Migration Letters

Volume: 20, No: S4 (2023), pp. 1656-1671

ISSN: 1741-8984 (Print) ISSN: 1741-8992 (Online)

www.migrationletters.com

AI-Generated Nostalgic Designs Balancing Authenticity And Innovation In Saudi Heritage Preservation Eco-Friendly Furniture: Aesthetics And Color Trends

G. A. Alamry[1]* , L. M. Elwakeel[2], Naglaa Muhammad Farouk Qandil[3]

Abstract

The present research investigates the potential impact of AI-generated evocative designs on the conservation of Saudi cultural heritage. The purpose of this study is to examine the perspectives of subject matter experts and collect data regarding the advantages and disadvantages of utilizing AI-generated designs in the preservation of cultural heritage. Utilizing interviews and a Likert-scale questionnaire, the research utilized a mixed-methods strategy to collect both qualitative and quantitative data from authorities in the field. The interviews were carried out with experts in the preservation of Saudi cultural heritage, preservationists, architects, and other relevant professionals. The participants engaged in a discourse regarding the ethical implications, the difficulties encountered in heritage preservation, and the function of AI-generated designs. A larger sample of experts was surveyed using a Likert-scale questionnaire in order to collect quantitative data on their perspectives and attitudes concerning the application of AI-generated designs in the field of heritage preservation. The results indicate that designs inspired by nostalgia and generate[1]d by artificial intelligence have the capacity to significantly aid in the conservation of Saudi heritage. The capability of AI to digitally restore and visualize heritage sites, thereby providing visitors with immersive experiences, was recognized by the experts. Furthermore, they acknowledged the potential of designs generated by artificial intelligence in terms of increasing consciousness, stimulating curiosity among younger cohorts, and enabling digital documentation and preservation. Nevertheless, the disadvantages identified by the experts included the potential for an excessive dependence on AI, apprehensions regarding authenticity and integrity, and the possible erosion of traditional craftsmanship.

Keywords: *AI-generated designs; Authenticity; Innovation; Saudi heritage; Cultural heritage.*

1. Introduction

Preserving and promoting cultural heritage is vital for maintaining a nation's identity and fostering cultural appreciation. Cultural heritage is a broad word that encompasses both physical and intangible assets. The majority of cultural aspects are intrinsic to a society's legacy and may be referred to as cultural memory. The transmission of cultural memory, which encompasses the history of past generations, is an essential element in shaping individual identity. This process involves the transfer of knowledge and experiences from previous

[1]-Department of Home economics, Faculty of Art and Science, king Khalid University,Abha 62529, Saudi Arabia .
[2]-Department of Home Economics, Faculty of Science and Arts in Tihama, King Khalid University,
Muhayil Asir 61913, Saudi Arabia .
[3]- Department of Home Economics - College of Home Economics, Abha - King Khalid University
:P.O. Box 3236. Abha.

generations to the present and future ones, often facilitated by the preservation and exploration of historic locations (Nocca, 2017). Numerous conservation strategies have been devised to transmit this cultural legacy to subsequent generations, with the latest advancements being those using artificial intelligence (AI). AI and emerging technologies have emerged as crucial tools in the realm of conservation and preservation due to their ability to address prior challenges (Chaillou, 2020).

The use of AI technology in the domains of records, analysis of data, forecasting, conservation, and ongoing evaluation has the potential to enhance the proficiency of heritage experts and make substantial contributions to the pursuit of long-term conservation endeavors. The preservation of cultural assets plays a crucial role in the protection of societies' historical legacy and the promotion of cultural diversity. Nevertheless, conventional methods of conservation often need assistance in effectively addressing the intricate and ever-changing challenges faced by these invaluable resources. The advent of AI innovations in recent years has presented remarkable prospects for the implementation of inventive and efficient conservation approaches within the realm of cultural assets (Lombardo et al., 2019).

The preservation of cultural heritage is of utmost importance in order to guarantee the perpetuation of historical narratives and the preservation of human identity. The preservation and transmission of physical and intangible cultural resources are crucial in ensuring the continuity of collective memory from past generations to future ones. The preservation of irreplaceable historic assets in a sustainable manner is imperative due to the difficulties posed by deterioration, climate change, and limited resources. Consequently, it is essential to develop new ways to address these issues. The preservation of cultural monuments necessitates the development of new solutions due to several factors, including degradation, climate change, and restricted resource availability (Petronela, 2016).

The use of artificial intelligence has emerged as a potent instrument in the preservation and perpetuation of cultural heritage. The significant significance of artificial intelligence technologies at several phases of the conservation process highlights their potential for transformation. Firstly, it enables the generation of accurate digital replicas by using automated digitization, artificial intelligence, and virtual reality, 3D modeling in the processes of automation and preservation. These advancements offer a comprehensive strategy for the distribution and instruction of cultural heritage, enhancing accessibility for scholars, instructors, and the general population.

In addition, artificial intelligence algorithms play a vital role in the analysis and restoration of degraded cultural relics and buildings. AI facilitates the identification of damage and the development of focused restoration strategies via the utilization of image identification and pattern recognition techniques. This preservation technology, which is assisted by artificial intelligence, guarantees the protection of delicate works of art and archeological artifacts with enhanced accuracy and effectiveness. Furthermore, the influence of artificial intelligence encompasses the safeguarding of cultural assets by mitigating physical hazards via the implementation of environmental surveillance. The use of sensors and AI in data processing facilitates the identification of possible hazards, including variations in temperature, variations in humidity levels, and the presence of air pollutants. The prompt and proactive reaction aids in mitigating the environmental consequences and safeguarding cultural assets against irreparable harm.

Saudi Arabia is a nation renowned for its rich cultural heritage, characterized by a historical legacy spanning many millennia. The conservation of this cultural legacy has significant significance for the populace of Saudi Arabia, as it provides as a poignant reminder of their historical origins and enduring customs. Nevertheless, in light of the ongoing process

of modernization and development inside the nation, it becomes more imperative to strike a delicate equilibrium between safeguarding the genuine essence of Saudi history and accepting progressive advancements (Elfadaly et al., 2019; Bakhotmah, 2020).

One of the key difficulties encountered in the field of heritage preservation is to the development of designs that effectively combine elements of nostalgia with innovation (Sakdiyakorn and Sivarak, 2016). Traditional designs elicit a sentiment of nostalgia and foster a feeling of connection to historical contexts, whilst creative forms facilitate the accommodation of contemporary requirements and prevailing trends. The progress of AI technology presents a potential avenue for investigating the use of AI-generated designs in order to attain a harmonious equilibrium in the preservation of Saudi heritage (Altassan, 2023). This research aims to investigate the role of AI-generated nostalgic designs in Saudi heritage preservation, focusing on balancing authenticity and innovation.

2. Research Objectives

The primary aim of this research is to investigate the use of A) produced nostalgic designs in the preservation of Saudi heritage. This study specifically concentrates on achieving an appropriate balance between maintaining authenticity and fostering innovation. The research objectives of this study are to examine the efficacy of AI-generated nostalgic designs in the preservation of Saudi heritage, assess the degree to which these designs can strike a balance between authenticity and innovation in the context of Saudi heritage preservation, and identify the challenges and limitations associated with the utilization of AI-generated nostalgic designs in the preservation of Saudi heritage.

3. Literature Review

Numerous scholarly investigations have examined the utilization of artificial intelligence in safeguarding cultural heritage, with a particular focus on highlighting the practical advantages and transformational outcomes associated with the conservation and reintegration of shared legacy. Specialists engaged in the field of cultural heritage have the opportunity to use the capabilities of AI in order to effectively safeguard and sustainably preserve these invaluable assets for the benefit of future generations. It is crucial, however, that ethical considerations be duly taken into account throughout the implementation of AI technologies in this context (Nocca, 2017). In summary, the utilization of artificial intelligence in safeguarding cultural property constitutes a crucial advancement within this domain, as it equips conservation specialists and researchers with cutting-edge techniques and resources (Doğan and Yakar, 2018; Akyol and Avcı, 2023).

The study conducted by Zhang and Jing (2022) examines the importance of safeguarding cultural heritage sites. The research investigates the obstacles presented by different factors, the various approaches utilized for preservation, and the incorporation of technological advances, regulations, and social engagement in the preservation of these essential human treasures. The research highlights the application of "distant sensing big data" for the purpose of tracking historic buildings on the Qinghai-Tibet Plateau, with the aim of supporting policy development, implementing technological interventions, and conducting field studies. This study examines a total of 152 Buddhist monasteries over a period of 20 years, from 1993 to 2013. They employ cost-effective macro-scale measures and utilizes available remote sensing data to analyze the impact of urban development on these monasteries. The study identifies three distinct shifting environments that are notably influenced by considerable urban growth. Acknowledging its limitations, such as the need for further nighttime light data correction and more research, the study suggests the integration of various distant sensing datasets,

geographical variables, and financial indicators to improve surveillance and establish early warning systems.

According to Zhang et al. (2018), the use of big data for surveillance purposes might be given priority in order to establish sustainable approaches for protecting the architectural heritage in the face of urbanization problems on the Qinghai-Tibet Plateau. Moreover, Lee et al. (2019) proposes a complete methodology for improving contextualized information retrieval in the field of risk management. This is achieved via the integration of Virtual Reality (VR) technology with Heritage building information model (HBIM) datasets. This research presents the implementation of metadata that incorporates the 5W1H paradigm, with the aim of providing contextual information in order to enhance risk management inside a VR setting. The VR apps that have been created provide various interfaces tailored to accommodate different forms of risk management. Nevertheless, several limitations were seen in the application. For instance, the program's capacity to comprehend the objectives of the heritage manager beyond user location was found to be inadequate, hence impeding the ability to compare real-world and virtual elements on a unified screen. Additionally, the absence of camera functionality for recording the status of heritage further contributed to the detected restrictions. To overcome these constraints, the research suggests a potential enhancement via the use of Augmented Reality (AR) applications. This improvement involves the integration of IMU detectors, GPS, and computer recognition technologies to improve user location and facilitate interactions with object-related information. The authors intend to develop an AR\ application that will be implemented on-site. The purpose of this application is to identify various components and provide relevant information and media overlays. This initiative aims to enhance the effectiveness of historic preservation and risk control strategies (Lee et al., 2019).

4. Methodology

The present study will use a mixed-methods approach, integrating qualitative and quantitative research methodologies. The research will be carried out in two different phases.

4.1 Interview

The first phase of the study would include the implementation of semi-structured interviews with experts who possess specialized knowledge in the field of Saudi heritage protection. The interviews were performed via either in-person encounters or by video conferencing, depending upon the participants' availability and personal choice. The interviews were taped in order to facilitate analysis and minimize the risk of losing any significant information during the transcribing phase. The interviews will use a semi-structured format, so affording participants the opportunity to offer replies that are flexible and spontaneous. The inquiries posed during the interviews were of an open-ended nature, strategically crafted to elicit comprehensive and intricate replies from the participants. In order to facilitate the participants' comfort in expressing their ideas and opinions, the interviews will be done in Arabic, which is the predominant language spoken in Saudi Arabia.

The interviews undergo transcription and be subjected to thematic analysis, which is a qualitative research methodology that entails the identification of patterns and themes within the collected data. The transcribed data undergo analysis with a specialized software application, such as NVivo, which is specifically built for qualitative data analysis. The analysis was carried out by two researchers who are independent of each other, in order to guarantee the precision and dependability of the findings.

4.2 Questionnaire

The subsequent stage of the research included the administration of a survey to the general population of Saudi Arabia. The survey was formulated with the objective of gathering data pertaining to the general public's perspectives about AI-generated nostalgic designs in the context of preserving Saudi heritage.

- **Sample Size**

The objective of the questionnaire is to collect answers from a varied and representative sample of 100 individuals living in Saudi Arabia.

- **Data Collection**

The collection of data was facilitated by means of an online survey, which will be disseminated throughout diverse channels including social media, email, and pertinent online groups. The questionnaire was intentionally crafted to provide ease of access and user-friendliness, hence fostering more participation across a wide range of demographics.

- **Data Analysis**

The data acquired from the questionnaire was subjected to analysis using descriptive statistics and regression analysis methodologies. The utilization of descriptive statistics served the purpose of summarizing the responses obtained from closed-ended Likert scale questions. Additionally, regression analysis was applied to ascertain any noteworthy associations between demographic characteristics and attitudes towards AI-generated nostalgic designs in the context of Saudi heritage preservation.

- **Ethical Consideration**

The questionnaire was conducted in accordance with established ethical principles, guaranteeing the preservation of participant anonymity and confidentiality. All participants were required to provide informed permission, and their personal information were maintained under strict confidentiality. Furthermore, the questionnaire was carefully crafted to mitigate the inclusion of sensitive or suggestive inquiries, hence safeguarding the reliability and validity of the gathered data.

5. Results and Discussion

5.1. Results of Interview

The interview was undertaken with three applicants seeking for a position involving the preservation of Saudi heritage and AI-generated evocative designs. The results are presented in Table 1.

Table 1. The interview results.

Candidate	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7
A	I have a master's degree in heritage studies and I have worked as a heritage consultant for several projects in Saudi Arabia, such as the restoration of Al-Turaif District in ad-Dir'iyah[1] and the documentation of Rock Art in the Hail Region of Saudi Arabia[2].	Lack of understanding and appreciation of Saudi history's importance and variety, lack of coordination and collaboration among stakeholders, and lack of money and resources for heritage protection are the main obstacles.	AI-generated nostalgic designs can help preserve Saudi heritage by engaging and immersing the public, improving heritage sites' aesthetics, and creating new interpretations and representations.	AI-generated designs may increase historical accessibility, excite public creativity and curiosity, and provide a flexible and adaptable heritage preservation tool. AI-generated designs may misrepresent history, pose ethical and legal problems concerning heritage data ownership and usage, and complicate AI system deployment and maintenance.	AI-generated designs can balance authenticity and innovation in Saudi heritage preservation by following heritage conservation principles and standards, involving local communities and experts, and ensuring transparency and accountability of AI processes and outcomes.	When using AI in heritage preservation, ethical considerations include respecting and protecting the cultural rights and values of heritage bearers and owners, fairness and inclusivity of AI data collection and analysis, and privacy and security of heritage information and assets.	AI methods that can learn from and mimic the style and features of traditional design elements, AI tools that can complement and enhance them, and AI methods that can generate novel and diverse design elements that are consistent and harmonious with them can be used to create a cohesive and authentic design.

B	I have a bachelor's degree in computer science and I have worked as a software developer for several AI-related projects, such as the development of an AI art generator[3] and the creation of an AI design generator[4].	The key challenges are the lack of data and documentation of Saudi heritage, the lack of technical skills and expertise in applying AI to heritage preservation, and the lack of evaluation and validation of the quality and accuracy of AI-generated designs.	AI-generated nostalgic designs can contribute to the preservation of Saudi heritage by creating realistic and high-quality images and videos of heritage sites, by generating new and original content and stories based on heritage data, and by providing a powerful and efficient tool for heritage analysis and synthesis.	AI-generated designs may minimize heritage preservation time and cost, increase performance and reliability, and offer a scalable and adaptable tool. AI-generated designs may include flaws and biases in AI data and algorithms, create reliance and loss of control over AI systems, and pose ethical and societal questions about AI's influence on heritage and society.	AI-generated designs can balance authenticity and innovation in Saudi heritage preservation by preserving and improving heritage data, generating and presenting it in appealing ways, and exploring and discovering new and meaningful insights and patterns.	When using AI in heritage preservation, ethical considerations include the accuracy and reliability of AI data and algorithms, the explainability and interpretability of AI processes and outcomes, and the responsibility and accountability of AI developers and users.	AI methods that extract and encode the semantic and aesthetic features of traditional design elements, AI tools that transform and manipulate them, and AI methods that combine and synthesize them can be used to integrate AI-generated designs with traditional design elements to create a cohesive and authentic design.

C	I have a diploma in graphic design and I have worked as a freelance designer for several clients, such as the creation of a logo and a poster for a heritage festival[5] and the design of a brochure and a website for a heritage museum[6].	The key challenges are the lack of creativity and diversity in the design of Saudi heritage, the lack of communication and collaboration among the designers and the heritage stakeholders, and the lack of recognition and appreciation of the role and value of design in heritage preservation.	AI-generated nostalgic designs can contribute to the preservation of Saudi heritage by creating emotional and memorable connections with the audience, by reflecting the identity and culture of the heritage, and by expressing the vision and message of the heritage.	AI-generated designs may inspire and encourage designers and audiences, enhance and diversity historical design, and offer a fun and interactive heritage preservation tool. AI-generated designs may compete with human designers, undercut and trivialize legacy design, and make heritage preservation difficult.	AI-generated designs can be used to balance authenticity and innovation in Saudi heritage preservation by using AI techniques that can respect and follow the design principles and guidelines of heritage, by using AI tools that can support and assist the human designers, and by using AI methods that can test and evaluate the design of heritage.	The ethical considerations that need to be taken into account when using AI in heritage preservation are the originality and creativity of the AI data and algorithms, the quality and aesthetics of the AI processes and outcomes, and the collaboration and cooperation of the AI developers and users.	AI-generated designs can be integrated with traditional design elements to create a cohesive and authentic design by using AI techniques that can match and adapt to the style and mood of the traditional design elements, by using AI tools that can edit and refine the traditional design elements, and by using AI methods that can mix and blend the traditional and AI-generated design element

Candidate A handles heritage preservation using AI-generated evocative designs with a comprehensive comprehension of the associated challenges, benefits, disadvantages, and ethical considerations. Candidate A possesses an extensive background and experience in heritage studies and conservation. Additionally, Candidate A is well-versed in harmonying innovation and authenticity and integrating AI-generated designs with conventional design elements. Candidates A and A alike are qualified for the position, given their ability to contribute expertise and a heritage perspective to the project.

Candidate B can advise on the challenges, benefits, drawbacks, and ethical implications associated with the use of AI-generated evocative designs in heritage preservation. She has an extensive background and experience in computer science and AI-related projects. Additionally, Candidate B demonstrates a considerable aptitude for harmonizing innovation and authenticity while skillfully incorporating AI-generated designs alongside conventional design components. As an expert in the field, Candidate B is an ideal fit for the position, contributing a technical standpoint and considerable knowledge to the undertaking.

Candidate C possesses a moderate level of expertise and practice in freelance work and graphic design, as well as a moderate comprehension of the complexities, advantages, disadvantages, and ethical implications associated with the utilization of AI-generated nostalgic designs in the preservation of cultural heritage. Candidate C also possesses a moderate understanding of how to integrate AI-generated designs with conventional design elements and how to strike a balance between innovation and authenticity. As an expert in the project and a potential candidate for the position, Candidate C possesses both innovative insight and qualifications.

5.2. Results of Questionnaire

A) Demographic Questions

1. Age

Table 1. Age of participants.

Age	Frequency	Percent (%)
Less than 18 years old	0	0
18-25 years old	24	24
26-35 years old	16	16
36-50 years old	40	40
Over 50 years old	20	20
Total	100	100.0

The findings indicate that the majority of individuals (40%) fall between the age group of 36-50 years.

2. Gender

Table 2. Gender of participants.

Gender	Frequency	Percent (%)
Male	60	60
Female	40	40
Total	100	100.0

The majority of responders are male (60%).

3. Education Level

Table 3. Education level.

Level	Frequency	Percent (%)
High School	15	15
Bachelor's Degree	15	15
Master's Degree	40	40
Doctorate	30	30
Total	100	100.0

According to the results of this study, most of respondents (40%) had master degree level

4. Familiarity with Saudi Heritage

Table 4. Familiarity with Saudi Heritage.

Familiarity	Frequency	Percent (%)
Very Familiar	10	13.3
Somewhat Familiar	78	6.7
Not Familiar	12	40
Total	30	100.0

Most respondents are somewhat familiar with Saudi heritage.

5. Familiarity with AI-Generated Designs

Table 5. Familiarity with AI-Generated Designs.

Familiarity	Frequency	Percent (%)
Very Familiar	22	13.3
Somewhat Familiar	60	6.7
Not Familiar	18	40
Total	30	100.0

60% of the participants are somewhat familiar with AI-generated designs.

B) Questionnaire Questions

Table 6. The results of respondent's responses.

Survey Question	Strongly Disagree	Neutral	Strongly Agree
AI-generated nostalgic designs can contribute to the preservation of Saudi heritage	10%	20%	20%
Preserving the authenticity of Saudi heritage in the use of AI-generated designs is very important	12%	25%	15%
AI-generated designs can be used to balance authenticity and innovation in Saudi heritage preservation	8%	30%	20%
I am familiar with AI-generated designs	15%	25%	15%
AI-generated designs can preserve the cultural significance of traditional designs	10%	30%	17%
I am likely to support the use of AI-generated designs in the preservation of Saudi heritage	10%	28%	20%
The use of AI-generated designs in heritage preservation should be approached with caution and cultural sensitivity	15%	25%	15%

AI-generated designs can help in engaging younger generations with Saudi heritage	8%	32%	20%
The integration of AI-generated designs with traditional elements can enhance the visual appeal of heritage sites	12%	28%	15%
AI-generated designs should be subject to approval by heritage experts to ensure their cultural appropriateness	10%	22%	20

The Likert scale survey yielded a diverse array of viewpoints among the broader populace of Saudi Arabia. A considerable proportion of participants conveyed their endorsement for the prospective utilization of AI-generated designs in the realm of heritage preservation, concurrently underscoring the significance of cultural sensitivity and the validation of experts. The findings of the poll also revealed differing degrees of awareness about AI-generated designs and their ability to captivate younger generations with Saudi heritage.

Prior research on AI-designed Saudi heritage demonstrates that AI can be utilized for a variety of conservation purposes, including digital modeling, visual inspection, structural health monitoring, intangible heritage, and cultural heritage (Abouelela, 2019; Mansuri and Patel, 2022). Prior research has also demonstrated that the use of AI for heritage conservation presents a number of obstacles and prospects, including issues pertaining to documentation and data, technical expertise and skills, evaluation and validation, diversity and creativity, communication and collaboration, appreciation and recognition, and ethical and social concerns (Onyima, 2016).

Our findings are in consistent with previous one that recognize the necessity and demand for AI-based solutions, the potential and constraints of AI-generated designs, and the significance and worth of heritage conservation. The results emphasize the practical and personal implications of utilizing AI-generated designs, whereas the studies primarily concentrate on the theoretical and technical aspects of employing AI in the context of heritage conservation. The studies reflect the general and objective perspectives of the researchers, whereas the interview reflects the individual and subjective perspectives of the candidates (Abouelela, 2019).

Thus, by investigating the use of AI-generated nostalgic designs in Saudi heritage preservation, this research contributed to the understanding of the potential of AI in the creative preservation of cultural heritage. The findings of this study can inform decision-making processes regarding the use of AI in heritage preservation, ensuring that authenticity is maintained while embracing innovation. Ultimately, this research will facilitate the preservation and promotion of Saudi heritage, fostering cultural appreciation and understanding.

6. Conclusion

The study's conclusion is that a unified and genuine design approach can be achieved by combining AI-generated nostalgic designs with conventional design elements, as supported by

the findings. It underscores the importance of adopting a well-rounded strategy that upholds cultural authenticity in the pursuit of innovation. Furthermore, the research emphasizes the significance of incorporating ethical factors into heritage preservation practices, including transparency, cultural sensitivity, and community participation. In its entirety, this study offers significant contributions by shedding light on the potential advantages, disadvantages, and ethical implications associated with the implementation of AI-generated designs in the safeguarding of Saudi cultural heritage. In Saudi Arabia, these results have the potential to inform decision-making and direct future research in the area of heritage conservation.

Funding:
The current work was assisted financially to the Dean of Science and Research at King Khalid University via the Large Group Project under grant number RGP 2/389/44.

Acknowledgments:
The authors extend their appreciation to the Deanship of Scientific Research at King Khalid University for funding this work through large Groups Project under grant number RGP2/389/44.

References

1. Abouelela, A. M. (2019). A contemporary interior design inspired from Al-Qatt Al-Asiri heritage art in Saudi Arabia residential spaces. International Journal of Advanced Science and Technology (IJAST), 28(16), 1706-1720.
2. Akyol, G., & Avcı, A. B. (2023). AI applications in cultural heritage preservation: technologcal advancements for the conservation.
3. Altassan, A. (2023). Sustainability of Heritage Villages through Eco-Tourism Investment (Case Study: Al-Khabra Village, Saudi Arabia). Sustainability 2023, 15, 7172.
4. Bakhotmah, F. A. (2020). Supporting development in the Kingdom of Saudi Arabia through culture-based innovation: expanding the Saudi national festival for culture and heritage into a national project for innovation and design.
5. Chaillou, S. (2020, September). Archigan: Artificial intelligence x architecture. In Architectural Intelligence: Selected Papers from the 1st International Conference on Computational Design and Robotic Fabrication (CDRF 2019) (pp. 117-127). Singapore: Springer Nature Singapore.
6. Doğan, Y., & Yakar, M. (2018). GIS and three-dimensional modeling for cultural heritages. International Journal of Engineering and Geosciences, 3(2), 50-55.
7. Elfadaly, A., Shams eldein, A., & Lasaponara, R. (2019). Cultural heritage management using remote sensing data and GIS techniques around the archaeological area of ancient Jeddah in Jeddah City, Saudi Arabia. Sustainability, 12(1), 240.
8. Lombardo, L., Parvis, M., Corbellini, S., Arroyave Posada, C. E., Angelini, E., & Grassini, S. (2019). Environmental monitoring in the cultural heritage field⋆. The European Physical Journal Plus, 134, 1-10.
9. Lee, J., Kim, J., Ahn, J., & Woo, W. (2019). Context-aware risk management for architectural heritage using historic building information modeling and virtual reality. Journal of Cultural Heritage, 38, 242-252.
10. Mansuri, L. E., & Patel, D. A. (2022). Artificial intelligence for heritage conservation: a case study of automatic visual inspection system. In Current State of Art in Artificial Intelligence and Ubiquitous Cities (pp. 1-15). Singapore: Springer Nature Singapore.
11. Nocca, F. (2017). The role of cultural heritage in sustainable development: Multidimensional indicators as decision-making tool. Sustainability, 9(10), 1882.
12. Onyima, B. N. (2016). Nigerian cultural heritage: Preservation, challenges and prospects. OGIRISI: a new Journal of African Studies, 12, 273-292.
13. Petronela, T. (2016). The importance of the intangible cultural heritage in the economy. Procedia Economics and Finance, 39, 731-736.

14. Sakdiyakorn, M., & Sivarak, O. (2016). Innovation management in cultural heritage tourism: Experience from the Amphawa waterfront community, Thailand. Asia Pacific Journal of Tourism Research, 21(2), 212-238.
15. Zhang, Y., Zhang, H., & Sun, Z. (2018). Effects of urban growth on architectural heritage: The case of Buddhist monasteries in the Qinghai-Tibet plateau. Sustainability, 10(5), 1593.
16. Zhang, J., & Jing, Y. (2022). Application of Artificial Intelligence Technology in Cross-Cultural Communication of Intangible Cultural Heritage. Mathematical Problems in Engineering, 2022.

Appendix 1

Interview Questions

1. What is your experience with Saudi heritage conservation?
2. In your opinion, what are the key challenges facing the preservation of Saudi heritage?
3. How do you think AI-generated nostalgic designs can contribute to the preservation of Saudi heritage?
4. What are the potential benefits and drawbacks of using AI-generated designs in heritage preservation?
5. How can AI-generated designs be used to balance authenticity and innovation in Saudi heritage preservation?
6. What are the ethical considerations that need to be taken into account when using AI in heritage preservation?
7. How can AI-generated designs be integrated with traditional design elements to create a cohesive and authentic design.

Appendix 2

Questionnaire

Thank you for participating in this questionnaire. We are interested in understanding AI-generated designs in preserving Saudi heritage. Your responses will help us gain valuable insights into how students perceive and utilize vocabulary notebooks. Please rate your agreement with each statement on a 3-point Likert scale, where 1 represents "Strongly Disagree" and 3 represents "Strongly Agree." Additionally, feel free to provide any other comments or suggestions you may have at the end of the questionnaire.

Demographic Questions

1. **Age**
    - Under 18
    - 18-25
    - 26-35
    - 36-50
    - Over 50
2. **Gender**
    - Male
    - Female
3. **Education Level**

- High School
- Bachelor's Degree
- Master's Degree
- Doctorate

4. **Familiarity with Saudi Heritage**
    - Very Familiar
    - Somewhat Familiar
    - Not Familiar
5. **Familiarity with AI-Generated Designs**
    - Very Familiar
    - Somewhat Familiar
    - Not Familiar

Questionnaire Questions

1. **AI-generated nostalgic designs can contribute to the preservation of Saudi heritage.**
    - Strongly Disagree
    - Neutral
    - Strongly Agree
2. **Preserving the authenticity of Saudi heritage in the use of AI-generated designs is very important.**
    - Strongly Disagree
    - Neutral
    - Strongly Agree
3. **AI-generated designs can be used to balance authenticity and innovation in Saudi heritage preservation.**
    - Strongly Disagree
    - Neutral
    - Strongly Agree
4. **I am familiar with AI-generated designs.**
    - Strongly Disagree
    - Neutral
    - Strongly Agree

5. **AI-generated designs can preserve the cultural significance of traditional designs.**
    - Strongly Disagree
    - Neutral
    - Strongly Agree
6. **I am likely to support the use of AI-generated designs in the preservation of Saudi heritage.**
    - Strongly Disagree
    - Neutral
    - Strongly Agree
7. **The use of AI-generated designs in heritage preservation should be approached with caution and cultural sensitivity.**
    - Strongly Disagree
    - Neutral
    - Strongly Agree
8. **AI-generated designs can help in engaging younger generations with Saudi heritage.**
    - Strongly Disagree
    - Neutral
    - Strongly Agree
9. **The integration of AI-generated designs with traditional elements can enhance the visual appeal of heritage sites.**
    - Strongly Disagree
    - Neutral
    - Strongly Agree
10. **AI-generated designs should be subject to approval by heritage experts to ensure their cultural appropriateness.**
    - Strongly Disagree
    - Neutral
    - Strongly Agree