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Bridging textile design and AI: An innovative methodological approach for the Ghanaian Textile Designer

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Abstract

Purpose: The study aimed to investigate the feasibility of employing selected artificial intelligence (AI) software to generate contemporary textile designs. Focusing on bridging textile design and AI, with a methodological approach for the Ghanaian Textile Designer. With AI emerging as a transformative force in multiple industries, including textiles, the research sought to assess its capacity to enhance design processes and meet consumer preferences.

Methodology/Design: Three AI software programs, including Playground, Leonardo, and Lexica, were selected for the study. Each was provided with identical prompts to generate contemporary textile designs. The outputs were then systematically analysed to identify similarities, differences, and overall design quality.

Findings: The results showed that while the software received identical prompts, the generated designs displayed notable variations, alongside some shared visual features. The AI-driven process proved significantly faster and more efficient than traditional methods and yielded designs consistent with consumer specifications.

Practical and Social Implications: The findings suggest that AI tools can substantially improve productivity, creativity, and responsiveness in textile design. Introducing AI-based design tools to textile designers in Ghana could enhance competitiveness, foster innovation, and better align production with evolving market demands.

Originality: This study offers an early exploration of the comparative application of multiple AI software tools for contemporary textile design, contributing novel insights into their feasibility, efficiency, and adaptability within the Ghanaian textile industry context.

Keywords
Artificial intelligence software, contemporary textile design, Ghanaian, text-to-image models

1 | INTRODUCTION

The textile industry has been an integral part of Ghana's cultural heritage, contributing significantly to the nation's economy and identity. According to Sarpong et al. (2023), during its peak, the textile subsector alone comprised approximately 16 major manufacturers and 138 medium- to large-scale registered garment manufacturers, providing employment to over 25,000 individuals. However, the industry faced significant challenges due to trade liberalisation policies and the economy's opening in the 1980s and 1990s. These changes had a devastating impact, leading to the influx of inexpensive second-hand clothing from Europe and the Americas, as well as cheap new goods, particularly from Asian nations like India. In the early 2000s, the situation worsened as stiff competition from low-cost imports and counterfeit textiles from China further hindered local creativity and profits. Even the African Growth and Opportunity Act (AGOA), designed to benefit African countries in trade with the USA, failed to rescue the industry, as China skilfully exploited the Act, using Ghana as a stop-off for exports to the USA and circumventing tariffs. Nevertheless, by the 2010s, the industry experienced an unparalleled transformation in response to government industrial policies and the efforts of industry stakeholders to

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adapt to the changing dynamics of their once-sheltered market. The struggling industry began to rebound significantly. Today, the garment and apparel sub-sector alone employs over 6000 people and exports goods valued at approximately $30 million annually (Sarpong et al.,2023). The previously prevalent language of failure used by commentators to describe the industry has now largely fallen out of use. Stakeholders in the industry are constantly looking for ways to rejuvenate the sector, and in recent years, technological advancements, particularly in the field of Artificial Intelligence (AI), have shown immense potential to revolutionise various industries, including textiles. AI has emerged as a powerful tool capable of enhancing creativity, efficiency, and productivity in the textile design process.

As per the 2018 report by the Artificial Intelligence High Level Group of the European Commission, "Artificial intelligence (AI), pertains to systems that demonstrate intelligent behaviour through the analysis of their surroundings and the undertaking of actions - with a certain level of autonomy - to accomplish specific objectives. AI-based systems can be entirely software-based, functioning in the virtual realm (e.g., voice assistants, image analysis software, search engines, speech and face recognition systems), or AI can be integrated into hardware devices (e.g., sophisticated robots, autonomous cars, drones, or Internet of Things applications)" (European Commission, 2018). The clothing and textile industry, being labour-intensive, stands to gain immense benefits from the implementation of artificial intelligence (AI) to enhance production and design efficiency. By leveraging AI, the industry can process and analyse vast amounts of data, make predictions on future consumer trends, manipulate colourways and create superior clothing and textile products (Yan et al., 2021). Considering AI as an inevitable choice for Ghana's clothing and textile industry's future development, it becomes crucial to integrate it into industry practices to achieve efficiency, speed and modernisation. The primary aim of this study was to explore the feasibility of employing text-to-image AI models for generating contemporary textile designs that resonate with consumer preferences. Text-to-image AI models fall within the broader scope of AI technology, capable of converting textual prompts into visual representations. These models have proven effective across various creative fields, including art, design, and multimedia content generation. The transformative potential of AI is expected to revolutionise the textile design sector, empowering designers to streamline their creative processes, optimise pattern and colour choices, and produce intelligent textile designs. Artificial intelligence is transforming the textile industry across the entire value chain, from design to manufacturing to sustainability. In design, generative AI tools enable rapid creation of novel patterns, streamlining creative workflows and enabling 3D simulation (Marwaha et al., 2025). In manufacturing, AI-driven logistics, including Autonomous Mobile Robots (AMRs), improve operational efficiency by up to 20%, while computer vision systems achieve over 95% shade accuracy in dyeing and reduce water and energy consumption by up to 30% (Gurusamy, 2025). Additionally, AI enhances quality assurance, textile recyclability assessment, and demand forecasting, helping brands reduce waste and overstock (Biswas, 2025). Ultimately, AI is not merely automating tasks but fundamentally reshaping how textiles are designed, produced, and sustained in a more efficient and environmentally conscious manner.

For the Ghanaian textile design sector, AI would automate many of the tasks involved in textile design, which can free up designers to focus on more creative aspects of the process. This can lead to increased efficiency and productivity. It would also be used to generate more accurate and consistent patterns and colours. This can lead to improved quality of textile designs. Finally, AI would be used to create new and innovative textile designs that would not be possible using traditional methods. This could help Ghanaian textile designers to stay ahead of the curve and compete in the global market. Textile design has a crucial role to play in creating innovative and attractive products for various end-user applications, which range from fashion to automotive to sportswear and to medical textiles (Studd, 2002). It is a part of the broader term "designing," which involves creating planned arrangements of elements to form objects or images. Design is the expression of the mind, interpreted through a process of planning and organising accepted elements and principles to give form to an idea. It can serve both functional and aesthetic purposes and is fundamental to every work of art. Design and ornamentation in textiles often draw from traditional or ethnic motifs and beliefs, reflecting cultural expressions (Walker et al., 2019). Various definitions emphasise the significance of design in life, with some describing it as "making things better for people" and linking it to an improved future (Guo, 2017). Advancements in technology have revolutionised textile design, allowing designers to combine creative vision with technical knowledge to produce finished textiles using computer-aided design software (Hu, 2011). This integration of artistry and technicality is essential for successful textile design. In the postmodern environment, a growing aesthetic saturation of images, driven by consumer culture and technological progress, has arisen with the advent of modernity and industrialisation, causing a shift in the influence and impact of illusion from traditional art forms to diverse facets of contemporary life, such as fashion. In the 21st century, textile

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designers work in an environment marked by heightened competition, consumer awareness, and rapid technological advancements. To thrive in this dynamic setting, designers must demonstrate extreme innovation.

In Ghana, the significance of various types of cloth and textile designs extends beyond mere fashion. Notable examples of these textiles include Kente, Adinkra cloth, African prints (Ankara/Wax Prints), and Fugu, among others. Woven Kente cloth, in particular, holds great importance as a status symbol, representing wealth and, historically, high-ranking positions. It is reserved for significant occasions and esteemed individuals. On the other hand, Adinkra cloth is a handmade, printed fabric primarily worn during funerals, which hold immense significance as essential celebrations in Ghana. The creative processes of making these textiles exemplify how traditional designs continue to maintain their relevance and cultural importance in the country.

Both indigenous and contemporary Ghanaian textile designers have long admired the spontaneous runny effect, which beautifully complements the careful use of asymmetrical pattern variations. African cultural heritage is rich with values and beliefs that naturally intertwine with art forms like textiles. African textile designs and arts serve as representative symbols of African society. In some regions, people and societies have translated proverbs, sayings, and quotes from kings into artistic symbols. Additionally, designers draw inspiration from cultural landscapes, natural objects, and innovative works, incorporating them into contemporary designs. The collection of these symbols from diverse concepts culminates in artistic patterns used for fabric decoration and design. These design elements are later transformed and incorporated into fabrics. The aesthetic value of African textile designs is well-defined through design elements like lines, colours, curves, symbols, and motifs. However, their significance goes beyond visual pleasure, as they also serve as a medium of communication, conveying spiritual values and beliefs from ancestors within the society (Buami et al., 2022). This paper argues that generative AI can help rejuvenate Ghana's textile industry by blending technology with cultural heritage. Thereby bridging textile design and AI, with a focus on methodological practice for the Ghanaian Textile Designer. Rather than viewing the sector as purely traditional, it offers a path toward technological adaptation and resilience. The research provides practical guidance for industry on the use of AI for efficiency and innovation, while also helping policymakers create strategies that support economic development and protect cultural identity. This approach offers a systematic methodology and is easy to replicate for other sectors facing similar challenges. Furthermore, this paper addresses the notable gap in empirical research on the application of AI within African textile contexts.

2 | MATERIALS AND METHODS

The study adapted the studio-based research design using the Aesthetico-action Model as outlined by Marshall (2010). The model allows toggling between creative processes in both theory and practice (Bekoe et al., 2021). The model outlines observation, reflection, planning and creation as the steps to guide a creative process, and this was what was used for the study. However, because of the use of AI, which comes with modifications and distortions from basic to complex, such as colour modification, motif alterations, pattern adjustments, etc. Ethical considerations were introduced as a variable to check for cultural compliance. Thus, a checklist comprising various items was used to assess the compliance of the generated designs with the expected outcomes. Furthermore, the final designs created by the AI were shared with a population comprising of textile design lecturers and students for the purpose of gathering and evaluating their perspectives, feedback, and critiques. The lecturers' years of experience ranged from 5 to 22 years, with their design focus covering areas such as the elements and principles of design, basic design, motif design, indigenous traditional textile designs, commercial design, and others. The participating students were third- and fourth-year textile design students. Using three (3) focus group discussions (FGD) with a sample size of twenty-one (21), participants were asked about the textures, resemblance of motif and colour to the reference image, quality and craftsmanship of the design generated, attractiveness, and acceptability of the design to participants. The sample size was achieved at the point of theoretical saturation. That is the point where no new information was derived. The FGDs were conducted over a period of two weeks, and the duration of each FGD was between 30 and 45 minutes. Consent was sought from participants, and the discussions were recorded on a recorder. After the FGDS, the discussions on the recorder were transcribed, coded and analysed using thematic analysis.

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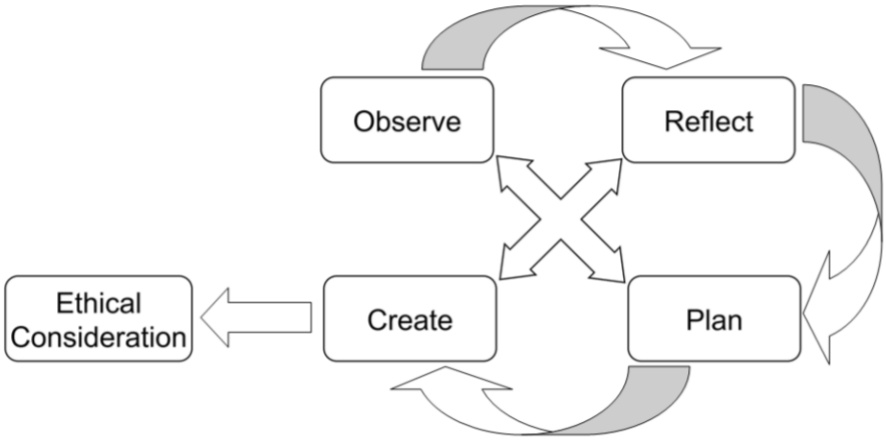


Figure 1. Adapted Aesthetico-Action Model (Source: Author's Construct, 2024)

2.1| Observation

The advent of AI has brought about a paradigm shift in the art and design sphere. AI software is used in all areas of the arts, including music, literature, crafting, visual art forms, etc. In the area of textile design, AI is used in creating unique designs, making design arrangement easier and faster, among others. However, the researchers observed that not much has been done with regard to using AI software in the creation of contemporary Ghanaian Textile designs. A visual analysis of existing fabrics in open markets from fabric merchandisers presents similar essential characteristics in motifs and colour palette applications, which makes diversity in designs a challenge. Thus, this study explores the feasibility of generating textile designs using text-to-image-based artificial intelligence models. The primary focus was to investigate how this AI-driven process can create a single design unit that lends itself to seamless pattern creation through its predictability.

2.2 | Reflection

Reflection as a variable in the Aesthetico-action Model aids the artist in developing ideas and transforming such ideas into creative concepts to solve a problem. It shows the interaction with the materials to develop appropriate ideas that lead to a creative process. Through reflection and reflexivity, three AI software tools were selected to generate contemporary Ghanaian textile designs. The criteria for the selection of the AI Software included being a Text-to-image AI model, ability to use the reference image (command prompt and negative command prompt), ease of use, availability and cost. Based on these criteria, Playground, Leonardo & Lexica AI were selected. The criteria were to enable the researchers to produce results in accordance with the demands of the study.

2.3 | Planning

The planning stage exposed the researchers to numerous Ghanaian Adinkra designs with cultural implications. For the purpose of this study, the Adinkra symbol 'Dwennimmen,' as shown in Figure 2, which translates to Ram's horns, was used as the reference image (Motif). This symbol conveys themes of strength (in mind, body, and soul), humility, wisdom, and learning. The researchers considered the Dwennimmen symbol because it could be used by both powerful and ordinary people in the cultural area when converted into a cloth design and other textile applications. The symbol was also considered because it manifests a unisex appeal. The intended end use was to produce fabric that could be used for different purposes within the Ghanaian rites of passage, such as puberty, marriage, etc. Based on the end use, the researchers planned the intended cloth pattern with brilliant colours that could portray victory, happiness, etc. A single unit was to be produced as a tile for replication by adopting an appropriate textile design pattern. These planning strategies enabled the researchers to use the selected AI software to achieve the set goals.

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Figure 2. *Dwennimmen*

2.4 | Creation

This phase encompasses the practical execution of the designs using the chosen AI software. It involves translating conceptual ideas into the physical creation or design of tangible items utilising suitable materials (Kishawy et al., 2018). The subsequent section provides a comprehensive experimental account of the specific procedures employed to craft each design. The selected software was given the same prompt to generate contemporary textile designs, and the final outputs were analysed. The study observed and analysed the stylistic approach, colour utilisation, and, most importantly, how AI draws inspiration from the referenced image to create a distinct repeating unit. To achieve this, the CorelDRAW software was utilised to assemble the repeating unit and ultimately produce the complete design. The all-over repeat pattern was used because it gave a seamless and complete design. The step-by-step procedure employed in developing the repeating unit was as follows:

1. Selection of the Adinkra symbol to be used as a specimen for testing the chosen AI model.
2. Formulation of a well-crafted command prompt to provide guidance to the AI, including the incorporation of negative prompts. Details of the command prompts used are presented below:

Command Prompt: The primary purpose of the command prompt in this research was to guide the referenced image, aligning it with the researchers' desired sense of design. Additionally, a negative command prompt is employed to prevent the main prompt from deviating away from the intended design. Using this command prompt, the researchers executed the task for the unit repeat through the AI: motif, as per image, African textured negative space, tile, brilliant colours, fabric art, Seamless geometric patterns, repeating patterns design, highly detailed, clean, flat illustration, Vector image. --width 100 --height 100 --output seamless pattern.

The intention behind incorporating these simple descriptions, such as motif, African textured, negative space, brilliant colours, and fabric art, is to guide the AI in adhering to the specified motif while incorporating African textured elements in the background. The colour inspiration is drawn from the referenced image but enhanced to be brilliant. Throughout this process, the ultimate goal was to create a design with a focus on fabric design. Additionally, essential prompts like seamless geometric patterns, repeating pattern design, highly detailed, clean, tile, flat illustration, vector image, and output seamless pattern are included in the command to ensure the design aligns with the modus operandi of textile design. Emphasising these prompts is vital for achieving repeat pattern creation, a significant asset in textile print design, and even tessellations. By doing so, the AI remains on track and follows the given directives. Moreover, the introduction of vector images and flat illustrations is essential, considering the end result and available technology. In Ghana, screen printing or serigraphy is prevalent, and vector images are particularly useful in this context. Finally, the prompt specifying the size of the repeat pattern serves the purpose of creating a square-shaped unit repeat. This facilitates the assembly of the patterns from all angles when rendering the full design in CorelDRAW or Photoshop.

Negative Prompt: This prompt serves as a safeguard to prevent the AI from deviating from the given instructions and ensuring strict adherence to them.

3. Input both the command prompt and the referenced image (Adinkra symbol) into the AI system.
4. Utilise the AI-generated unit repeat and input it into CorelDRAW for rendering the final textile design.

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2.4.1| Creating a design with Playground AI

Playground is one of the artificial intelligence tools among the three chosen for this research. It stands out for its user-friendly interface (Figure 3), allowing for simple command prompts without the need for complex coding commands. While most default settings remained unchanged, two significant settings were adjusted: the image strength and the number of images.

Image Strength: The research placed great importance on the image strength as it profoundly influences the creativity and stylistic expression of the artificial intelligence when processing the input image. By adjusting the image strength, one can achieve either a strong resemblance or a more distinct interpretation of the referenced image. Given the significance of achieving semblance in this study, the careful regulation of image strength cannot be underestimated.

Number of Images: Creating a higher number of images offers a greater range of options and showcases the creative prowess of the AI. Although the default setting for Playground generates only one image, this research chose to produce four images to explore a wider array of possibilities and observe the diversity in the generated outputs. Below is the summary of the settings used.

Table 1. Image generation settings used for Playground AI

Setting	Value
Prompt	motif, as per image, African textured negative space, tile, brilliant colours, fabric art, Seamless geometric patterns, repeating patterns design, highly detailed clean, flat illustration, Vector image.
Width	100
Height	100
Output	seamless pattern
Exclude From Image	distortion, deformity
Image Dimensions	512 × 512 (or your preferred choice from the list)
Prompt Guidance	(Higher = closer to prompt; adjust as needed)
Quality & Details	(More steps = higher quality; adjust as needed

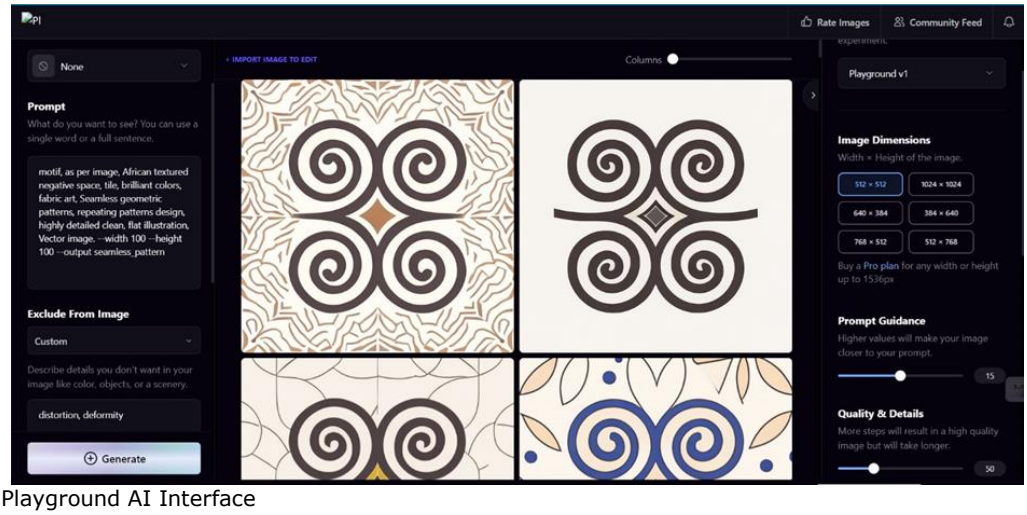


Figure 3. Playground AI Interface

2.4.2| Creating a design with Leonardo AI

This artificial intelligence (AI) software was also among the selected AIs to experiment with the Adinkra motif as a reference image. Accessing the image-to-image or text-to-image part of the AI involves locating the fine-tune model setting. This opens an interface which makes it possible to work on an image using a preferred command prompt (Figure 4). Although the interface may seem overwhelming with numerous settings, it becomes efficient to work with time. Within this setting, there are other models available, one of which is Dream Shaper V5 (Version 5), allowing the designer to choose a model depending on the desired outcome. All the default settings of the model are ready for use. Creating the design in this section of the AI involves importing the reference image using the image import tool while having the image-to-image or image prompt activated, as shown in Figure 3. For textile design purposes,

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it is essential to activate the tile setting, which communicates the intention to focus on pattern creation. All settings used are listed in the table below:

Table 2. Image generation settings used for Leonardo AI

Setting	Value
Number of Images	4
Prompt	motif, as per image, African textured negative space, tile, brilliant colours, fabric art, Seamless geometric patterns, repeating patterns design, highly detailed clean, flat illustration, Vector image.
Width	100
Height	100
Output	seamless pattern
Negative Prompt	distortion, deformity
Model	Stable Diffusion 2.1
Image Dimensions	768 × 768 px
Init Strength	0.3
Tiling	Enabled (seamless pattern output)
Image to Image	Enabled (Image Prompt mode)
Input Image	Upload or drag and drop an image (PNG or JPG, max 5MB)
Advanced Settings	Show Advanced Settings (enabled)
Plan	Free (8 tokens used, 134 remaining)

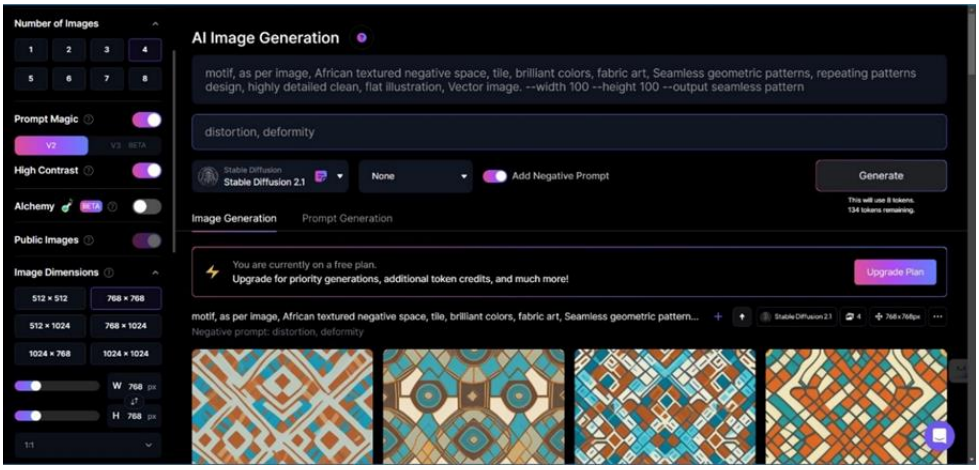


Figure 4. Leonardo AI Interface

Leonardo AI offers users the flexibility to select multiple images, greatly enhancing the creative and stylistic potential of the design output. It is essential to note that when the reference Adinkra image is imported, the model settings automatically adjust and adapt to match the characteristics of the reference image. Furthermore, users have the option to make adjustments as needed, including resizing to achieve the desired size. Leonardo AI also provides an input area for command prompts (Figure 5a), similar to Playground, and includes the option for negative prompts. Both of these features serve the same purpose as in Playground AI. The research regulated two key settings within this AI to ensure the desired design is achieved successfully. The first setting, "Init strength" (Figure 5b), determines the level of influence the referenced image should have on the final outcome. It is adjusted throughout the process to allow for diverse designs and to facilitate the creation of the desired design. The second setting relates to the number of images generated, which in this case is four (4). This choice of generating four images offers a broader range of design options and helps achieve the desired creative output.

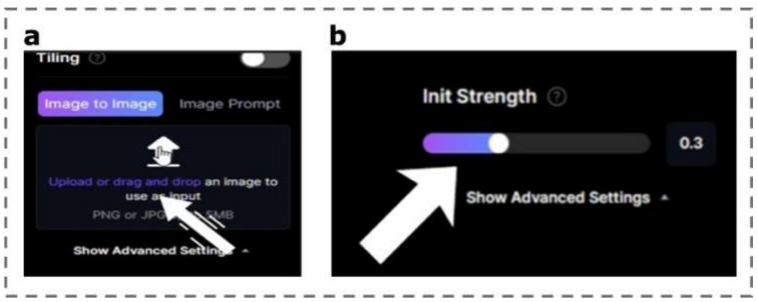


Figure 5. (a) Image Import and (b) Init Strength

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2.4.3| Creating a design with Lexica

Lexica stands out among the two AIs already explored with its user-friendly and straightforward interface (Figure 6), making it an ideal platform for beginners to delve into. Users have the convenience of adjusting the image size directly without the need for a command prompt. Depending on the image orientation, the image size bar can be easily dragged to achieve landscape, portrait, or full square dimensions. Moreover, Lexica offers advanced settings, allowing users to explore various model types it is trained on throughout the design process, thus facilitating a variety of designs and unleashing creativity. These model types include Lexica Aperture V2 and Lexica Aperture V3. The AI's creativity is further enhanced by the guidance scale setting, which either grants it the freedom to create or imposes restrictions on its creative output. Throughout this study, most of the settings adhered to were the default ones, providing insight into the AI's creative ability in its original state. However, two settings that the researchers frequently adjusted across all three AIs were the number of images to be generated at a time and the image strength. Additionally, the command prompt consistently guided the AI, giving it clear directions throughout the design process. The table below outlines all the settings used:

Table 3. Image generation settings used for Lexica

Setting	Value
Number of Images	4
Prompt	motif, as per image, African textured negative space, tile, brilliant colours, fabric art, Seamless geometric patterns, repeating patterns design, highly detailed clean, flat illustration, Vector image.
Width	100
Height	100
Output	seamless pattern
Negative Prompt	distortion, deformity
Model	Stable Diffusion 2.1
Image Dimensions	768 × 768 px
Init Strength	0.3
Tiling	Enabled (seamless pattern output / Tiled patterns)
Image to Image	Enabled (Image Prompt mode)
Input Image	Upload or drag and drop an image (PNG or JPG, max 5MB)
Advanced Settings	Show Advanced Settings (enabled)
Style Tags	Tiled patterns, Ethnic design, More ideas
Plan	Free (8 tokens used, 134 remaining)

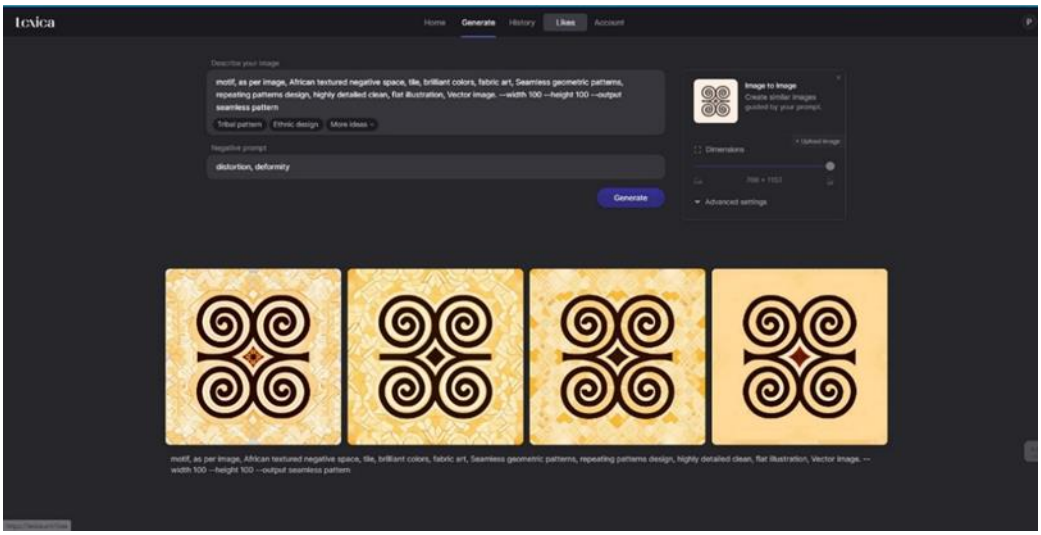


Figure 6. Lexica AI Interface

2.5 | Ethical Consideration

The challenge of combining artificial intelligence with deep cultural traditions is not unique to Ghana, as similar research in different countries demonstrates. For instance, researchers in China have built specialised image datasets for traditional crafts like Miao embroidery and batik, and used AI to generate new patterns inspired by historic porcelain and palace artworks (Ciurea, 2025). There have been ethical questions such as how to build culturally representative datasets, who owns AI-generated designs, and

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how master craftsmen can collaborate with algorithms rather than be replaced by them. In some Chinese craft communities, artisans already use AI to speed up pattern design while still performing final handwork themselves (Chen & Lou, 2025), mirroring the Ghanaian tensions around fidelity to tradition, consumer acceptance, and production feasibility. However, the Ghanaian context introduces a distinct ethical dimension, as value systems, cultural norms, ethos, symbolic imagery, colours, patterns, communal hierarchical status, group identity, and cosmological relationships are all embedded in cultural aesthetics. This makes ethical consideration critical within the adapted Aesthetico-action Model framework outlined by Marshall (2010), particularly when leveraging AI for textile design generation. AI prompts and their accompanying outputs often generate modifications to inputted symbols, creating variations from simple to complex that necessitate ethical oversight. Nested within Ghanaian culture, this ethical consideration operates after the "create" variable in the framework, ensuring that generated designs comply with cultural design concepts, symbolism, and appropriation related to colour, imagery, and meaning. It also safeguards respect for communal values, radiates cultural sensibilities, supports identity materialisation, and ensures cultural preservation and heritage protection. Ultimately, this ethical layer gives designers the tools to modify colours, imagery, and concepts to conform to Ghanaian cultural values and context. The question of how AI can preserve cultural authenticity while making traditional crafts commercially viable reminds us that technology is never neutral; it carries the values of the people who build it. The real question is not just what AI can do for traditional crafts, but whose cultural values will be encoded in the algorithms that shape the future of heritage industries.

3 | RESULTS

This section discusses the final designs that were generated by the AI software. It presents the findings based on the benchmarks that were set before the creation of the various designs, which included the stylistic approach, colour utilisation, and how the AI draws inspiration from the referenced image to create a distinct repeating unit. The findings are discussed below.

3.1 | Playground AI

The generated image (Figure 7) beautifully captured the colours of the reference image, resulting in an AI output motif closely related to the original. This textile design is likely to resonate well with Ghanaian consumers, as they are familiar with such motifs. The AI demonstrated remarkable creativity with the background textures, combining ornamental and floral elements. Additionally, the design being vector-based rather than bitmap or rasterised makes colour separation an effortless process, which aligns perfectly with the serigraphy printing technology commonly used in Ghana, favouring vector-oriented designs. When assembling the unit repeat of the design generated by Playground, the seamless outcome was highly achieved. This could be attributed to the command prompts focused on pattern, tile, and seamless, which significantly contributed to achieving this seamless result.

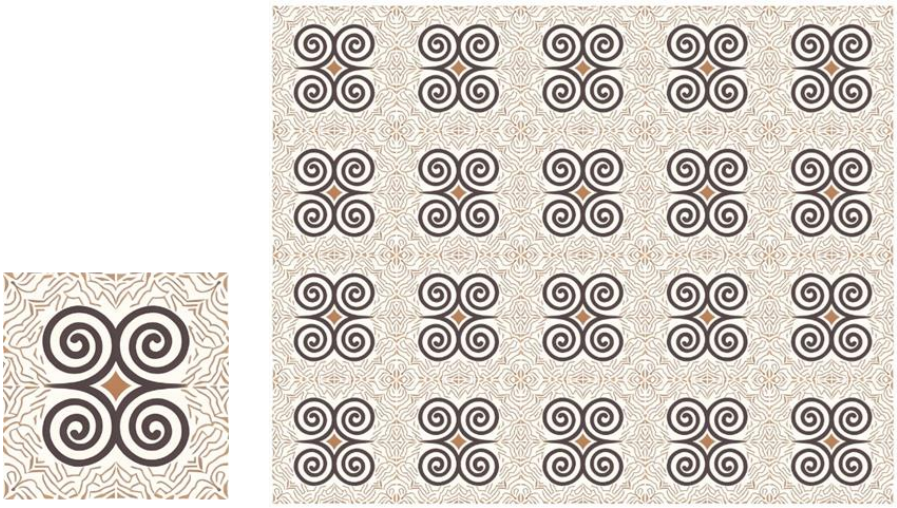


Figure 7. Playground AI Output

With regard to the FGD, all the participants (21) unanimously concurred that the motif and colours produced closely resembled those in the reference image. Several participants (8) also expressed fascination with the generated textures, finding them sophisticated and captivating. However, they believed that replicating such textures manually would be challenging. The majority (18) of the

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participants were notably impressed by the AI's ability to showcase high-quality craftsmanship. It effectively created a design that precisely depicted the desired commands. Furthermore, all participants (21) reached a consensus that the generated design was aesthetically appealing, leading them to readily accept it as a textile design for the Ghanaian textile market. Some of the views expressed by participants are; "This is beautiful, customers will like it." and "The craftsmanship is excellent".

3.2 | Leonardo AI

The colours of the image (Figure 8) produced by the AI were closely related to those of the reference image, with the addition of extra colours such as blue. However, the motif created was distinct from the reference image. Instead of being motif-based, the design focused on textures, resulting in an intriguing and sophisticated appearance which did not have any resemblance to the reference image. When assembling the unit repeat to form the full design, it exhibited seamless characteristics. Furthermore, the design was vector-based, enhancing its versatility and suitability for various applications.

The FGD participants expressed satisfaction with the AI's significant departure from the given command prompt. The motif and colours generated bore no resemblance to the reference image. While they acknowledged the quality and attractiveness of the design created, they unanimously decided against accepting it due to its failure to align with the client's (command prompt) expectations. A participant stated that "The output is totally different from the reference image". Moreover, they raised dissatisfaction about the AI's suitability for textile design production, given its tendency to deviate from the required specifications, as shown in Figure 8. One participant said, "I do not think we can use this AI for textile designing. The design is totally different from what it was asked to produce." Another participant expressed his disappointment with the design output. He stated that "No no no … this is not acceptable. Was this design derived from the reference image?". Consequently, it was agreed that textile designers should delve further into exploring the potential of Leonardo AI to ascertain its capability in generating textile designs that align with the provided command prompts.

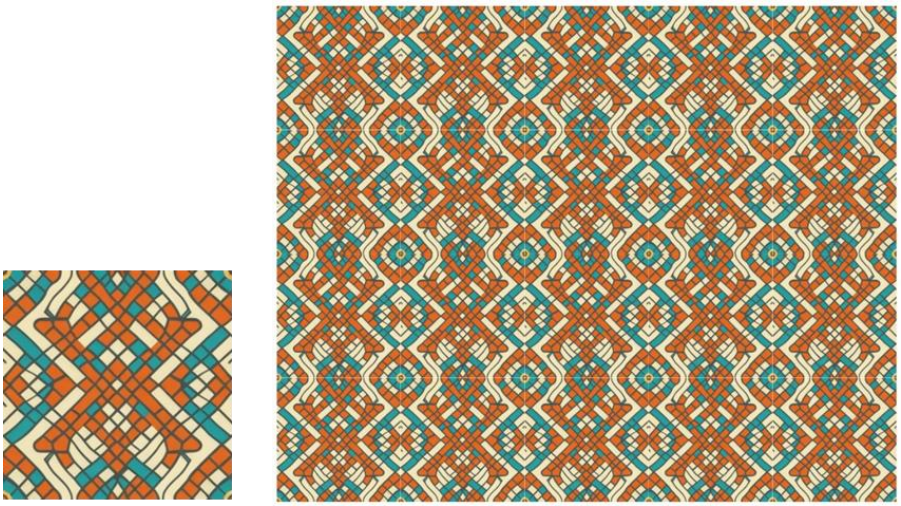


Figure 8. Leonardo AI Output

3.3 | Lexica AI

Results from the experimentation revealed that colours generated by Lexica AI were largely in line with the reference image, but there were some additional colours introduced by the AI. The motif of the generated image (Figure 9) was an exact match to the reference image, making it a favourable choice for Ghanaian consumers due to their familiarity with this design. The textures displayed a watercolour effect, albeit somewhat subtle and faded, which accentuated the floral-oriented motif. When assembled, the design seamlessly merged together, producing a fabric-like pattern.

The participants (21) reached a consensus regarding the motif, noting that it closely resembled the reference image. This shared view was echoed in participant feedback, with comments such as "the motif captures the essence of the original perfectly" and "I can immediately see the reference in this design, reinforcing the strength of the agreement". However, some participants expressed dissatisfaction with the textures that were generated. One participant raised a concern, saying", The textures are too subtle. How can we effectively print this on fabric?" In terms of colour, many (15) participants agreed that while the generated colour was comparable to the reference image, they expected the AI to produce a more captivating and engaging colour palette. Nonetheless, all (21) participants were in agreement when it

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came to the exceptional quality and craftsmanship exhibited in the creation of the design. Furthermore, they collectively concluded that the generated design was suitable for use as a textile design and therefore unanimously accepted it.

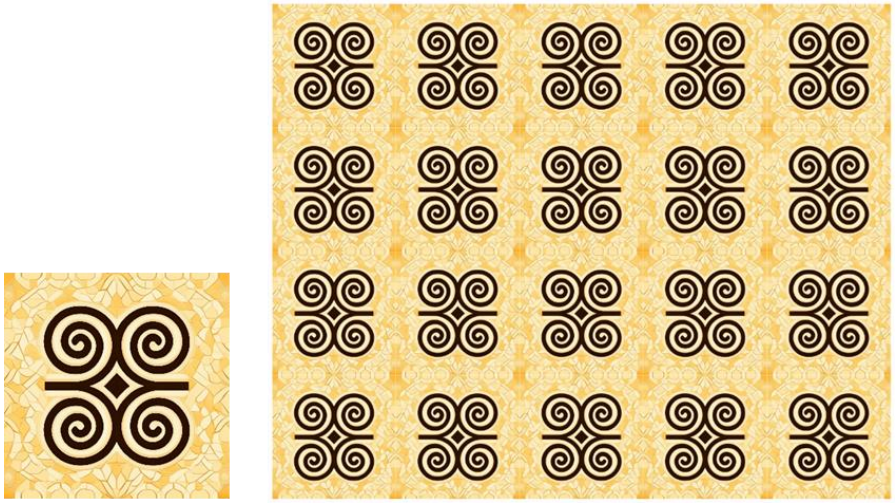


Figure 9. Lexica AI Output

During the FGD, it was observed that, with the exception of Leonardo AI, all the other AI-generated textile designs closely aligned with the requirements specified in the command prompts. The consensus was that there was a need to further explore the AI used in the study to fine-tune the textile designs they produced. Regarding the participants' willingness to utilise AI in future textile design endeavours, they unanimously expressed their readiness, citing several compelling reasons. First, they acknowledged that AI had become an integral part of the contemporary landscape, and as textile designers, they recognised the necessity to explore its potential for enhancing their work; otherwise, they risked falling behind in their field. Additionally, they appreciated the ease and speed with which AI could be employed, which could significantly expedite their turnaround times. One participant commented, "This will simplify my work and appears straightforward to use." Another participant remarked, "This will greatly enhance the quality of work I produce."

4 | DISCUSSION

The analysis of Figure 7 and the corresponding Focus Group Discussion (FGD) results present a compelling case for the effective and harmonious integration of generative AI into culturally specific design systems. This instance demonstrates not merely the technical capability of AI, but its potential to function as a powerful augmentative and bridging tool that respects cultural parameters, meets technical production standards, and enhances creative possibilities. The unanimous acceptance by Ghanaian textile designers (participants) marks a significant finding, indicating the conditions under which AI transitions from a novel experiment to a viable professional instrument bridging tradition and innovation. The foremost factor in the successful integration was the AI's precision in adhering to the core design brief. The accurate replication of the reference image's colours and motif ensured the output remained within the recognisable visual language of the target market. This aligns with the principles of culturally and ethically responsive design, where innovation must be rooted in existing symbolic and aesthetic frameworks to ensure resonance and acceptability (Reitsma, 2019).

Simultaneously, the AI demonstrated value-added creativity within the defined constraints. The generation of sophisticated, complex background textures that participants found "captivating" illustrates AI's strength in augmenting human creativity. This supports the concept of "combinatorial creativity" (Han et al., 2019), where AI can synthesise existing elements (ornamental, floral) in novel, intricate ways that may be conceptually unexpected for a human designer. The remark that manually replicating these textures would be "challenging" highlights AI's role in expanding the feasible design space, introducing a layer of detail and complexity that enhances the final product's perceived craftsmanship and value. The technical suitability of the output for local production methods was a critical and practical advantage. The vector-based nature of the design, leading to "effortless" colour separation, is not a minor technical detail but a major operational benefit. It directly addresses a key bottleneck in serigraphy (screen printing) production, as noted by Hettinga et al. (2022). This shows that AI tools, when properly configured, can align with and even optimise for specific manufacturing sectors. The achieved seamless repeat further

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confirms that through targeted prompt engineering (using terms like "pattern, tile, and seamless"), AI can reliably handle the precise, mathematical requirements of textile design that are fundamental to industry readiness (Kumar et al., 2024). The FGD participants' dual recognition of both high-quality craftsmanship and precise command fulfilment is particularly insightful. It dispels a common concern that AI-generated art is generic or lacks skilled execution (Asperti et al., 2025). The participants stated that the output (designs) were both aesthetically pleasing and a correct solution to the stated problem. This positions the AI as a reliable and skilled assistant for the initial design phase. The readiness of the participants to accept this design signals a viable path forward. It suggests that for AI to be adopted in traditional creative fields, it must not seek to replace the cultural knowledge of the designer but must instead act as a precision instrument that amplifies and refines that knowledge, while seamlessly merging with local technical and economic realities.

Figure 8 presented a counterpoint in the assessment of generative AI for applied design, revealing a fundamental tension between the model's autonomous "creativity" and the stringent requirements of client-driven, culturally specific design briefs. While the AI-generated output was technically proficient and aesthetically sophisticated, its failure to meet the core requirements of the command prompt led to its unanimous rejection by Ghanaian textile design stakeholders. This outcome necessitates a discussion on the limitations, interpretative gaps, and necessary human oversight in AI-augmented design workflows. Firstly, the AI's performance underscores a key distinction between generative capability and design dependencies. The AI successfully produced a vector-based, seamlessly tileable design with "intriguing and sophisticated" textures, confirming its strength in generating novel visual compositions and handling complex technical parameters (Petráková & Šimkovič, 2023). However, its significant departure from the reference image's motif, which is the core of the design brief, highlights a critical failure in understanding or adherence. This aligns with research by Oppenlaender (2024), who notes that text-to-image models often prioritise stylistic or compositional keywords over subject fidelity, leading to "prompt drift" where the output diverges from the user's specific intent. In a commercial textile context, where motifs carry cultural, symbolic, or brand-specific meaning (Li, 2026), this drift is not a creative feature but a critical flaw.

The unanimous rejection by all FGD participants is highly instructive. The participants' satisfaction and subsequent decision were not based on the aesthetic quality of the output in a vacuum, but on its failure as a design solution to a given problem. This reinforces the concept of "design as a service" or "design as problem-solving," where meeting client specifications is paramount (Petráková & Šimkovič, 2023). The participants' reaction shifts the evaluation criteria from pure visual appeal to functional appropriateness and a judgement AI currently lacks. The subsequent doubts from participants about the technology's suitability for production emphasise that in professional settings, reliability and predictability are as valuable as creativity. This case also illustrates the interpretive ambiguity of language in human-AI collaboration. While the command prompt may have been clear to the human designer, the AI's interpretation led to an over-emphasis on "textures" at the expense of the "motif." This underscores the emerging discipline of "prompt engineering," which requires designers to learn how to structure requests to minimise ambiguity for the AI (Federiakin et al., 2024). The conclusion that designers must further explore Leonardo AI's capabilities to understand its alignment with prompts is a direct call for this kind of technical, experimental literacy. Furthermore, the introduction of an extra colour (blue) not present in the reference image points to the AI's inherent tendency towards interruption and addition, a function of its training on vast datasets. While this can be a source of innovation, in a context requiring colour accuracy such as matching brand colours or specific dyestuffs, this "creativity" becomes a liability. It challenges the designer's role as a curator and editor, needing to rigorously assess AI output against a fixed brief (Tsao, 2025). The findings from the evaluation of Figure 9 and the concluding FGD consensus reveal a conditional acceptance in the adoption of generative AI for textile design. While the AI-generated design was unanimously accepted for use, the participant feedback underscores a balanced depth of understanding with clarity of analysis and a focus on achievable outcomes. The discussion was beyond acceptance or rejection of the design created, but the exploration of the conditions under which AI is deemed suitable. The acceptance of Figure 9 was based on its consistency with the core design brief. That is an exact match to the reference motif. This reiterates the paramount importance of specification adherence in commercial and culturally sensitive design (Asperti et al., 2025). The AI's success demonstrates that when models reliably interpret and execute core subject matter, they can produce viable, market-ready products. However, the participants' dissatisfaction with the "too subtle" watercolour textures and the desire for a "more captivating" colour palette reveals a critical insight. The concern about print viability, as expressed by one of the participants: "How can we effectively print this on fabric?"

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The print viability directly ties aesthetic evaluation to production practicality. Subtle, faded textures may not translate well in serigraphy, which often relies on bold, defined areas of colour (Hettinga et al., 2022). This critique highlights that designers are not passive recipients of AI output; they are expert evaluators who assess it through a multi-faceted lens of cultural resonance, aesthetic impact, and technical feasibility. The accepted design is not an end product but a high-quality starting point. The participants' willingness to use AI moving forward, coupled with their specific critiques, envisions a system where AI handles the heavy lifting of initial concept generation and repeat construction, while human designers retain control over the crucial stages of art direction and production refinement. They would take the AI-generated base, enhance the colour palette for greater vibrancy, and adjust textures for print clarity. This aligns with the "co-creativity" model proposed by Kabir (2024), where AI generates possibilities that humans then curate, modify, and contextualise based on cultural ethical considerations. Finally, Figure 7 shows that AI can work successfully within a strong cultural framework when it closely adheres to reference material. Figure 8 shows that when it operates outside that framework, its output, however sophisticated, becomes culturally and commercially irrelevant. This supports Tubadji et al.'s (2021) argument that AI lacks the intrinsic cultural intentionality of human creators, and its value is entirely contingent on precise human guidance and contextual framing.

5 | IMPLICATIONS OF FINDINGS

The findings of this study demonstrate the feasibility and variability of AI-generated textile designs and carry significant implications for the textile industry and creative practice. The ability of AI to facilitate a faster, more efficient process and produce designs aligned with consumer specifications implies a shift towards more responsive and demand-driven manufacturing. This can lead to reduced time-to-market for new products and lower costs associated with the initial design phase. Additionally, the variation in outputs from different AI software, even with identical prompts, underscores that these tools are not autonomous replacements for designers. Instead, they function as powerful "co-creators" or "design assistants." The designer's role evolves from executing every detail to curating, refining, and imbuing the AI-generated options with artistic intent and cultural meaning. Finally, the observed variations in output suggest that each AI software has its own inherent "style" or algorithmic bias. This implies that designers can strategically select different AI tools to access a wider range of aesthetic possibilities and creative directions that may not have been initially conceived, thereby expanding the visual lexicon of contemporary textiles. By integrating AI, local industries can increase their productivity and innovate rapidly, potentially capturing new market segments with contemporary designs. For a country with a rich heritage like Ghana, known for Adinkra and Kente, AI presents a novel implication. Designers can use prompts infused with cultural symbols (e.g., "Generate a pattern inspired by Adinkra symbol 'Gye Nyame' in a modern colour palette") to create contemporary designs that are culturally grounded. This offers a pathway to preserve and evolve traditional aesthetics for a global audience.

6 | LIMITATIONS OF THE STUDY

The study was limited to using AI software to generate contemporary Ghanaian textile designs. It was also confined to only three AI software programs, including Playground, Leonardo, and Lexcia. The findings are therefore not representative of the entire ecosystem of AI design tools.

7 | CONCLUSION AND FUTURE STUDIES

Ghana boasts a rich history of textile design, stretching back to the 17th century. Renowned for their vibrant colours, intricate patterns, and cultural significance, traditional Ghanaian textiles have long captivated admirers. Recent studies have highlighted the exceptional results achieved through computer-aided design software in textile creation, benefiting both consumers and designers (Buami et al., 2022). Moreover, a growing interest in leveraging artificial intelligence (AI) has emerged, promising to revolutionise the Ghanaian textile design process. As AI software becomes more accessible and data availability increases, an increasing number of Ghanaian textile designers can embrace AI solutions, leading to a more efficient, innovative, and competitive textile industry. The research findings shed light on the fascinating potential of text-to-image AI models in the context of Ghanaian textile design. Despite receiving identical prompts, the AI software produced diverse outputs, signalling opportunities for novel and creative design solutions. The findings revealed that while two of the software applications used in this study responded positively to the given prompt, one deviated notably. This suggests that certain AI tools may ultimately fail to pass ethical scrutiny with regard to cultural appropriation or distortion. It is at this juncture that the ethical consideration variable introduced in the conceptual framework becomes

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essential. In some instances, the generated designs may diverge from the reference image and thus require modification to ensure alignment with cultural values, context, meaning, and the avoidance of appropriation. Furthermore, the integration of AI streamlined the design process, offering promising implications for enhanced productivity and competitiveness within the textile industry. As Ghanaian designers explore the integration of AI in textile design, it is essential to acknowledge potential challenges and ethical considerations. Preserving traditional craftsmanship and cultural sensitivity must be paramount as AI technology becomes part of Ghana's vibrant textile heritage. Based on the research findings, the researchers advocate for the introduction of text-to-image AI models to the Ghanaian textile design community. Embracing this technology would empower designers to produce contemporary designs that cater to individual preferences and market demands. Additionally, the adoption of AI technology could position Ghana's textile industry at the forefront of innovation, enabling it to adapt and thrive in the rapidly evolving global marketplace.

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DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article, as no datasets were generated or analysed during the current study.

CONFLICT OF INTEREST STATEMENT

The author declares no conflict of interest.

ETHICS APPROVAL STATEMENT

The Ethics Committee at Takoradi Technical University approved the set of questions before data collection started. Respondents were informed of the purpose of the study; therefore, their consent was obtained before they answered the interview questions. The confidentiality and anonymity of respondents were also assured.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work, the author(s) used PLAYGROUND, LEONARDO, AND LEXCIA in order to generate textile designs. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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