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Technology as a Heritage Partner: Balancing Tradition and Innovation in Bát Tràng Pottery Village

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Abstract

This article examines the role of technology in the preservation and development of traditional pottery craft in Bát Tràng Village, Gia Lâm District, Hanoi. Grounded in posthumanist theory, the study approaches technology not as a force opposing tradition, but as a “co-creative partner” within an interactive network of humans, materials, and heritage. Through a case study of Bát Tràng—using field observations and in-depth interviews with workshop owners, artisans, and other stakeholders—the article clarifies how technology, when selectively integrated and respectful of local contexts and indigenous knowledge, can enhance production efficiency, expand creative capacities, and simultaneously maintain the uniqueness and spirit of traditional craft. Bát Tràng represents a dynamic slice of modern Hanoi, where the past, present, and future coexist within hybrid cultural forms that are reshaping urban identity. However, the study also highlights risks, including the erosion of traditional knowledge, product homogenization under market pressures, and over-commercialization. Based on these findings, the article proposes a sustainable technology integration model in which technology does not replace humans but expands the capacity for expression, connection, and heritage transmission. The conclusions contribute to posthumanist theory in the Southeast Asian context and offer practical suggestions for preserving and restructuring traditional craft villages as part of Hanoi’s cultural identity development—an ancient capital now envisioning itself as a regional hub of creative cultural industries.

Keywords: Technology and Cultural Heritage, Hanoi, Bát Tràng, Posthumanism, Innovation, Sustainable Development, Human–Machine Collaboration, Traditional Craft Identity.

Introduction

Located along the banks of the Red River in Gia Lâm District, Hanoi, Bát Tràng Ceramic Village is a prominent symbol of the capital’s cultural space. Established in the 14th century and flourishing under various feudal dynasties—particularly during the Lê era—Bát Tràng has long been regarded not only as a traditional craft village but also as a fundamental component of the historical and cultural identity of Thăng Long – Hanoi. Throughout the capital’s developmental trajectory, Bát Tràng has played the role of a “cultural satellite,” representing the artisanal spirit, folk aesthetics, and indigenous knowledge of the Kinh people of the Red River Delta (Phan Huy Lê et al., 2019; Kikuchi & Kikuchi, 2021).

Bát Tràng ceramics, deeply rooted in Hanoi’s cultural heritage, are renowned not only for their diversity and richness but also for their harmonious integration of traditional artistic essence with modern creativity. Products from Bát Tràng—ranging from household items to decorative objects and ritual utensils—embody unique aesthetic and artistic values, reflecting the intimate

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relationship between people and their surrounding environment. Household wares such as bowls, plates, cups, and teapots serve not only daily functions but also convey artistic value, showcasing the skill and meticulous craftsmanship of Bát Tràng artisans. These items, though utilitarian, always retain aesthetic appeal through a refined combination of practical needs and artistic innovation. In addition, decorative items such as flower vases, ceramic jars, figurines, spiritual animals, and ceramic lamps have become objects imbued with artistic expression, marking the evolution of Bát Tràng ceramics over time. Of particular note are the ritual objects—such as incense burners, offering vessels, and other ceremonial wares—that reflect a deep reverence for spiritual beliefs and religious life, not only among Hanoians but across Vietnam. These items hold not only aesthetic significance but also play a crucial role in preserving and promoting traditional cultural values. Within Hanoi's broader development, Bát Tràng ceramics have played a dual role: sustaining everyday life and contributing to the transmission of cultural heritage. From small souvenirs to large-scale artistic works, Bát Tràng ceramics stand as vivid evidence of the city's ongoing creativity and the enduring link between past and present (Gồm sứ Bảo Khánh, 2024; Gồm sứ Huỳnh Hương, 2024; Gồm sứ Sáng tạo, 2024; Xưởng Gốm Việt, 2024).

Beyond their artistic value, Bát Tràng ceramics also play an indispensable role in Hanoi's economy. These products constitute not only a vital cultural heritage but also the primary source of income for thousands of families within the village, significantly contributing to the capital's economic development. Bát Tràng ceramic wares—including bowls, plates, vases, and decorative statues—have transcended their local context to become sought-after commodities both domestically and internationally, especially among overseas Vietnamese communities. The fusion of traditional handcrafting techniques with contemporary innovation has helped establish a strong and reputable brand identity. With exceptional quality and intricate decorative patterns, these products serve not only as elegant gifts but also as cultural emblems of pride for Hanoians. As such, Bát Tràng ceramics have played an integral role in fostering cultural tourism in Hanoi. Visitors from across Vietnam and abroad are drawn not only to admire the beauty of the products but also to engage in hands-on experiences of traditional ceramic-making processes, from material selection and shaping to glazing and kiln firing (Nguyễn, 2023). The village has emerged as a cultural tourism destination, attracting millions of visitors and making significant contributions to Hanoi's economic growth. This influx has also created employment opportunities and stimulated supporting services such as accommodation, dining, and retail. Furthermore, Bát Tràng ceramics serve as a cultural bridge connecting Hanoi to the global stage. These products are not only consumed domestically but are also exported worldwide, carrying with them the distinctive cultural imagery of both Hanoi and Vietnam. As such, Bát Tràng ceramics are more than just artistic creations; they are cultural symbols that reinforce the value of traditional craft villages within a globalized economy, enriching Vietnam's cultural identity in the process.

However, in the context of globalization and digital transformation, this traditional craft village faces systemic challenges: the encroachment of industrial products, the risk of losing artisanal knowledge, increasing commercial pressures, and significant shifts in the cultural structure of the community. The adoption of technology in ceramic production has become an inevitable trend, yet it raises complex questions regarding the boundary between innovation and preservation, economic growth and cultural heritage conservation.

This paper approaches technology not merely as a technical factor but as a *cultural agent* that reshapes the relationship among people, heritage, and environment in the contemporary cultural

landscape of Hanoi. Through a case study of Bát Tràng Ceramic Village—employing field observation, expert interviews, and theoretical analysis—this study investigates: (1) How is technology currently being applied in Bát Tràng? (2) What are the benefits and consequences for local cultural identity? and (3) How can a suitable technological integration model be developed that balances economic development, cultural preservation, and environmental protection?

This research aspires to offer a new perspective on the interplay between tradition and innovation in the sustainable development of craft villages, while also broadening the multidimensional approach to technology within urban cultural spaces such as Hanoi—a capital city rich in heritage yet undergoing profound transformation in the 21st century.

Understanding the role of technology in the sustainable development of traditional craft villages requires an interdisciplinary lens encompassing production studies, cultural analysis, and heritage research. In the context of globalization and industrialization, many ceramic-making communities worldwide have integrated modern technology into their production processes, not only to increase efficiency but also to preserve cultural value.

Gosselain (1992), for instance, showed that in Bafia, Cameroon, potters combined traditional techniques with modern technologies to meet changing demands while maintaining stylistic traditions. Similarly, García Rosselló (2019) examined the case of Pomaire, Chile, where technologies such as improved kilns and potter's wheels were adopted to enhance product quality without eroding artisanal identity. Winslow (2016) documented the integration of technology in Sri Lanka, which enabled ceramic communities to sustain traditional production rhythms while adapting to the demands of contemporary markets. Beyond production processes, studies such as those by Akilandeewari & Pitchai (2016) highlighted the role of Information and Communication Technologies (ICT) in marketing and product distribution, facilitating broader access to global markets for artisans. In Southeast Asia, Tupamahu et al. (2022) analyzed how ceramic artisans in Polutan (Indonesia) responded to the challenges of the Fourth Industrial Revolution by creating a symbiotic model between technology and indigenous knowledge. Ohimai & Okunna (2016) also noted innovative transformations in the design and function of Ojah ceramic pots in Nigeria, exemplifying the intersection of tradition and innovation in ceramic production.

In Vietnam, Bát Tràng Ceramic Village—one of Hanoi's cultural icons—has undergone a long historical development from the early Lê dynasty to the present, evolving from producing goods for domestic needs to creating high-end products for international markets. Research by Phan Huy Lê (1995) and Nguyễn (2020) indicated that while Bát Tràng has retained its traditional handcrafted methods, it has also actively embraced technical innovation to meet market demands. More recently, studies have reported significant transformations in production processes thanks to the adoption of modern technologies such as 3D ceramic printing (Anikwaa, 2024), and advanced mixing and pressing machines (Eirich, 2024; McLanahan, 2024). These technologies not only optimize productivity but also improve product uniformity and quality. Simultaneously, artisans and businesses in Bát Tràng are intensifying their digital communication efforts, building brands, and expanding international collaboration networks, as analyzed by Nguyễn (2023) and Nguyễn & Lương (2018).

However, it is noteworthy that most current research primarily focuses on the technical aspects and production efficiency, without delving into the cultural and social impacts of the technological integration process, particularly in terms of preserving traditional craftsmanship

knowledge, community identity, and the role of artisans as cultural agents. The relationship between technology and intangible heritage values—such as skills, creative styles, and community interactions—remains a significant research gap. Notably, no studies have approached this issue from a posthumanist perspective, where technology is seen not only as a tool but also as a partner alongside humans and material entities in the creation and preservation of heritage.

In this context, this study aims to fill the gap by exploring how the Bát Tràng craft village—considered a unique cultural space of Hanoi—is reshaping the relationship between humans, technology, and materials. Through this, the research not only clarifies the forms of symbiosis between tradition and innovation but also proposes a human-centered technological application model aimed at the sustainable development of craft villages in the Southeast Asian context.

Methodology

This study is based on theoretical frameworks concerning the preservation of cultural identity in the process of industrial modernization of traditional crafts, specifically the theory of the tradition-modernity interface and the theory of living cultural heritage.

First, according to the theory of the tradition-modernity interface, technological development in traditional craft communities does not necessarily equate to cultural decline, but can be a process of redefining and restructuring cultural identity (Inglehart & Baker, 2000). The integration of technology can lead to new forms of cultural expression, while still maintaining traditional core values if approached consciously and creatively.

Additionally, the approach from UNESCO's theory of living cultural heritage (2003) emphasizes that craft knowledge, craftsmanship skills, and traditional cultural practices must be preserved through intergenerational transmission and flexible adaptation to contemporary social contexts. In this case, technology can serve as a tool to support the "survival" of heritage, provided it does not eliminate the creative and cultural expression space of the community.

The study also draws upon practice theory, particularly Bourdieu's framework, which stresses that cultural practices (such as pottery production) are an ongoing process of reproduction within a social field, where factors such as cultural capital, social capital, and material conditions (including technology) influence the behavior and choices of practitioners (Bourdieu, 1990; Robbins, 2014).

Building on these theoretical foundations, this research aims to explore how the Bát Tràng ceramic community is restructuring its cultural identity through the application of technology, while maintaining the core elements of intangible heritage in the context of modernization.

The research adopts a qualitative approach to explore the role of technology in the transformation and preservation of the Bát Tràng craft village—a distinct cultural space in Hanoi that holds traditional craft values developed over generations. The study uses semi-structured in-depth interviews combined with field observation to directly access local knowledge, personal experiences, and the community's perception of the intersection between modern technology and traditional pottery. The survey sample consists of 15 representative artisans from the village, selected using purposive sampling. These individuals are recognized as masters at the local or national level, actively involved in production, teaching, or creating pottery art, and have practical experience applying technology in traditional craft activities. This selection ensures

professional depth, a diversity of perspectives, and the influence of the participants within the craft community.

The interviews were conducted directly at the artisans' homes or workshops from January to March 2025, with each session lasting between 15 to 30 minutes, recorded (with consent) and meticulously transcribed to ensure the accuracy and integrity of the data. The interview content focused on issues such as how artisans integrate technology into the pottery production and business processes while preserving cultural identity; the impact of technology on craftsmanship and artistic creativity; personal views on the balance between modernization and heritage conservation; changes in the transmission of craft skills and technology adoption by younger generations; the influence of contemporary taste on the form, functionality, and symbolic value of products; and specific strategies for preserving traditional knowledge in the context of technological development. Concurrent with the interviews, field observations were conducted at pottery workshops, exhibition spaces, and community events in the village to complement the data, particularly in identifying cultural practices that are difficult to capture through verbal accounts.

The collected data will be processed using thematic analysis, combining manual coding with support from NVivo software to ensure systematic, consistent, and logical data encoding and extraction. The thematic coding framework will be guided by core theoretical frameworks, including modernization and tradition conservation theory (Inglehart & Baker, 2000), UNESCO's concept of "living intangible cultural heritage" (2003), and Pierre Bourdieu's practice theory, particularly the concepts of "habitus" and "field of practice" within the cultural space of the craft village. Statements cited in the results section will be anonymized using abbreviations to protect confidentiality while maintaining the expressive nuances and authenticity of the participants' information.

The research adheres to strict ethical principles in social and humanities research. Prior to each interview, participants are fully informed about the purpose, content, and use of the information collected. Participation is entirely voluntary, confirmed through verbal consent and recorded as per regulations. All personal data is coded and securely stored. A coding list and identifying information will only be provided in supplementary materials upon official request from the reviewing authority, ensuring the absolute protection of participants' privacy and interests.

The Production Process of Bát Tràng Pottery: From Technique to Heritage

Through field research in the Bát Tràng pottery village (Gia Lâm District, Hanoi), the research team directly observed various stages of production and conducted in-depth interviews with many experienced artisans such as T.D., L.M.C., N.V.H., T.H., to gain a deeper understanding of the crafting process as well as the cultural and spiritual values associated with traditional pottery. The results showed that Bát Tràng pottery production is not only a manual technical process but also a vivid expression of the art and cultural heritage of Hanoi.

The entire pottery production process, from raw material selection, shaping, decoration, glazing, to firing, encompasses folk knowledge accumulated over generations. According to the artisans, the process begins with selecting clay from mines along the Red River, which is believed to contain a type of clay with high plasticity, cohesion, and heat resistance. The evaluation of clay quality is done manually, based on sensory experience: smell, touch, observation of color and texture, reflecting the close relationship between humans and nature in the artisan's mindset.

After extraction, the clay undergoes several steps such as filtering, drying, pounding, and kneading to achieve the desired smoothness and pliability. Through observation and notes at the workshops, the research team noted that at this stage, the skill and refined sensitivity of the craftsmen play a crucial role. At production households, products are primarily shaped by hand or using traditional pottery wheels. Each movement demonstrates precision, consistency, and the harmonious combination of technique and artistic emotion.

When the product reaches a certain level of dryness, the decoration phase is carried out with great care. Images such as lotus flowers, birds, branches, and dragons are engraved or painted directly onto the product, reflecting the worldview, human philosophy, and beliefs of ancient Hanoians. The artisans explained that the selection and arrangement of patterns are not based on fixed templates but depend on the inspiration and theme of each product, showcasing individual creative depth in a traditional craft.

Next is the glazing process, an important step to create shine, color, and protect the product from environmental influences. According to artisan N.V.H., Bát Tràng glaze is made from natural materials such as ash, lime, and finely ground glass, passed down through generations. The firing process takes place in traditional kilns at temperatures ranging from 1,200 to 1,300°C, requiring highly skilled temperature and time control, as even a small deviation can cause the glaze to crack or the color to be off.

After firing, the products are carefully checked and selected. Unsuccessful pieces are discarded or repurposed. The completed products not only have practical value but also serve as works of art bearing the cultural and spiritual imprints of the Bát Tràng community. Through observing the process and listening to the artisans' stories, the research team found that each bowl, each vase carries a part of memory, dedication, and the culture of Hanoi.

From the fieldwork, it can be affirmed that Bát Tràng pottery is not merely a manual labor but a crystallization of local knowledge, traditional aesthetics, and creative spirit. The production process is not just a series of technical steps but an artistic journey, where individual skills blend with collective culture, reflecting the strong relationship between humans, nature, and community. Bát Tràng pottery, therefore, deserves to be recognized as an essential part of both the tangible and intangible cultural heritage of Hanoi.

The Application of Technology in Pottery Production and Its Consequences on Traditional Culture in Bát Tràng

In the context of the rapid development of technology and global integration, the application of technology in Bát Tràng pottery production has become a key factor in helping the craft village maintain and develop sustainably. Technology has not only enhanced the productivity and quality of products but also helped meet the increasingly high demands of both domestic and international markets. Survey and interview results showed that in the wave of globalization and the 4.0 technology revolution, Bát Tràng pottery village – a symbol of Hanoi's traditional craftsmanship – had not remained outside this trend. Many establishments in Bát Tràng had actively invested in clay mixing machines, gas kilns, and more advanced technologies such as 3D printers, automatic molding machines, automatic glazing machines, and laser engraving machines. For example, artisan L.M.C., the owner of a large production facility, shared: “Without applying technology, it would be impossible to fulfill orders quickly and consistently, especially when international customers require large quantities with high precision.” His workshop currently uses both Fuji electric kilns and Jolly Machine automatic molding machines

to increase efficiency and control quality. Similarly, artisan P.T.C. also affirmed: “Switching to Seger gas kilns helped save costs and reduce pollution compared to the traditional wood-fired kilns,” showing that technology not only enhances production capacity but also improves environmental conditions.

Not only in production, but technology has also infiltrated advertising and product consumption activities. Thanks to social media platforms and e-commerce, many establishments have expanded their markets beyond national borders. Artisan N.T.T.H. mentioned: “Customers from abroad place orders through our website and Facebook; some months our orders are double compared to before.” Practices such as livestreaming the production process and behind-the-scenes videos are also being applied by many workshops to tell the story behind each piece of pottery, thereby enhancing the emotional and cultural value of the product. The application of modern technology in production has thus become an inevitable strategy to sustain the craft village in the face of fierce competition and fluctuating market demands. Artisan L.M.C., the head of a large facility in the craft village, shared: “Without applying technology, it would be impossible to meet large orders from abroad, especially when they demand near-perfect precision.”

However, in the process of modernization, one can clearly see the inherent contradictions between production efficiency and traditional cultural identity – a distinctive feature of Hanoi's craft villages in particular and Vietnam's traditional craftsmanship in general. Unlike Western industrial production, which separates the worker from the product, the traditional craftsmanship of Bát Tràng always emphasizes the “soul” of the artisan – where technique, emotion, and folk knowledge intertwine in each product. Observations in the field also show that some stages still maintain traditional methods due to the deep attachment to old techniques. Artisan T.D. said: “We still shape the pottery by hand because custom orders require the soul of handcrafted products, which is preferred over industrial styles.” This view was also shared by artisan T.T.S.: “Machines can't always replace human hands, especially in shaping and decorating.” This reveals that while technology offers many benefits, there remains a gap between the demand for modernization and the preservation of traditional values. Artisan T.D. remains committed to the traditional hand-shaping method, stating: “Customers order handmade pieces because they can feel the soul of the ethnicity in every line – something machines cannot replicate.”

On the other hand, the essence of Bát Tràng pottery culture is not only in the product but also in the process of creating it – a communal process passed down through generations. Although technology brings efficiency, its widespread use is inadvertently breaking these bonds. The replacement of hand-shaping, hand-glazing, or wood-fired kilns with machinery has reduced the space for interaction between generations of artisans. Traditional Vietnamese craft culture – especially in a historically rich place like Hanoi – always honors the intentional imperfection, where every small crack or curve bears the personal mark of the maker, and cannot be replicated. When machines produce flawless items that lack soul, the human value – the core of craftsmanship culture – is gradually eroded. Artisan N.V.H. shared: “Machines make hundreds of identical pieces, but the charm of pottery lies in its imperfection.” These comments show that the artisans are not just producers, but also transmitters of cultural values through their products – something machines cannot fully replace.

Artisan L.Q.C. reflected: “In the past, pottery was a family affair, with everyone involved in making it and passing on the craft. Now, machines do much of the work, and younger people no

longer learn the craft.” This reality shows that when technology overtakes the role of people, folk knowledge and traditional craftsmanship are at risk of being lost.

It is also because of technology that the traditional labor structure is changing dramatically. Pottery, which once served as a communal and family-based activity, is now gradually turning into an industrialized and specialized form of production. Artisan V.D.T. bluntly stated: “In the past, the whole village worked together, but now each household does things their own way; those who are good with technology can survive.” This division creates gaps within the community, and at the same time diminishes the role of elderly artisans – once considered the “living museums” of traditional knowledge.

The expansion of production scales and the establishment of modern workshops are also changing the cultural landscape of the craft village. Characteristic spaces such as wood-fired kilns, drying yards, and small handcrafted workshops are gradually being replaced by solid factories with modern assembly lines. Artisan V.M.T. thoughtfully remarked: “The pottery village now looks like a mini industrial park, it no longer has the soul it once had.” This is a clear sign of the shift from living cultural spaces to commercial production spaces, in which technology, despite its many benefits, is also contributing to the gradual fading of the cultural identity of the craft village.

Methods of Preserving the Traditional Craft Culture of Bát Tràng Artisans

In the context of modernization, the artisans of Bát Tràng demonstrated creativity by combining advanced technology with traditional craftsmanship, thereby preserving and promoting the unique cultural values of their craft village. The use of technology to enhance production efficiency and meet market demands was indispensable, but the artisans of Bát Tràng were always aware that high artistic products must involve direct human involvement. This was not only a technical issue but also a cultural one, as each handcrafted product became a unique representation of traditional identity.

Many artisans, such as D.V.C., L.Q.Q.C., and N.V.H., confirmed that processes like shaping, sculpting, and hand-painting were key to creating the uniqueness and aesthetic difference in ceramic products. For example, artisan T.D. shared: “Feeling and working with clay by hand not only ensures its plasticity and smoothness but also helps me detect and adjust any irregularities in the materials, something machines cannot achieve.” This was especially important with rare types of clay or those requiring high technical expertise, where the artisans' sensitivity and experience became the deciding factor in quality.

For products requiring fine detail and high artistic value, hand-painting remained central. Artisans like L.M.C. and N.K. continued to use this technique to create traditional motifs or symbolic religious imagery. Mr. N.K. shared: “Hand-painting not only allows me to express emotions but also creates unique patterns, leaving a personal imprint that machines cannot replicate.” Observing the ceramic drawings being worked on at his workshop showed that no two products were exactly the same, even if they followed the same theme. This uniqueness helped Bát Tràng ceramics maintain their cultural value while enhancing their competitiveness in international markets.

In the glazing process, artisans utilized the flexibility of handcraft techniques to adjust the thickness of the glaze, creating natural effects such as veins and unique colors. We observed that even the same type of glaze resulted in entirely different effects depending on each artisan's technique and perception. Especially, products such as Bát Tràng's distinctive cracked glaze,

beloved for its rustic and traditional beauty, were prime examples of blending modern and traditional elements.

The firing process was also maintained by artisans like D.V.C. and T.D., who used traditional wood-fired kilns. This was not only a way to recreate the natural cracked glaze effects but also part of preserving the cultural memory of the craft village. The streaks of color and the cracks created by fire and wood smoke added a unique beauty, increasing the artistic value of the products. According to Mr. T.D.: "Using a wood-fired kiln not only helps create natural cracks but also gives the product its distinct beauty, showing respect for nature and a connection to local cultural elements."

The harmonious combination of tradition and modernity not only helped Bát Tràng preserve its cultural identity but also opened up sustainable development opportunities in the era of globalization. This showed that preservation was not just about replicating old values but also about creativity and adaptation to keep traditions vibrant and meaningful in a new context. As a result, Bát Tràng ceramics became not only material products but also cultural symbols embodying the creativity, resilience, and traditional values of the Vietnamese people.

Commentary:

The Bat Trang pottery village, located in the heart of Hanoi, is not only a renowned cultural heritage site of Vietnam but also a vibrant example of how traditional craft communities respond to profound societal and technological changes. This phenomenon is significant, where the preservation of traditional values is not just a story of the past but also an ongoing journey from previous generations to future ones. The integration of modern technology into pottery production, without sacrificing the core values of the craft, clearly demonstrates the creativity, adaptability, and cultural identity preservation of the Bat Trang community.

From a cultural theory perspective, the Bat Trang phenomenon can be analyzed through the concept of "cultural balance," wherein the craft village is not passive in the face of modernization but actively adjusts traditional and modern elements to create harmony. The decision to preserve handcraft processes, such as hand painting, glazing, and wood-fired kiln firing, is not only for technical reasons but also a way to preserve the "soul" of the cultural product. This is a refined cultural strategy that maintains distinctiveness while responding to the demands of the modern market.

At a deeper level, the Bat Trang pottery village carries a mission oriented towards future generations, especially within the context of Hanoi—a city that carries a rich history while also entering an industrial and modernization revolution. The story of Bat Trang serves as a reminder that preservation is not only about retention but also about continuity and creativity, ensuring that traditional culture is not forgotten but inherited, developed, and elevated in the modern world. The future-oriented approach in this case recognizes that subsequent generations not only continue traditions but can also innovate and renew them, thus helping to maintain and promote cultural identity in a constantly changing society.

The role of artisans in the relationship between technology and culture in Bat Trang cannot be overlooked. They are not only creators of artistic products but also custodians of local knowledge, transmitting cultural values through each product. The community, led by these artisans, is not only safeguarding heritage but also creating spaces for the convergence of modernity and tradition, making Bat Trang pottery products not just commodities but cultural symbols.

Bat Trang, by choosing to preserve handcraft elements, affirms its cultural identity in the context of globalization. Preserving these elements is not merely an economic strategy but also a statement that, in the era of integration, profound cultural values can still exist and thrive. This approach not only provides a competitive advantage in the global market but also represents a sustainable strategy that allows future generations to continue learning and innovating from the heritage preserved by the Bat Trang community.

Particularly, the living cultural heritage story of Bat Trang holds profound meaning in the formation of a model for living heritage preservation, not only for Hanoi but for all of Vietnam. The artisans of Bat Trang, through continuous innovation within the traditional framework, are contributing to sharing Vietnam's unique cultural story with the world. This serves as proof that heritage preservation is not only about the present but also the future, ensuring that future generations not only continue but also develop and enrich these values. With the connection between preservation and development, Bat Trang can be viewed as a model for famous craft villages worldwide, where each product is not just a material item but a part of cultural heritage, imbued with the marks of time and human creativity.

In the context of modernization, the application of technology in traditional craft production is not only a choice but also an essential need to ensure competitiveness and long-term sustainability. However, this process requires caution to balance economic development and cultural identity preservation. Drawing from Bat Trang's practical experience, combined with theoretical research, we propose several theoretical and practical principles to support traditional craft villages in this transition:

Balance Between Tradition and Modernity: The use of technology should not aim to replace traditional methods but to assist in enhancing productivity and optimizing production processes. Bat Trang's practice shows that steps requiring high precision or repetition can be automated, while creative processes remain handcrafted. As Lowenthal (1985) pointed out, preservation is not just about maintaining objects but also about conserving the meaning and spirit of cultural heritage.

Preservation of Handcraft and Individual Uniqueness: A core value of traditional products is their uniqueness, reflecting the creativity and skill of each artisan. According to Appadurai's (1986) "uniqueness value" theory, handcraft products are not merely commodities but cultural symbols. In Bat Trang, limiting technology to repetitive processes helps preserve uniqueness and enhances artistic value. Each pottery product is not just a commodity but an artwork carrying profound cultural significance.

Documenting and Transmitting Traditional Knowledge: Digital technology not only supports production but also serves as an important tool for preserving and spreading cultural knowledge. Digitizing Bat Trang's pottery techniques through videos, images, and 3D models has made it easier for younger generations to access and learn. As Coombs and Ahmed (1974) emphasized, documenting traditional knowledge is key to preserving intangible cultural heritage, especially in the context of globalization.

Promoting Sustainable Development: The principle of sustainable development, according to the Brundtland Report (1987), emphasizes meeting present needs without compromising the ability of future generations to meet their needs. Bat Trang's use of energy-efficient technology and materials has contributed to environmental protection while maintaining product quality,

creating a crucial model for traditional villages to develop economically while building a positive image in the international community.

Avoiding Over-commercialization: Commercialization is a risk when applying technology to traditional craft production. As Hesmondhalgh (2013) noted, in the market economy, the cultural industry tends to standardize products to maximize profit, which can lead to a reduction in uniqueness and artistic value. In Bat Trang, controlling production volumes and maintaining uniqueness has helped the village avoid this issue while preserving cultural identity.

Meeting Market Preferences Without Losing Identity: Market research technology helps craft villages grasp consumer trends and adjust products accordingly, without diluting cultural identity. According to Bourdieu (1984), handcraft products not only meet material needs but also carry profound cultural symbolic value. In Bat Trang, the use of technology in design has helped the products meet market demand while preserving their uniqueness.

Expanding Connectivity and Promotion via Information Technology: Digital platforms have opened up significant opportunities for craft villages to promote products and cultural values. As Castells (1996) observed, global networks have enabled small cultural communities to access international markets. Bat Trang pottery, through social media and e-commerce, has become a symbol of Vietnamese culture, demonstrating the potential for craft villages to develop in the digital age.

These principles aim to guide the application of technology in traditional craft production in a balanced way, enhancing productivity and meeting market demands while preserving traditional cultural values.

Conclusion

This study contributed valuable insights into the role of technology in bridging modernization and the preservation of tradition in the pottery production of Bát Tràng Village, Hanoi, Vietnam. In the context of globalization and Industry 4.0, the application of technology was not only an essential tool for improving productivity but also a means of storing, preserving, and transmitting traditional pottery knowledge. The study affirmed that modernization and cultural preservation were not opposing forces but could harmoniously combine, creating a model of sustainable economic development that was closely tied to maintaining cultural values.

Technology also played a significant role in connecting and promoting the cultural values of the Bát Tràng pottery village to the world. The use of digital platforms helped enhance the brand value, expanding opportunities for Bát Tràng pottery not only in the domestic market but also in international markets. This was a clear demonstration that technology could enrich the soft power of national culture, especially in promoting the integration of traditional cultural values into the global cultural flow.

The study also proposed a set of principles for applying technology to traditional craft villages, based on theories such as cultural intersection, sustainable development, and the cultural industry. These principles emphasized a balance between technology and traditional knowledge, minimizing the negative impacts of modernization. They suggested a model for sustainable development, where technology played a supportive role rather than replacing traditional methods, helping to protect the uniqueness of products and preserve cultural identity. This model avoided the risk of product homogenization during industrialization and safeguarded traditional spiritual and artistic values.

From an academic perspective, this study enriched research on the relationship between modernization and cultural preservation in the context of globalization. Practically, the model combining technology and craftsmanship in Bát Tràng could serve as a valuable lesson for other craft communities in Vietnam and worldwide, particularly in developing traditional crafts in the digital age.

Although this study made important findings about the application of technology in the Bát Tràng craft village, there were still some limitations to consider. The study focused solely on Bát Tràng, while Vietnam has many other pottery villages, which might reduce the diversity in how technology is applied in different contexts. Testing the research principles in practice was a crucial factor for evaluating effectiveness and making adjustments. Future studies could compare other craft villages, expand the technology application model from Bát Tràng to other villages, and conduct experiments. This would contribute to the development of sustainable models that protect the environment and promote traditional cultural values in the context of modernization.

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