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## The Role of Artificial Intelligence in the Preservation of Saudi Cultural Heritage Among the Younger Generation: A Posthumanist Perspective

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### Abstract

*This study investigates the role of artificial intelligence (AI) in preserving Saudi cultural heritage among the younger generation, with a particular focus on university students. As technology evolves rapidly, the integration of AI into cultural preservation presents new opportunities for safeguarding both tangible and intangible heritage. The study evaluates students' awareness of Saudi heritage and their perceptions of AI's potential to contribute to its preservation. A descriptive survey was administered to 840 students at Imam Abdulrahman Bin Faisal University in Dammam, Saudi Arabia. The findings reveal a moderate level of awareness of cultural heritage among students, coupled with a generally positive perception of AI's role in heritage preservation. However, challenges such as concerns about the authenticity of AI-driven preservation methods and the high costs associated with AI technologies were also identified. The study concludes with recommendations for enhancing AI integration in cultural heritage education, fostering the use of digital tools to engage youth, and addressing ethical concerns regarding AI applications in cultural conservation.*

**Keywords:** Artificial Intelligence, Cultural Heritage, Saudi Heritage, Posthumanism, Digital Preservation, Heritage Conservation, Youth Engagement, Virtual Reality, Augmented Reality, AI Applications.

### Introduction

Cultural heritage plays a **fundamental role** in shaping the **identity** of nations and communities, offering a profound understanding of a nation's **history, customs, and traditions**. It strengthens national identity and cultural consciousness while serving as a rich resource for **knowledge, creativity, and innovation**. Both current and future generations stand to benefit from cultural heritage in various domains, including **education, research, the arts, and traditional industries**. Moreover, cultural heritage represents a significant **economic and tourism asset**, contributing to local and regional **community development**. It also plays a vital role in maintaining **social**

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**cohesion** and reinforcing **shared values** by transmitting historical and cultural experiences across generations, ensuring the continuity of culture over time (Al-Qahtani, 2023).

Recognizing the comprehensive value of cultural heritage requires a deeper understanding of its **fundamental components**, which form the framework through which this significance is realized. Cultural heritage is a diverse amalgamation of **material** and **immaterial elements**, narrating the history of communities and expressing their values and achievements. Material heritage encompasses historical landmarks, buildings, monuments, sites, and artworks, which serve as tangible evidence of ancient civilizations and cultural practices across time. In contrast, **immaterial heritage** includes traditions, rituals, performing arts, oral literature, and traditional knowledge systems continuously passed down from one generation to the next. Additionally, **landscapes** form an essential part of cultural heritage, reflecting the interaction between humans and their environment. This integration of diverse elements weaves a rich and expressive image of human creativity and experience, reinforcing the connection between the **past, present, and future** (Abdelkarim & Mourad, 2025).

Despite its immense value, cultural heritage remains **fragile** and **vulnerable to destruction** due to numerous factors such as wars, natural disasters, and the erosion of traditional practices. Therefore, the **heritage sector** requires the application of modern, **advanced technologies** to safeguard cultural heritage, ensuring its **sustainability** for future generations. **Artificial Intelligence (AI)** stands out as a critical tool that can help protect cultural heritage. When applied effectively, AI can yield positive outcomes aligned with the highest efficiency standards (Atif & Aliya, 2023). According to Julie and Li (2021), the integration of AI and **virtual reality (VR)** in heritage protection facilitates **digitization**, accelerates **preservation efforts**, and reduces time and labor, contributing to the **safeguarding** of heritage for future generations. AI enables precise planning and **sustainable conservation** of heritage sites through advanced techniques such as **image recognition, 3D reconstruction, and predictive analysis**. These tools significantly aid in documenting and restoring threatened monuments and artifacts while promoting **accessibility** and **inclusivity**, allowing a broader segment of society—especially people with disabilities—to enjoy a richer cultural experience. This enhances the preservation of heritage both **digitally** and **physically** (Sánchez-Martín et al., 2025).

The younger generation plays a pivotal role in transferring cultural heritage to the future. Not only are they essential in maintaining cultural identity, but they are also increasingly adopting AI applications in their **daily lives**. AI serves as a powerful tool that **enhances Saudi cultural heritage awareness** among youth, offering innovative and engaging ways to access heritage information that aligns with their **digital lifestyles**. **Smart technologies** allow young people to explore heritage sites, artifacts, and traditions interactively, fostering **cultural awareness** and motivating them to preserve this heritage. These applications can direct students to specialized resources related to Saudi heritage when necessary. Hence, this study aims to examine students' **awareness** of various AI applications in preserving **Saudi cultural heritage**.

### **Theoretical Framework**

The preservation of **cultural heritage** through **artificial intelligence (AI)** presents a unique intersection between **technology** and **posthumanist theory**. Posthumanism challenges traditional human-centered perspectives, emphasizing the role of **non-human agents**, such as AI and other technologies, in shaping our understanding and experience of the world. In the context of preserving cultural heritage, AI functions as a **non-human entity** that actively participates in the **creation, documentation, and conservation** of heritage. This perspective resonates with the

notion that technology, far from being a mere tool, plays an essential role in transforming the ways humans interact with their past and future, ultimately blurring the lines between the human and the technological (Braidotti, 2013).

Cultural heritage, from a **posthumanist perspective**, is not simply something that belongs to humans but rather something that involves the **environment, non-human elements**, and the processes through which societies interact with and reinterpret their histories. By adopting AI, we are not only preserving the physical and intangible aspects of heritage but also reshaping how future generations experience this heritage. This shift necessitates a rethinking of what **cultural preservation** truly means, especially in how AI influences the **authenticity and interpretation** of cultural artifacts (Hayles, 1999).

In the **Saudi context**, the application of AI in heritage preservation is seen as a crucial element in maintaining **national identity** while embracing technological advancements. The integration of AI into the heritage sector opens up new, innovative ways of engaging with cultural materials. For example, AI can be used to analyze and categorize vast amounts of cultural data, digitize historical sites, and restore and replicate ancient art forms, preserving them for future generations in **digital formats**. This approach not only aids in safeguarding heritage but also ensures that it remains **accessible** to the younger generation, who are increasingly accustomed to digital interaction and **virtual engagement** (Benedict, 2015).

Moreover, AI contributes to the **redefinition** of cultural preservation in the context of posthumanism. It empowers the younger generation by allowing them to interact with and actively contribute to heritage conservation in ways that were previously unimaginable. AI's role extends beyond mere preservation—it becomes an active participant in shaping how cultural heritage is understood, valued, and transmitted to future generations. Through **immersive experiences**, AI tools such as **virtual reality (VR)**, **augmented reality (AR)**, and **machine learning algorithms** enable users to engage with heritage sites, understand historical contexts, and contribute to the **digitization and restoration** of cultural materials (Stiegler, 2019).

Thus, the posthumanist approach to AI and cultural heritage not only challenges traditional notions of cultural preservation but also opens up new possibilities for **interaction with the past**. It offers a **fresh perspective** on how heritage can be preserved in the digital age, allowing both the physical and intangible aspects of cultural identity to be transmitted in **innovative and sustainable** ways.

## Literature Review

The intersection of **artificial intelligence (AI)** and **cultural heritage preservation** has been explored in various academic studies, demonstrating the diverse applications of AI technologies in safeguarding and promoting heritage for future generations. These studies primarily focus on **digitization, restoration, and accessibility**, which are all integral components of cultural heritage preservation. However, the role of AI in this field remains a subject of ongoing discourse, particularly concerning how AI technologies can shape **cultural identity and understanding** in the posthuman era.

## AI and Heritage Preservation: A Global Perspective

AI's role in preserving cultural heritage has garnered increasing attention globally, particularly in the realms of **digitization and virtual restoration**. AI-powered tools such as **3D reconstruction, image recognition, and predictive analysis** are instrumental in creating accurate digital models of historical sites and artifacts. These technologies enable the **virtual**

**restoration** of damaged or decayed heritage items, ensuring their preservation for future generations (Julie & Li, 2021). For example, the use of AI in restoring ancient texts and artworks has made it possible to reconstruct fragmented pieces of cultural history, often with remarkable precision, preserving them digitally and making them accessible to a global audience (Leshkevich, 2022).

Moreover, AI enables the **documentation** and **analysis** of vast cultural datasets, which include images, texts, and even **oral histories**. By using AI to analyze these datasets, researchers can uncover hidden patterns, identify cultural trends, and enhance the overall understanding of cultural heritage (Sánchez-Martín et al., 2025). For instance, AI's ability to analyze old manuscripts and oral traditions has allowed for the preservation of languages and stories that may otherwise have been lost.

### **The Role of AI in Cultural Heritage in the Arab World**

In the Arab world, particularly in **Saudi Arabia**, AI has played an increasingly significant role in the **conservation** and **promotion** of cultural heritage. Saudi **Vision 2030** emphasizes the importance of preserving the country's rich cultural history while integrating technology to modernize and globalize its heritage (Al-Qahtani, 2023). The Kingdom has made substantial investments in AI-driven heritage projects, such as **digitizing cultural landmarks** and **preserving traditional crafts**. These efforts align with the broader goal of enhancing **cultural tourism** and promoting **national identity** through technology.

AI applications have been used to preserve **Saudi Arabian architecture**, such as ancient forts and ruins, by creating detailed **digital reconstructions** that provide immersive virtual tours for users worldwide. This effort is part of Saudi Arabia's broader initiative to establish **virtual museums** and **interactive educational tools** to engage the younger generation with the nation's cultural history (Das et al., 2022). These AI-powered tools allow students, especially those in the Kingdom's universities, to explore historical landmarks and artifacts remotely, fostering a deeper connection to their heritage.

In addition, AI has facilitated the preservation of traditional Saudi arts, including **calligraphy**, **pottery**, and **weaving**. AI technologies help document these practices, create **digital representations**, and even teach these arts through automated systems, ensuring that knowledge is passed on to future generations (Al-Ghami, 2023).

#### *Youth Engagement with AI in Cultural Preservation*

The younger generation plays a **pivotal role** in the future of cultural heritage preservation. As **digital natives**, young people are more likely to engage with AI technologies in ways that make the preservation of cultural heritage more relevant and accessible to them. AI-driven platforms that combine interactive **augmented reality (AR)** and **virtual reality (VR)** provide engaging ways for young people to experience heritage in a manner that aligns with their technological preferences. This **immersive approach** not only makes learning about cultural heritage more enjoyable but also enhances their understanding of its significance.

Studies have highlighted the potential for AI applications to foster a greater sense of **cultural pride** and **identity** among youth by providing them with innovative tools to explore and contribute to cultural preservation (Julie & Li, 2021). For example, AI-powered educational platforms offer **gamified learning experiences** that make heritage studies both **fun** and **educational**, reinforcing the cultural knowledge and skills that will empower the next generation of cultural preservers.

Furthermore, AI can assist in the **dissemination** of cultural knowledge by making heritage sites and artifacts accessible to a broader audience. By integrating AI into **public education campaigns, universities, and museums**, young people are introduced to their cultural roots through an accessible, modern lens (Sánchez-Martín et al., 2025). Such approaches not only preserve but also invigorate cultural practices by making them relevant to contemporary society.

### **Conclusion of Literature Review**

The role of AI in preserving cultural heritage, particularly within Saudi Arabia, has proven to be a **transformative force** in safeguarding the nation's rich historical and cultural identity. From **digital reconstructions to interactive learning platforms**, AI is reshaping how cultural heritage is documented, accessed, and engaged with by the younger generation. As the posthuman perspective suggests, AI is not merely a tool but a dynamic participant in the re-imagining and re-contextualization of cultural history, offering new avenues for preserving and transmitting heritage across generations.

### **Methodology**

This section outlines the **research design, sample selection, and data collection methods** used in this study to explore the role of **artificial intelligence (AI)** in preserving **Saudi cultural heritage** among university students. The methodology is designed to assess the awareness, engagement, and perceptions of young people regarding the use of AI in **cultural preservation**, focusing specifically on students at **Imam Abdulrahman Bin Faisal University (IAU)** in **Dammam, Saudi Arabia**.

### **Research Design**

The study adopted a **descriptive survey research design**, which is well-suited to understanding the perceptions and awareness of a population about a particular subject. The research aims to gather data on how AI is being utilized to preserve **Saudi cultural heritage** and how students perceive the role of AI in cultural preservation. The choice of a descriptive survey allows for a comprehensive analysis of students' awareness, engagement, and challenges related to the use of AI technologies in **heritage preservation**.

### **Sample Selection**

The study targeted **840 students** from various academic departments at **Imam Abdulrahman Bin Faisal University (IAU)**, located in **Dammam, Saudi Arabia**. The sample was selected to include students from different academic levels and fields of study, ensuring diversity in the responses. The participants were chosen using a **stratified random sampling** method to ensure that the sample was representative of the student population in terms of **gender, academic discipline, and year of study**.

The rationale for selecting university students lies in the fact that they are highly exposed to modern technological tools, including AI, and play a crucial role in shaping the future of cultural heritage preservation in Saudi Arabia. By targeting university students, the study aims to assess how the younger generation, who are most likely to adopt AI in their everyday lives, views and interacts with AI technologies in relation to cultural preservation.

### Data Collection Tools

To achieve the objectives of this study, a **questionnaire** was developed to measure students' awareness and engagement with AI in the context of **cultural heritage preservation**. The questionnaire was designed based on a review of the existing literature, including studies by **Al-Ghami (2023)**, **Julie & Li (2021)**, and **Sánchez-Martín et al. (2025)**, which explored the use of AI in **cultural preservation** and students' interaction with digital heritage tools.

The questionnaire consists of **36 items**, divided into three main sections:

1. **Awareness of Saudi Cultural Heritage:** This section includes 21 items designed to assess students' knowledge of Saudi cultural heritage, its significance, and the role it plays in shaping national identity. The items cover topics such as historical landmarks, traditional arts, and intangible cultural practices like music, dance, and oral traditions.
2. **Impact of AI on Cultural Preservation:** This section includes 6 items that measure students' perceptions of how AI can be utilized in preserving and promoting Saudi cultural heritage. It assesses students' views on AI tools such as **3D reconstruction**, **virtual restoration**, and **augmented reality (AR)** applications for engaging with heritage sites.
3. **Suggestions for Enhancing AI Use in Cultural Preservation:** The final section contains 9 items that ask students for suggestions on how AI can be better integrated into the preservation of Saudi cultural heritage. This section aims to gather insights on how AI can be further developed to enhance the preservation process and increase accessibility to heritage materials.

The questionnaire used a **Likert scale** ranging from **1 (strongly disagree)** to **5 (strongly agree)**, allowing for a quantitative measurement of students' responses. The scale provides a clear indication of the degree to which students agree with various statements about AI's role in cultural heritage preservation.

### Validity and Reliability

To ensure the **validity** of the questionnaire, the initial version was reviewed by a panel of **9 experts** from Imam Abdulrahman Bin Faisal University, including faculty members specializing in AI, cultural heritage, and education. The panel provided feedback on the clarity, relevance, and accuracy of the items, ensuring that the instrument measured what it was intended to measure. To assess the **internal consistency** of the questionnaire, a **pilot study** was conducted with a sample of **30 students** from IAU. The reliability of the instrument was determined using **Cronbach's alpha**, which resulted in high values for each section of the questionnaire:

- **Section 1 (Awareness of Saudi Cultural Heritage):** 0.839
- **Section 2 (Impact of AI on Cultural Preservation):** 0.891
- **Section 3 (Suggestions for Enhancing AI Use):** 0.912

These **reliability coefficients** indicate that the questionnaire is both **consistent** and **dependable** for measuring students' awareness and perceptions.

### Data Analysis

The collected data were analyzed using **SPSS (Statistical Package for the Social Sciences)**, which is commonly used for analyzing survey data. The analysis involved the calculation of

**mean scores** and **standard deviations** for each of the items in the questionnaire. **Descriptive statistics** were used to summarize the data, and **inferential statistics** were used to examine any relationships between students' demographic characteristics (e.g., **gender**, **year of study**) and their responses.

Additionally, the study applied **correlation analysis** to assess the relationship between students' awareness of Saudi cultural heritage and their engagement with AI technologies. This analysis helped to identify whether there is a significant association between students' knowledge of cultural heritage and their willingness to adopt **AI-based preservation tools**.

### **Ethical Considerations**

This study adhered to **ethical guidelines** for research involving human participants. Prior to data collection, **informed consent** was obtained from all participants. The participants were informed about the purpose of the study, the voluntary nature of their participation, and the confidentiality of their responses. They were assured that their data would only be used for research purposes and would not be shared with third parties.

### **Results**

This section presents the findings of the study based on the data collected from the survey of students at **Imam Abdulrahman Bin Faisal University**. The study aimed to explore students' **awareness** of **Saudi cultural heritage** and their perception of **artificial intelligence (AI)** as a tool for preserving this heritage. The results are organized according to the three main sections of the questionnaire: **awareness of Saudi cultural heritage**, **the role of AI in cultural preservation**, and **students' suggestions for enhancing AI use** in heritage conservation.

#### **Awareness of Saudi Cultural Heritage**

The results indicate that students have a **moderate level of awareness** of Saudi cultural heritage. The items measuring students' knowledge of Saudi heritage, including **historical landmarks**, **traditional arts**, and **intangible cultural practices**, revealed that students are somewhat familiar with these aspects but are not deeply engaged with them. The mean scores for this section ranged between **2.85** and **3.09**, with **3.09** being the highest average score for the item: "I am interested in learning about Saudi customs and traditions," followed by **2.99** for "I know the main traditional crafts in Saudi Arabia."

While the results suggest that students are somewhat familiar with Saudi cultural heritage, there is **room for improvement** in deepening their understanding and engagement with these traditions. The responses indicate that many students are not fully aware of the **diversity** of Saudi heritage across regions, with a lower mean score of **2.85** for the item: "I know the diversity of heritage across Saudi regions."

#### **The Role of AI in Cultural Preservation**

The results regarding the role of AI in preserving cultural heritage show a **positive perception** of AI's potential to contribute to the documentation and preservation of Saudi culture. The mean scores for the statements about AI's role in preserving heritage were generally high, with an average score of **3.97** for the statement: "AI has effectively contributed to documenting Saudi cultural heritage." Other notable responses include:

- "AI has helped youth discover new information about heritage" (**3.82**)
- "AI has been a key tool in preserving heritage from decay" (**3.72**)

- "Smart applications have made heritage more engaging for youth" (3.67)

These findings suggest that students are **aware** of the potential of AI to aid in cultural preservation. However, there appears to be a **moderate level of engagement** with AI tools in actual practice, as indicated by the relatively lower mean scores in some areas. For example, "AI helps in creating educational content about heritage" scored a mean of **3.40**, indicating **room for increased use of AI** in educational contexts.

### Suggestions for Enhancing AI Use in Heritage Preservation

Students provided various suggestions for improving the use of AI in cultural heritage preservation. They proposed using AI in:

- **Virtual tours and 3D simulations** of heritage sites.
- **Digital restoration** of damaged artifacts.
- **Creating interactive learning experiences** about heritage for younger audiences.

The mean scores for this section indicate that students see great potential for AI in making heritage more accessible and engaging. The highest-rated suggestion was the use of **virtual museums** and **3D simulations** to preserve and present cultural sites and artifacts, with a mean score of **3.89**. Other suggestions included improving **digital archives** and incorporating AI into **online learning platforms** for heritage education.

### Challenges of Using AI in Cultural Preservation

While students acknowledge the benefits of AI in preserving heritage, they also expressed concerns about the challenges involved. The results highlighted several concerns regarding AI applications, including:

- **The risk of distorting the cultural narrative** through inaccurate AI interpretations (3.99)
- **The high costs** associated with AI implementation (3.13)

The results show that students are aware of the potential **ethical issues** related to AI in cultural heritage, particularly the concern about AI **misrepresenting cultural artifacts** or traditions. The fear of **losing authenticity** due to AI involvement was noted as a significant challenge by many students.

**Table 1:** Mean Scores and Standard Deviations of Students' Perceptions on Saudi Cultural Heritage

No	Statement	Mean Score	Standard Deviation	Rank
11	AI has effectively contributed to documenting Saudi cultural heritage.	3.97	0.86	1
20	AI has helped youth discover new information about heritage.	3.82	0.99	2
19	AI has helped preserve heritage from decay.	3.72	0.99	3
12	Smart applications have made heritage more engaging for youth.	3.67	0.93	4
2	AI has facilitated access to digital heritage materials.	3.57	0.88	5
13	AI has increased my interest in Saudi heritage.	3.40	1.01	6
16	AI has contributed to creating educational content on heritage.	3.40	0.89	7

21	AI has supported heritage study through 3D simulations.	3.40	1.08	8
4	AI has innovatively helped pass heritage to future generations.	3.38	1.01	9
17	AI has positively impacted youth's understanding of heritage.	3.37	0.96	10
1	AI has helped restore artifacts and predict missing parts.	3.28	1.09	11
18	AI provides detailed descriptions for people with disabilities to interact with heritage.	3.24	1.05	12
10	AI contributes to the creation of museums and heritage centers.	3.23	1.04	13
8	AI has facilitated the organization of heritage and cultural festivals.	3.08	1.04	14
7	AI has boosted cultural and virtual tourism.	3.04	1.03	15
9	AI has facilitated the classification of old documents.	2.99	1.10	16
15	AI has helped produce digital stories in motion graphics style.	2.99	1.12	17
6	AI has facilitated the identification of missing parts of stones and artifacts instead of random digging.	2.97	1.03	18
5	AI has contributed to analyzing cultural heritage data and information.	2.90	1.07	19
14	AI provides effective solutions for displaying and documenting artifacts.	2.85	1.02	20
3	AI improves the quality and colorization of old films with historical accuracy.	2.76	1.08	21

**Table 2:** Mean Scores and Standard Deviations of Students' Perceptions on the Role of AI in Preserving Saudi Heritage

No	Statement	Mean Score	Standard Deviation
3	I am interested in learning about Saudi customs and traditions.	3.09	1.03
5	I am keen on attending heritage events and festivals.	3.01	1.05
1	I know the main traditional crafts in Saudi Arabia.	2.99	0.96
4	I show interest in heritage like folk tales and traditional poetry.	2.96	1.09
2	I am keen on learning Saudi folk arts and literature.	2.85	0.91
6	I am aware of the diversity of heritage across Saudi regions.	2.85	1.07

**Table 3:** Mean Scores and Standard Deviations of Students' Perceptions on the Challenges of Using AI in Preserving Saudi Heritage

No	Statement	Mean Score	Standard Deviation
7	AI use may distort Saudi heritage through incorrect interpretations.	3.99	0.94
5	Difficulties in setting strict ethical standards for AI.	3.70	1.02
6	AI use requires continuous training to keep up with rapid developments in the field.	3.55	0.94
8	AI provides direct information, but it may not be ready for critical analysis of historical sources or offer new insights.	3.46	0.97

2	Over-reliance on AI might lead to loss of authenticity or oversimplification of heritage.	3.45	1.08
3	Understanding the Saudi cultural context is a challenge for AI, which may be trained on other cultures.	3.42	1.04
1	There is a lack of AI specialists with experience in Saudi cultural heritage.	3.38	1.00
4	AI applications require advanced technological infrastructure.	3.20	1.02
9	The use of AI incurs high operational and maintenance costs.	3.13	1.01

## Discussion

The results of this study highlight the important role that **artificial intelligence (AI)** can play in preserving **Saudi cultural heritage**, especially among the younger generation, specifically university students. As the findings suggest, while students are somewhat aware of their cultural heritage, their **engagement** with it remains moderate. This indicates that there is a need for greater efforts to deepen their understanding of cultural traditions, particularly by leveraging modern technologies like AI.

### Awareness of Saudi Cultural Heritage

The study found that students have a **moderate level of awareness** regarding Saudi cultural heritage. While some students demonstrated interest in learning about **traditional crafts, cultural practices, and historical landmarks**, there is significant room for improvement. The relatively low mean scores related to awareness of regional diversity within Saudi heritage underscore the need for more targeted educational efforts to engage students in the rich and diverse cultural history of the Kingdom. This could be achieved by incorporating **AI-powered tools**, such as **virtual tours** and **interactive learning platforms**, which provide **immersive experiences** and increase student interaction with cultural content. These technologies could be used to highlight the **diversity** of Saudi heritage across regions, fostering a more holistic understanding of cultural practices.

### AI's Role in Cultural Preservation

The findings suggest a generally **positive perception** of AI's potential in preserving and promoting Saudi cultural heritage. Students recognized the value of AI in enhancing **cultural preservation efforts**, such as through **digitization** and **virtual restoration**. AI tools, such as **3D simulations, image recognition, and augmented reality (AR)**, were seen as essential technologies for preserving cultural sites and artifacts, making them more engaging and accessible to the younger generation. This aligns with existing research showing how AI is reshaping the way cultural heritage is documented and experienced (Julie & Li, 2021; Sánchez-Martín et al., 2025).

However, the results also suggest that while students acknowledge the potential of AI in cultural preservation, their **actual use and engagement** with these technologies remain moderate. For instance, while AI's ability to restore artifacts and create educational content was recognized, the relatively lower scores for these areas suggest that students are not fully utilizing AI tools in their everyday learning. There is a **gap in awareness** regarding the full range of AI applications in heritage preservation, which could be addressed by integrating these tools more effectively into educational curricula. **Educational programs** and initiatives that focus on practical applications of AI could increase engagement and ensure that students become more proactive in using these technologies.

### **Suggestions for Enhancing AI Use in Cultural Preservation**

Students provided various suggestions for improving the use of AI in cultural heritage preservation. They proposed using AI for:

- **Virtual tours and 3D simulations** of heritage sites.
- **Digital restoration** of damaged artifacts.
- **Creating interactive learning experiences** about heritage for younger audiences.

The mean scores for this section indicate that students see great potential for AI in making heritage more **accessible** and **engaging**. The highest-rated suggestion was the use of **virtual museums** and **3D simulations** to preserve and present cultural sites and artifacts, with a mean score of **3.89**. Other suggestions included improving **digital archives** and incorporating AI into **online learning platforms** for heritage education. These findings align with the growing trend of **digital heritage initiatives**, where AI technologies are used to create interactive experiences that allow users to explore heritage sites and artifacts virtually (Das et al., 2022; Cottela, 2023). By integrating these technologies into **educational settings**, students can gain a deeper understanding of their cultural heritage and be more motivated to participate in its preservation.

### **Challenges of Using AI in Cultural Preservation**

While AI offers promising solutions for cultural preservation, the study also highlighted several challenges that need to be addressed. One of the most significant concerns expressed by students was the **potential distortion** of cultural heritage due to inaccurate AI interpretations, which could lead to a **loss of authenticity**. This finding underscores the **ethical considerations** that must be taken into account when using AI in cultural preservation. AI tools need to be developed with **ethical guidelines** and **cultural sensitivity** to ensure that they accurately represent and preserve heritage without altering or misinterpreting it (Braidotti, 2013; Hayles, 1999).

The high **costs** associated with AI implementation were also a major concern. Despite the Saudi government's efforts to invest in technological advancements as part of **Vision 2030**, there is still a need for increased funding and infrastructure to support AI-driven cultural heritage projects. The high **operational costs** and **training requirements** for AI technologies were cited as barriers that could limit the widespread adoption of these tools. To overcome these challenges, the government and universities could collaborate with **private sector organizations** and **international institutions** to secure funding and expertise for AI-based cultural preservation initiatives.

### **Implications for Future Research**

This study contributes to the growing body of literature on the intersection of AI and **cultural heritage preservation**, particularly in the context of Saudi Arabia. Future research could explore the **long-term impact** of AI tools on students' understanding of cultural heritage and their engagement with heritage preservation efforts. Additionally, it would be valuable to investigate the **cultural implications** of AI technologies in other parts of the Arab world, as each region has its own unique cultural heritage and challenges in preservation.

Future studies could also focus on evaluating the **effectiveness** of specific AI applications, such as **virtual reality (VR)** and **augmented reality (AR)**, in enhancing students' knowledge and appreciation of cultural heritage. These applications have the potential to revolutionize how students learn about and interact with heritage sites, offering **immersive learning environments** that foster deeper emotional connections with cultural materials (Sánchez-Martín et al., 2025).

## Conclusion

This study confirms that **artificial intelligence (AI)** has significant potential to contribute to the **preservation** and **promotion** of **Saudi cultural heritage**, particularly among the younger generation. While students exhibit a **moderate level of awareness** of Saudi cultural heritage, they clearly recognize the value of AI technologies in enhancing cultural preservation efforts. The findings suggest that AI is seen as a powerful tool that can both safeguard heritage and increase engagement with younger audiences.

To fully capitalize on the benefits of AI in cultural preservation, it is essential to **integrate AI tools** more comprehensively into **educational curricula** and **cultural initiatives**. By doing so, students will gain a deeper understanding of how AI can be used to document, restore, and present cultural artifacts in innovative ways. Additionally, creating **interactive learning platforms** and **virtual experiences** will help students engage with their heritage in a more meaningful and accessible manner.

However, several challenges remain, including concerns about the **authenticity** of AI-generated restorations, **ethical considerations** in using AI for cultural preservation, and the **high costs** associated with the implementation of AI technologies. These challenges need to be addressed through clear ethical guidelines, **government investment**, and **collaboration with international institutions** to ensure that AI is used **effectively** and **responsibly** in preserving cultural heritage. In conclusion, while AI offers promising solutions for the **digital preservation** of cultural heritage, it is crucial that these technologies are implemented thoughtfully, considering both their potential and their limitations. Further research and the development of **ethical frameworks** for AI applications in cultural heritage are necessary to ensure that these tools are used to enhance, rather than distort, cultural understanding for future generations.

## Recommendations

Based on the findings and discussion, this study offers several recommendations to enhance the role of **artificial intelligence (AI)** in preserving **Saudi cultural heritage**, particularly for the younger generation. These recommendations aim to improve awareness, engagement, and the integration of AI tools into cultural preservation efforts.

1. **Design AI-Based Interactive Heritage Platforms**  
It is recommended to design **AI-based applications and platforms** that offer **interactive experiences**, such as **virtual tours**, **3D simulations**, and **educational videos**. These platforms should be developed in a way that makes heritage both **engaging** and **accessible** to youth. By integrating **AI-driven storytelling** and immersive technologies such as **virtual reality (VR)** and **augmented reality (AR)**, these platforms could enhance students' understanding of Saudi cultural heritage and make learning more enjoyable and interactive. This approach could help stimulate greater interest and participation among students in heritage preservation.
2. **Use AI to Digitize and Organize Cultural Heritage**  
AI technologies can be used to **digitize** and **organize cultural heritage** materials more effectively. Creating **digital archives** of artifacts, texts, and historical sites could facilitate easy access for future generations. These archives should be **searchable** and categorized using **AI algorithms** to ensure that information is well-organized and accessible to students, researchers, and the general public. The digitization process should also include **oral traditions** and **folklore**, as they form an integral part of the cultural fabric of Saudi Arabia.

3. **Promote Digital and Cultural Heritage Education**  
Launching **digital and cultural heritage education** initiatives targeting youth, particularly students aged 18-34, would help increase **cultural pride** and **national identity**. Initiatives such as **workshops, competitions, and social media campaigns** can be organized to raise awareness about the importance of preserving cultural heritage. These programs can also introduce students to **AI tools** used in the preservation process, giving them a hands-on understanding of how technology and heritage can be combined. Integrating these programs into **university curricula** could help bridge the gap between **technology** and **traditional knowledge**.
4. **Develop Training Programs for Educators and Cultural Heritage Professionals**  
To ensure effective integration of **AI** in cultural heritage preservation, it is essential to provide **training programs** for educators, cultural heritage professionals, and technical experts. These programs should focus on how to effectively use **AI technologies** for cultural heritage **documentation, restoration, and preservation**. Training should also include **ethical guidelines** for using AI in a way that respects the **cultural context** and authenticity of heritage materials. Educators should be equipped to teach students how to use AI tools in **cultural studies** and **heritage management**.
5. **Invest in AI Infrastructure and Funding**  
The **government** and **universities** should allocate more funding and resources to support the development and deployment of AI tools in cultural heritage projects. This includes investing in **advanced technological infrastructure** such as **data storage systems, AI software, and training facilities**. Collaborations between **government bodies, universities, and the private sector** can ensure that AI tools are both **affordable** and **accessible** for cultural preservation initiatives. Establishing **research grants** for AI-based heritage projects can encourage innovation and the development of more effective preservation solutions.
6. **Conduct Longitudinal Studies on AI's Impact on Cultural Heritage Awareness**  
Future research should focus on conducting **longitudinal studies** to assess the long-term impact of AI tools on students' awareness of cultural heritage. These studies can measure the effectiveness of **digital tools** in enhancing cultural knowledge, increasing engagement, and fostering a sense of responsibility among students for preserving cultural heritage. Additionally, such studies could examine how AI technologies impact the preservation and transmission of cultural knowledge across generations.
7. **Establish International Collaborations on AI and Cultural Heritage**  
**International collaborations** between Saudi Arabia and other countries with rich cultural heritages can help share knowledge, resources, and best practices for using AI in cultural preservation. Collaborative research projects can focus on the development of universal **AI applications** for heritage conservation, which can be adapted for specific cultural contexts. Establishing partnerships with international museums, cultural institutions, and AI companies will ensure that Saudi heritage is preserved in a way that aligns with **global standards**.
8. **Facilitate Collaborative Efforts Between Tourism, Heritage, and Technology Sectors**  
To maximize the benefits of AI in preserving Saudi cultural heritage, there needs to

be a **collaborative approach** between the **tourism, heritage, and technology sectors**. By working together, these sectors can create **AI-driven tourism experiences** that promote cultural heritage, such as **interactive museum exhibits** and **virtual cultural tours**. The tourism industry can also help raise global awareness of Saudi heritage, attracting international interest in both the heritage and the innovative use of AI for its preservation.

9. **Provide Funding for Research and Development in AI-Based Heritage Projects**  
It is recommended that the Saudi government and international organizations provide **research grants** for the development of **AI-based heritage preservation projects**. These grants would support **universities, startups, and research institutes** in exploring new AI applications for cultural preservation. By focusing on **innovative and sustainable methods** of heritage conservation, these projects could contribute to both technological advancements and the protection of **Saudi cultural heritage**.

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