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Designing the Future: AI in Modern Textile Creations Rooted in Cultural Heritage, 2025

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Abstract

This study investigates the application of generative artificial intelligence (AI) to recreate historic Saudi textile arts, specifically Al-Qatt Al-Asiri and Al-Sadu, as modern fashion and design fields. By generating culturally motivated flat patterns and apparel using DALL-E, the aim of this study was to bridge the preservation of heritage with the creation of new content.

With culture-based stimuli, AI-generated outcomes were compared critically for beauty and cultural appropriateness by experts and were seen to be highly rated in both these aspects. The research then compares its findings with that of current regional and global research, confirming that AI is useful as an addendum to creative processes but needs ethical safeguards against cultural homogenization and design homogenation.

Results show that AI can support sustainable innovation in heritage-based design when properly managed and in conjunction with traditional artisans. The article contributes a theoretical framework combining posthuman design, decolonial theory, and participatory design that offers a path to culture-situated, ethically conscious textile innovation in the intelligent technology era.

This study highlights the ability of generative AI to link between cultural heritage and sustain modernity by rephrasing Saudi Arabia's Al-Qatt Al-Asiri and Al-Sadu motifs. Nevertheless, in order to strengthen the found evidence and develop it even more, future research should emphasize on prioritizing ethical practice and developing co-operation between AI developers and artisans, with the aim of guaranteeing long-term cultural preservation.

Keywords: generative AI, Al-Qatt Al-Asiri, Al-Sadu, cultural heritage, textile design, fashion innovation, ethical AI, Saudi Arabia, DALL-E, participatory design.

1. Introduction

Preserving cultural heritage is essential in maintaining identities in a rapidly globalizing world. In Saudi Arabia, **Al-Qatt Al-Asiri** and **Al-Sadu** are two traditions emblematic of the nation's cultural richness and identity. **Al-Qatt Al-Asiri**, recognized by UNESCO in 2017, is a geometric and colorful art form traditionally practiced by women (UNESCO, 2017). Similarly, **Al-Sadu**, a Bedouin weaving tradition, reflects the nomadic lifestyle and tribal connections through its earthy tones and symbolic patterns (UNESCO, 2011).

Modernization and globalization have significantly impacted these traditions, threatening their continuity (Alsadi, 2022; Albugami, 2018). This study explores how generative AI tools, such as **DALL-E**, can reimagine traditional motifs for contemporary applications, including flat patterns and fashion garments, while preserving their cultural authenticity. Ethical considerations, including artisan inclusion and preventing cultural appropriation, are central to this exploration (Smith & Lee, 2023; Lamont & Zhang, 2023).

2. Literature Review

2.1 Al-Qatt Al-Asiri and Al-Sadu:

Al-Qatt Al-Asiri represents hospitality and communal themes. Passed down from generation to generation, it is characterized by bold geometric patterns and vibrant colors (Alsadi, 2022). Despite its UNESCO designation, the art practice faces threats due to urbanization (UNESCO, 2017).

In the same vein, Al-Sadu weaving is also Bedouin cultural heritage. Its practice has been on the decline with the introduction of industrial textiles and the lessening of nomadic ways of life (Albugami, 2018; Alharthi, 2019). Revival attempts for Al-Sadu involve infusing it into contemporary design education and sustainable design (Al-Ogayyel & Oskay, 2024; Khalid & Johnson, 2023).

2.2 The role of generative AI in cultural preservation:

Generative AI, particularly software like DALL-E, has opened the door to new reinterpretations of art from the past. These tools reinterpret textual descriptions into visual forms, creating new designs grounded in tradition (Pavlova & Kuzmin, 2024). Critics, however, argue that such reinterpretations through AI must

be centered on cultural authenticity and the involvement of artisans to avoid cultural appropriation (Lamont & Zhang, 2023; Smith & Lee, 2023).

2.3 Applications in textile design:

AI has been widely used in modern textile practice to automate design work and achieve environmentally sustainable innovations. It has been evidenced to be used for enhancing fashion design and addressing cultural sustainability (Imtiaz et al., 2024; Cheung, 2023).

2.4 Previous studies:

A recent study was carried out by Alshaikh et al. in Saudi Arabia in 2025 with the objective of creating women's dresses according to digital patterns of Najdi Sadu art through a new approach based on artificial intelligence and professional fashion design programs. The findings indicated that Design 3 ranked best in the aesthetic aspect with the highest relative weight percentage of 95%. Functionally, Design 3 also topped with a relative weight percentage of 94%, followed by Design 2 with 87%. The rest of the design options had relative weight percentages ranging from 73.23% to 46.43%, which indicated a medium level of quality (Alshaikh et al., 2025).

Another study was also conducted in Egypt by Adel in 2024 to explore artificial intelligence in its nature, tools, and correct application in the textile printing design sector, achieve new and innovative design solutions through the application of artificial intelligence tools, employ designs that express the authentic Egyptian character in covering global sporting events, and identify the creative role of the designer when applying artificial intelligence approaches. The research came to the conclusion that rapid development in AI design can deliver innovative design solutions while saving time and effort. It proved that intelligent technologies support human creative work with reduced chances of errors and wastage of material and human resources. It also revealed that over-reliance on technology can lead to losing the diversity and richness of culture in design, and emphasizing speed and quantity can cause a decline in the quality of work and the loss of artistic innovation and depth (Adel, 2024).

Again, in Egypt, Halim et al. carried out a study in 2024 to benefit from artificial intelligence techniques to establish textile craft industries, determine the standards of preservation and development, and come up with a strategy to remake the sector based on modern needs. From the study, it was realized that through AI adoption, small heritage industries can leverage this technology to market their cultural heritage. Additionally, AI can help these small heritage industries create more efficient and cheaper preservation techniques. The revival and development of textile arts and crafts by artificial intelligence techniques reduce the unemployment rate, convert some of the needy groups to productive groups, resolve some of the economic problems, and promote tourism. Artificial intelligence techniques aid in the revival of textile arts and crafts and even regional development, such as urban and rural areas. They also contribute to enhancing textile craft industry efficiency, product development, and production quality (Halim et al., 2024).

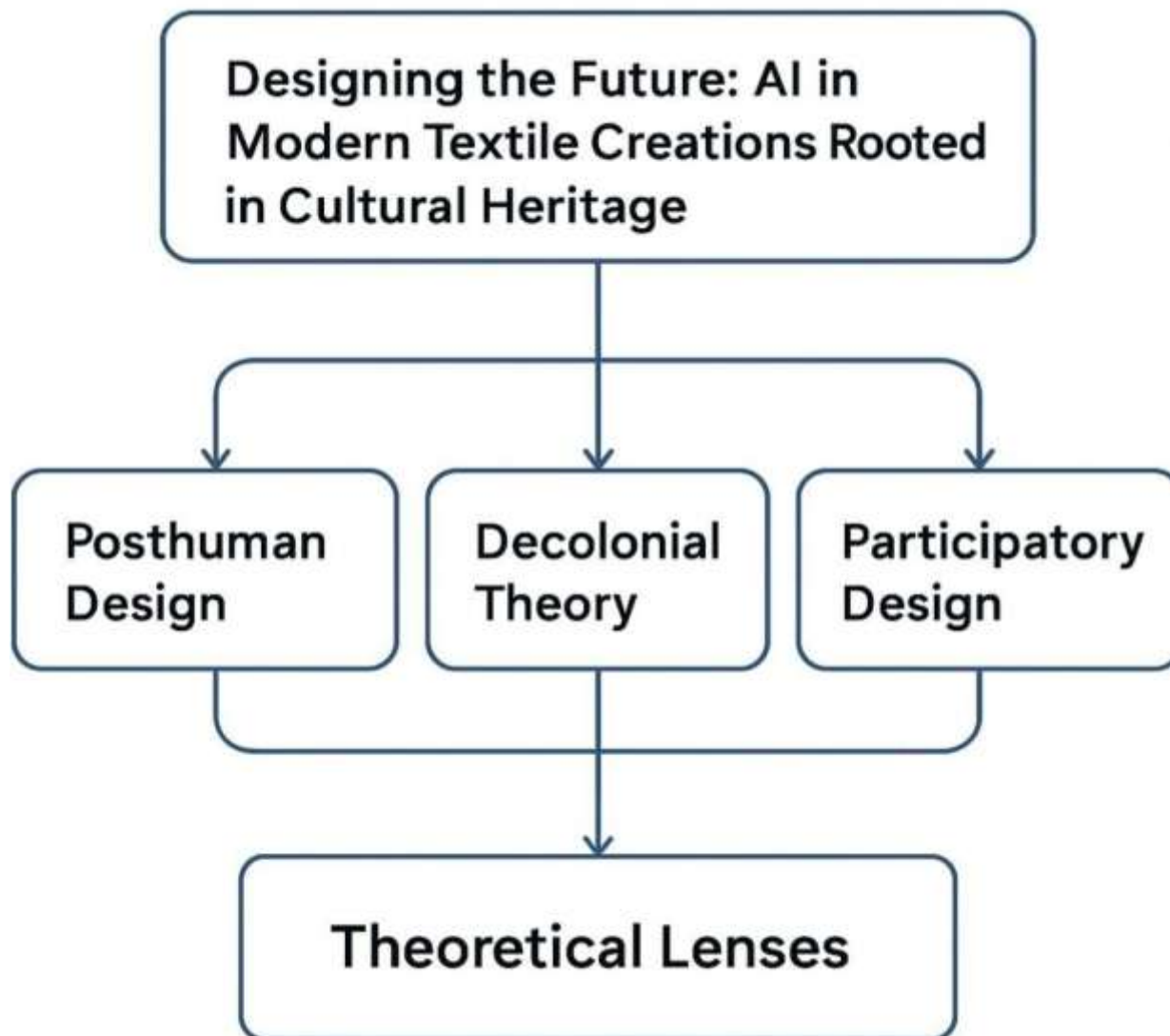
Besides, there is a systematic review study carried out in Singapore by Gupta et al. in 2024 on the same topic. The paper scans a body of 1319 Scopus records covering the years 1985–2023 and encompasses journal articles, books, book chapters, conference papers, and chosen working papers. The research determined seven topic clusters in GAI research: image processing and content analysis, content generation, emerging use cases, engineering, cognitive inference and planning, data privacy and security, and Generative Pre-Trained Transformer (GPT) academic applications. The paper reports on the research outcomes and identifies some of the challenges and opportunities in GAI research. The paper concludes by calling for increased research on GAI, particularly in explainability, robustness, cross-modal and multi-modal generation, and interactive co-creation. The paper further identifies the necessity to address data privacy and security concerns in GAI and ethical utilization of GAI (Gupta et al., 2024).

Lastly, Deng et al. conducted another study in China in 2023 with the aim to investigate the new application of Artificial Intelligence (AI) and machine learning algorithms in the area of ethnic fashion design based on the Miao women's clothing. The new application of the Multimodal Unsupervised Image-to-Image Translation (MUNIT) algorithm, an AI method, generated various and trendy designs, thereby improving the originality of ethnic clothing. This study highlights the synergetic integration of traditional crafting methods and modern technological applications, as embodied in the AI-supported green development of ethnic fashion. In addition, we also demonstrate the advantages of Made-to-Measure (MTM) methods, highlighting the requirement for individual customization in current fashion design (Deng et al., 2023).

3. Theoretical Framework

This research is well-versed by the conjunction of posthuman design theory, cultural semiotics, and decolonial design strategies. Roland Barthes's semiotic theory reveals the inscribed meaning of Al-Qatt Al-Asiri and Al-Sadu designs, as visual texts bearing socio-cultural signifiers. Posthuman design proposes a paradigm for perceiving human and machine collaboration—generative AI in this context—as co-creative and not an extractive process. Decolonial design principles stress the highlights the importance of indigenous knowledge systems, calling for a participatory model immune to Western-biased models of innovation. The paradigms as a whole enable an ethical and critical re-reading of designs of culture with

the aid of AI.



3. Methodology

3.1 Data collection:

Motifs of Al-Qatt Al-Asiri and Al-Sadu were retrieved from academic studies, culture collections, and UNESCO reports (UNESCO, 2011; Alharthi, 2019). Motifs were examined on the color scheme, geometric intricacy, and cultural meaning.

3.2 Application of generative AI:

Text prompts were created using DALL-E to reinterpret classical motifs in flat graphics and apparel. Some text prompts for Al-Qatt Al-Asiri were:

❖ “Create a vibrant textile design inspired by Al-Qatt Al-Asiri’s bold geometric shapes and colorful themes.”

For Al-Sadu, prompts emphasized horizontal weaving motifs and earthy tones:

❖ “Generate a modern textile pattern inspired by Al-Sadu weaving, featuring horizontal motifs and tribal patterns.”

3.3 Expert evaluation:

Five cultural historians and three textile designers compared the designs generated by DALL-E to a rubric that was measuring: (1) visual similarity to historical motifs, (2) cultural accuracy, (3) fashion/textile usability, and (4) aesthetic appeal. Ratings were 5-point Likert and discussed in group workshops for increased validity.

4. Results

4.1 Reimagining Al-Qatt Al-Asiri:

The AI designs maintained the strong geometric forms and bright colors characteristic of Al-Qatt Al-Asiri as a mark of its cultural importance as an icon of Saudi hospitality and communalism. Two two-dimensional designs (**Figures 1 and 2**) reflect the progressive development of the traditional patterns to modern-day designs for use in ornamental as well as practical applications. Because the designs were found to be true to form, averaging 4.6/5 in cultural fidelity and 4.7/5 in visual appeal, these kinds of motifs could be fruitfully translated both into flat patterns and clothing, with excellent potential for both clothing and home decor.

Furthermore, the AI-created designs were transformed into fashion dresses, which demonstrated the way historic motifs can impact modern style. In **Figure 3, 4, and 5**, dresses were made using Al-Qatt Al-Asiri patterns. The dresses reveal the flexibility of the motifs in haute couture, while still retaining cultural legitimacy.



Figure (1): A design inspired by Al-Qatt Al-Asiri, featuring bold geometric patterns and vibrant colors that honor the rich artistic traditions of Saudi Arabia's Asir region.



Figure (2): Flat pattern emphasizing geometric symmetry and vibrant color schemes.



Figure (3): Dress design integrating Al-Qatt Al-Asiri motifs into a modern silhouette.



Figure (4) Full-length dress featuring a reinterpretation of Al-Qatt Al-Asiri patterns.



Figure (5): Fashion garment combining traditional and contemporary elements of Al-Qatt Al-Asiri.

4.2Innovating Al-Sadu designs:

The reinterpretation of the design motifs of Al-Sadu shows the ability of AI in keeping Bedouin traditions in the modern era without sacrificing their symbolic character. Two floor patterns (**Figures 6 and 7**) emphasize horizontal motifs and nature-based colors typical of Al-Sadu. Both textiles and interior design can be used with designs, e.g., rugs and wall hangings.

Besides, the AI-created works were translated into fashionable clothes that combine Al-Sadu motifs with contemporary fashion. **Figures 8, 9, 10, and 11** show Bedouin weaving pattern-inspired dresses, demonstrating they are adaptable in contemporary fashion settings without losing the cultural essence of Al-Sadu.

Designers' remarks valued good continuity of design, at 4.5/5 for cultural relevance. The deliverables also comprised plain and fashionable dress forms, which were suitable for cultural collections and fashion.



Figure (6): Flat design based on Al-Sadu weaving traditions.



Figure (7): Flat design incorporating symbolic tribal patterns from Al-Sadu.



Figure (8): Modest dress inspired by Al-Sadu's horizontal motifs.



Figure (9): Contemporary garment showcasing Al-Sadu-inspired patterns.



Figure (10): Dress design emphasizing earthy tones and tribal connections from Al-Sadu.



Figure (11): Fashion garment that bridges Al-Sadu weaving with mixed eras textile innovation.

5. Discussion

This current research demonstrates how generative artificial intelligence (AI), in the form of DALL·E, remakes and reinterprets Saudi Arabian cultural symbols, namely Al-Qatt Al-Asiri and Al-Sadu, as new textile patterns and fashion wear. By holding on to the geometric order, vibrant coloration, and symbolic density of heritage, the AI-generated patterns bridge heritage with modernity. Professional reviews suggest high cultural fidelity and visual appeal, particularly in the reinterpretation of Al-Qatt Al-Asiri motifs into flat and three-dimensional fashion items. Similarly, reinterpretation of Al-Sadu traditions was widely accepted, suggesting strong potential to incorporate AI-created ethnic motifs into contemporary interior design and fashion. This validates AI's potential as a creative collaborator in the preservation and modernization of heritage.

In comparison to the study of Alshaikh et al. (2025) in Saudi Arabia—in which AI and fashion software were used to design women's dresses inspired by Najdi Sadu art—the findings of the present study show an equivalent enthusiasm for aesthetic appeal and functionality. A design of Alshaikh's study (Design 3) received the top scores under both parameters (95% aesthetic, 94% functional), indicating that designs created by humans can be matched or even exceeded by AI outputs when properly guided. The present study supports such conclusions, the identical high rating scores on cultural fidelity (4.6/5) and beauty (4.7/5), indicating that AI is not merely an efficiency aid, but also a catalyst of aesthetic excellence in heritage-inspired fashion design (Alshaikh et al., 2025).

On the other hand, the study of Adel (2024) in Egypt emphasized the dual function of AI in textile printing—its ability to innovate and alerting us to the danger of cultural waterdown. While the current study celebrates AI's success in modernizing cultural forms, it also acknowledges ethical risks like over-reliance on algorithms, which Adel highlighted as a threat to cultural richness and artistic depth. The current research aligns with this by advocating for artisan collaboration, contextual training of AI models, and ethical co-design frameworks to preserve authenticity while leveraging innovation (Adel, 2024).

Furthermore, the study of Halim et al. (2024) also studied AI in textile crafts and concluded that artificial intelligence could revitalize heritage industries based on heritage, promote regional economic development, and boost tourism. The current study proves this fact by illustrating how AI is not only able to save such threatened crafts as Al-Qatt Al-Asiri and Al-Sadu but rebrand them to profitability as well. The transformation of flat designs into haute couture and home décor indicates how heritage can be scaled up, merchandised, and blended in modern lives through the application of AI-driven design. This collaboration between on-screen technology and on-loom labor is particularly crucial to preserve textile culture in urban as well as rural lives (Halim et al., 2024).

The overall technology landscape of generative AI (GAI) was charted by Gupta et al. (2024), whose systematic review indicates imminent-to-emerge clusters in content generation, co-creation, and explainability. Their findings are a repeat of the calls for interactive and ethical AI systems—a call resonated in this study's emphasis on co-design with artisans, ethical data acquisition, and inclusive AI pipelines. Gupta et al.'s focus on multimodal generation and cross-modal platforms also resonates here, as this research shows how textual initiation generated visual motifs that maintain cross-cultural consistency (Gupta et al., 2024).

Also, Deng et al. (2023) utilized the MUNIT algorithm in China to generate indigenous Miao artistry blended with AI-generated motifs for ethnic fashion. Their successful utilization of AI in sustainable fashion—essentially through adaptive Made-to-Measure (MTM) approaches—supports our study's outcomes regarding cultural themes' transformatory appeal across different forms of garments. As with Deng et al., it was found that digitization of heritage patterns can lead to preservation and innovation, opening up new markets but still preserving ancestral identity markers (Deng et al., 2023).

In all these comparisons combined, the intersection of AI and textile heritage promises much but is full of responsibility. As new ways of cultural reinterpretation are presented by means like DALL·E, they must be regulated by watchful human curation, the participation of artisans, and ethical guidance. In line with earlier research, this study insists that innovation models must have an inclusive approach to tradition bearers, remain culturally loyal, and avoid homogenizing various identities. AI may be a bridge—if built while consulting and considering.

5.1 Limitations of the study:

This study does not include direct involvement of artisans in the design loop. Nor does it examine consumer reception or long-term cultural impacts. Additionally, the outputs are bound by the dataset and capabilities of DALL·E, which lacks cultural contextual training.

5.2 Future research:

Future research should focus on involving shared design workshops with local artisans. Furthermore, it is

vital to include surveys for perceptions of the public, as well as exploring AI training courses focusing on heritage datasets. Not forgetting the importance of co-developing ethical protocols with original communities.

6. Ethical and cultural considerations:

AI application on cultural heritage should be responsibly co-created with tradition custodians. Cultural patterns cannot be purely digitized for trade but recontextualized by permission and proper compensation. It is vital to handle issues of design ownership of works created, indigenous artists' IP rights, and data representation bias carefully.

Recommendations:

- It is important to have boards for ethical review when it comes to cultural AI projects.
- Co-design should be combined with artisans in all phases.
- Identification of original sources of cultural motifs should be confirmed.

7. Conclusion

As overall, this study highlights the ability of generative AI to link between cultural heritage and sustain modernity by rephrasing Saudi Arabia's Al-Qatt Al-Asiri and Al-Sadu motifs. Nevertheless, in order to strengthen the found evidence and develop it even more, future research should emphasize on prioritizing ethical practice and developing co-operation between AI developers and artisans, with the aim of guaranteeing long-term cultural preservation.

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