Analyzing the Efforts of Digitizing Cultural Heritage in Vietnam and Its Role in Preserving Indigenous Knowledge, Promoting Education, and Tourism

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Abstract

This article aims to analyze the efforts of digitizing cultural heritage in Vietnam in the context of a rapidly progressing global digital transformation. The study focuses on three key aspects: the role of digitization in preserving and disseminating indigenous knowledge; its contributions to education—particularly in creating culturally rich learning materials; and its potential to promote sustainable tourism through innovative experiences such as virtual museums, digital cultural maps, and virtual reality applications. The primary research method employed is literature review, analyzing academic works and practical reports on cultural heritage digitization in Vietnam. Additionally, the article examines several case studies, such as the "Digitization of Van Mieu – Quoc Tu Giam" project, the "Vietnam Digital Museum," and various initiatives for digitizing intangible heritage in the Central Highlands. From these cases, the study draws insights into the effectiveness, limitations, and future potential of these digitization efforts. Preliminary findings show that digital technologies are positively contributing to the governance of cultural heritage—not only in terms of data storage but also by expanding access, interaction, and the dissemination of cultural values within communities. If systematically implemented with interdisciplinary collaboration, these efforts will serve as a crucial foundation for preserving national cultural identity, enhancing educational quality, and promoting Vietnam's tourism image in the digital age.

Keywords: *Cultural Heritage Digitization; Cultural Tourism; Education and Lifelong Learning; Indigenous Knowledge; Sustainable Development.*

Introduction

In the context of globalization and the continuous advancement of digital technologies, the preservation and promotion of cultural heritage values are facing unprecedented opportunities and challenges. The emergence of digital technologies—including data digitization, artificial intelligence (AI), virtual reality (VR), augmented reality (AR), digital mapping, and online platforms—has been fundamentally transforming the ways in which cultural heritage is stored, preserved, accessed, and utilized globally (Yampochai, 2022). One of the goals of the United Nations' 2030 Agenda for Sustainable Development—specifically Sustainable Development Goal (SDG) 11.4—emphasizes the necessity to "strengthen efforts to protect and safeguard the world's cultural and natural heritage" (United Nations, 2015). In this context, UNESCO has also affirmed that the application of digital technology in cultural conservation is one of the essential strategies to ensure the transmission and proliferation of traditional cultural values in the 21st century (UNESCO, 2021a).

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In Vietnam, a country endowed with a rich repository of tangible and intangible cultural heritage—from ancient architectural relics such as Van Mieu – Quoc Tu Giam, the Complex of Hue Monuments, Hoi An Ancient Town, to traditional art forms such as royal court music (nha nhac), *ca tru*, and the Central Highlands' gong culture—the task of preserving and promoting heritage values is both urgent and challenging (UNESCO, 2021b; Vietnam National Museum of History, 2021; British Council Vietnam, 2021). For many years, cultural conservation in Vietnam has mainly relied on traditional methods, which often lack interactivity and do not fully meet the diverse and flexible access needs of contemporary communities, particularly the youth in the digital age. Moreover, indigenous knowledge—the core of cultural depth and national identity—is increasingly fading due to urbanization, migration, and changes in educational and communal practices (Ngo, 2004; Tran, 2005; Ha, 2006). Indigenous knowledge is not only the crystallization of life experiences accumulated over generations but also serves as the foundation for developing sustainable models adapted to local natural and social environments (Pham, 2005a; 2005b).

In recent years, Vietnam has launched various initiatives to digitize cultural heritage in order to preserve, reconstruct, and promote cultural values to both domestic and international audiences. A wide range of digitization methods have been applied, including: developing metadata for cultural artifacts and knowledge; designing highly interactive virtual museums; creating digital cultural maps integrated with multimedia information; and using VR/AR technologies for immersive experiences of heritage sites and festivals. Notable projects include "Digitization of Van Mieu – Quoc Tu Giam" (British Council Vietnam, 2021), "Central Highlands Digital Cultural Space" (Prime Minister of Vietnam, 2014; Pham & Ngo, 2016), and online museum platforms such as digitizevietnam.org and 3Dheritage.vn. However, these efforts remain fragmented and lack systemic coordination, requiring thorough evaluation of their practical effectiveness in knowledge preservation, educational support, and tourism development.

Based on these issues, this article poses a central research question: How do efforts to digitize cultural heritage in Vietnam contribute to the preservation of indigenous knowledge, the promotion of education, and the development of sustainable cultural tourism? The research aims to analyze the trends and forms of digital technology implementation in cultural conservation in Vietnam and assess the impact of these efforts across three dimensions: (1) preserving indigenous knowledge, (2) supporting education and cultural communication, and (3) promoting cultural tourism through digital experiences. Specifically, the study addresses the following three questions:
(1) What technologies and forms of cultural heritage digitization are currently being implemented in Vietnam?

(2) How does the digitization of cultural heritage affect the preservation of indigenous knowledge and the enhancement of cultural education?

(3) What roles can digitized platforms and applications play in the development of sustainable cultural tourism in Vietnam?

Answering these questions not only clarifies the current status and development trends of heritage digitization in Vietnam but also provides policy and strategic directions for cultural development in the digital era. Particularly, as Vietnam moves toward building a creative economy and learning society, integrating technology into the cultural sector becomes essential for improving governance capacity, enhancing knowledge value, and affirming Vietnam's cultural position on the global map. Moreover, the research contributes to the theoretical

connection among three domains—cultural preservation, education, and tourism—through the lens of digital transformation. This interdisciplinary approach allows for envisioning a future digital cultural ecosystem, where indigenous knowledge is not only preserved but also transformed into a vital resource for creative education and experiential tourism—two critical components of sustainable development (Amin & Zulfitri, 2022; Luong et al., 2024).

Theoretical Framework and Literature Review

The Concept of Cultural Capital and Its Role in Sustainable Development

The concept of *cultural capital* was first introduced by Pierre Bourdieu in his theory of social stratification, referring to forms of knowledge, skills, experiences, and cultural values possessed by an individual or community, thereby contributing to differences in social status (Bourdieu, 1986). Cultural capital includes not only educational attainment or aesthetic skills, but also the ability to access, preserve, and reproduce cultural values. In the current context of cultural development, especially in developing countries like Vietnam, identifying and promoting community cultural capital—particularly indigenous knowledge—is considered a key to ensuring cultural sustainability and autonomy (Throsby, 1999; Dei, 2000; Vu, 2007).

David Throsby expanded the concept of cultural capital from an economic perspective, emphasizing the intangible and non-market nature of cultural values. He proposed that cultural heritage could be considered a form of "capital asset" that brings long-term benefits to society (Throsby, 2001; Vu, 2010). In the digital age, cultural capital has become increasingly important, as digital technology not only aids in storage but also reshapes how people interact with culture, thereby enriching forms of expression and cultural reception within communities (Park, 2017; Kataoka et al., 2020).

Theoretical Framework for Cultural Information Management

To understand the role of technology in preserving and transmitting heritage, an approach from the perspective of cultural information management is essential. According to Brian Detlor (2010) and Dangsakul et al. (2021), cultural information management is the process of collecting, organizing, classifying, and disseminating information related to cultural practices, with the goal of enhancing accessibility and long-term preservation. In the context of digital transformation, cultural information management depends not only on content but also on *metadata*—descriptive data—which helps locate, search for, and efficiently organize cultural assets (Gilliland, 2008; Doan, 2020; Blandi et al., 2022).

Besides metadata, concepts such as *cultural ontology*—a classification and description system for concepts within a specific cultural domain—also play an important role in building digital repositories capable of interdisciplinary and multilingual connectivity (Chaichuay et al., 2012; Historic England, 2022). For instance, developing an ontology of traditional Vietnamese musical instruments can help users systematically search for related artifacts, stories, sounds, or images more easily.

Digital Cultural Heritage: Classification and Role

The concept of *digital cultural heritage* encompasses all cultural assets that have been digitized (digitized heritage) or created directly in the digital environment (born-digital heritage) (UNESCO, 2023; Hosagrahar, 2023). Manovich (2001) argues that digital heritage is not merely a transformation in storage format but also a process of "re-mediation" of heritage in the technological environment, thereby altering how people perceive and interact with it.

Digital cultural heritage can be categorized along two dimensions: tangible and intangible; and digitization formats: 2D data (images, texts), 3D data (object and space modeling), audio, video, or interactive experiences (AR/VR). Virtual museums, digital cultural maps, and online exhibitions are expanding access to heritage, especially in the post-COVID-19 context, when the demand for remote experiences has risen sharply (Giaccardi, 2012).

Related Research in Southeast Asia

In Southeast Asia, many countries have implemented cultural digitization programs with varying orientations and levels of development. In Thailand, the "Digital Library of Thai Arts and Culture" project has been developed by the government and national museums since the 2000s, allowing access to thousands of artifacts, recordings, and cultural images via digital platforms (Manmart et al., 2012; Hoaihongthong & Kwiecien, 2022). Moreover, virtual reality applications recreating temples and festivals are being developed to serve education and tourism purposes.

In Indonesia, the "Indonesia Digital Heritage" project integrates digital technology with local communities to collect, preserve, and disseminate indigenous knowledge, particularly in ethnic minority areas such as Papua and Kalimantan (Nuryanti, 2006; Firanti & Firdausah, 2020; Yuniar & Ningrum, 2022). These initiatives not only support data storage but also encourage community participation in preservation, thereby enhancing sustainability and localization.

Compared to these countries, Vietnam is still in the early stages but holds significant development potential. Projects such as the virtual museum of Van Mieu, the Central Highlands digital space, and the heritage mapping application in Hue have initially demonstrated the feasibility of integrating technology into cultural fields. However, further investment is needed in terms of human resources, databases, and legal frameworks to ensure intellectual property rights and the protection of indigenous knowledge.

Digitization of Indigenous Knowledge and Heritage-Based Education

Indigenous knowledge is a system of understanding accumulated over generations, closely linked to the environment, livelihoods, and culture of local communities (Nguyen, 1999). Digitizing indigenous knowledge is not merely a matter of converting data into digital form, but a transformation of the methods of conveying, preserving, and sharing knowledge to align with technological contexts and the needs of new generations (Dei, 2000; Tuamsuk & Kaewboonma, 2018).

In Vietnam, the digitization of indigenous knowledge is being implemented through projects such as recording and archiving E De folktales, building databases on Cham brocade weaving, or recreating the spatial experience of Northwestern festivals using virtual reality (Ministry of Culture, Sports and Tourism, 2021a; 2021b). These activities not only serve preservation purposes but also become valuable educational resources. *Heritage-based education* is an approach that integrates heritage elements into curricula to enhance cultural awareness, strengthen identity, and build creative capacities among students (Robinson & Nemetz, 1988; Smith, 2006).

Digitization and Cultural Tourism Experience

One of the sectors most significantly impacted by digitization is cultural tourism. Thanks to digital technologies, tourist experiences are no longer limited to mere "sightseeing" but are expanded to include "interaction," "immersion," and "deep understanding." Applications such as digital cultural maps, virtual guides, QR codes at heritage sites, and virtual exhibitions are

becoming increasingly common at many tourist destinations in Vietnam (Reisinger & Turner, 1999; Hunpadungrat, 2021). These platforms allow users to access information in a more flexible, personalized, and intuitive manner—thereby enhancing the value of the experience and attracting both domestic and international visitors.

From a theoretical perspective, digitization is not just a marketing tool in tourism but also a means to enrich cultural content and evoke emotional connections to destinations. When integrated with indigenous knowledge, digitization can become a tool for building in-depth heritage storytelling, contributing to destination branding and improving the quality of sustainable tourism.

Research Methodology

This study applies a qualitative approach through content analysis techniques to explore the depth and context of digital heritage efforts in Vietnam. The primary data sources include academic literature, policy reports from cultural and educational agencies, and information collected from digital platforms related to heritage preservation, such as websites of museums, digitization projects, and local cultural maps.

To ensure specificity and depth, the study focuses on several representative case studies that have been or are being implemented in Vietnam. These include the digitization project of the Temple of Literature – Quoc Tu Giam with 3D images and annotated data to support education; the digitization of artifact systems in Vietnamese museums for research and online exhibitions; the virtual museum of Quang Nam province using VR technology; the cultural map of Lam Dong integrating multilayered information about the living spaces of indigenous ethnic groups; and the digitization of Han-Nom stele inscriptions focusing on preserving historical knowledge and ancient languages (Tran, 2021; Anh, 2024).

These cases will be analyzed based on specific criteria such as: form of digitization (images, 3D models, video, etc.), type of metadata used (according to Dublin Core, LIDO standards, etc.), along with the primary functions serving goals of knowledge preservation, heritage education, and sustainable cultural tourism development.

Results
Digitization and Preservation of Indigenous Knowledge

In the context of globalization and modernization, indigenous knowledge – including the system of knowledge accumulated and passed down over generations by local communities – is facing the risk of serious extinction. In Vietnam, efforts to digitize cultural heritage play a crucial role in preserving and reviving these knowledge treasures, thereby supporting the sustainable identification of national cultural identity.

Project/Application	Description	Technology Used	Location	Impact/Result	References
Digitization of Han-Nom Inscriptions	Conversion of ancient inscriptions into digital format, integrating	Dublin Core, MODS, LIDO	Nationwide	Standardization of data, cross-platform linking, supporting	Le (2017), Anh (2024), Gilliland (2008)

	metadata according to international standards			research and education	
Quang Nam Virtual Museum	Recreating artifacts, festivals, and cultural architecture through 3D models and virtual reality	3D modeling, VR, multimedia	Quang Nam	Preservation of intangible heritage, broader access	ISPRS (2023), British Council Vietnam (2021)
Lam Dong Cultural Map	Documenting sacred sites, integrating oral stories of the K'Ho and Mạ people	Interactive map, audio-visual	Lam Dong	Reviving community memories, connecting youth with indigenous culture	Tran (2015), Tran (2021), Nguyen (2015)
Virtual Memory Space	Recreating traditional festivals and rituals through 3D models and virtual reality	3D modeling, VR storytelling	Northern and Central Highlands	Instilling cultural pride, creating new emotional symbols	Manovich (2001), Nguyen (2021)
Digitization of Traditional Festivals	Storing video and images of festivals (Giong Festival, Keo Pagoda) on digital platforms	YouTube, multimedia data repository	Nationwide	Transmitting intergenerational knowledge, preventing cultural disruption	Smith (2006), Giaccardi (2012)
Temple of Literature – Quoc Tu Giam Project	Digitizing doctoral stone steles with educational metadata on	Open metadata (explaining symbols, philosophy)	Hanoi	Turning heritage into open educational resources, connecting	Detlor (2010), Astike (2021)

	Confucian philosophy			culture with education	

Table 1. Application of Digital Technology in the Preservation of Indigenous Knowledge in Vietnam

Notes:

- Main Technologies: Standard metadata (Dublin Core, LIDO), VR, 3D modeling, multimedia platforms.

- Trends: Multidimensional data linking, converting heritage into open educational resources, intergenerational connections.

- Key Impacts:

o Revived over 80 oral stories and minority ethnic rituals (Lam Dong Map).

o Open metadata application increased information retrieval by 40% (Temple of Literature Project).

o Over 10,000 views per year for digitized festivals on YouTube.

One of the notable outcomes of the cultural heritage digitization process is the expansion of the scope and format of content converted into digital environments (ISPRS, 2023). Data collected from exemplary projects such as "Digitization of Han-Nom Inscriptions" or "Quang Nam Virtual Museum" show significant diversity in the types of indigenous knowledge being recorded and transformed (Le, 2017; Anh, 2024). Common content includes: folk tales, legends, minority ethnic epics (such as Dam San, Xinh Nha...), folk festivals (Giong Festival, Keo Pagoda Festival), life-cycle rituals (weddings, funerals), traditional crafts (weaving brocade, pottery, blacksmithing), traditional medicine knowledge, seasonal agricultural practices, and environmental knowledge related to forests, rivers, and sacred stones. Notably, many forms of knowledge that were previously only transmitted orally or confined to local villages are now accessible more widely through digital platforms such as interactive cultural maps, digital folk repositories, or multimedia-integrated online museums (British Council Vietnam, 2021; Doan, 2024).

The existence of a community is not only based on its place of residence but is also deeply connected to the cultural memory maintained over time. Digitization projects have opened up opportunities to restore and recreate community memories that were gradually being forgotten. For example, the Lam Dong Cultural Map not only records sacred sites of the K'Ho and Mạ people but also integrates oral stories linked to each location (Tran, 2015; Tran, 2021). This not only helps indigenous communities reconnect with their own cultural values but also provides the younger generation – who are strongly influenced by market culture – an opportunity to reconnect with their ethnic cultural roots (Nguyen, 2015). Furthermore, the ability to create virtual memory spaces through 3D modeling, virtual reality images, and interactive storytelling has contributed to reigniting cultural pride, particularly in ethnic minority communities. According to Manovich (2001) and Nguyen (2021), digital technology is not just a medium for transmitting content but can also establish new "emotional symbols" for cultural entities – a concept that has been applied in several initiatives to preserve folk knowledge in the Northern and Central Highlands of Vietnam.

A key factor in the process of preserving indigenous knowledge through digitization is the ability to access and organize information – which depends on building effective metadata. Projects

such as "Digitization of Han-Nom Inscriptions" have applied international standards like Dublin Core, MODS (Metadata Object Description Schema), or LIDO (Lightweight Information Describing Objects) to tag and organize data. The use of metadata not only helps standardize content descriptions (author, subject, time, location...) but also enables data linking across platforms, allowing users to easily access and search for information. In particular, open metadata fields such as "cultural meaning," "usage context," and "community connections" help recreate cultural depth – something that pure descriptions of images or sounds cannot fully express (Gilliland, 2008; Astike, 2021). In the Temple of Literature – Quoc Tu Giam Project, metadata was extended towards education – with fields explaining Confucian philosophy, the symbolic meanings on the doctoral steles, or the connection between the monument and the feudal education system. This shows that metadata is not only a data management tool but also a means of transmitting indigenous knowledge in the form of open educational resources (Detlor, 2010).

Another positive outcome from digitization efforts is the ability to transmit indigenous knowledge beyond geographical and generational boundaries. Thanks to digital technology, recordings of epics, images of crafts, or 3D simulations of traditional festivals can be stored long-term, shared with the overseas Vietnamese community, or integrated into educational curricula for students. This is especially important as many young people are increasingly disconnected from traditional environments and have fewer opportunities to engage with indigenous cultural activities. Initiatives such as "Digitization of Traditional Festivals on YouTube" or "Folk Festival Map" undertaken by universities and museums have shown how digital technology acts as a bridge across generations, ensuring that indigenous knowledge is not interrupted in the flow of modern times (Smith, 2006; Giaccardi, 2012).

Application in Education

The integration of digital technology into heritage education is becoming an irreversible trend, especially in the context of modern education, which focuses on developing comprehensive skills, critical thinking, and connections to cultural and social practices. In Vietnam, digital cultural heritage platforms are gradually asserting their role as an open educational resource ecosystem, making indigenous knowledge more dynamic and effective in the classroom than ever before.

Project/Platform Name	Description	Technology Used	Location	Educational Impact	References
Sa Huynh – Champa Virtual Museum	3D artifact database with multilingual videos (Vietnamese, English, Cham)	3D modeling, multilingual video	Quang Nam	Supports teaching local history and culture	Hoang (2020), May (2022), Tieu (2025)
Lam Dong Cultural Map	Integration of sound and image	Digital map,	Lam Dong	Teaches Geography, Literature	Tran (2021),

	markers with K'Ho customs	audio-visual		in mountainous schools	Anh (2024)
"Students Tell Heritage Stories"	Students record videos of local monuments, upload to digital museum platform	Digital storytelling, digital platform	Hanoi	Increases cultural awareness, develops technology skills and critical thinking	Giaccardi (2012)
Virtual Museum (VR360)	Virtual tours of monuments (Temple of Literature, National History Museum, etc.)	VR360, gamification (quizzes, challenges)	Nationwide	Increases knowledge retention by 76%, higher learning engagement than traditional methods	Detlor (2010), CESTI (2023), Hong (2025)
Interdisciplinary Teaching in Phu Yen	Combining Literature, Technology, History: students create 3D videos of legends	3D software, video creation	Phu Yen	Better content retention, pride in national history	Tran (2022), Thai (2024)
Open Learning Platform (YouTube, AR/VR)	Provides heritage resources for informal education and lifelong learning	AR tour, VR game, podcast, documentary film	Nationwide/International	Expands learning opportunities, connects culture for overseas Vietnamese	UNESCO (2003), Smith (2006)

Table 2. Application of Digital Technology in Heritage Education in Vietnam

Notes:

• Main technologies: VR (Virtual Reality), AR (Augmented Reality), 3D modeling, Gamification.

• Trends: Active learning, personalized experiences, interdisciplinary.

- Effectiveness: 76% increase in knowledge retention (CESTI, 2023), 83% of students more engaged (survey in Ho Chi Minh City).

One of the prominent contributions of the digitalization of heritage is the creation of rich educational resources in various forms: documentary videos, virtual reality (VR) simulations, interactive 3D models, digital cultural maps, podcasts of folk storytelling, and high-resolution image libraries (Ioannides et al., 2018; Ioannides & Žarnić, 2020; Zhang & Park, 2023). These resources not only help students access cultural phenomena that were previously confined to physical spaces, but also stimulate learning enthusiasm through multisensory experiences.

For example, in Quang Nam province, the "Virtual Museum of Sa Huynh and Champa Culture" project provides a 3D database of artifacts, accompanied by captions and videos in three languages (Vietnamese, English, Cham), thus supporting local schools in teaching history and local culture (Hoang, 2020; May, 2022; Tieu, 2025). Similarly, the Lam Dong Cultural Map integrates audio-visual markers and images of K'Ho customs, which are used as a learning tool in Geography and Literature subjects in schools in mountainous regions (Tran, 2021; Anh, 2024). Not only do digital resources provide content, but they also allow learners to participate in content creation – for instance, the "Heritage Storytelling by Students" project in Hanoi, where students use their phones to record short videos about local monuments and upload them to the school's digital museum platform. Participating in the creative process not only enhances cultural awareness but also develops technology, digital storytelling, and critical thinking skills (Giaccardi, 2012).

An important trend today is the redefinition of the role of museums – from being places that store artifacts to becoming experiential learning spaces. With the development of virtual museums, learners can "visit" historical sites, religious architecture, or rare artifact collections without having to travel to those places. In Vietnam, several museums have developed virtual platforms for educational purposes, notably the National History Museum, the Vietnam Fine Arts Museum, and projects simulating the Temple of Literature – the Imperial Academy using virtual reality (VR360) technology.

According to Detlor (2010), virtual museums provide an "active learning" environment, where users can freely explore, ask questions, and choose a learning path that suits them. The integration of gamification elements – such as quizzes, artifact-finding challenges, or "historical character role-playing" tasks – also helps increase interaction and information retention. Research from a group of History teachers in Vietnam noted that this new approach through virtual museums helps students feel "more engaged" compared to traditional methods, in line with the 83% positive survey results in Ho Chi Minh City. This project uses 3D interactive technology and multimedia materials (CESTI, 2023). Similarly, the research on developing creative capacity through monuments and museums conducted by the Ho Chi Minh City Science and Technology Center (CESTI) confirms that the use of digital heritage (including virtual museums) in Ho Chi Minh City helps students "increase their historical knowledge retention by 76%" and improve their learning experience (Hong, 2025).

A key highlight in applying digital heritage in education is the ability to teach interdisciplinary subjects. Instead of using heritage only in History classes, teachers can now integrate cultural content into other subjects such as Geography (analyzing cultural heritage maps, regional ecosystems), Literature (exploring folk tales, epics), Fine Arts (studying traditional motifs and decorations), and Information Technology (creating 3D models of monuments, making digital storytelling videos). For example, in a high school in Phu Yen province, teachers organized an

interdisciplinary lesson combining Literature, Technology, and History, where students used video-making software to recreate the legend "Le Lai Saves the King" with 3D models of Lam Kinh Monuments built by the students themselves. A post-lesson survey showed that students not only retained the content better but also felt prouder and more connected to the national history (Tran, 2022; Thai, 2024).

Another important contribution of digital heritage to education is the ability to extend learning beyond the classroom. Platforms such as YouTube, mobile apps (AR tours, VR games), or online heritage portals have become resources for informal education and lifelong learning. Adults can learn about traditional festivals, handicrafts, or folk philosophy through podcasts and documentaries; young children can explore museums through interactive games; Vietnamese people abroad can reconnect with their homeland culture through multilingual platforms. According to UNESCO (2003) and Smith (2006), heritage education should not be limited to schools but should be expanded into a broader learning ecosystem – where all citizens can find joy and motivation for lifelong learning. In this context, digital platforms are not only tools for storing knowledge but also "doors" that lead learners to dynamic, personalized, and continuous cultural experiences.

Promoting Cultural Tourism

In the digital age, as travelers' behaviors shift toward seeking personalized, authentic, and culturally rich experiences, the application of digital technology in the field of cultural tourism has become particularly important (Bui & Nguyen, 2007; Chu & Tran, 2016; Pham, 2024). Efforts to digitize cultural heritage in Vietnam not only play a role in preservation and education but also directly contribute to enhancing the attractiveness of destinations, promoting cultural tourism to develop sustainably, intelligently, and inclusively.

Project/Application	Description	Technology Used	Location	Impact/Results	References
Digital Cultural Map	Integrates multimedia (images, videos, sounds) and designs cultural tour routes	Digital map, multimedia, AI recommendation	Lam Dong, Quang Nam, Ho Chi Minh City	68% of domestic tourists use it to enhance their experience	Mai (2024), Minh (2024)
Virtual Museum & Digital Exhibitions	Visit monuments and artifacts through VR360 and interactive 3D models	VR360, 3D modeling, multilingual narration	Nationwide/International	Attracted 100,000 visits from 43 countries (project "Soul of Vietnam")	Manovich (2001), Luong & Doan (2024), Bao (2025)

Digital Cultural Product Promotion	Digitized over 500 handicraft products, integrated multilingual website for tour bookings	E-commerce, video marketing, virtual exhibition	Quang Nam	Cultural tourism searches increased by 25% after 6 months	Vietnam National Administration of Tourism (2015), Ministry of Culture, Sports, and Tourism (2023)
Smart Tourism App	Integrates information on monuments, tour bookings, online feedback (e.g., Hue-S)	AR/VR at the site, Big Data, Social Media	Thua Thien Hue	18% increase in international return visitors, 52% satisfaction with digital experience	HUE CIT (2022), Lien (2024), Detlor (2010)
Digital Tourism Ecosystem	Combines digital culture, smart tourism, and multichannel communication	AI behavior analysis, rating system	Nationwide	Shapes the "experience – learning – interaction" tourism model	Xiao et al. (2018), Srithon (2021)

Table 3. Digital Technology Applications Promoting Cultural Tourism in Vietnam

Notes:

- Key Technologies: VR/AR, AI recommendation, Big Data, Digital Twins.

- Trends: Personalized experience, borderless tourism, comprehensive digital transformation.

- Notable Statistics:

o 68% of domestic tourists use the digital cultural map (Mai & Minh, 2024).

o 25% increase in cultural tourism searches in Quang Nam (Ministry of Culture, Sports, and Tourism, 2023).

o   18% growth in international visitors returning to Hue thanks to the smart app (Lien, 2024).

One of the forms of digitization that is yielding clear results in the field of tourism is digital cultural maps. These maps not only display the locations of monuments and landmarks, but also integrate multimedia content such as photos, videos, historical documents, folk storytelling audio, and travel guides. In several provinces such as Lam Dong, Quang Nam, and Ho Chi Minh City, digital cultural maps help tourists design their own tour routes based on cultural themes such as "The Traditional Handicraft Journey," "Footprints of Ethnic Minorities," or "Monuments Related to the Patriotic Movement." According to research by Mai (2024) and Minh (2024), over 68% of domestic tourists surveyed in Da Lat reported using digital maps to learn about destinations before traveling, with the cultural integration in the map helping them experience a deeper connection with the tourism experience. This demonstrates that digital cultural maps are not only positioning tools but also serve as "digital tour guides" that personalize the journey and provide a deeper cultural exploration.

With the development of virtual museums and digital exhibitions, the concept of "destination" in cultural tourism is expanding beyond geographic boundaries, opening up the possibility of accessing Vietnam's cultural heritage for visitors worldwide. Platforms such as the "Vietnam Fine Arts Museum Online," "Temple of Literature – Quoc Tu Giam VR360," and the digital exhibition "Han-Nom Heritage" have allowed users to visit, interact with, and explore artifacts, architecture, and culture vividly through virtual reality (VR), 3D models, and multilingual narration. Manovich (2001) and Luong & Doan (2024) argue that when culture enters the digital realm, cultural experiences are no longer limited by space or time but become an "interactive stream of information" – where each individual can choose an approach that fits their needs. In tourism, this opens up new possibilities: travelers can "try out" a visit through a virtual museum before the trip, or continue exploring after returning, deepening their connection with the destination. Additionally, virtual museums also serve as bridges for overseas Vietnamese and foreigners interested in Vietnamese culture. The "Soul of Vietnam" digital exhibition project, carried out by a group of students in France, attracted over 100,000 visits from 43 countries, showcasing the potential of "digital culture" in building a global tourism community interested in Vietnam's heritage (Bao, 2025; Ha, 2025).

An important contribution of heritage digitization is its ability to enhance destination communication effectiveness and promote cultural products. Thanks to digital platforms, local knowledge products such as Bau Truc pottery (Ninh Thuan), M'nong ethnic fabric (Dak Nong), or the Then Tay – Nung ritual… are not only preserved digitally but also introduced to tourists through videos, online stores, and virtual exhibitions. Quang Nam province, in its strategy to develop community tourism, has digitized over 500 cultural products from craft villages, linked with tour routes, and launched a multilingual tourism website integrating videos, maps, and tour booking functions. The results show that cultural tourism searches in Quang Nam increased by more than 25% after six months of the digital platform's implementation (Vietnam National Administration of Tourism, 2015; Ministry of Culture, Sports, and Tourism, 2023). According to Xiao et al. (2018) and Srithon (2021), culture is not only symbolically valuable but also an economic resource. Digitization helps localities "turn" local knowledge into unique tourism products while enhancing the destination's competitiveness in the global market.

The convergence of digital culture, smart tourism, and digital communication is reshaping how destinations are built, promoted, and maintain relationships with tourists. Integrated applications

such as smart tourism maps, virtual tour guides, AR/VR technology at the destination, along with online feedback and review systems, create a seamless, multi-dimensional, and personalized travel experience. In Hue, the "Hue-S" app integrates information about monuments, festivals, cultural tours, weather, restaurants, hotels, and online feedback, while also connecting with social media platforms to support destination communication (HUE CIT, 2022). Data from the Thua Thien Hue Department of Tourism shows that international repeat visitors increased by 18% after the implementation of the smart tourism ecosystem, with 52% stating that they were attracted by the "modern, easy-to-access digitalized cultural experience" (Lien, 2024). This demonstrates that the role of digital technology is not just in "supporting" promotion, but is becoming the core "soft infrastructure" of cultural tourism development strategies. According to Detlor (2010), the integration of cultural information and digital technology is the key to building communication capacity for cultural destinations, aiming for the "experience – learning – interaction" tourism model.

Discussion

The results of surveys, case studies, and current practices show that the digitization of cultural heritage is not just a tool for preservation, but also an important platform that creates new value, serving not only conservation but also bringing practical benefits to other fields such as education and tourism. However, there are also many challenges that require policy adjustments as well as increased interdisciplinary cooperation to develop sustainable and effective cultural digitization models. As analyzed in the results section, cultural heritage digitization in Vietnam can be seen as a development model with three pillars: preservation, education, and tourism.

Area	Specific Benefits	Examples
Preservation	- Creation of sustainable databases	3D model of Hoi An Old Town
Education	- Visual access through VR/AR	Virtual museums, interactive videos
Tourism	- Development of smart tourism	Digital cultural maps, mobile apps

Table 4. Benefits of Cultural Heritage Digitization

Source: Author's synthesis

These three elements are not only strongly interconnected but also support each other in the process of sustainable development. The combination of digitization and preservation provides a solid foundation for protecting and maintaining local cultural values, while digitization allows for more effective preservation of folk knowledge compared to traditional methods. In education, digitization not only introduces new approaches but also supports the development of diverse and rich teaching programs. Digital tools such as virtual museums, 3D models, videos, and VR/AR experiences help students engage with cultural heritage in a visual and vivid manner, enhancing their understanding and appreciation of national heritage (VR3D.vn, 2021). This is one of the clear benefits of cultural heritage digitization in education. For tourism, digitization of cultural heritage has opened up opportunities for developing smart cultural tourism, allowing tourists to not only learn about destinations before traveling but also participate in online experiences, visit virtual museums, or engage in interactive tours. Tools like digital cultural maps, mobile apps supporting smart tourism, and online feedback systems create a comprehensive and personalized tourism experience (Smithsonian Institution, 2023). Moreover, the development of digital platforms helps promote unique cultural products from each locality, which is an important factor in enhancing the competitiveness of local tourism.

One of the key findings from the research is that the role of digitization extends beyond simply storing and preserving cultural heritage. Digitization brings new value in education and tourism, as mentioned in the results section. In education, the application of digitization helps expand the scope of teaching cultural heritage from theoretical learning in textbooks to direct experiences and interactions with cultural elements through digital platforms (Time Machine Organization, 2023). For example, virtual museums not only allow students to access artifacts but also enable them to learn about the history, art, and customs of ethnic groups in an online learning environment, especially during the COVID-19 pandemic when in-person learning was challenging. In tourism, digitization plays an important role in introducing and promoting cultural heritage to tourists, especially international visitors. Mobile apps, virtual museums, and other online tools help tourists better understand local culture, enabling them to make decisions about choosing destinations that match their personal preferences (Kim & Lee, 2021; Choi, 2021). Furthermore, the digitization of heritage helps tourism businesses enhance their access to customers while providing new services such as virtual tourism or smart tourism, thereby promoting the growth of this industry (Gonzalez-Jorge et al., 2024).

Although the benefits of cultural heritage digitization are clear, there are still significant challenges that need to be addressed during the implementation and development of this model.

No.	Challenge	Proposed Solution
1	Lack of interdisciplinary human resources	Training that combines culture and technology
2	Lack of metadata standards	Building a standardized system
3	Limited interdisciplinary cooperation	Multi-sector coordination mechanisms

Table 5. Challenges in Heritage Digitization

Source: Author's synthesis

(1) Lack of Human Resources Understanding Both Culture and Technology: One of the major challenges in cultural heritage digitization in Vietnam is the shortage of personnel with the necessary knowledge and skills to carry out this work (Nguyen, 2020; Vietnamese Government, 2020). Digitizing heritage is not simply about using technology; it requires a deep understanding of culture, tradition, and local history. The workforce needs to be able to combine digital techniques with cultural knowledge to create digital products that are both contentually accurate and visually appealing (Nguyen et al., 2025).

(2) Lack of Metadata Standards and Systematic Unity: Another major challenge is the lack of consistency in the development and application of metadata standards for cultural digital platforms. Metadata is a crucial element for organizing, classifying, and retrieving cultural heritage information. The absence of a standardized metadata system makes the digitization process difficult and inefficient, as each digitization project may use different standards, leading to data inconsistencies and limiting the connectivity between digital platforms (Manmart et al., 2012).

(3) Need for Supportive Policies and Interdisciplinary Collaboration: A key factor for ensuring the success of cultural heritage digitization efforts is support from the government and relevant organizations. Supportive policies in areas such as funding, human resources training, and encouraging research will promote digitization activities. Furthermore, collaboration among

sectors such as culture, technology, education, and tourism is essential to creating a sustainable digital ecosystem (Matrone et al., 2022).

Suggestions for Developing Cultural Heritage Digitization

Solution	Implementation Method	Relevant Partners
Cultural Information Ecosystem	- Open data-sharing platforms	Cultural agencies, researchers
Three-way Collaboration Model	- Connect museums, schools, and tourism businesses	Museums, schools, tourism businesses

Table 6. Development Solutions

Source: Author's synthesis

(1) Develop a Community Cultural Information Ecosystem: To address the challenges mentioned above, one suggestion is to build and develop a community cultural information ecosystem where cultural heritage data is shared, stored, and managed in a unified way. Ethnic minority communities, cultural organizations, and researchers can contribute to this ecosystem, ensuring the accuracy and diversity of cultural information. This ecosystem not only helps preserve heritage but also supports the development of new applications based on digitized information.

(2) Enhance Cooperation Between Museums, Schools, and Tourism Businesses: Finally, to promote the application of digital cultural heritage in education and tourism, cooperation between museums, schools, and tourism businesses should be strengthened. Museums can serve as valuable resources for teaching heritage, while tourism businesses can use these resources to develop new tourism products. Collaboration between these parties will help ensure that cultural heritage is not only preserved but also becomes a resource for community and local economic development.

Conclusion and Recommendations

The digitization of cultural heritage is becoming an increasingly significant factor in preserving and promoting the values of national culture, particularly in the context of globalization and the development of information technology. Through the research process, it can be affirmed that digitization not only plays a pivotal role in safeguarding indigenous knowledge but also exerts a positive impact on the fields of education and cultural tourism. Digitization projects, ranging from virtual museums to digital cultural maps, offer profound and sustainable value, bridging the gap between the past and present, between communities and generations, while simultaneously creating new development opportunities for local communities and the economy.

(1) Preserving and Disseminating Indigenous Knowledge:

Digitizing cultural heritage plays a critical role in preserving and disseminating indigenous knowledge, helping to maintain national cultural values in the face of time and social transformation. Forms of digitization such as virtual museums, online platforms, and metadata documentation help record and safeguard cultural heritage at risk of fading, while also providing an effective tool for spreading this knowledge to both domestic and international communities. Storing cultural materials in digital form not only protects them from deterioration over time but also creates an easily accessible and shareable knowledge repository.

(2) Supporting Local Education and Lifelong Learning:

One of the most significant benefits of digitization lies in its support for education and lifelong learning. Digital platforms for cultural heritage—ranging from educational videos and virtual museums to VR/AR models—create opportunities for students to access cultural heritage beyond local boundaries and on a global scale. These digital tools allow students not only to learn theory but also to engage directly, learn through simulations, and interact with cultural artifacts. This not only enriches learning content but also fosters a spirit of self-directed learning and exploration throughout the educational journey.

(3) Enriching Content and Experience for Cultural Tourism:

Digitizing cultural heritage also plays an important role in developing sustainable cultural tourism. Digital platforms such as virtual museums, digital exhibitions, and online cultural maps not only provide extensive information about cultural landmarks but also offer unique tourism experiences, especially for international visitors. Tourists can explore cultural destinations virtually before physically visiting, while also gaining insight into the history and cultural values of the locations they plan to visit. This not only enriches tourists' experiences but also enhances the competitiveness of local tourism.

To maximize the potential of cultural heritage digitization in Vietnam, concrete measures and long-term strategies are required. Below are several recommendations aimed at promoting the future development of this field:

(1) Investing in Local Digitization Infrastructure:

One of the key factors for the success of cultural heritage digitization projects is investment in local digitization infrastructure. Localities need digitization centers equipped with adequate technology and qualified personnel to carry out digitization work. Investing in advanced technologies such as VR, AR, and 3D simulation tools will enhance the quality of digital resources and produce creative and accessible products for the community. At the same time, training human resources with skills in digitization and cultural data management must be prioritized.

(2) Standardizing Metadata and Information Retrieval Systems:

A major issue in the implementation of cultural heritage digitization is the lack of standardization in metadata and information retrieval systems. The absence of unified metadata standards complicates data storage and searching, limiting the ability to connect and share data across different platforms. Therefore, the development and application of a standardized metadata system are essential to ensure consistency and synchronization in the digitization process. Relevant authorities and research organizations should collaborate to develop a unified, easily accessible, and updatable metadata system.

(3) Integrating Digitized Heritage into Educational Curricula and Tourism Products:

One important recommendation is the close integration of digitized cultural heritage with educational programs and tourism products. Virtual museums and digital platforms should be incorporated into school curricula, enabling students to access cultural heritage more easily and visually. At the same time, integrating digitized heritage into tourism products will increase the perceived value of heritage among tourists, thereby contributing to the development of cultural tourism.

Tourism businesses and educational institutions need to collaborate closely to develop smart tourism products, where travelers can use digital platforms to learn about the history, culture, and key destinations of their journeys. This not only enriches the tourist experience but also allows localities to fully leverage the value of cultural heritage in sustainable tourism development.

In summary, the digitization of cultural heritage is not only a method for heritage preservation but also a powerful tool for disseminating indigenous knowledge, supporting education, and enriching cultural tourism experiences. However, to achieve this goal, Vietnam needs to implement comprehensive investment strategies in digitization infrastructure, standardize metadata systems, and integrate digitized heritage into educational and tourism programs. Doing so will not only preserve and promote the value of cultural heritage but also create sustainable development opportunities for communities and the economy.

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