JOURNAL OF THE FACULTY OF TOURISM AND HOTELS
UNIVERSITY OF SADAT CITY
Journal homepage:
https://mfth.journals.ekb.eg/

Awareness of Smart Heritage Cities: Public Engagement ar Cultural Preservation Practices

Walaa Adel Hussein Toka Mahrous Reda Abou Zaid AbdelFattah Shawaly

Tourism Studies Department, Faculty of Tourism and Hotels, University of Sadat City, Egypt

Printed ISSN: 2537-0952
Online ISSN: 3062-5262
DOI: 10.21608/MFTH.2025.453153

ABSTRACT

This study investigates the awareness of smart heritage cities, focusing on conceptual understanding, perceived benefits, and levels of community engagement. A structured questionnaire was administered to a diverse group of participants, analyzed using SPSS software. The sample included both local residents and international tourists with balanced gender representation.The findings indicate that most respondents had prior exposure to smart heritage cities, and the awareness scale recorded a relatively high mean score. Accessibility was rated as the strongest awareness dimension, while knowledge of governmental initiatives appeared weakest.The study concludes that the public acknowledges the importance of smart heritage cities in enhancing tourism and cultural management, yet gaps persist in awareness of official strategies and policies. Accordingly, it recommends the development of targeted awareness campaigns, the establishment of participatory digital platforms, and the adoption of integrated policy approaches to foster sustainable heritage management

.

KEYWORDS

Smart Heritage Cities, Cultural Heritage Preservation, Public Awareness, Community Engagement.

الوعي بالمدن التراثية الذكية:
مشاركة الجمهور وممارسات صون التراث الثقافي

ولاء عادل حسين تقى محروس رضا أبوزيد عبدالفتاح شوالى
قسم الدراسات السياحية، كلية السياحة والفنادق، جامعة مدينة السادات

الملخص

يهدف هذا البحث إلى دراسة مستوى الوعي بالمدن التراثية الذكية من خلال تحليل الفهم المفاهيمي، والفوائد المتصورة، ومستويات المشاركة المجتمعية. وقد تم توزيع استبيان منظم على مجموعة متنوعة من المشاركين، وتم تحليل البيانات باستخدام برنامج SPSS، حيث شملت العينة سكانًا محليين وسياحًا دوليين مع تمثيل متوازن من حيث النوع الاجتماعي. أظهرت النتائج أن غالبية المشاركين لديهم خبرة سابقة مع مدن التراث الذكي، وسجل مقياس الوعي متوسطًا مرتفعًا نسبيًا. وقد حظيت إمكانية الوصول بأعلى درجات التقييم ضمن أبعاد الوعي، في حين جاء الوعي بالمبادرات الحكومية في المرتبة الأدنى. ويخلص البحث إلى أن الجمهور يدرك أهمية مدن التراث الذكي في تعزيز السياحة وإدارة التراث الثقافي، إلا أن هناك فجوات واضحة في الوعي بالاستراتيجيات والسياسات الرسمية. وبناءً عليه، يوصي البحث بضرورة إطلاق حملات توعية موجهة، وتطوير منصات رقمية تشاركية، وتبني مقاربات سياساتية متكاملة لضمان إدارة مستدامة للتراث.

الكلمات الدالة

المدن التراثية الذكية، الحفاظ على التراث الثقافي، الوعي العام، المشاركة المجتمعية.

الترقيم الدولى الموحد للطباعة:
2537–0952
الترقيم الدولى الموحد الإلكترونى:
3062–2562
DOI:
10.21608/MFTH.2025.453153

1. Introduction

Cultural heritage is a central pillar of urban identity and tourism development, embodying the historical, social, and architectural values of cities (UNESCO, 1972). The rapid advancement of digital technologies has profoundly transformed the ways in which heritage is managed, interpreted, and preserved. The integration of digital tools into heritage management has enabled innovative approaches to conservation, accessibility, and interpretation. Within this framework, the concept of "smart heritage cities" has emerged as a strategic paradigm that combines smart city technologies—such as the Internet of Things (IoT), Augmented Reality (AR), Virtual Reality (VR), and big data analytics—with heritage conservation and tourism management. These technologies aim to enhance preservation efforts, broaden access, and enrich visitor engagement (Della Corte et al., 2017; Selim et al., 2022). Understanding public awareness of such initiatives is essential for developing sustainable urban policies, promoting participatory governance, and ensuring the long-term safeguarding of cultural assets.

Globally, the transition toward smart heritage cities is increasingly regarded as a pathway to achieving sustainable urban development while maintaining cultural identity. This is particularly important in heritage-rich nations, where historic sites serve as both cultural treasures and economic engines through tourism. However, the successful implementation of smart heritage city initiatives depends heavily on public awareness and stakeholder engagement. Measuring public awareness is therefore crucial not only to assess community readiness for adopting these innovations but also to identify knowledge gaps that may hinder policy effectiveness and citizen participation (UNESCO, 2021).

Despite the growing scholarly interest in the concept, empirical research on public awareness of smart heritage cities remains limited. Existing studies often focus on technological applications, governance frameworks, or single-city case analyses, while overlooking the perceptions and knowledge of the general public. This gap is particularly notable in contexts where both residents and international visitors interact with heritage, as their perceptions may differ according to cultural background, prior exposure, and personal engagement with heritage technologies (Azambuja, 2022; Angelidou, 2015).

Recent scholarship has explored smart heritage from multiple angles. Some studies emphasize public participation through artistic practices and interactive initiatives (Ke & Mustafa, 2024; Muthuswamy & Esakki, 2024), while others examine smart planning and the integration of digital technologies into site management and conservation (Marsella & Marzoli, 2017; Trillo et al., 2021; Irawan et al., 2024). Additional contributions have investigated issues of identity and place attachment in relation to authenticity and revisit intentions (Al-Azab & Abulebda, 2023), and cultural heritage has also been recognized as a catalyst for place-making within smart city frameworks (Tousi et al., 2025). Furthermore, research has addressed institutional and governance aspects, such as building public trust through open data and smart city development (Yue et al., 2025), or balancing tradition and innovation in Mediterranean contexts (Aida, 2024).

Nevertheless, several research gaps remain. Much of the existing literature continues to focus on theoretical models, technological applications, or qualitative case studies, with limited efforts to develop comprehensive quantitative assessments of public awareness. Comparative studies that evaluate differences between local residents and international tourists remain scarce, even though their awareness and engagement are likely to diverge due to cultural and experiential factors. Moreover, little attention has been given to the relationship between experiential exposure—such as visiting a smart heritage city—and subsequent preservation-oriented practices, including volunteering, supporting local economies, or adopting environmentally responsible behaviors. Addressing these gaps is critical for developing a more holistic understanding of how awareness influences participation in smart heritage initiatives and for informing policies that promote inclusive and sustainable heritage management.

To bridge these gaps, the present study adopts a quantitative approach to assess awareness of smart heritage cities among local residents and international visitors. It further examines the influence of demographic characteristics and prior visitation patterns on perceptions and engagement levels. The study is guided by the following research questions:

1. What is the overall level of public awareness of smart heritage cities among local residents and international tourists?
2. To what extent do participants perceive the practical benefits of these cities in enhancing heritage conservation and sustainable tourism?
3. What is the relationship between public awareness and heritage-preservation practices (e.g., minimizing environmental impact, supporting local communities, volunteering)?
4. Do awareness and engagement levels vary across demographic characteristics (age, education, income)?

2. Literature Review

2.1: Smart Cities and Cultural Heritage

Smart city concepts emphasize the integration of digital technologies into urban management to enhance quality of life, efficiency, and sustainability (Batty et al., 2012; Kourtit et al., 2012). Applied to the heritage sector, these solutions support monitoring, conservation, and visitor engagement through immersive tools such as AR and VR, alongside data-driven decision-making platforms (Zhang et al., 2018; Egusquiza & Gavalda, 2020).

The intersection of smart city development and cultural heritage has become a central research focus. Early contributions highlighted the role of digital tools in safeguarding and promoting heritage (Marsella & Marzoli, 2017), while subsequent work expanded toward sustainable preservation strategies that emphasize community participation (Muthuswamy & Esakki, 2024) and participatory art as mechanisms of engagement (Ke & Mustafa, 2024). Recent scholarship has linked cultural heritage to urban identity and cohesion through place-making (Tousi et al., 2025) and demonstrated how authenticity shapes attachment and revisit intentions (Al-Azab & Abulebda, 2023).

Institutional perspectives also highlight governance and trust. Studies show that open data and smart mechanisms enhance public trust in heritage revitalization (Yue et al.,

2025), while balancing tradition and innovation is critical to sustaining cultural values in Mediterranean smart cities (Aida, 2024). Digital planning and smart tools further contribute to resilient conservation practices (Trillo et al., 2021; Irawan et al., 2024).

Overall, the literature converges on the view that smart cities and cultural heritage are mutually reinforcing: technologies enable efficiency, sustainability, and interactive experiences, while heritage provides identity, meaning, and legitimacy to urban agendas. The key challenge is to ensure that innovation strengthens rather than compromises authenticity, fostering inclusive and participatory urban development.

2.2: Concept of Smart Heritage Cities

The concept of Smart Heritage Cities reflects the convergence of cultural heritage preservation and smart city innovation, integrating digital tools with socio-cultural sustainability. Advanced technologies such as IoT, big data, AR, and VR enhance monitoring, documentation, and interpretation of heritage assets, improving both conservation and accessibility (Qiu et al., 2015; Della Corte et al., 2017; Selim et al., 2022).

More than a technological model, smart heritage cities are conceived as socio-technical ecosystems that embed heritage in urban development, sustainability, and identity frameworks (Trillo et al., 2021; Irawan et al., 2024). Cultural heritage is framed as both a driver and beneficiary of smart urbanism, fostering place-making, cohesion, and attachment (Al-Azab & Abulebda, 2023; Tousi et al., 2025).

Equally, participatory governance is central. Public engagement—whether through participatory art, community-based initiatives, or co-creation platforms—ensures responsiveness to local needs (Ke & Mustafa, 2024; Muthuswamy & Esakki, 2024). Meanwhile, big data and AI contribute to transparency and public trust in government-led projects (Yue et al., 2025). At the global level, UNESCO (2021) stresses that smart heritage encompasses not only tangible assets but also intangible practices, safeguarded through inclusive governance and knowledge-sharing.

In sum, smart heritage cities aim to preserve cultural authenticity while leveraging innovation, positioning heritage as an active agent in building sustainable, inclusive, and future-oriented urban environments.

2.3: Awareness and Public Perception

Public awareness and perception are critical factors in the adoption, acceptance, and long-term success of smart heritage cities initiatives. Citizens' understanding of smart technologies significantly influences their readiness to engage with and support such projects (Alawadhi et al., 2012). In heritage contexts, awareness extends beyond technological literacy to include recognition of how innovations—such as IoT monitoring, AR, and VR applications—enhance conservation, accessibility, and sustainability (Borda & Bowen, 2017; Zhang et al., 2018; Mourby et al., 2021).

Awareness shapes both cognitive and behavioral responses. Informed individuals are more likely to perceive smart heritage initiatives as essential tools for safeguarding cultural identity, support co-production of heritage experiences, and adopt responsible practices, including participation in digital crowdsourcing, documentation, and virtual initiatives (Mason, 2002; Timothy & Nyaupane, 2009; Rahaman et al., 2019). Conversely, limited awareness may result in resistance to technological interventions,

skepticism toward data collection, or indifference to conservation priorities (Meijer & Bolívar, 2016).

Furthermore, awareness influences experiential engagement and emotional attachment. Citizens' and tourists' perceptions of heritage authenticity shape behaviors such as loyalty revisit intention, and environmental responsibility (Al-Azab & Abulebda, 2023; Irawan et al., 2024). Participatory practices, including community projects, strengthen collective awareness and reinforce cultural value (Ke & Mustafa, 2024; Muthuswamy & Esakki, 2024). Nevertheless, formal participation remains limited, highlighting a gap between perception and action.

Awareness also intersects with governance. Communities may understand heritage's cultural significance but lack knowledge of institutional policies or smart governance mechanisms (Yue et al., 2025), while tourists often view sites primarily as attractions rather than as elements of smart urban strategies (Tousi et al., 2025). Bridging these gaps through educational programs, participatory engagement, and digital storytelling is essential to ensure Smart Heritage Cities are both technologically advanced and socially inclusive (Angelidou et al., 2017; Egusquiza & Gavalda, 2020).

In conclusion, strengthening public awareness is vital for fostering acceptance, participation, and sustainable management of cultural heritage within smart urban contexts.

2.4: What Shapes Public Awareness of Smart Heritage Cities?

Drawing on insights from smart city and heritage studies, public awareness of Smart Heritage Cities is shaped by several interrelated factors.

First, experience design and value signaling play a crucial role. Immersive, authentic, and educationally rich experiences enhance visitor satisfaction and strengthen intention to engage, which in turn reflects deeper awareness. Conversely, poorly implemented technologies risk generating superficial novelty without meaningful cultural value (Egusquiza & Gavalda, 2020).

Second, communication and policy framing significantly influence awareness. Clear articulation of the benefits, risks, and citizen roles within heritage digitization programs and smart city branding fosters legitimacy and engagement. International organizations, such as UN-Habitat (2020), emphasize the importance of inclusive communication strategies and proactive awareness campaigns to ensure broader public understanding (Alawadhi et al., 2012).

Third, socio-demographic characteristics act as filters shaping awareness. Factors such as education and income determine how awareness translates into expectations, participation, and long-term support. This highlights the need for targeted outreach and co-creation strategies with underrepresented groups (Mourby et al., 2021).

Finally, institutional integration enhances the diffusion of awareness. When heritage digitization aligns with wider city data strategies—such as tourism information systems, accessibility services, and urban sustainability metrics—public awareness is more likely to extend beyond museum or site visitors to the wider urban population. Scholars argue that linking heritage technologies to city-scale governance frameworks ensures more durable impacts (Zhang et al., 2018; Selim et al., 2022).

2.5: Smart Technologies in Heritage Conservation

Smart technologies have transformed heritage conservation by enabling precise documentation, proactive management, and enhanced public engagement within smart heritage cities. Internet of Things (IoT) sensors allow real-time monitoring of environmental and structural conditions, supporting preventive conservation and timely interventions (Qiu et al., 2015; Egusquiza & Gavalda, 2020). Similarly, tools such as Geographic Information Systems (GIS), 3D laser scanning, photogrammetry, and Building Information Modeling (BIM) facilitate accurate site documentation, structural assessment, and digital archiving (Yin et al., 2020; Trillo et al., 2021).

Immersive technologies, including Augmented Reality (AR) and Virtual Reality (VR), provide interactive experiences that enhance interpretation, education, and visitor engagement while reducing physical pressure on fragile sites (Bekele et al., 2018; Zhang et al., 2018; Aida, 2024). Mobile applications and smart platforms further enable real-time navigation, interpretation, and participatory engagement (Marsella & Marzoli, 2017).

Digital repositories and high-fidelity 3D models preserve heritage assets, support restoration, and promote knowledge exchange and inclusivity at a global scale (Borda & Bowen, 2017; García et al., 2019;). Big Data analytics and Artificial Intelligence (AI) optimize heritage management by analyzing datasets from sensors, drones, and visitor flows to predict risks and guide sustainable decision-making (Rahaman et al., 2019; Yue et al., 2025).

Challenges remain, including high costs, technical expertise requirements, data security concerns, and unequal access to digital resources (Muthuswamy & Esakki, 2024). Nevertheless, smart technologies are essential enablers of sustainable heritage conservation, balancing preservation with accessibility, education, and community participation, particularly when integrated with participatory governance and inclusive policies (Meijer & Bolívar, 2016; Angelidou et al., 2017).

2.6: Case Studies and Global Practices

Global practices in smart heritage cities demonstrate diverse strategies for integrating digital technologies, participatory governance, and heritage conservation within urban development. Successful initiatives highlight the importance of combining technological innovation with community engagement and cultural authenticity to enhance preservation and sustainability.

In **Europe**, Mediterranean cities employ (AR) and (VR) to reconstruct historic environments and enrich visitor experiences, while digital platforms enable residents to participate in heritage decision-making (Trillo et al., 2021; Aida, 2024).

In **Asia**, Chinese cities utilize Big Data analytics and (AI) to monitor industrial heritage sites, optimize resources, and promote sustainable reuse, illustrating the role of institutional frameworks in linking technology with governance (Yue et al., 2025).

In the **Middle East**, smart heritage initiatives prioritize cultural authenticity, which strengthens visitors' place attachment and influences revisit intentions, emphasizing alignment with local identity and values (Al-Azab & Abulebda, 2023).

Other **international examples** include Amsterdam, Barcelona, and Kyoto, where open data platforms, IoT monitoring, and awareness campaigns enhance tourism management, heritage interpretation, and site protection (Angelidou et al., 2017).

Overall, these case studies indicate that the most effective Smart Heritage City practices integrate technology, participatory engagement, and transparent governance while respecting cultural authenticity. Disparities in financial resources, technical capacity, and community inclusion remain, but these examples provide adaptable models for sustainable heritage management in both developed and developing contexts (Irawan et al., 2024; Tousi et al., 2025).

3. Methodology

This study employed a quantitative research design using a structured questionnaire to assess public awareness of smart heritage cities. The survey instrument was organized into four sections covering demographic and travel characteristics, visits to smart heritage cities, awareness of smart heritage cities, and engagement in cultural heritage preservation practices.

A total of 650 questionnaires were distributed across selected cultural heritage sites and public spaces, targeting both local residents and international tourists to ensure diversity and relevance to the study context. Of these, 548 were returned (response rate of 84.3%), and after data screening, 517 valid responses were retained for analysis. The final sample comprised 41.8% local residents and 58.2% international tourists, providing a balanced representation of key stakeholder groups. Participants were selected using convenience sampling, which was deemed appropriate due to the exploratory nature of the research, the accessibility of respondents in public cultural sites, and the need to capture a wide spectrum of visitor experiences. This method also offered efficiency in terms of time and resources, making it a suitable choice for the study objectives.

To accommodate linguistic diversity, the questionnaire was prepared in both English and Arabic. For local participants, the survey was translated into Arabic and subsequently back-translated into English to ensure semantic accuracy and reliability of responses. Responses were recorded on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The construction of the questionnaire items was guided by established scales in the literature to ensure validity and reliability. Items measuring awareness of smart heritage cities were adapted, rather than directly adopted, from frameworks on smart city awareness and technology acceptance (Alawadhi et al., 2012; Mourby et al., 2021). The section on cultural heritage engagement was based on instruments assessing heritage participation and preservation practices, which were modified and contextualized to fit the scope of smart heritage cities (Timothy & Nyaupane, 2009). Questions related to perceived benefits of smart heritage integration drew inspiration from validated scales on smart tourism technologies and cultural value perception (Gretzel et al., 2015; Yu, Kim & Hailu, 2023). In each case, the original wording of the scales was rephrased and contextualized to ensure relevance, cultural appropriateness, and clarity for both local and international respondents. Content validity was further strengthened through expert review and a pilot test with 30 participants prior to the main survey.

Data collection was conducted between September and December 2024 through a combination of face-to-face distribution at cultural heritage sites across Egypt—specifically in Cairo, Giza, Luxor, Aswan, and South Sinai—and online circulation to

broaden the reach. The collected data were analyzed using descriptive statistical techniques, including means, standard deviations, frequencies, percentages, and ranking, in order to identify patterns and evaluate the overall level of awareness and participation among the surveyed groups.

4. Findings

4.1: Demographic Characteristics of Respondent

Table (1) Demographic Information

Demographic and Travel Information		Freq.	%
Gender	Male	270	52.2
	Female	247	47.8
Age	Less 25 years	66	12.8
	25 - 35 years	169	32.7
	36 - 45 years	158	30.6
	More than 45 years	124	24.0
Income	less than500 $	151	29.2
	500 $ - 999 $	43	8.3
	1000 $ - 1499$	73	14.1
	1500 $ - 2000$	79	15.3
	More than 2000$	171	33.1
Education	Bachelor	67	13.0
	High School	188	36.4
	Master's degree	76	14.7
	Doctoral degree	121	23.4
	Others	65	12.6
Occupation	Student	59	11.4
	Private business owner	70	13.5
	Professional	129	25.0
	Office/administrative/technical post	111	21.5
	Others	148	28.6
Nationality	Local resident	216	41.8
	International tourist	301	58.2
Purpose of visit Heritage sites	Tourism	71	13.7
	Business	279	54.0
	Study	106	20.5
	Others	61	11.8
Total		**517**	**100%**

Table (1) outlines the demographic characteristics of the study sample, reflecting both diversity and representativeness across key variables such as age, gender, education, income, occupation, and nationality. The sample was relatively balanced in terms of gender, with males slightly outnumbering females, while the majority of respondents were aged between 25 and 45 years. A considerable proportion reported monthly incomes exceeding \$2,000, and educational attainment was varied, though most participants had at least a high school qualification, with a notable shareholding postgraduate degrees. In terms of occupation, professionals and office or administrative employees formed the largest groups. More than half of the participants

were international tourists, underscoring the study's international scope, while the remainder were local residents. Regarding purpose of visit, business was the most common, followed by study and tourism. These demographic attributes form a critical foundation for subsequent analyses, as they help contextualize variations in awareness, perceptions, and participation in cultural heritage preservation. The diversity of the sample not only enhances the reliability and validity of the findings but also ensures that the perspectives of multiple stakeholder groups are represented, thereby offering nuanced insights into the potential of smart heritage cities to safeguard cultural heritage while addressing diverse societal needs.

4.2 : Experiences with Smart Heritage Cities

Table (2): Respondents' Experiences with Smart Heritage Cities

	Frequencies	Percentages
Yes	421	81.4
NO	96	18.6

Table (2) summarizes respondents' experiences with visiting heritage cities that have integrated smart technologies. A substantial majority, 421 respondents (81.4%), reported having visited at least one Smart Heritage City, while 96 respondents (18.6%) indicated no prior experience. This high visitation rate reflects a relatively broad level of exposure to smart heritage practices, emphasizing the growing implementation of digital technologies in cultural heritage sites and their increasing accessibility within global tourism. Such findings suggest that Smart Heritage Cities are no longer an abstract concept for most respondents but rather a lived experience that likely strengthens their awareness, perceptions, and recognition of associated benefits. Moreover, this direct exposure serves as an important driver of familiarity, reinforcing the idea that engagement with immersive, digitally enhanced heritage environments can deepen public understanding and participation in cultural heritage preservation.

4.3 :Awareness of Smart Heritage Cities

Table (3) Awareness of Smart Heritage Cities

No.	Items	Mean	SD	Rank
1	I am familiar with the concept of Smart Heritage Cities .	4.03	.978	**4**
2	I understand how smart technologies (e.g., IoT, augmented reality) are used in heritage conservation .	3.90	1.14	**7**
3	I am aware of initiatives to transform heritage cities into Smart Heritage Cities .	3.65	1.29	**9**
4	Smart Heritage Cities are effective in enhancing visitor engagement with cultural heritage .	4.02	1.00	**5**
5	I am aware of the role that technology plays in preserving cultural heritage .	3.86	1.24	**8**
6	Smart Heritage Cities increase the sustainability of cultural heritage preservation .	4.12	1.00	**2**
7	I believe Smart Heritage Cities are essential for modern urban	4.04	1.04	**3**

	planning .			
8	The use of technology in Smart Heritage Cities helps prevent the deterioration of heritage sites .	4.01	1.10	**6**
9	Smart Heritage Cities make cultural heritage more accessible to the public .	4.13	1.01	**1**
10	I am aware of government initiatives supporting the development of Smart Heritage Cities .	3.58	1.34	**10**
Awareness of Smart Heritage Cities		3.93	1.02	

Table (4) presents an analysis of respondents' awareness of smart heritage cities, measured through ten items assessing familiarity with the concept, understanding of smart technologies, and perceptions of their role in heritage preservation. The results indicate an overall mean score of 3.93 (SD = 1.02), reflecting a moderately high level of awareness across the sample. Respondents particularly acknowledged the contribution of smart heritage cities to improving accessibility to cultural heritage, enhancing sustainability, and supporting tourism development and urban planning. At the same time, the findings reveal variability in responses, with comparatively lower awareness of government-led initiatives and policy frameworks. This suggests that while the public readily recognizes the practical benefits of integrating digital technologies—such as IoT, big data, and immersive tools—into heritage management, their understanding of institutional strategies and governance mechanisms remains limited. Addressing this gap through targeted communication and educational programs could foster a more comprehensive awareness, positioning smart heritage cities not only as technological innovations but also as integrated systems for sustainable cultural heritage management.

4.4 : Preservation of Cultural Heritage Practices

Table (4) Preservation of Cultural Heritage

No.	Items	Mean	SD	Rank
1	I actively participate in local cultural heritage events and activities .	4.04	.987	**8**
2	I make an effort to educate others about the importance of preserving cultural heritage .	4.08	.978	**7**
3	I support local businesses and artisans that contribute to cultural heritage preservation .	4.26	.780	**3**
4	I visit and promote cultural heritage sites in my community .	4.32	.789	**2**
5	I engage in volunteer work focused on preserving cultural heritage .	3.86	1.11	**10**
6	I participate in discussions and forums about cultural heritage conservation .	4.03	.977	**9**
7	I use social media to raise awareness about cultural heritage issues .	4.19	.975	**5**
8	I advocate for policies that support the preservation of cultural heritage in my community .	4.20	.842	**4**
9	I am committed to reducing my environmental impact to protect heritage sites .	4.35	.795	**1**
10	I believe that my personal actions can contribute to the preservation of cultural heritage .	4.16	.895	**6**
Preservation of Cultural Heritage		4.15	.796	

Table (4) presents a detailed analysis of respondents' engagement with cultural heritage preservation, measured through ten items that examined participation in activities aimed at safeguarding cultural resources. The results indicate an overall mean score of 4.15 (SD = 0.796), reflecting a generally high level of engagement and positive attitudes toward conservation practices. Respondents reported frequent involvement in practices such as minimizing environmental impacts, supporting local businesses, and promoting heritage sites, while participation in structured activities like volunteer work was less common. These findings suggest that preservation is increasingly perceived as an active and everyday responsibility, expressed through sustainable behaviors and community support, rather than a passive obligation. At the same time, the limited participation in formal volunteer initiatives highlights a gap that could be addressed through awareness campaigns, community-based opportunities, and inclusive engagement strategies. Overall, the results underscore a strong collective commitment to cultural heritage and point to the potential of leveraging this awareness and engagement in advancing smart heritage city strategies.

In summary, the analysis of the survey responses revealed several key insights:

- **High Awareness of Smart Heritage Cities**

A majority of respondents (81.4%) indicated that they had visited a Smart Heritage City, suggesting strong public engagement with technologically enhanced heritage destinations. The composite mean for Awareness of Smart Heritage Cities was 3.93 (SD = 1.02), reflecting a generally positive familiarity with the concept. The highest-rated item was "Smart Heritage Cities make cultural heritage more accessible to the public" (M = 4.13), followed closely by their role in enhancing sustainability (M = 4.12).

- **Moderate Awareness of Government Initiatives**

While overall awareness was high, the lowest mean score (M = 3.58) was related to knowledge of government initiatives supporting Smart Heritage City development, suggesting a communication gap between policy makers and the public.

- **Strong Commitment to Cultural Heritage Preservation**

The Preservation of Cultural Heritage dimension recorded a higher composite mean of 4.15 (SD = 0.796), indicating strong individual commitment to safeguarding heritage resources. The most highly rated statement was "I am committed to reducing my environmental impact to protect heritage sites" (M = 4.35), reflecting awareness of the environmental dimension of heritage conservation.

- **Active Public Engagement**

Respondents showed high levels of participation in heritage-related activities, including visiting and promoting heritage sites (M = 4.32) and supporting local artisans (M = 4.26). Social media was also recognized as an important tool for raising awareness (M = 4.19).

5. Discussion

The findings of this study provide valuable insights into the evolving relationship between citizens, tourists, and the emerging concept of Smart Heritage Cities. The demographic diversity of the respondents underscores the representativeness of the results, with both local residents and international tourists contributing perspectives shaped by different cultural and educational backgrounds. This broad base of

participation enhances the credibility of the findings, particularly in understanding how socio-demographic characteristics influence awareness and engagement. These results align with the study of Zhang, Wu, and Buhalis (2018), who demonstrated that demographic variables—particularly education and travel experience—play a significant role in shaping individuals' awareness of and attitudes toward smart heritage technologies. Similarly, Egusquiza and Gavalda (2020) highlighted that inclusive engagement across socio-demographic groups strengthens the effectiveness of smart heritage initiatives by ensuring that diverse voices contribute to policy design and heritage management strategies. The present study extends these findings by showing that respondents with higher educational levels and prior travel exposure exhibited greater familiarity with smart technologies, while less experienced groups demonstrated enthusiasm but lacked detailed knowledge of institutional frameworks.

Moreover, the active participation of both local residents and international tourists supports the claim made by Nofal et al. (2022) that cultural heritage conservation benefits most when local knowledge and global perspectives intersect. Residents often emphasize the cultural and identity-related significance of heritage preservation, while tourists bring an external appreciation and curiosity that can stimulate innovation in heritage interpretation. This intersection reinforces the argument of Buhalis and Amaranggana (2015) that smart solutions in tourism and heritage are most effective when designed to address the needs of multiple stakeholders simultaneously.

However, the results also point to gaps in awareness of policy frameworks and institutional support mechanisms. While respondents demonstrated strong personal commitment to heritage preservation, knowledge of government-led initiatives remained limited. This finding reflects the concern raised by Yin et al. (2020), who argued that the success of smart heritage cities depends not only on citizen engagement but also on transparent governance and visible policy communication. Without adequate institutional visibility, even technologically advanced solutions may fail to achieve their intended impact.

Overall, the study highlights that demographic diversity is not merely descriptive but fundamentally shapes the awareness, engagement, and expectations of stakeholders in Smart Heritage Cities. Recognizing these patterns provides a pathway for designing targeted communication campaigns, capacity-building initiatives, and participatory frameworks that can bridge gaps between different groups. By doing so, smart heritage development can move beyond technological implementation to foster inclusive, community-centered, and sustainable cultural preservation.

A central result concerns the high percentage (81.4%) of respondents who reported visiting at least one Smart Heritage City. This demonstrates that the integration of smart technologies into heritage destinations is no longer perceived as a theoretical aspiration but as a lived reality for the majority of participants. Such widespread exposure provides fertile ground for cultivating deeper awareness of how digital tools can transform heritage management, accessibility, and interpretation. These findings resonate with the arguments of Borda and Bowen (2017), who emphasized that the adoption of immersive technologies in heritage sites accelerates public recognition of their value when visitors experience them firsthand. Similarly, Rahaman et al. (2019) contend that visitor exposure to smart technologies—such as augmented reality (AR),

mobile applications, and interactive interpretation platforms—creates a feedback loop that not only enhances the visitor experience but also builds long-term support for digital heritage innovation.

Moreover, the fact that the majority of respondents had prior exposure suggests a global shift in the tourism and cultural sectors. Heritage cities are increasingly adopting smart technologies to balance preservation with accessibility, as argued by Angelidou et al. (2017). This shift also confirms the point made by Qiu et al. (2015) that smart heritage systems function most effectively when visitors act as active users of technology rather than passive consumers. By positioning tourists and residents as co-creators of heritage experiences, Smart Heritage Cities advance both sustainability and inclusivity in cultural heritage management.

Awareness levels, reflected in a moderately high overall mean score of 3.93, suggest that respondents recognize the value of smart technologies in enhancing cultural heritage experiences. However, the lower ratings on knowledge of governmental initiatives reveal a persistent gap between public perception and institutional communication. This indicates that while experiential and technological dimensions of awareness are relatively strong, policy-level visibility remains limited. Such results align with Meijer and Bolívar (2016), who emphasize that the success of smart city initiatives depends not only on technological deployment but also on transparent governance and effective communication. Similarly, Lombardi et al. (2012) argue that without clear institutional narratives, citizens may struggle to connect policy frameworks with their own lived experiences of technology. The findings therefore reinforce the need for governments and heritage authorities to strengthen strategic communication efforts, ensuring that the integration of smart heritage technologies is accompanied by inclusive and visible policy engagement.

Equally important is the robust commitment to cultural heritage preservation, with an overall mean of 4.15 demonstrating active involvement in sustainable practices, heritage promotion, and support for local communities. These behaviors reveal that respondents perceive heritage preservation not merely as safeguarding monuments but as an integrated set of social, economic, and environmental practices. Such findings are consistent with Bandarin and van Oers (2012), who argue that heritage, must be embedded within wider sustainable development frameworks, linking conservation with local livelihoods and community identity. Nevertheless, the results also highlight barriers to wider engagement, suggesting the need for more accessible and participatory opportunities for individuals to contribute to preservation efforts. As Della Corte et al. (2017) note, engaging citizens through participatory models and inclusive platforms is essential to ensure that cultural heritage preservation evolves from individual responsibility to collective practice.

Overall, these results confirm that while public engagement and awareness are generally high, there remains a need for targeted strategies to improve visibility of governmental programs and encourage deeper community participation. Bridging these gaps could involve integrating citizen engagement platforms into smart heritage initiatives, as suggested by Qiu et al. (2015) in their “one platform—three systems” model, thus linking technological innovation with participatory governance.

6. Conclusion

This study explored public awareness, experiences, and engagement with smart heritage cities, highlighting how citizens and tourists perceive the integration of smart technologies into cultural heritage preservation. The findings confirm that Smart Heritage Cities are becoming tangible realities within cultural tourism and heritage management, and that public recognition of their value is steadily increasing.

However, gaps remain in awareness of governmental initiatives and policy frameworks, pointing to the need for more transparent communication and visible institutional support. At the same time, the strong personal commitment of respondents to preservation practices reflects growing recognition of shared responsibility for safeguarding cultural resources.

Overall, the success of smart heritage cities rests on three interconnected pillars: technological innovation, transparent governance, and inclusive community engagement. Strengthening these dimensions will ensure that smart heritage cities evolve not only as technologically advanced destinations but also as socially inclusive and sustainable models for cultural heritage preservation.

7. Practical Implications and Recommendations

The findings of this study provide practical guidance for policymakers, heritage managers, and urban planners seeking to advance smart heritage city initiatives. The demonstrated awareness among both residents and tourists offers a solid foundation for designing participatory programs that foster community engagement and cultural stewardship. Decision-makers can build on this foundation by implementing transparent communication strategies that clearly convey government-led initiatives, thereby bridging the existing gap between institutional actions and public understanding.

High levels of visitation and exposure to smart heritage environments highlight the potential of immersive technologies—such as (AR) and (VR)—to enrich educational experiences, enhance tourism appeal, and deepen connections to heritage sites. Practical interventions, including accessible volunteer programs, inclusive co-creation platforms, and partnerships with local businesses and artisans, can translate individual commitment into collective action, ensuring that heritage preservation becomes a shared responsibility across stakeholders.

Based on these insights, the study recommends:

1. Enhancing Community Engagement: Encourage residents and tourists to participate in programs that strengthen responsibility toward cultural heritage.
2. Improving Institutional Communication: Develop transparent and clear strategies to explain government-led initiatives and connect them with public awareness.
3. Leveraging Interactive Technologies: Utilize AR, VR, and other digital tools to enhance educational and tourism experiences and strengthen engagement with heritage sites.
4. Expanding Inclusive Participation Opportunities: Promote accessible volunteer programs, co-creation platforms, and community initiatives to transform individual commitment into effective collective action.

5. Strengthening Local Partnerships: Collaborate with local businesses and artisans to support heritage preservation and promote local economic development.
6. Adopting Sustainable Models: Align technological innovation with heritage preservation to ensure citizen-centered and sustainable urban heritage management.

8. Future Research Directions

While the study provides important insights, several areas merit further exploration. First, comparative research across different cultural and geographical contexts could reveal variations in awareness, engagement, and policy effectiveness, offering a broader understanding of how Smart Heritage Cities can adapt to diverse settings. Second, longitudinal studies are needed to assess the long-term impacts of smart technologies on heritage preservation, community participation, and sustainable tourism development.

Future research should also investigate innovative governance models that integrate technology with inclusive decision-making, as well as the role of public–private partnerships in supporting heritage preservation. Finally, examining the effectiveness of specific digital tools, such as AR/VR applications or AI-driven heritage management systems, can provide practical evidence to guide investment and implementation strategies.

References

Aida, A. H. (2024, May). Cultural Heritage Preservation in the Digital Age: Balancing Tradition and Innovation in Mediterranean Smart Cities. In 2024 Mediterranean Smart Cities Conference (MSCC) (pp. 1-6). IEEE.

Alawadhi, S., Aldama-Nalda, A., Chourabi, H., Gil-Garcia, J. R., Leung, S., Mellouli, S., Nam, T., Pardo, T. A., Scholl, H. J., & Walker, S. (2012). Building understanding of smart city initiatives. *Electronic Government, 9* (2), 137–147. https://doi.org/10.1504/EG.2012.046448

Al-Azab, M. R., & Abulebda, M. A. (2023). Cultural heritage authenticity: Effects on place attachment and revisit intention through the mediating role of tourist experience. Journal of Association of Arab Universities for Tourism and Hospitality, 24(1), 328-352.

Alvarez, M., & Yarime, M. (2021). Integrating cultural heritage and smart city strategies for sustainable urban development. *Sustainability, 13*(5), 2551. https://doi.org/10.3390/su13052551

Angelidou, M., Karachaliou, E., Angelidou, T., Stylianidis, E., & Fragkou, P. (2017). Cultural heritage in smart city environments. *ISPRS Annals of Photogrammetry, Remote Sensing and Spatial Information Sciences, IV-2/W2*, 9–16. https://doi.org/10.5194/isprs-annals-IV-2-W2-9-2017

Angelidou, M., Psaltoglou, A., Komninos, N., Kakderi, C., Tsarchopoulos, P., & Panori, A. (2017). Enhancing sustainable urban development through smart city applications. *Journal of Science and Technology Policy Management, 8* (2), 146–169. https://doi.org/10.1108/JSTPM-05-2017-0016

Bandarin, F., & van Oers, R. (2012). The historic urban landscape: Managing heritage in an urban century. Wiley-Blackwell.

Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., ... & Portugali, Y. (2012). Smart cities of the future. *The European Physical Journal Special Topics, 214*(1), 481–518. https://doi.org/10.1140/epjst/e2012-01703-3

Borda, A., & Bowen, J. (2017). Smart cities and heritage: Implications for policy and practice. *Journal of Heritage Management, 2* (1), 1–15. https://doi.org/10.1177/2455929616688024

Borda, A., & Bowen, J. P. (2017). Smart cities and cultural heritage: A review of developments and future opportunities. In Electronic Visualisation and the Arts (EVA 2017) (pp. 9–18). BCS Learning and Development. https://doi.org/10.14236/ewic/EVA2017.2

Buhalis, D., & Amaranggana, A. (2015). Smart tourism destinations enhancing tourism experience through personalisation of services. In I. Tussyadiah & A. Inversini (Eds.), Information and communication technologies in tourism 2015 (pp. 377–389). Springer. https://doi.org/10.1007/978-3-319-14343-9_28

Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J. R., Mellouli, S., Nahon, K., ... & Scholl, H. J. (2012). Understanding smart cities: An integrative framework. Proceedings of the 45th Hawaii International Conference on System Sciences, 2289–2297. IEEE. https://doi.org/10.1109/HICSS.2012.615

Della Corte, V., Del Gaudio, G., & Sepe, F. (2017). The smart city and cultural heritage: The case of Naples. *International Journal of Management Cases, 19*(2), 4–19. https://doi.org/10.5848/APBJ.2017.00102

Della Corte, V., Piras, A., & Zamparelli, C. (2017). Cultural heritage and smart tourism: Towards a system of smart cultural destinations. *Tourism Analysis, 22* (4), 437–449. https://doi.org/10.3727/108354217X15021906132213

Egusquiza, A., & Gavalda, J. (2020). Augmented reality in cultural heritage: A systematic review of applications and impacts. *Journal of Cultural Heritage Management and Sustainable Development, 10* (4), 431–446.

Egusquiza, A., & Gavalda, J. (2020). Internet of Things applications for cultural heritage: Review and future challenges. *Journal of Cultural Heritage, 42*, 181–190. https://doi.org/10.1016/j.culher.2019.09.004

Egusquiza, A., & Gavalda, J. (2020). Smart technologies applied to heritage conservation: A review. *Journal of Cultural Heritage Management and Sustainable Development, 10*(4), 383–397. https://doi.org/10.1108/JCHMSD-02-2020-0022

Egusquiza, A., & Gavaldà, M. (2020). Smart heritage and citizen participation: Towards inclusive heritage governance. *International Journal of Heritage Studies, 26* (10), 998–1013. https://doi.org/10.1080/13527258.2019.1691315

Graham, B., Ashworth, G. J., & Tunbridge, J. E. (2016). A geography of heritage: Power, culture and economy (2nd Ed.). Routledge.

Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2015). Smart tourism: Foundations and developments. *Electronic Markets, 25* (3), 179–188. https://doi.org/10.1007/s12525-015-0196-8

Irawan, B., Syafrudin, S., & Budihardjo, M. A. (2024, July). A Review of Smart City Initiatives: Assessing the Integration and Impact on Sustainable Environmental Management in Urban Heritage Sites. In 2024 7th International Conference on Informatics and Computational Sciences (ICICoS) (pp. 370-375). IEEE.

Ke, Z., & Mustafa, M. (2024). Promoting Public Engagement in Urban Heritage Preservation through Participatory Art Case Studies of Practices and Approaches. Archives of Design Research, 37(5), 221-243.

Kourtit, K., Nijkamp, P., & Arribas-Bel, D. (2012). Smart cities perspective—A European perspective. *Cities, 29*, S12–S23. https://doi.org/10.1016/j.cities.2011.11.003

Lombardi, P., Giordano, S., Farouh, H., & Yousef, W. (2012). Modelling the smart city performance. Innovation: *The European Journal of Social Science Research, 25* (2), 137–149. https://doi.org/10.1080/13511610.2012.660325

Marsella, S., & Marzoli, M. (2017, May). Smart cities and cultural heritage. In 2017 IEEE 14th international conference on networking, sensing and control (ICNSC) (pp. 281-286). IEEE.

Mason, R. (2002). Assessing values in conservation planning: Methodological issues and choices. In M. de la Torre (Ed.), Assessing the values of cultural heritage (pp. 5–30). Los Angeles: The Getty Conservation Institute.

Meijer, A., & Bolívar, M. P. R. (2016). Governing the smart city: A review of the literature on smart urban governance. *International Review of Administrative Sciences, 82* (2), 392–408. https://doi.org/10.1177/0020852314564308

Mourby, M., Kaye, J., Williams, E. D., Moraia, L. B., Gowans, H., Wallace, S. E., & Smith, H. (2021). Governance of digital heritage data: A review of citizen engagement and ethical challenges. *International Journal of Heritage Studies, 27* (6), 587–603.

Mourby, M., Mackey, T., Elliot, M., & Kaye, J. (2021). Transparency, trust and smart heritage: Ethical issues in digital heritage technologies. *Journal of Cultural Heritage Management and Sustainable Development, 11* (3), 254–270. https://doi.org/10.1108/JCHMSD-07-2020-0118

Mourby, M., Smith, H., Moran, N., Tavel, P., & Kaye, J. (2021). Public awareness and perceptions of digital heritage technologies. *Heritage Science, 9* (1), 115. https://doi.org/10.1186/s40494-021-00592-9

Muthuswamy, V. V., & Esakki, S. (2024). Exploring Sustainable Cultural Preservation: Strategies, Challenges, and Community Engagement in Heritage Conservation Efforts. Rita Revista Indexada de Textos Academicos, (21).

Nofal, E., Helmy, Y., & El-Gohary, H. (2022). Smart cities and heritage preservation: A framework for sustainable cultural tourism in Egypt. *Journal of Tourism Futures, 8* (2), 197–215. https://doi.org/10.1108/JTF-07-2020-0112

Qiu, H., Xu, F., & Zhang, J. (2015). Smart heritage management: One platform–three systems approach. *Journal of Cultural Heritage Management and Sustainable Development, 5* (1), 65–80. https://doi.org/10.1108/JCHMSD-06-2014-0022

Qiu, Y., Li, X., & Chen, X. (2015). One platform–three systems: A model for smart heritage site management. *Journal of Cultural Heritage, 16*(6), 883–890. https://doi.org/10.1016/j.culher.2015.03.005

Rahaman, H., Champion, E., & Bekele, M. (2019). From photo to 3D to mixed reality: A complete workflow for cultural heritage visualisation and experience. *Digital Applications in Archaeology and Cultural Heritage, 13*, e00102. https://doi.org/10.1016/j.daach.2019.e00102

Selim, G., Elkhateeb, M., & Elzoghby, H. (2022). Smart heritage in Egypt: Digital transformation for cultural preservation. *Heritage Science, 10*(1), 45. https://doi.org/10.1186/s40494-022-00669-5

Selim, G., Hassan, A. M., & Elkady, A. (2022). Towards smart heritage: Digital transformation and cultural sustainability in historic cities. *Sustainable Cities and Society, 82*, 103905.

Timothy, D. J., & Nyaupane, G. P. (2009). Cultural heritage and tourism in the developing world: A regional perspective. Routledge. https://doi.org/10.4324/9780203869705

Timothy, D. J., & Nyaupane, G. P. (2009). Cultural heritage and tourism in the developing world: A regional perspective. Routledge.

Tousi, E., Pancholi, S., Rashid, M. M., & Khoo, C. K. (2025). Cultural heritage sites as a facilitator for place making in the context of

Tousi, E., Pancholi, S., Rashid, M. M., & Khoo, C. K. (2025). Integrating Cultural Heritage into Smart City Development Through Place Making: A Systematic Review. Urban Science, 9(6), 215.

Trillo, C., Aburamadan, R., Makore, B. C. N., Udeaja, C., Moustaka, A., Gyau Baffour Awuah, K., ... & Mansuri, L. E. (2021, July). Towards smart planning conservation of heritage cities: Digital technologies and heritage conservation planning. In International Conference on HumanComputer Interaction (pp. 133-151). Cham: Springer International Publishing.

UNESCO. (1972). Convention concerning the protection of the world cultural and natural heritage. UNESCO. https://whc.unesco.org/en/conventiontext

UNESCO. (2011). Recommendation on the historic urban landscape. United Nations Educational, Scientific and Cultural Organization.

UN-Habitat. (2020). Smart cities and communities: Guidance note. Nairobi: United Nations Human Settlements Programme.

Yu, J., Kim, S., & Hailu, T. B. (2023). Demographic influences on digital service perceptions and satisfaction at world heritage sites in Chinese coastal cities: An empirical analysis. *Journal of Hospitality and Tourism Technology, 15* (1), 70–103. https://doi.org/10.1108/JHTT-02-2023-0046

Yue, H., Wei, Y., Yuan, H., & Li, H. (2025). Revitalizing urban industrial heritage: Enhancing public trust in government through smart city development and open big data analysis using artificial neural network (ANN) modeling. Cities, 156, 105538.

Zhang, J., Wu, B., & Buhalis, D. (2018). A model of perceived value for smart tourism cities: A case study of heritage tourism. *Tourism Management, 69*, 122–133. https://doi.org/10.1016/j.tourman.2018.06.003

Zhang, K., Wu, Y., & Buhalis, D. (2018). A smart heritage tourism system for sustainable destination management. *Information Technology & Tourism, 20* (3–4), 233–253.

Zhang, L., Wu, Y., & Buhalis, D. (2018). A model of perceived image, memorable tourism experiences and revisit intention. *Journal of Destination Marketing & Management, 8*, 326–336. https://doi.org/10.1016/j.jdmm.2017.06.004