects. By using intelligent algorithms and automated procedures, AI can help us make faster and more accurate decisions, thus saving time and effort [Nguyen, 2023]. However, there are also concerns about the negative impact of AI on humanity, as the McKinsey Global Institute analysis estimates that by 2030, technological advances may cause the loss of 800 million jobs globally [Pchelnikova, 2020, p. 4].

1.3. The integration between designers and AI technologies:

The integration of AI into the design process aims to enhance individual abilities and overcome their limitations, while making the most out of available resources and encouraging innovation [Figoli, Mattioli, & Rampino, 2022, p. 28]. Experts and professionals in the field agree that AI will have an impact on the design process, but it will not completely replace the creative abilities of designers [Irbite & Strode, 2021]. Artificial intelligence can conceive and arrange ideas more rationally, while creative thinking typically deviates from conventional thinking [Pchelnikova, 2020, p.

20]. Although AI will revolutionize the design sector, human designers will still be needed to handle these advancements in their unique way. AI will mainly deal with speed and performance. Various studies suggest that the increased speed and efficiency provided by AI will allow designers to create designs faster and at a lower cost [Irbite & Strode, 2021, p. 541]. Therefore, the relationship between designer and AI technology is complementarity, where human creativity and machine intelligence work together to compensate for one another's shortcomings and raise the result's overall quality [Figoli, Mattioli, & Rampino, 2022, p. 28], as summarized in Figure (7).
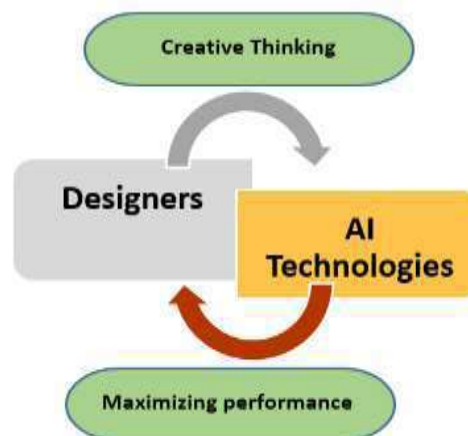

Figure 7. The relationship between the designer and AI technology.

1.3.1. AI as a design material VS AI as a design tool:

The product and the design process are the two primary, and hotly contested, domains in which artificial intelligence (AI) may be applied in product design. As a result, AI may serve as a design tool or as the design material [Figoli, Mattioli & Rampino, 2022, P. 20], as shown in Figure (8).
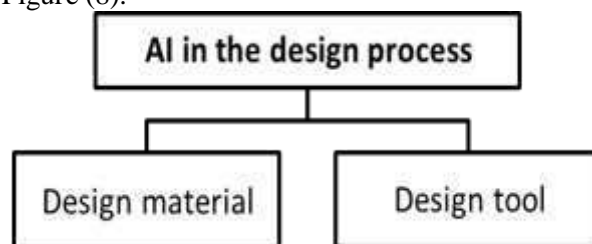

Figure 8. The application of AI technologies in the design field.

1.3.1.1. AI as a design material:

In this category, AI features are included in the finished output [Figoli, Mattioli, & Rampino, 2022, p. 20]. The AI itself represents the main design material. Because ML is so different from the tools designers often use—such as drawings, film methods, blueprints, and physical models made of paper—prototyping using AI as the design material can be challenging in practice. In fact, this path

requires new prototyping methodologies [Dove et al., 2017]. Using AI as a design material requires cooperation between designers and engineers. Thus, this process is considered more technology-driven than design-driven [Caramiaux & Alaoui, 2022, p. 5]. Its application is more obvious in digital fabrication studies [Torres, 2019]. In this kind of design, the artist is more like a practitioner who depends on the computer as a creating material than a design tool [Caramiaux & Alaoui, 2022, p. 5].

1.3.1.2. AI as a design tool:

Artificial intelligence (AI) is being increasingly used to enhance and optimize the outcomes of the design process [Figoli, Mattioli, & Rampino, 2022, p. 20]. AI algorithms collaborate with artists and designers from different fields to co-create artworks because of the dynamic features of these algorithms [Caramiaux & Alaoui, 2022, P. 4]. Numerous studies have recently focused on the use of AI in different design areas. For instance, in the architecture field, AI could be used in building, modeling, and adding details [Amer, 2023], as in Figure (9-a). In the advertisement design field, El-Aasy (2023) discussed the application of AI technologies in advertising Egyptian products and foundations using the mid-journey program, as shown in Figure (9-b). In addition, Hamdy (2022) illustrated the use of AI technology represented in 5D planner applications in developing interior design processes, as in Figure (9-c). In the 3D modeling area, AI could be a time- and effort-saving tool. However, it cannot replace the designer entirely, as it can only generate basic 3D models. The designer must still provide ideal reflections, lighting, and shading. We can notice the difference between the same 3D model created entirely using AI in Figure (10-a) and the model that was enhanced by a 3D designer in Figure (10-b) [Pchelnikova, 2020, P. 8]. The designer, through her or his interaction with AI, could shape the algorithms during the design creation process, which is known as interactive machine learning (IML) [Amershi et al., 2014, p. 6]. The machine learning concept is based on the human experience idea. Thus, the foundation of machine learning is the idea of self-learning, which denotes the application of models derived from empirical data to recognize patterns and enhance efficiency with time. The lack of explicit programming in the learning process is what makes this technology intriguing. Hence, a device receives input data in place of an input command, which is then transformed into an outcome through a processed model. As a result, ML has made it possible to teach a machine to adapt and change assumptions depending on input data, much as people learn from practice and experience [Figoli, Mattioli, & Rampino, 2022, P. 25], as summarized in Figure (11).

Figure 9. Shows the utilization of AI in various design areas. (a): AI as a design tool in the architecture field [Amer, 2023, p. 7], (b): advertisement field [El-Aasy, 2023, p. 257], and (c): interior design processes [Hamdy, 2022, p. 244].

Figure 10. Shows the difference between AI and human creation in 3D modeling. (a): 3D modeling created completely with AI technology. (b): the same one created by a human designer [Pchelnikova, 2020, p. 8].
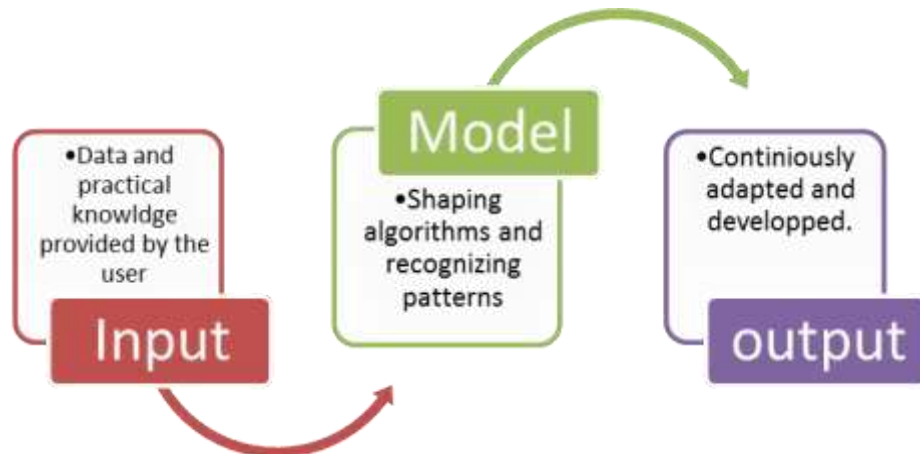
Figure 11. Shows ML mechanism in processing data.

1.4. Artificial intelligence in the textile design field:

Design as an artwork cannot be achieved in isolation from all the social and technological influences surrounding the designer. The designer, as an artist, needs to gain many experiences with life, its updates and problems, and with the human soul itself in order to create an adaptable design. Textile design, in particular, is heavily influenced by cultural and community demands [Worbin, 2010, p. 10]. Because of the nature of textiles as a design material, the textile designer must consider numerous elements such as aesthetics, traditions, coloration techniques, context, and user [Nilsson, 2015, p. 25]. Thus, for textile designers, AI technologies are an essential part of the creation and production processes. Several studies in the textile design field have focused on generative AI technologies to create textile designs. The term "generative AI" refers to AI systems that can autonomously produce textual or visual material in response to text prompts [Inie, Falk, & Tanimoto, 2023]. These systems depend on generative adversarial networks (GANs) that can generate many design ideas based on specific output, selection patterns, and strategies [Vuruskan et al., 2022]. AI technologies like Midjourney can produce realistic pictures and text utilizing a plethora of online data; they have become increasingly popular in many design fields. They are essential for concept development and expansion [Fatima, 2023, P. 1]. Thus, generative AI technologies are more associated with the concept or ideation phase. Numerous studies in the textile design field have relied on generative AI technologies to create design ideas. Hagag (2023) created textile design ideas inspired by ancient Egyptian art on T-shirts using Midjournry prompts, as shown in Figure (12). Additionally, AI design tools like Fabric Genie provide the possibility of generating textile design ideas by using a sequence of prompts, completing repeats, preparing patterns, and even printing the ideas on any fabric type if requested [Nicolaus, 2023], as shown in Figure (13). Quan et al. (2018) developed a neural style transfer model for innovative product design built on Kansei engineering and deep learning. It enables inputting content images with style images to create innovative products, as shown in Figure (14).

Figure 12. Textile design ideas for T-shirts created using mid-journey prompts [Hagag, 2023, p. 2309].

Figure 13. Generating textile design ideas through Fabric Genie depending on textual prompts [Nicolaus, 2023].

Figure 14. Shows feeding (a,b) into the style transfer model to get the desired outputs (c). The outcomes kept the form of (a) while acquiring characteristics like color and textures that resembled (b) [Quan, Li, & Hu, 2018, p. 10].

1.5. Balancing subjectivity and AI in printed hanging textile design

Design in general is the skillful interaction with the physical medium in order to achieve a specific goal [Mikhail, 2002, p. 77]. Printed hanging textile design, as defined by Hussein Haggag, is a human activity that is created through a textile medium to express the designer while considering design elements and principles to achieve adequacy for a particular situation [Haggag, 2006, p. 4]. It is a complex artistic pattern that depends mainly on the method and interaction with the textile medium [Haggag, 2003]. The hanging textile is a means for expressing feelings, as it represents an integrated entity and an artwork that relies on textiles as a material medium to convey artistic value. It requires a type of design that is predominantly purely artistic and is therefore considered a link between textile printing designs and the fine arts. Creating printed hanging textiles involves that kind of creative, one-of-a-kind activity since it depends on in-depth knowledge, expanding the designer's mental horizons, and genuine artistic experience that can only be communicated to the audience

through the designer's unique vision [Mandour, 2022, p. 193]. Depending on traditional textile printing in particular enables more interaction with the textile medium. Thus, it enhances the emergence of the designer's unique emotions and thoughts.

Traditional printing on textiles requires sufficient printing skills and higher creativity powers [Badoe, Samadu, & Frimpong, 2015, p. 200]. It is considered a creative way for the designer to produce his/her personal touch. Textile material is more than a medium that conveys design ideas; it represents the designer's world and reflects his/her emotions, subjective vision, and experience. Professional designers have the potential to produce novel forms using traditional textile printing techniques. These forms involve skill abilities with creative thinking and practice [Mandour, 2024, p. 6].

On the other hand, according to Irbite & Strode (2021), AI does not contradict the design thinking process. It achieves the highest level of people-centeredness by eliminating constraints on scale and scope, allowing for experiences that are personalized and enhanced for every individual. By extending the boundaries of the design world beyond product sectors, AI may improve authenticity and creative thinking. AI's capacity to automate some design processes can greatly decrease labor-intensive work, allowing more time for the creative process [Karaata, 2018]. It may support and enhance designers' unique requirements and skills, ultimately leading to better design outputs. Many opinions point out that AI is fostering "creativity escalation" where any individual may compose music with Bach style, paint in Van Gogh style, and write at the proficiency of Shakespeare [Caramiaux & Alaoui, 2022, p. 2]. However, no one could be them, as AI operates based on their original styles. AI platforms like Midjourney allow users to paint or design with a specific artist's style by only writing the artist's name, as shown in Figure (15). Additionally, several AI applications may recreate any content based on a specific artwork style. For instance, one of the first effective uses of convolutional neural networks for picture style transfer was created by Gatys et al. (2016). By modifying the content and style of pictures, the system creates new outputs. As a result, well-known artworks (style images) emerge in unrelated pictures (content images), as exhibited in Figure (16). In previous cases, the artists' names or the characteristics of their artwork represented the spark through which AI technologies generated ideas. The AI algorithms have been written and created by humans. Thus,

human creativity is the main driver of artificial intelligence technologies.

Hanging textile designs, in particular, require a high level of uniqueness. The unique sense is mainly related to the designer's subjectivity, which is represented in his/her ability to express their unique authentic visions and emotions. Textile printing designers need to express originality through their designs. Thus, they experiment with all the physical materials and mediums to create an authentic hanging textile design structure [Kamal, 2022]. The designer thinks through the textile medium, which includes a consistent structure directly linked to the designer's emotions and thoughts. Thus, the designers' ideas and experiences are embodied in their textile medium. The designer's vibrant imagination and sensitivity to the textile medium are essential to creating an authentic and creative hanging textile design [Haggag, 2006]. Thus, traditional textile printing techniques enable more interaction with the medium and represent the optimum means to reflect the designer's subjective vision.

The massive development of AI technologies in the design field does not necessarily mean that anyone can be a designer, as only a professionally educated designer can create successful designs by making the optimal use of AI technologies [Irbite & Strode, 2021]. Additionally, relying entirely on AI technologies to generate textile design ideas may negatively impact the authenticity and creativity of the output, as it is difficult to express the uniqueness of personal experience through descriptions or prompts alone. Although an AI textile design may be flawless in general, it may lack personality and, more crucially, taste. The greatest ideas are the result of human senses, understanding, experiences, and exploration, rather than a series of algorithms. However, by accelerating the concept exploration or creative process, AI might be of great use to textile designers and artists as a tool to facilitate creation and production [Power, 2023]. Finally, it is worth noting that plagiarism programs are increasingly able to detect AI-generated texts and images. For instance tools like the "IS IT AI?" platform enables detecting if an image was most likely created by a person or an AI system. The tool operates by analyzing the picture's several elements, such as colors, textures, and forms, depending on ML models. Figures (17) and (18) show AI detection of textile designs generated by the Bing AI and Leonardo AI platforms. The variation in AI percentage in both AI-generated images indicates that the detections were not completely accurate. However, the various AI detection tools are expected to develop over time as they depend on

machine learning and deep learning models. These tools are also described as authenticity-verifying tools, as the originality of any design idea or artwork is associated with human subjective experience and creative sense.

To reconcile the tension that exists between designer subjectivity and the use of AI technologies in the design process, it is necessary that the primary source of the hanging textile design be created entirely according to the designer's subjective vision. However, AI technologies can be used to expedite and streamline the editing process, surpassing the capabilities of programs such as Photoshop and Illustrator. Additionally, AI-generated ideas can be crafted based on the original source to achieve a balance between the designer's subjectivity and the use of AI technologies.

Figure 15. Generating visual images based on a well-known artist's name using the Midjourney platform [El-Aasy, 2023, p. 251].

Figure 16. Shows the emergence of well-known artwork styles in content image A. Each panel's (B, C, D, E, F) lower left side displays the artwork that provided the style references [Gatys, Ecker, & Bethge, 2016, p. 2418].
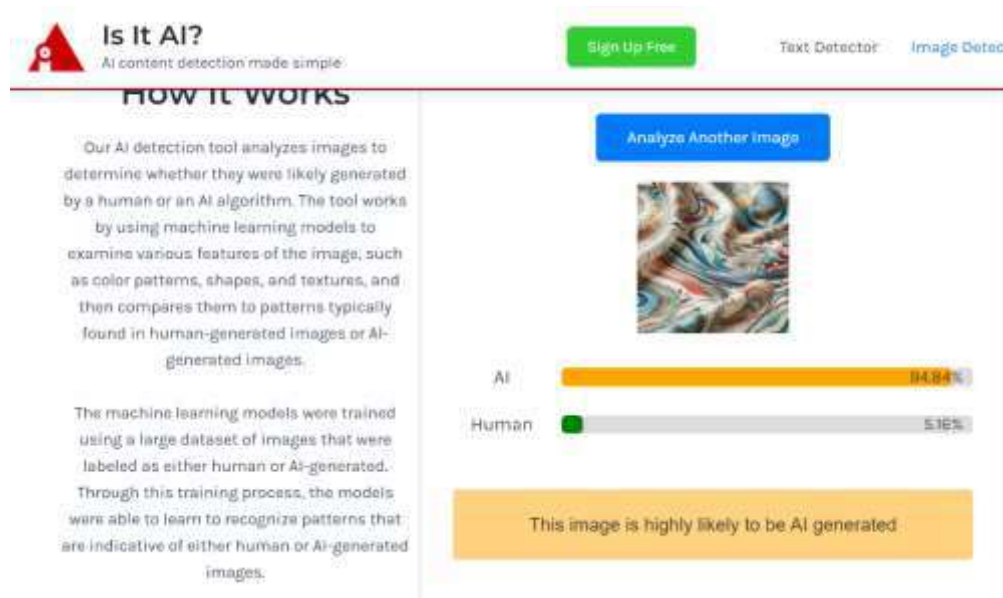
Figure 17. Shows using the Is It AI? online tool to detect AI content in a textile design image generated by the Bing AI platform.
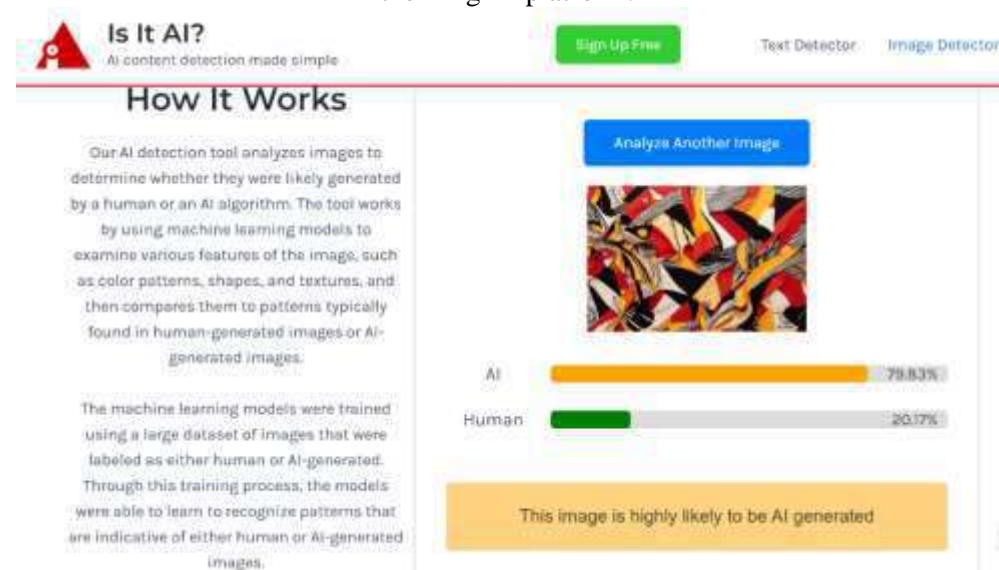

Figure 18. Shows using the Is It AI? tool to detect AI content in a textile design image generated by the Leonardo AI platform.

2. The experimental framework:
2.1. The main concept:
The practical framework of the current study is based on two sections:

The first section: creating the original design idea (source) directly on the fabric using traditional textile printing techniques, such as silkscreen, tie and dye, and direct painting on fabric. The various potentials of the textile material, dyes, printing pastes, and inks are vital tools in guiding the design process while considering important textile design principles like unity, balance, and rhythm. The original design idea is created in the abstract expressionism style, which reflects the researcher's subjective vision and is a result of direct interaction with the textile material to form unique abstract hanging textile designs featuring the designer's personal and pure emotional touch in the light of tightening the design structure.

The second section: is about generating different possibilities for the original ideas by utilizing AI technologies as creative editing tools. Editing designs used to be a time- and effort-consuming procedure. Recently, many AI techniques and tools have been available to improve photos, simplify repetitive activities, and increase the precision of complicated selections. Many AI platforms and applications improve image editing to a completely new level [Tomic et al., 2023, p. 85]. In this study, design ideas are mainly edited using the Leonardo AI platform and the Picsart AI photo editor application.

Leonardo AI is an AI-powered platform designed to help generate artwork by selecting models and employing text prompts. It is similar to the Med Journey platform, but what sets it apart is that it still offers a free version to its users. The platform also

provides a "Canvas Editor" tool that allows users to edit designs by drawing a mask on the uploaded source design or image to select specific areas for editing. Once the selection is made, the user can describe the edits using a precise text prompt and press the generate button to see the output. The platform edit also enables choosing the modes of the edits, image dimensions, number of trails, and various editing tools, as shown in Figure 19. Additionally, privacy needs to be considered when sharing personal information online, as anyone using AI technologies for data collection and design should ensure that data is managed appropriately and not exchanged with other parties [Tomic et al., 2023, P. 92]. One of the most significant advantages of the Leonardo AI platform is that, even in the free edition, it does not automatically share the edited outputs in the personal feed with the public. Instead, it shares any generated images with the public automatically. This aspect highlights the necessity to preserve professional designers' privacy by using AI editing capabilities on source designs rather than relying completely on AI technology to generate ideas.
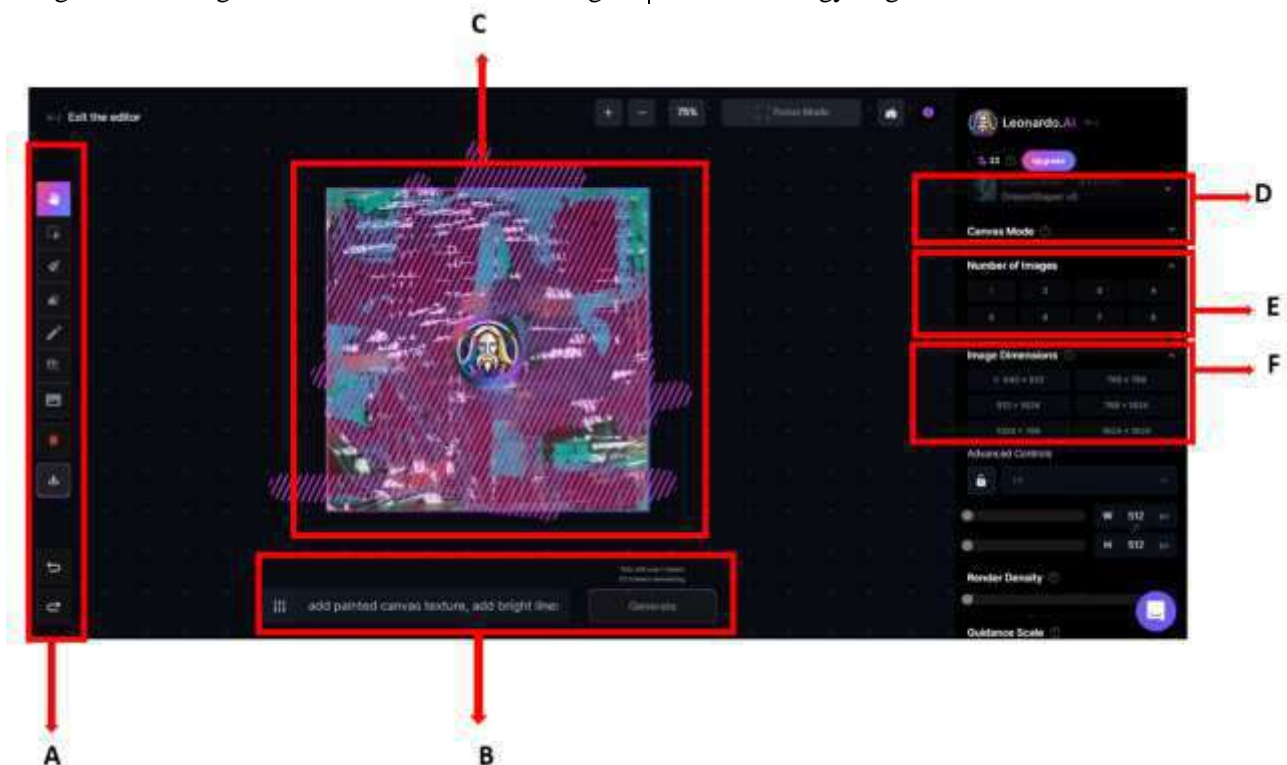

Figure 19. Shows the canvas editor interface on the Leonardo AI platform. A includes the editing tools (moving, selecting, drawing masks, erasing, sketching, writing texts, uploading images, clearing history, downloading the output, undoing, and redoing). B refers to the text prompts to describe the desired edits; C includes the editing process after drawing masks; and D refers to the canvas models and modes that lead to various outputs. E refers to the number of trials or outputs, and F enables choosing the image dimensions.

The Picsart application: is a user-friendly AI-powered photo editing tool that can enhance the quality of any image and add special effects to it. Unlike traditional photo editing programs, it doesn't require any prior expertise in editing, which means you can focus on other creative aspects of your work instead of getting bogged down in the editing process. The application is available both as a web-based edition and an app for Android devices, making it convenient to use at any time. It can even convert text prompts into images, like many other AI platforms. The focus of this study will be on the editing section of the application. Adding textures, applying effects, and changing color modes are the most significant and creative parts of the application editing section. They enable the generation of numerous designs from an original source and the exploration of unlimited possibilities, as shown in Figure (20).

The practical framework of the current study can be summarized in Figure (21)

Figure 20. Shows the Picsart application editing interface. A refers to the original uploaded source, B refers to the various editing tools, and C includes the application of various types of textures, effects, and color modes to the original source
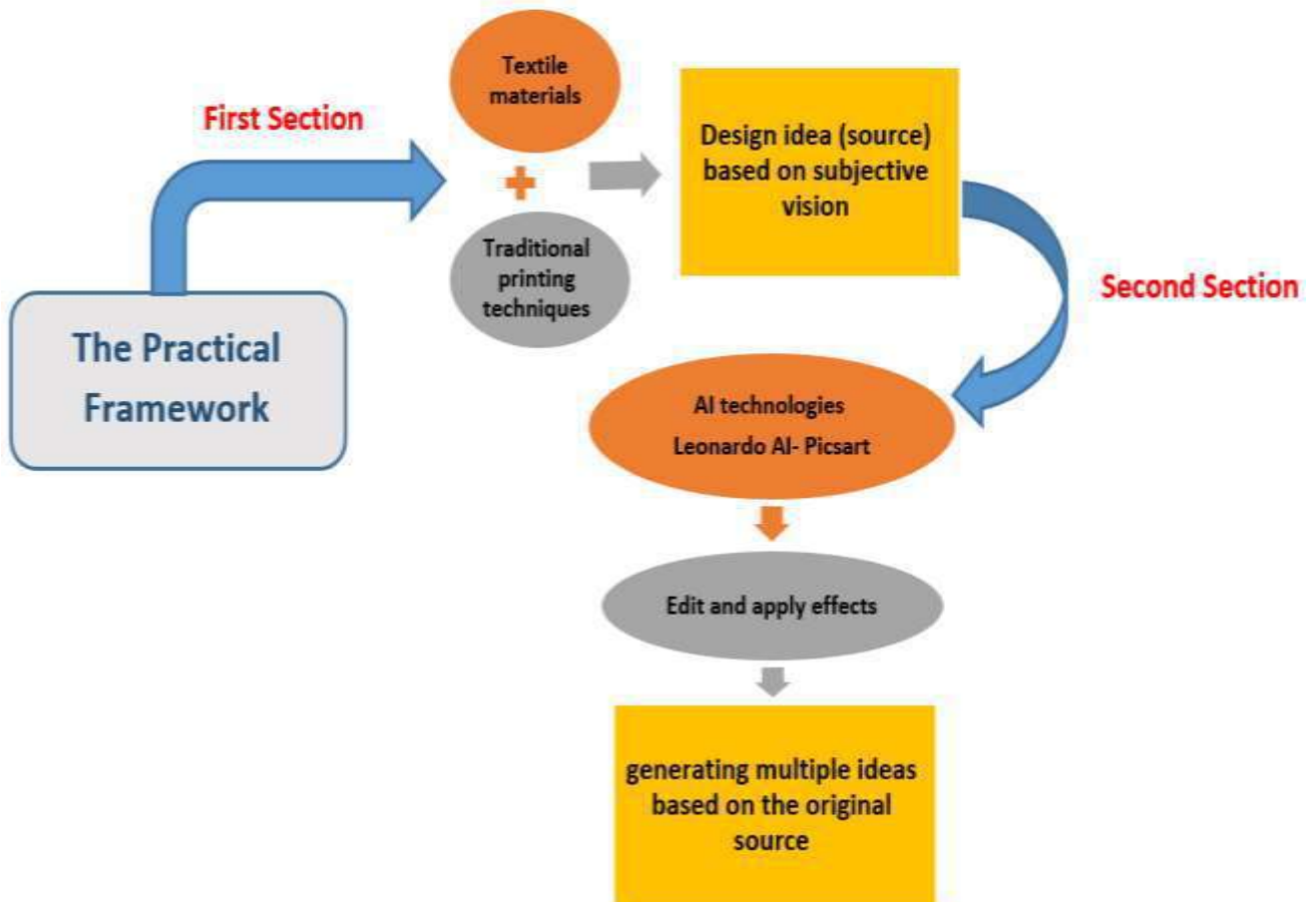

Figure 21. Shows the general practical framework of the current study.

2.2. The first hanging textile design:

2.2.1. The original/source design:

Figure 22. The original design 1

This design was implemented on 100% cotton material, and its size is about 100 x 70 cm. It was entirely created based on direct painting on fabric using pigment printing pastes and inks. Several tools were used to express the researcher's subjective vision, such as sponges, brushes, and painting droppers of different sizes. The design was not pre-planned or sketched but was created through constant interaction with the textile material. The use of different tools helped to achieve rhythm and flow throughout the design by creating unique textures and flowing lines with varying thicknesses and directions of movement. The black lines that connect various elements in the design were created continuously with a single hand movement to achieve unity and control the eye path throughout the design structure. Pure red and yellow colours were added separately to balance the different shades of cool green.

2.2.2. Generated ideas from the source design utilizing AI technologies:

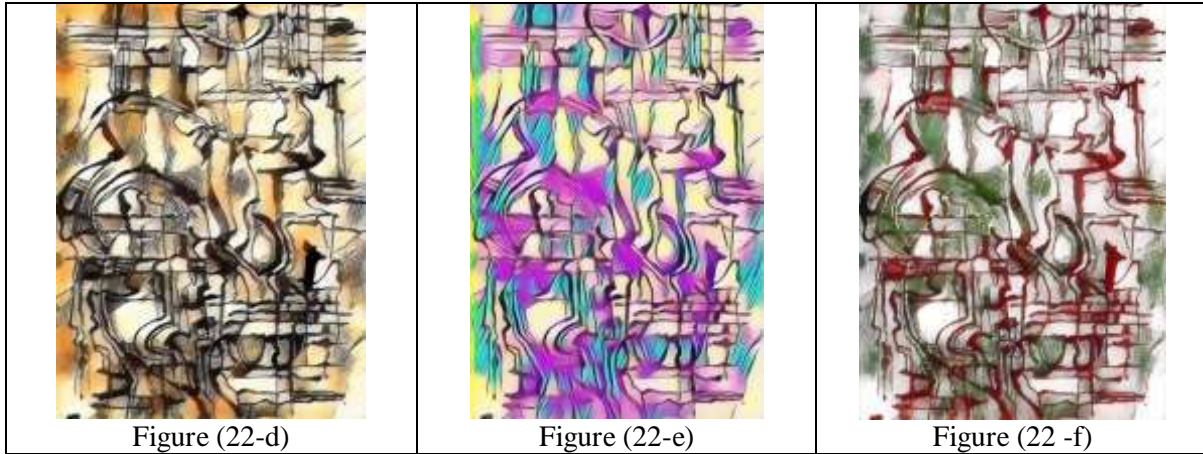| Using canvas editor in Leonardo AI platform		
Figure (22 -a)	Figure (22 -b)	Figure (22 -c)
Adding various effects using Picsart application		

Figure (22-d)	Figure (22-e)	Figure (22 -f)

Utilizing the canvas editor in the Leonardo AI application offers various editing possibilities based on selected and masked areas of the design and the text prompt used to describe the editing process. Both Figures (22 -a) and (22 -b) resulted from the same text prompt "increasing the space", but the masked areas were wider and more intense in Figure (22-a), while in Figure (22-c) the text prompt was "Applying geometric style". Adding effects to the original design using the Picsart application, which allows for easy and fast exploration of color modes and textures and application to specific areas of the design instead of using traditional filters found in other editing programs. This level of quality in adding effects in Figures (22 -d), (22-e), and (22 -f) would require more time and steps to produce using traditional editing programs.

2.3. The second hanging textile design:

2.3.1. The original/source design:

Figure 23. The original design 2

This design was implemented on tied and dyed 100% cotton fabric, and its size is about 95 x 45 cm. The fabric was tied and dyed using direct dye, then printed using the silk screen technique and pigment printing pastes. The researcher relied on the spontaneous overlapping of the silk screens to create untraditional textures that are consistent with the tied and dyed background. An open screen with stencil papers was also used to print solid areas, which balanced the textured shapes and background. The color brown was applied as both solid and textured areas to create rhythm and tighten and connect the design structure. The researcher's subjective vision for this design is to overprint and form several layers with various silk screens to create integrated levels of depth and dynamics. The printing order was not determined beforehand. Instead, each print inspired the designer for the next one, and each print complemented the previous one until the creation of a harmonious final design structure.

2.3.2. Generated Ideas from the source design utilizing AI technologies:

Using canvas editor in Leonardo AI platform

Figure (23-a)

Figure (23-b)

Figure (23-c)

Adding various effects using Picsart application

Figure (23-d)

Figure (23-e)

Figure (23-f)

Figures (23-a), (23-b) were generated via the Leonardo AI canvas editor by writing the text prompt "Simplify the structure, add yellow and red touches" with the same masked areas in both trials. The text prompt to generate Figure (23-c) was "Highlight the textures and increase the details". In all previous figures, the AI editor regenerated the structure while maintaining the overall style of the original design in Figure (23). On the other hand, the Picsart editor application kept the design structure as it was and changed the color modes and textures according to the selected effects. Thus, the designer could generate an unlimited number of color modes and effects for his/her original design within minutes.

2.4. The third hanging textile design:

2.4.1. The original/source design:

Figure 24. The original design 3

The original design in Figure (24) was implemented on 100% cotton fabric, with an approximate size of 75 x 45 cm. It was completely created by throwing and dripping pigment printing inks that had been combined with diammonium and binder onto the fabric. Throwing and dripping techniques were implemented spontaneously using various types and sizes of syringes and through the designer's continuous movement in all directions around the textile material. Thus, the design embodies the designer's emotional expression, active practice, and engagement with the textile. The warm colors of red and yellow were used predominantly, indicating the intense emotional involvement of the designer in the creation process.. The resulting lines, color drops, and splashes emphasize a high level of dynamic and rhythm. Additionally, the connection between lines with different thicknesses, nature, movement direction, and color splashes with various forms and sizes enhances unity throughout the design structure.

2.4.2. Generated Ideas from the source design utilizing AI technologies:

Using canvas editor in Leonardo AI platform

| Figure (24-a) | Figure (24-b) | Figure (24-c) |

Adding various effects using Picsart application
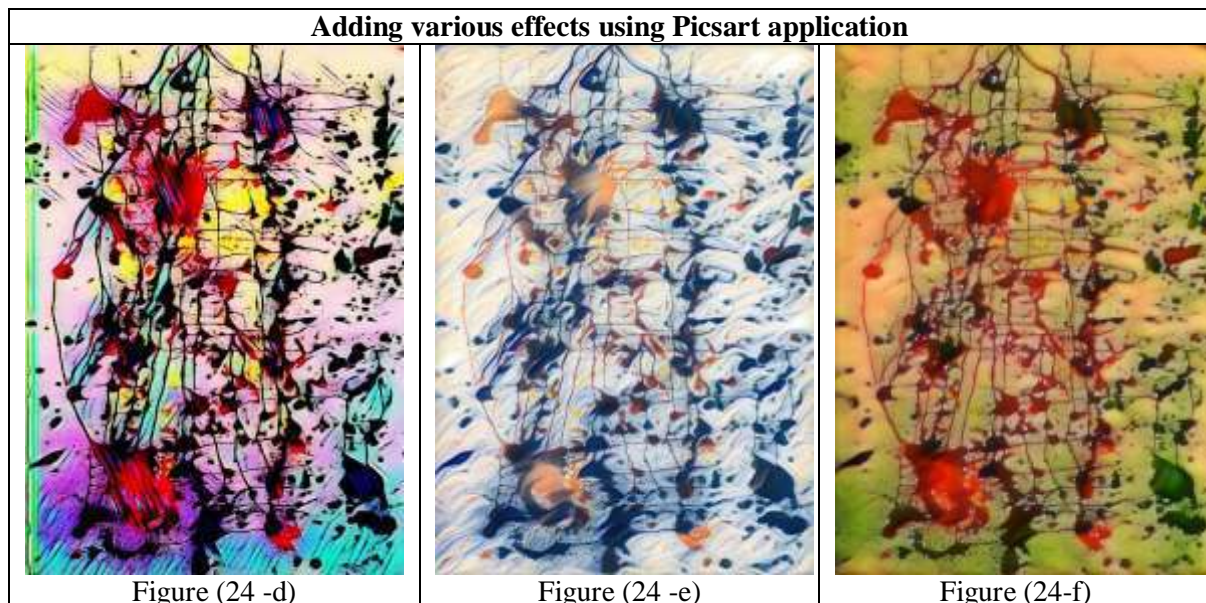

| Figure (24 -d) | Figure (24 -e) | Figure (24-f) |

Figure (24-a) was generated by Leonardo AI using the text prompt "add colour yellow and increase spontaneity", while Figure (24-b) was edited according to the text prompt "highlight spontaneous red color splashes". Figure (24-c) resulted from the prompt "Increasing lines, highlight geometric style". Each one of the previous results regenerated the original design structure Figure (24) while maintaining its spontaneous features. Experimenting with various effects using the Picsart application allows different possibilities and modes of the original design, as in Figures (24-d), (24-e), and (24-f) that could be hung in different spaces and match the various preferences of users.

2.5. The fourth hanging textile design:

2.5.1. The original/source design:

Figure 25. The original design 4

This design was implemented on 95 x 90 cm of 100% cotton fabric. It was created by utilizing several dyeing and printing techniques, like tie and dye, silk screen printing, and direct painting on fabric. To achieve the desired harmonious effect, the cotton fabric was tied and dyed using blue and purple direct dyes, and the silk screen printing was implemented using white foam and black pigment printing pastes. Also, pigment black ink combined with a binder and diammonium phosphate was used in direct painting on the fabric. The designer's subjective vision in this design is based on using the wide potential of traditional textile printing pastes, highlighting the contrast between black and white, textures generated from applying printing techniques with different materials, raised areas generated from foam printing, and other flat design areas. The free movement of the hand-painted lines in all directions captures the designer's movement and interaction with the textile material. The overlapping and transparent areas emphasize unity and dynamic rhythm flow through the design structure. The harmony and consistency between all of the printing techniques, materials, forms, and colours is what gave this design its personality and uniqueness.

2.5.2. Generated Ideas from the source design utilizing AI technologies:

Using canvas editor in Leonardo AI platform

Figure (25-a)

Figure (25-b)

Figure (25-c)

Adding various effects using Picsart application

Figure (25-d)

Figure (25-e)

Figure (25-f)

The Leonardo AI platform was used to edit the original design, resulting in Figures (25-a), (25-b), and (25 -c). Each figure was generated using a different text prompt. The first prompt was "Rearrange lines and colored areas," the second prompt was "Rearrange lines, emphasize geometric sense," and the third prompt was "Increase geometric sense with pure red touches." However, the AI was unable to incorporate the effects of tie and dye or the raised areas created by foam printing paste into the edited design. To generate various other designs, the Picsart application was used with different effects. Figure (25-d) was generated using the "Plein air effect," Figure (25-e) was created using the "Highlight effect," and Figure (25-f) was made using the "Wispy effect".

2.6. The fifth hanging textile design:

2.6.1. The original/source design:

Figure 26. The original design 5

The dimensions of the design are 85 x 70 cm. It was created on 100% cotton fabric using open-screen printing, various tools, and pigment printing pastes. The designer used different types and sizes of brushes, drops, and coloring knives to paint with a resistant material directly on the screen silk mesh to create a range of lines and unconventional spontaneous forms. Also, paper stencils and other textured materials were used with an open screen to create unique textures. The designer's subjective vision was based on overlapping these open screens to form an authentic and unexpected design structure. The horizontal, vertical, and inclined lines were arranged harmoniously within the fabric surface. The color palette combined warm, cool, and neutral colors to provide balance to the design structure. The overlapping of sharp and flowing emotional lines develops a sense of stability in addition to spontaneity and achieves unity and connection between all the design parts. Additionally, the contrast between lines with various natures, directions of movement, the generated white and colored areas, and textures create dynamism and rhythm within the design structure.

2.6.2. Generated Ideas from the source design utilizing AI technologies:

Using canvas editor in Leonardo AI platform

| Figure (26-a) | Figure (26-b) | Figure (26-c) |

Adding various effects using Picsart application		
Figure (26-d)	Figure (26-e)	Figure (26-f)

The text prompt used to generate Figure (26 -a) by the Leonardo AI canvas editor was "Reduce details, simplify the design structure". To generate Figure (26 -b) the text prompt was "Simplify the structure, add yellowish orange". Figure (26-c) resulted from the text prompt "Add circular shapes, yellowish orange, enhance geometric style". Thus, the canvas editor provides the possibility of rearranging and modifying the design structure while keeping the main style of the source design Figure (26). Various effects were added by the Picsart application while maintaining the design structure. Applying the "Feast effect" with altering the degree of lighting and intensity generates Figure (26-d). The textures in Figure (26-e) were generated by applying the "Wispy effect", and in Figure (26-f) by applying the "Rainbow effect". Like all of the previous designs, the Picsart application aided in generating many design possibilities with different effects and color modes. However, it should be noted that the printing textures are less apparent compared to canvas editing by the Leonardo AI platform.

Results:

1- The designer's subjectivity is a key concept in design processes in general and in hanging textile design in particular, no matter the degree of technological advancement, as it validates the creativity, personality, and authenticity of the final product.

2- The wide potential of traditional textile printing such as tie and dye, silkscreen, and direct painting on fabric allows the emergence of the designer's subjective style by enabling more engagement with the textile material.

3- The greatest design concepts come from human imagination, creativity, and experiences, not from a series of algorithms. Thus, textile designs that are entirely generated by AI technologies may lack personality and authenticity. However, AI technologies could be used as a tool to facilitate and improve creation and production processes.

4- Balancing the designer's subjectivity and keeping pace with artificial intelligence technology could be achieved by depending on AI technologies to edit original hanging textile designs created by traditional printing techniques based on the designer's subjective interaction with the textile material by generating various possibilities for the original/source design.

5- Through the provision of an unlimited number of possibilities for each original/source design, the use of AI technologies in hanging textile design editing processes, such as the Leonardo AI platform and the Picsart application, helps to facilitate the process, save time and effort, and improve productivity. Concerning AI-generated designs, these AI editing tools are more protective of privacy.

6- AI editing tools provide the advantage of enhancing and accelerating productivity in hanging textile designs. However, a wide range of traditional textile printing techniques, such as transparency and raised surfaces, could not be imitated by AI technologies.

Recommendations:

1- Focusing on the significance of traditional textile printing techniques in creating authentic hanging textile designs by embodying the designer's subjective vision and creative interaction with the textile material.

2- Giving more attention to exploring the possibilities of AI technologies to edit and modify the designer-created ideas, considering the constant advancement in AI detection platforms and privacy concerns.

3- Emphasizing the role of the designer in all fields as the main pillar who can professionally adapt all tools, including AI technologies, in the design process while maintaining his/her original unique style .

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