
Digital Ethnography and Spatial Production in Ethnic Minority Village Spaces

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Abstract

This survey paper investigates the complex interplay between spatial production, spatial media, and cultural communication within ethnic minority village contexts, emphasizing the transformative role of digital technologies in cultural heritage preservation. By applying spatial production theory, the study explores the impact of globalization, modernization, and socio-political forces on village spaces, highlighting the significant influence of media technologies on cultural information dissemination and representation. The survey underscores the importance of digital ethnography as a methodological approach, offering advantages in documenting intangible cultural heritage while addressing ethical considerations in vulnerable communities. Through case studies, the research demonstrates the innovative application of digital tools, such as augmented reality and AI-driven platforms, in enhancing cultural heritage preservation and representation. The findings advocate for a holistic approach that integrates digital and traditional practices, emphasizing community-driven solutions and the need for interdisciplinary research to address the evolving challenges and opportunities in cultural heritage preservation. By fostering inclusivity and collaboration, the study contributes to a more authentic and diverse cultural landscape, ensuring that ethnic minority cultural narratives are preserved and transmitted to future generations.

1 Introduction

1.1 Structure of the Survey

This survey is structured to guide readers through the exploration of digital ethnography and spatial production within ethnic minority village spaces. The initial section introduces core themes, emphasizing the significance of spatial production, spatial media, and cultural communication in preserving ethnic minority cultures. Following this introduction, the survey outlines essential concepts and theoretical frameworks, drawing on existing literature to define key terms and methodologies.

Subsequent sections analyze the application of spatial production theory to village spaces, highlighting the effects of globalization, modernization, and socio-political forces on these communities [1]. The role of spatial media in cultural communication is examined, focusing on how media technologies influence the dissemination and representation of cultural information [2], and discussing the challenges and opportunities these technologies present.

An in-depth examination of digital ethnography as a methodological framework for researching cultural heritage preservation is presented, showcasing its unique advantages, such as enhanced participant engagement and innovative data collection techniques. The discussion also addresses significant challenges, including ethical dilemmas and complexities in researching vulnerable communities, emphasizing the need for researchers to navigate ethical considerations respectfully and inclusively, thereby enriching the understanding of cultural heritage in the digital age [3, 4, 5, 6, 7]. Case studies and examples illustrate these theoretical and methodological discussions, highlighting diverse ethnic minority groups and village contexts.

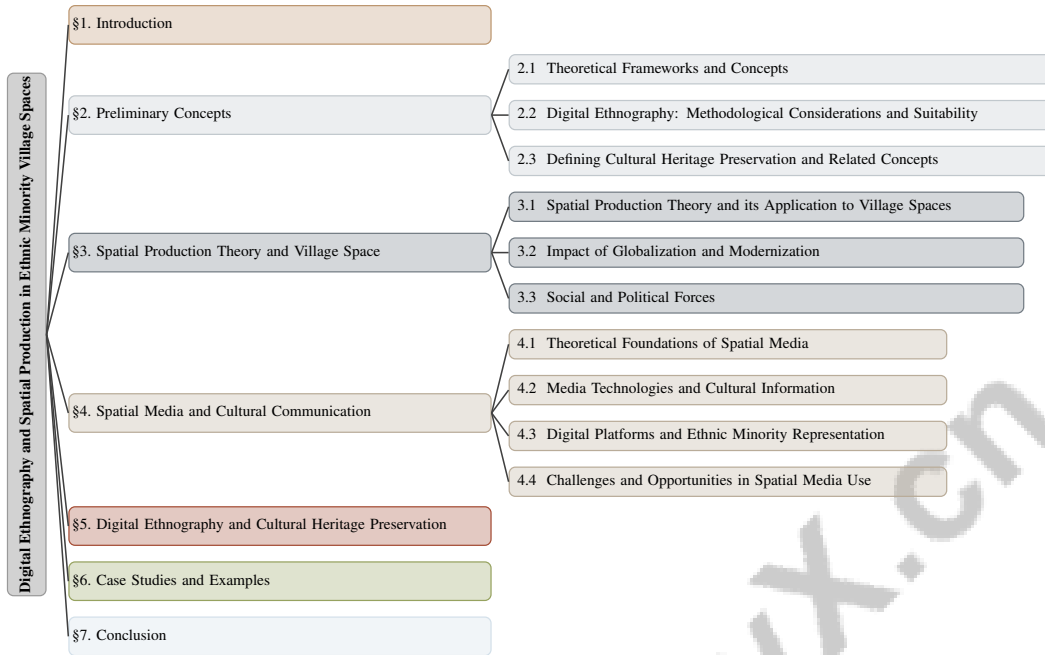


Figure 1: chapter structure

1.2 Overview of Key Findings

This survey reveals a complex interplay between spatial production, spatial media, and cultural communication within ethnic minority village contexts. The application of spatial production theory elucidates the significant impact of globalization, modernization, and socio-political forces on community spatial organization [1]. Analysis indicates that media technologies play a crucial role in shaping the creation and dissemination of cultural information, influencing the representation of ethnic minorities on digital platforms [2]. The study underscores the importance of digital ethnography in documenting and preserving intangible cultural heritage, while recognizing the challenges and ethical considerations of researching vulnerable populations.

Findings advocate for a holistic approach to cultural heritage preservation, which includes safeguarding intangible heritage, promoting community-led tourism initiatives, and addressing socio-economic disparities [8]. The integration of digital technologies enhances the efficiency and effectiveness of preservation efforts [1], aligning with the need for adaptive strategies that reflect the dynamic nature of traditional villages [9]. The research explores cultural variation and sustainability within inter-ethnic interactions, particularly the challenges faced by minority cultures [10].

Moreover, the study contributes to the growing body of research on digital ethnography, emphasizing the value of combining participant observation with technical walkthroughs for a comprehensive understanding of sociotechnical dynamics within communities of practice [3]. It suggests the necessity for future research to develop systematic frameworks that address the evolving needs of cultural heritage preservation in the digital age [9]. The potential of AI to transform digital humanities research and enhance efficiency in cultural heritage preservation is also discussed [11]. The survey acknowledges the importance of ethical guidelines and potential risks associated with emerging technologies like XR, as highlighted in related studies [12]. Finally, the study contributes to a broader understanding of how technological advancements are reshaping research methodologies and epistemologies in geography [13]. The following sections are organized as shown in Figure 1.

2 Preliminary Concepts

2.1 Theoretical Frameworks and Concepts

Our analysis of spatial production, spatial media, and cultural communication in ethnic minority villages draws upon diverse theoretical frameworks. Lefebvre's humanist Marxism provides a critical

lens for examining social relations and spatial dynamics, highlighting space as a social construct shaped by interactions, practices, and economic activities [3]. Within spatial media studies, digital environments are interpreted as socially produced spaces, necessitating an exploration of their geographies and governing rules [13]. This aligns with theories emphasizing the relational nature of economic actions within social and institutional contexts [14], crucial for understanding digital technology's influence on spatial dynamics in these villages. Communication, a dynamic process underpinning social structures and individual consciousness [15], challenges traditional representation in spatial media, advocating a shift from object-oriented to process-oriented approaches in cultural expression and preservation, especially within institutions like museums requiring adaptive frameworks for new media art [16]. A critical media literacy perspective promotes the creation of authentic, self-authored digital media representing ethnic minorities, shaping inclusive narratives [17, 1]. Current research themes, including spatial patterns, evaluation methods, and tourism development, highlight stakeholder involvement and methodological diversity [18], complemented by frameworks examining the impacts of cultural heritage conservation on tourism and climate change, emphasizing sustainability and community engagement [19]. Evolutionary anthropology and cultural transmission models offer insights into cultural norms within group-structured populations, crucial for understanding the transmission and evolution of practices in ethnic minority communities [11]. Phenomenological and poststructuralist perspectives offer nuanced analyses of embodied spaces connected through mobile interfaces, examining how spatial media fosters cultural communication and transcends physical boundaries for cultural exchange [13]. The indexical perspective highlights the gap between online and offline realms in digital culture, while dimensions like territory, place, scale, network, and temporality are vital for analyzing rural transformation's socio-spatial dynamics [20, 21]. These frameworks provide a robust foundation for analyzing the interplay between spatial production, spatial media, and cultural communication in ethnic minority villages, emphasizing inclusive representation and methodological diversity in cultural heritage preservation [1].

2.2 Digital Ethnography: Methodological Considerations and Suitability

Digital ethnography adapts traditional ethnographic methods to digital environments, making it suitable for studying cultural heritage preservation in ethnic minority communities. This methodology emphasizes participant observation and interviews within digital spaces, a practice highlighted during the pandemic [2]. The concept of 'anthropology from home' illustrates digital ethnography's adaptability, allowing remote community engagement and broadening ethnographic inquiry [22]. Its suitability is enhanced by integrating advanced technologies, such as augmented reality (AR), which provides immersive experiences deepening understanding of cultural narratives [23]. Digital ethnography captures nuanced socio-cultural dynamics by employing visual methods and addressing ethical considerations essential for accurate representation and preservation of cultural narratives. Its flexibility is crucial for developing research agendas in digital anthropology, offering comprehensive insights into cultural practices in the digital age [20]. This is particularly beneficial in rural settings where information and communication technologies (ICT) significantly impact cultural heritage preservation efforts, providing insights into socio-economic factors influencing these communities and contributing to sustainable conservation strategies. Ethical considerations are paramount, especially when researching vulnerable communities. Ethical frameworks guide researchers in navigating power dynamics, consent, and representation, ensuring respect for the unique challenges of these populations [6, 5, 7]. Researchers must address ethical dilemmas posed by rapid technological integration, upholding participants' rights and dignity. This emphasis on ethical decision-making fosters a holistic understanding of cultural practices within ethnic minority communities.

2.3 Defining Cultural Heritage Preservation and Related Concepts

Cultural heritage preservation involves safeguarding tangible and intangible cultural elements from degradation. In ethnic minority contexts, this is vital for protecting cultural practices, expressions, knowledge, and skills integral to community identity [24]. Intangible Cultural Heritage (ICH) encompasses non-physical aspects, presenting unique preservation challenges due to traditional documentation methods often relying on 2D imagery [25]. The vague definitions and complexities surrounding ICH, particularly in tourism, underscore the need for clarity [18]. 'Spatial dynamics' refers to the interplay of social, economic, and political forces shaping the organization and cultural landscapes of ethnic minority villages, essential for understanding how cultural expressions manifest and evolve across physical and digital spaces. Digital technologies play a pivotal role, offering

innovative methods for documenting and visualizing cultural narratives, although challenges remain in integrating new technologies into traditional practices [24]. 'Cultural expression' encompasses diverse ways communities articulate their cultural identity. Misrepresentation in mainstream media can adversely affect multicultural education and the authenticity of these expressions, emphasizing the need for accurate and inclusive representation [17]. Political appropriation of heritage can prioritize state narratives, complicating the representation and preservation of ethnic minority cultures [19]. Cultural preservation efforts must address challenges posed by fragmented and heterogeneous data in heritage management, complicating documentation and restoration processes [25]. Advanced digital technologies, such as augmented reality, offer promising solutions by providing immersive experiences that enhance understanding of cultural narratives and contribute to their preservation [26]. These technologies highlight the importance of innovative approaches that resonate with contemporary audiences and facilitate the preservation of cultural heritage in modern contexts. The preservation of cultural heritage is further enriched by concepts like 'ephemeral mobilities,' referring to fleeting interactions and experiences in digital ethnographic contexts, particularly on social media [27]. Leveraging these frameworks and addressing ethical dilemmas and power dynamics in visual ethnography allows for effectively tailored cultural heritage preservation efforts to safeguard and transmit cultural narratives for future generations.

In examining the intricate dynamics of spatial production theory, it is essential to understand the hierarchical structure of key concepts and relationships that shape village spaces. Figure 2 illustrates this structure, highlighting the influence of globalization, modernization, and various social and political forces. The figure categorizes the main ideas into three primary areas: the application of spatial production theory to village spaces, the impact of globalization and modernization, and the role of social and political forces. Each of these areas is further divided into detailed subcategories and specific elements, providing a comprehensive overview that enhances our understanding of the subject matter. This visual representation not only complements our discussion but also serves as a valuable tool for synthesizing the complex interactions at play in the study of spatial production theory.

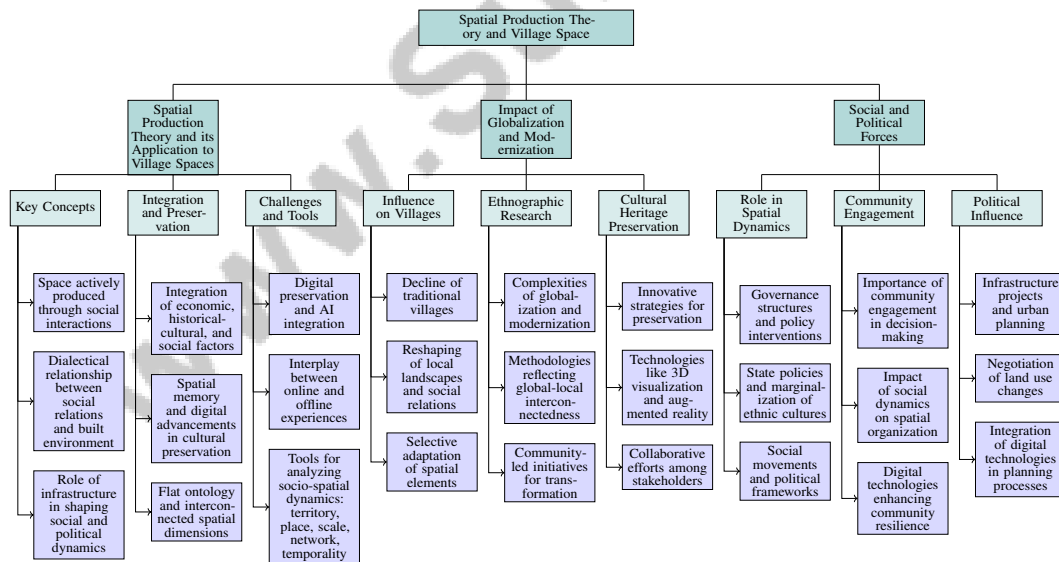


Figure 2: This figure illustrates the hierarchical structure of key concepts and relationships in the study of spatial production theory and its impact on village spaces, highlighting the influence of globalization, modernization, and social and political forces. The chart categorizes the main ideas into three primary areas: the application of spatial production theory to village spaces, the impact of globalization and modernization, and the role of social and political forces, each further divided into detailed subcategories and specific elements.

3 Spatial Production Theory and Village Space

3.1 Spatial Production Theory and its Application to Village Spaces

Spatial production theory provides a critical framework for understanding the dynamics of village spaces, especially in ethnic minority regions. It posits that space is actively produced through social interactions, aligning with Lefebvre's concept of the dialectical relationship between social relations and the built environment [28]. In these villages, infrastructure such as transportation and communication systems plays a pivotal role in shaping social and political dynamics [29]. Integrating economic, historical-cultural, and social factors, as seen in hybrid models for renovation prioritization, allows for a nuanced understanding of spatial production that respects cultural sensitivities and promotes economic sustainability [30].

As illustrated in Figure 3, the application of spatial production theory in village spaces highlights the roles of infrastructure, digital integration, and socio-spatial dynamics in shaping rural transformation and cultural preservation. Research underscores the importance of spatial memory in preserving cultural narratives, especially with digital advancements [31]. The integration of digital networks with traditional landscape restoration further enhances preservation efforts [1]. A shift towards a flat ontology offers an egalitarian perspective on spatial production, emphasizing interconnected spatial dimensions [32]. Combining traditional and digital ethnographic methods allows for a thorough examination of both stable online communities and dynamic interactions in meta-fields [4, 3]. The challenges of digital preservation and AI integration highlight the need for innovative approaches to spatial production and cultural heritage preservation [11]. Understanding the interplay between online and offline experiences is crucial for a comprehensive view of spatial production [20]. Concepts like territory, place, scale, network, and temporality provide robust tools for analyzing rural transformation's socio-spatial dynamics [21].

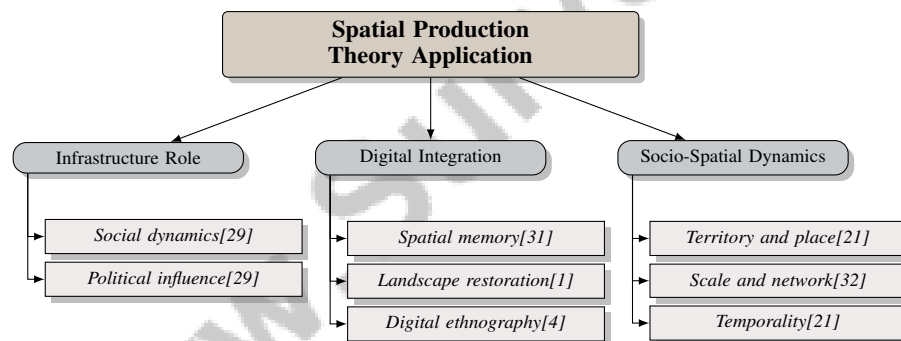


Figure 3: This figure illustrates the application of spatial production theory in village spaces, highlighting the roles of infrastructure, digital integration, and socio-spatial dynamics in shaping rural transformation and cultural preservation.

3.2 Impact of Globalization and Modernization

Globalization and modernization significantly influence the spatial organization and cultural dynamics of ethnic minority villages, often leading to the decline of traditional villages as urbanization disrupts spatial memory and cultural inheritance [33]. The integration of global economic systems and modern infrastructure reshapes local landscapes, altering social relations and cultural practices. Multiview stereo depth methods exemplify the selective adaptation of spatial elements in response to global influences [34].

Ethnographic research must navigate the complexities of globalization and modernization, which challenge traditional field site boundaries and require methodologies that reflect global-local interconnectedness [35]. Ethnic minority villages actively engage in shaping their transformation through community-led initiatives [21], crucial for preserving cultural heritage and promoting sustainable development amid external pressures.

The interaction of globalization, modernization, and spatial organization necessitates innovative strategies in cultural heritage preservation. Technologies like 3D visualization and augmented

reality enable documentation and engagement with cultural heritage, ensuring its relevance for future generations. Collaborative efforts among stakeholders are essential to address fragmented data and resource allocation challenges in cultural heritage management [36, 24, 37, 15, 38]. By merging traditional practices with modern technologies, communities can enhance resilience and safeguard their cultural identity against global influences.

3.3 Social and Political Forces

Social and political forces play a significant role in shaping the spatial dynamics and cultural landscapes of ethnic minority villages. These forces operate through governance structures, policy interventions, and community-led initiatives. State policies prioritizing economic development often marginalize ethnic minority cultures and their spatial practices, complicating representation and preservation [19].

The interaction between social forces and political structures is crucial for cultural heritage preservation, influencing efforts to maintain vital cultural assets. Social movements advocating for heritage protection may face support or obstacles from political frameworks that dictate funding and regulations. The discovery of historical artifacts can highlight past economic and political relationships, emphasizing interdisciplinary collaboration to respect and preserve cultural heritage [36, 38]. Community engagement in decision-making ensures development projects align with cultural values and needs, fostering ownership and empowerment among residents.

Social dynamics, including kinship networks and hierarchies, affect spatial organization and land use practices, dictating resource distribution and access to communal spaces. The incorporation of digital technologies into social frameworks enhances community resilience and opens avenues for cultural expression through social media and digital preservation initiatives [20, 11].

Political forces shape village spatial development through infrastructure projects and urban planning, as seen in the interaction between government actions and community responses. Traditional autonomous organizations often negotiate land use changes, utilizing "maneuver spaces" to advocate for their interests. The integration of digital technologies facilitates traditional landscape restoration and enhances community engagement in planning processes. Thus, a comprehensive approach combining political strategies, community networks, and technological advancements is essential for redefining village spaces amidst urbanization, advocating for tailored rural development policies that respect cultural heritage [1, 33, 21].

4 Spatial Media and Cultural Communication

4.1 Theoretical Foundations of Spatial Media

Spatial media theory is underpinned by the works of Henri Bergson, Gilles Deleuze, and Bruno Latour, who collectively provide a framework for understanding media spaces as intricate networks of relations [29]. Bergson's exploration of time and memory, Deleuze's ideas on difference and repetition, and Latour's actor-network theory highlight the complex interactions that transcend traditional boundaries. Ethnographic research now adopts a practices-based approach to capture the fluidity inherent in digital environments [39]. This approach embeds media practices within social contexts, influencing cultural communication and representation, and reveals how spatial media enable communities to express their identities across both physical and digital realms [20].

As illustrated in Figure 4, the theoretical foundations of spatial media are categorized by influential theories, research approaches, and cultural impacts drawn from the seminal works of Bergson, Deleuze, Latour, and others. This figure highlights the integration of practices-based research and multidisciplinary methods essential for understanding cultural communication and identity expression in both digital and physical spaces.

A multidisciplinary approach, integrating philosophy, ethnography, and digital studies, is crucial for understanding how media technologies impact cultural communication, particularly in ethnic minority communities where media practices are vital for preserving cultural heritage. By incorporating digital ethnography and media geography, we gain insights into how these communities represent their identities in varied spaces, emphasizing the role of ephemeral media mobilities and alternative digital representations in fostering multicultural understanding and agency [40, 39, 41, 27].

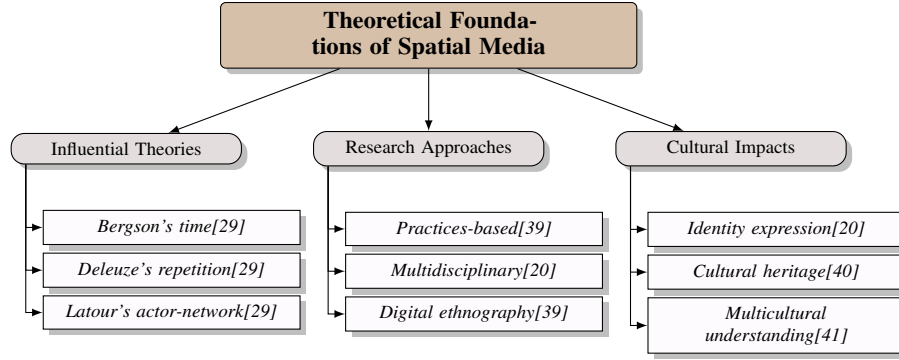


Figure 4: This figure illustrates the theoretical foundations of spatial media, categorizing influential theories, research approaches, and cultural impacts drawn from seminal works by Bergson, Deleuze, Latour, and others. It highlights the integration of practices-based research and multidisciplinary methods to understand cultural communication and identity expression in digital and physical spaces.

4.2 Media Technologies and Cultural Information

Media technologies significantly shape the production and dissemination of cultural information within ethnic minority communities. Advanced tools like generative AI and immersive 3D applications enhance cultural expression, allowing broader outreach and innovative preservation of cultural narratives. For instance, language models aid in processing ancient texts, while augmented and virtual reality create interactive experiences with intangible cultural heritage, promoting academic innovation and cross-cultural research [24, 37, 11].

The transition from traditional, linear information dissemination to interactive, participatory approaches is evident in digital storytelling, virtual, and augmented reality, offering immersive experiences that deepen cultural heritage understanding [23]. Such technologies democratize cultural production, empowering communities to self-represent and ensure authenticity, challenging dominant narratives and contributing to a diverse cultural landscape [17]. However, challenges like misrepresentation and cultural appropriation necessitate ethical considerations to respect and accurately portray cultural narratives [19]. Addressing digital divides is also crucial to ensure equitable access to these technologies.

4.3 Digital Platforms and Ethnic Minority Representation

Digital platforms are pivotal in mediating cultural expression and representation for ethnic minority communities, enabling them to articulate their identities and challenge dominant discourses [17]. These platforms facilitate participatory cultural expression, with social media playing a key role in sharing content, fostering dialogue, and creating networks that transcend geographic boundaries [20]. This connectivity enhances community solidarity and visibility in the digital realm.

However, digital inequality and access remain significant barriers, as not all communities have equal access to necessary technological resources [1]. The commercial and algorithmic nature of platforms can skew visibility, potentially marginalizing minority voices and leading to commodification or misrepresentation of cultural expressions [19]. Ethical considerations are critical, requiring a nuanced understanding of cultural contexts and a commitment to ethical media practices [2]. Recognizing the agency of ethnic minorities in shaping their representations and addressing power dynamics affecting their control over cultural narratives is essential.

4.4 Challenges and Opportunities in Spatial Media Use

Spatial media offer both challenges and opportunities for ethnic minority communities in cultural communication. The digital divide, marked by disparities in technology access and literacy, hinders effective cultural expression and preservation [1], potentially exacerbating existing inequalities. Additionally, platform algorithms often favor mainstream narratives, complicating the visibility and accurate representation of minority cultures [19]. This necessitates critical evaluation of how platforms curate and disseminate cultural content to ensure diverse narratives are represented equitably.

Despite these challenges, spatial media provide significant opportunities for cultural communication. The participatory nature of digital platforms empowers communities to self-represent, creating narratives that reflect their identities and experiences [17], enabling them to challenge stereotypes and contribute to inclusive cultural dialogue. Spatial media also facilitate the preservation and dissemination of intangible cultural heritage through innovative documentation and storytelling tools. Technologies like virtual and augmented reality create immersive experiences that enliven cultural narratives, fostering broader audience engagement [23]. These technologies bridge traditional cultural expressions with contemporary digital mediums, ensuring cultural knowledge transmission across generations. Moreover, spatial media enhance community engagement by connecting dispersed ethnic minority groups through digital networks, fostering collaboration, resource sharing, and advocacy on a global scale [20].

5 Digital Ethnography and Cultural Heritage Preservation

5.1 Advantages and Challenges of Digital Methods in Documenting Intangible Cultural Heritage

Digital methods have revolutionized the documentation of intangible cultural heritage by introducing tools that enhance accuracy and accessibility. Technologies like augmented reality (AR) effectively engage audiences, deepening their understanding and appreciation of cultural narratives, especially in educational settings [23]. These innovations enable ethnic minority groups to authentically portray their cultures, enriching cultural narratives [24]. Techniques such as scan-to-HBIM improve the management and preservation of heritage buildings by providing efficient data management and user-friendly interfaces accessible to non-experts [25].

In rural areas, digital methods counter challenges like depopulation and infrastructure deficits by leveraging platforms to improve community quality of life and promote sustainable conservation strategies [19]. Research highlights the adaptability of rural communities in maintaining cultural identities amidst urban pressures [21]. Digital ethnography allows for continuous engagement with research subjects despite physical barriers, facilitating extensive data collection from various online platforms.

However, the adoption of digital methods is not without challenges. The high cost of AR technology may discourage small organizations from investing, necessitating cost-effective solutions and proof of concept to encourage broader usage [26]. The focus on nationalistic perspectives in intangible cultural heritage (ICH) tourism studies often results in vague definitions, underscoring the need for inclusive frameworks that capture the complexities of cultural heritage [18].

Ethical considerations also pose challenges, particularly in navigating digital ethnography's implications and ensuring informed consent. The emotional aspects of media use and digital interactions demand adherence to ethical frameworks that respect participants' rights and dignity [27]. Moreover, integrating digital methods must address potential risks such as censorship, surveillance, and disruptions to traditional participation norms [24].

5.2 Ethical Considerations in Digital Ethnographic Research within Vulnerable Communities

Conducting digital ethnography in vulnerable communities requires a nuanced understanding of ethical principles to ensure respectful and inclusive research practices. A primary challenge is overcoming technological barriers that may limit participant engagement, especially in communities with restricted digital access [2]. Researchers must create equitable participation opportunities, acknowledging varying degrees of digital literacy among community members. Figure 5 illustrates the primary ethical considerations in digital ethnography within vulnerable communities, focusing on these technological barriers, as well as data management and cultural sensitivity.

The KE method offers practical advantages for cultural heritage diagnostics without complex setups, facilitating digital ethnography in vulnerable contexts [42]. This approach minimizes technological constraints, ensuring research methodologies remain accessible and adaptable to local conditions.

Ethical dilemmas also arise from the potential for overwhelming data collected during online participant observation, complicating analysis and interpretation [22]. Researchers must manage data responsibly, maintaining participants' privacy and confidentiality throughout the research process,

which requires robust data management practices and obtaining informed consent from all participants.

Integrating digital tools in ethnographic research must be approached cautiously to respect traditional cultural practices and expressions, which may be overshadowed by new digital methodologies [6, 20]. This balanced approach is crucial for preserving the authenticity and integrity of cultural narratives while leveraging digital innovations to enhance cultural heritage preservation efforts.

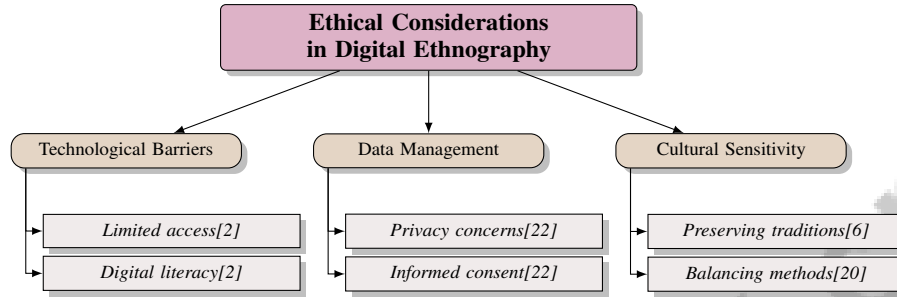


Figure 5: This figure illustrates the primary ethical considerations in digital ethnography within vulnerable communities, focusing on technological barriers, data management, and cultural sensitivity.

6 Case Studies and Examples

6.1 Case Studies and Applications

Case studies offer critical insights into how spatial production, media, and cultural communication intersect within ethnic minority communities, particularly in multicultural settings like Hong Kong. Digital media profoundly affects the perceptions and identities of racial and ethnic minorities, enhancing our understanding of cultural narratives and the mobilities inherent in digital ethnographic practices [13, 13, 35, 27]. These studies underscore the importance of innovative methodologies and digital technologies in cultural heritage preservation, fostering community engagement and sustainability.

A study on ephemeral mobilities in digital ethnography highlights how digital platforms enable dynamic interactions and cultural exchanges, capturing the fluid cultural narratives of ethnic minorities as they navigate their identities online [27]. Additionally, AI-driven platforms for document management reveal how digital technologies can improve access to ancient literature and facilitate cross-cultural communication, bridging cultural gaps and preserving historical narratives [38].

The pandemic has showcased the adaptability and resilience of digital ethnographic approaches in capturing social phenomena, emphasizing the need for methodological diversity to document cultural practices comprehensively [22]. Collectively, these case studies demonstrate the transformative potential of integrating spatial production, media, and cultural communication in cultural heritage preservation. By employing innovative methodologies and fostering inclusive practices, communities can safeguard and transmit their cultural narratives to future generations through technologies like digital storytelling and virtual reality, enhancing accessibility and contextual understanding of cultural heritage [43, 38].

6.2 Digital Technologies in Cultural Heritage Preservation: Case Studies from Diverse Contexts

Diverse case studies highlight the innovative applications of digital technologies in cultural heritage preservation. In Zhangguying village, digital monitoring tools, GIS spatial analysis, and stakeholder interviews demonstrate the potential of digital ethnographic projects to enhance preservation efforts by understanding spatial dynamics and cultural practices [1]. True Augmented Reality (AR) technologies improve visitor interaction and educational value, illustrating the role of digital projects in making heritage sites more accessible and engaging [44].

The Longmen Grottoes case study showcases a deep learning method using autoencoders, enhancing the accuracy and efficiency of heritage documentation [45]. Virtual reality applications, such as those

for bridge diving at Stari Most, illustrate the transformative impact of digital ethnographic projects on cultural heritage preservation, providing multisensory experiences that enrich understanding and appreciation [43].

The scan-to-HBIM method applied in the San Nicola in Montedoro church exemplifies the successful integration of digital technologies, supporting heritage site management and restoration [25]. The KE method further highlights the effectiveness of digital technologies in material analysis, contributing to the preservation and restoration of heritage artifacts [42].

These case studies collectively underscore the transformative potential of digital technologies in cultural heritage preservation. By adopting innovative methodologies and promoting inclusive practices, communities can leverage advanced technologies—such as AI, virtual reality, and digital storytelling—to preserve, celebrate, and transmit their cultural narratives, ensuring meaningful documentation and experience of both tangible and intangible heritage [46, 43, 38, 24, 37].

7 Conclusion

The exploration of spatial production, spatial media, and cultural communication within ethnic minority villages underscores the transformative impact of digital technologies on cultural heritage preservation. This survey highlights the pivotal role of digital tools in enhancing cultural documentation and education, while acknowledging the irreplaceable value of human interactions essential for safeguarding intangible cultural heritage. Empowering ethnic minority communities to self-represent through digital media challenges dominant narratives and promotes inclusivity, enriching the cultural landscape with authenticity and diversity.

The integration of Information and Communication Technology (ICT) is vital for addressing challenges in cultural heritage management, enhancing accessibility for both professionals and the public. Future research should focus on hybrid methodologies that blend digital and traditional practices, examining the evolving nature of intimacy in digital contexts. Community resilience demands tailored strategies that account for cultural and economic aspects, with an emphasis on community-driven solutions in urban planning.

Emerging technologies' effects on social interactions and the sensory body require further exploration, as new mobile media redefine cultural dynamics. A comprehensive approach to understanding and preserving ethnic minority cultural heritage is crucial, recognizing the interconnectedness of social, economic, and cultural influences. By adopting this holistic perspective, future research can develop adaptive strategies to meet the evolving demands of cultural heritage preservation in the digital era.

Interdisciplinary approaches, integrating archaeology, history, and cultural studies, are essential to explore the broader implications of cultural heritage and technology's role in societal development. A reflexive approach to ethics in research, particularly concerning digital communication technologies, is crucial. Additionally, combining meta-fieldwork with contextual fieldwork can deepen the understanding of digital identities and social practices, highlighting the necessity of adapting ethnographic methods to the dynamic digital landscape.

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