

## Article

# From Collaboration to Co-creation: Pathway of Digital Platform Public Art Participation and Aesthetic Education Symbiosis in Public Spaces of Free Trade Port Cities

Junhua Yu <sup>1,\*</sup> and Wei Guo <sup>1</sup><sup>1</sup> Hainan Vocational University of Science and Technology, Haikou, China

\* Correspondence: Junhua Yu, Hainan Vocational University of Science and Technology, Haikou, China

**Abstract:** The rapid development of the Hainan Free Trade Port urgently requires enhancing the cultural quality and aesthetic value of urban public spaces. However, traditional public art participation models frequently encounter significant challenges, such as the marginalization of public roles, limited community engagement, and the gradual weakening of essential aesthetic education functions. To address these critical issues, this study proposes a novel theoretical perspective of "participation-aesthetic symbiosis." It systematically demonstrates how emerging digital platforms can effectively transform conventional participation models from traditional "expert-led collaboration" to dynamic "multi-stakeholder co-creation," thereby achieving the organic integration and sustainable development of social aesthetic education. Through comprehensive case analyses of historical arcade districts and modern coastal parks, the study designs and implements a lightweight digital platform framework. This innovative framework seamlessly integrates "creative mapping, collaborative creation, and dynamic feedback mechanisms," empowering active public participation in artistic co-creation. Furthermore, it simultaneously cultivates essential aesthetic perception, enhances cultural expression, and fosters advanced spatial negotiation skills among community members. The research findings provide highly practical and scalable pathways for environmental art education to actively support the "soft environment" infrastructure development of free trade ports. Ultimately, this study significantly expands the practical implementation scenarios for social aesthetic education, offering a robust methodological reference for future urban cultural planning and participatory design initiatives in rapidly developing global port cities.

**Keywords:** digital platforms; public art; aesthetic education; free trade port; participatory design

Received: 07 July 2025

Revised: 14 August 2025

Accepted: 27 August 2025

Published: 31 August 2025



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## 1. Introduction

The development of Hainan Free Trade Port has introduced new expectations for the cultural quality of urban public spaces. Traditional public art participation often encounters the issue of "symbolic collaboration," where the public is granted limited decision-making power only at the final stages of project proposals. Meanwhile, creative leadership is predominantly controlled by experts. This dynamic results in superficial engagement and diminishes the educational potential of aesthetics. Artistic creations are reduced to mere visual decorations, failing to effectively engage the public's aesthetic perception, cultural expression, or the development of collaborative skills. Consequently, the potential of public spaces as "open aesthetic education classrooms" is significantly undervalued [1].

The emergence of digital platforms marks a pivotal shift in this context. With the advent of lightweight creative tools and augmented reality (AR) spatial annotation technologies, barriers to participation are being lowered. This transformation allows the public to evolve from mere "opinion providers" to "co-creators of meaning." Importantly, the participation process itself can be structured as an aesthetic education practice. For

instance, when audiences annotate artistic intervention points to document spatial memories or access cultural interpretations through pattern libraries, their aesthetic abilities naturally develop through active engagement. This creates a symbiotic relationship between participation and aesthetic education: deeper engagement enhances aesthetic literacy, which in turn fosters a greater willingness to participate, thereby establishing a virtuous cycle. This study examines how digital platforms facilitate the transition of public art participation from a "collaborative" model to a "co-creative" paradigm, achieving an organic symbiosis between participatory behaviors and social aesthetic education. In this context, "collaboration" refers to the passive adoption of pre-set solutions by the public, whereas "co-creation" emphasizes the involvement of multiple stakeholders throughout the creative process and implementation supervision. The concept of "aesthetic education symbiosis" suggests that these elements form mutually reinforcing mechanisms through platform design rather than simple integration. Using Haikou's arcade districts and coastal parks as case studies, the research develops a tripartite lightweight platform that integrates "creative mapping," "lightweight creation," and "collaborative feedback." This approach explores Hainan's path for transitioning public art from "spatial decoration" to "social empowerment" in the digital era. The study offers actionable and educational solutions for the development of a "soft environment" in free trade ports, while also expanding environmental art education from mere skill training to missions of cultural heritage preservation.

## **2. Absence of Aesthetic Education Participation in Public Art at Free Trade Ports**

### *2.1. Dual Demands of Public Spaces in Free Trade Ports*

The development of the Hainan Free Trade Port places dual demands on urban public spaces. On a material level, the plan for the port's construction emphasizes the need to enhance cultural soft power. Public art plays a crucial role in shaping an international and modern city image that aligns with the global flow of talent and capital. On a spiritual level, the diverse and highly mobile population of the free trade port, which includes seasonal migratory groups, foreign business professionals, and local Li and Miao residents, creates complex cultural identity tensions. Public spaces require artistic interventions to bridge these cultural differences [2]. Such interventions should showcase an open and inclusive international ethos while preserving indigenous cultural heritage, including maritime traditions and overseas Chinese culture. This approach aims to realize a spatial narrative where each culture appreciates its own beauty while sharing beauty collectively. By doing so, public art can serve as a medium for cultural exchange and integration, fostering a harmonious coexistence of diverse cultural identities within the free trade port.

### *2.2. Limitations of Traditional Participation Models*

Current public art participation often falls into the trap of what can be termed as "symbolic collaboration." For instance, in the sculpture competition at a coastal plaza in Sanya, while online voting was introduced, the core decisions regarding creative concepts, material selection, and spatial dimensions were still dominated by expert panels [3]. This left the public with only limited choices from a few pre-selected proposals. Such a model reduces citizens to mere "aesthetic consumers," effectively stripping them of their rights to cultural expression and spatial discourse. A deeper issue is the systemic absence of comprehensive aesthetic education. Participants often lack a complete aesthetic experience that encompasses site perception, cultural interpretation, and creative generation, leaving them as passive recipients of finished artworks. During the 2021 art wall renovation at Haikou's Qilou Old Street, resident surveys focused merely on "color preferences" without facilitating discussions on the emotional connections between Nanyang architectural motifs and the history of overseas Chinese communities. Consequently, the artistic interventions became mere visual decorations, failing to

activate collective memory or cultivate aesthetic judgment. This highlights the need for more inclusive and educational participation models in public art projects.

### *2.3. Synergistic Opportunities of Digital Platforms*

Digital technology introduces innovative solutions to overcome existing challenges in the realm of public art and cultural engagement [4]. By utilizing lightweight creative tools, such as augmented reality spatial annotation and intuitive drag-and-drop design interfaces, the barriers to artistic participation are significantly reduced. This democratization of creativity allows non-professional audiences to actively engage in the creative process. Furthermore, digital platforms have the potential to transform the dynamics of participation. When individuals use mobile devices to mark artistic intervention points, they are simultaneously documenting spatial memories. Additionally, when they generate designs from cultural pattern libraries, they gain insights into cultural interpretations. This process of participation evolves into a complex interaction involving aesthetic perception, cultural learning, and the negotiation of meaning. Public art transitions from being merely an object of contemplation to becoming an interactive medium for aesthetic education. In this context, participation inherently serves as a tool for social aesthetic education. Particularly within the unique environment of free trade ports, this mechanism of "participation-as-learning" is crucial. It rapidly cultivates cultural identity among transient populations with short-term stays, transforming public art into authentic bridges of aesthetic education. These bridges connect diverse communities and lay the groundwork for paradigm shifts from collaboration to co-creation.

## **3. The Symbiotic Logic of Participation in Aesthetic Education**

### *3.1. Paradigm Shift from "Collaboration" to "Co-creation"*

Traditional public art participation has often been limited to superficial "collaboration," where the public's role is primarily as "opinion providers," with minimal decision-making power, especially in the final stages of a project. For instance, during the 2022 art wall renovation of Haikou's arcade street, residents were involved in surveys, but their contributions were restricted to preferences for specific color schemes. The core processes, such as creative generation and cultural symbol extraction, were controlled by the design team, effectively excluding the public from the deeper aspects of meaning production. The "co-creation" model signifies a significant paradigm shift, transforming citizens into "co-constructors of meaning." This model allows them to engage actively throughout the creative proposal development, scheme iteration, and implementation oversight. A notable example is Singapore's "Art Science Co-Creation Platform," where citizens can directly generate light-and-shadow art concepts using digital tools. The system provides real-time spatial compatibility feedback, while artists serve as technical collaborators. The key transformation is the restructuring of power dynamics through digital platforms. Low-code creation interfaces and augmented reality spatial previews empower non-professionals with equal creative agency as experts, shifting participation from "passive selection" to "active creation." This framework naturally integrates aesthetic education functions into urban design, fostering a more inclusive and participatory approach [5].

### *3.2. Public Art as a Vehicle for Social Aesthetic Education*

The collaborative practice of public art extends beyond the traditional confines of school-based aesthetic education, transforming urban public spaces into dynamic "open aesthetic education classrooms." In this innovative framework, aesthetic education is no longer confined to specialized courses but is integrated into real-world spatial production processes. This approach creates three significant value dimensions. Firstly, the cultivation of aesthetic perception is enhanced through the use of augmented reality tools. These tools allow the public to preview variations in light and shadow on art installations in coastal areas or to compare the morphology of coral with the textures of concrete

through material simulation functions. This process gradually enhances the public's sensitivity to spatial forms and material language. Secondly, the reinforcement of cultural expression is achieved by utilizing digital creation tools that incorporate pattern libraries, such as those of Li and Miao brocade [6, 7]. The system simultaneously displays the marital customs and totemic symbolism associated with these patterns, enabling a deeper cultural understanding and emotional connection through creative engagement. Thirdly, the acquisition of negotiation literacy is fostered during online discussions about art intervention plans for arcade districts. Participants are encouraged to rationally consider spatial functions and cultural compatibility, thereby subtly cultivating public discourse and negotiation skills. Collectively, these three dimensions form a comprehensive social aesthetic education system based on the principle of "learning by doing."

### *3.3. "Symbiosis" Mechanism: Participating in Nurturing Aesthetic Education, with Aesthetic Education Providing Feedback to Participants*

"Participation" and "aesthetic education" are not merely additive but form a mutually nourishing symbiotic mechanism. On one hand, deep engagement continuously enhances public aesthetic judgment and cultural expression capabilities. For example, when residents repeatedly adjust color parameters of tidal art installations on digital platforms to match sunset spectra, their color perception abilities see substantial improvement. On the other hand, enhanced aesthetic literacy reciprocally stimulates participation willingness, creating a virtuous cycle of skill development, deeper engagement, and further skill enhancement. The Barcelona "Super Blocks" initiative provides empirical evidence: after residents participated in street landscape renovations through digital platforms, their sense of spatial belonging significantly strengthened. Follow-up participation rates in community aesthetic education activities, such as street painting workshops and architectural tours, increased by 37%, demonstrating the activating effect of participatory behavior on aesthetic education ecosystems. Within the context of free trade ports, this symbiotic mechanism holds greater practical value. Floating populations rapidly establish cultural connections through short-term collaborative practices, transforming public art into genuine "aesthetic education bridges" that transcend identity differences. This process not only enhances individual aesthetic capabilities but also fosters a collective cultural identity, thereby laying theoretical foundations for future implementation strategies. Such mechanisms are crucial in promoting inclusive cultural development and ensuring that aesthetic education becomes an integral part of community life.

## **4. Synergistic Pathways: Hainan's Practice Design Empowered by Digital Platforms**

### *4.1. Local Resources and Pain Point Diagnosis*

Public art practices in Hainan Free Trade Port showcase distinct advantages while also facing practical challenges. On the positive side, the geometric patterns of Li and Miao brocade textiles, tidal imagery that reflects maritime culture, and Nanyang-style architectural motifs in arcade buildings provide a rich repository of aesthetic education resources. The port's reforms aimed at streamlining administration, delegating power, and improving services offer a space for policy experimentation and innovative participation mechanisms. However, significant challenges remain: current practices often display "event-driven" and "fragmented" characteristics. For example, the 2023 "Haikou Public Art Season" organized citizen workshops, but lacked post-event interactive platforms, preventing public creative outputs from evolving into sustained spatial narratives [8, 9]. Similarly, Sanya's coastal promenade art installation competition adheres to the "expert proposal-public voting" model, with participation limited to single-choice formats that do not establish continuous aesthetic education mechanisms. The core issue is the absence of digital infrastructure that integrates "participation behaviors" with "aesthetic immersion," which hinders public art from achieving its long-term societal aesthetic education value. Addressing these challenges requires a comprehensive

approach that leverages digital platforms to enhance public engagement and ensure the continuity of aesthetic education.

#### 4.2. *Lightweight Platform Function Design*

To address these challenges, the design emphasizes a lightweight platform with dual objectives of fostering both participation and aesthetic education. This approach deliberately avoids the complexities of large-scale system development and instead focuses on three core modules that are integral to its function.

The Creative Map Module allows the public to annotate potential sites for art interventions, such as seaside promenade rest areas or arcade street corner spaces, within digital twin cities using mobile devices. A key feature of aesthetic education in this module is the requirement for users to describe their emotional memories associated with these spaces during the annotation process. For example, a user might note, "This place witnessed my family's decade-long sea-viewing experiences." Following this, the system automatically generates a "Place Spirit Heat Map." This initiative transforms what would typically be technical operations into exercises in spatial perception training, guiding the public to understand spaces through emotional and experiential perspectives rather than purely functional ones.

The Light Creative Tool Module is designed with a user-friendly drag-and-drop interface for generating artistic concept diagrams. It includes native element libraries featuring motifs such as Li Miao frog designs, coral fractals, and coconut tree silhouettes. The integration of aesthetic education follows the philosophy of "creation-as-learning." For instance, when users access Li ethnic embroidery patterns, a brief explanatory video is triggered, explaining that "This diamond motif symbolizes rice harvest abundance and is commonly seen on wedding tube skirts." Similarly, when users adjust parameters related to coral morphology, the system provides prompts like "Branch angles simulate the natural growth patterns of deer antler corals." By lowering technical barriers and offering real-time cultural insights, this tool empowers non-professionals to naturally achieve a dual reconstruction of aesthetic perception and cultural identity during their creative processes.

The Consultation Feedback Module employs geo-fencing technology to ensure that residents within a 500-meter radius of art installations have priority voting rights. This mechanism prevents the aesthetic preferences of tourists from overshadowing local needs. The integration of aesthetic education is evident in the requirement for voters to provide concise aesthetic rationales, such as "The blue gradient harmonizes with the sunset sea surface, avoiding glaring fluorescent colors." The system incentivizes rational expressions by offering points, transforming democratic decision-making into a form of aesthetic expression training [10, 11]. This approach cultivates the public's ability to engage in public discourse using professional language, thereby enhancing their capacity to participate meaningfully in discussions about public art and space.

#### 4.3. *Scenario Simulation of Hainan Characteristics*

The arcade district's "Digital Mural Co-creation" initiative offers an innovative experience where visitors can engage with art through technology [12, 13]. By scanning QR codes on the arcade walls, participants enter an augmented reality graffiti interface. This platform allows them to incorporate various cultural elements, such as Nanyang scrollwork patterns and ship anchor symbols, into their digital creations. These artworks are then seamlessly integrated with the building facades, creating a dynamic "flowing mural" that merges the real and virtual worlds. The project emphasizes cross-cultural dialogue as its core aesthetic value. Local Hainan residents contribute Li brocade motifs to express their cultural heritage, while elderly migratory bird enthusiasts depict northern snowscapes to convey a sense of nostalgia. International visitors add tropical plant symbols, showcasing a fusion of diverse cultural influences. Through this collaborative

process, a rich tapestry of aesthetic perspectives emerges, fostering mutual learning and interaction among participants.

The "Tidal Art Installation" at Binhai Park represents a unique fusion of technology and nature. This installation features a sensor-controlled lighting system along the holiday beaches, allowing citizens to adjust the color intensity and flashing frequency through a dedicated app. The system is integrated with real-time tidal data, automatically enhancing the blue spectrum during high tide and shifting to warm yellow tones during low tide. This interactive feature enables visitors to intuitively experience the ecological aesthetics of art that responds to natural rhythms. By transforming from passive observers into active participants, individuals engage more deeply with the environment. This initiative not only enhances the aesthetic experience but also cultivates an eco-conscious appreciation essential for sustainable development. It encourages a deeper understanding of the interconnectedness between art and nature, promoting a harmonious relationship that is vital for the future.

#### *4.4. Implementation Safeguards and Risk Prevention and Control*

In collaboration with several universities in Hainan, a "Public Art Co-creation Workshop" has been established [7]. This initiative involves faculty and students majoring in Environmental Art Design, who serve as "co-creation facilitators." They engage directly with local communities, particularly focusing on assisting elderly groups in navigating and utilizing digital platforms. Additionally, they guide these communities in interpreting cultural symbols, which is a crucial aspect of preserving and promoting cultural heritage. This initiative not only enhances the social service functions of universities but also provides students with the opportunity to practice the "design for the people" philosophy. By participating in real-world projects, students can achieve an effective integration of industry and education, thereby gaining practical experience and contributing to societal development.

A cultural advisory panel will be established, comprising Li ethnic cultural inheritors, marine ecologists, and community representatives. This panel will conduct preliminary reviews of platform element libraries and content generated by the public. The aim is to prevent the commercial exploitation of Li and Miao totem symbols, ensuring that these cultural elements are respected and preserved. Offline participation channels, such as community co-creation walls and paper suggestion boxes, will be maintained to protect the rights of digitally disadvantaged groups. This approach prevents technological empowerment from becoming a new barrier to participation. By integrating a tripartite strategy of "technology simplification, educational deepening, and ethical prioritization," the digital platform is designed to become a sustainable medium. It will foster coexistence between participation and aesthetic education, ensuring that all community members can engage meaningfully and benefit from the platform's offerings [3].

## **5. Conclusion**

This study explores how digital platforms facilitate the transition of public art participation in free trade ports from "collaboration" to "co-creation," achieving organic symbiosis between participatory behaviors and social aesthetic education. While traditional models reduce the public to mere "aesthetic consumers," lightweight digital platforms employ three core modules—creative mapping tools, lightweight creation interfaces, and collaborative feedback mechanisms—to enable users to naturally cultivate spatial awareness, cultural identity, and negotiation skills through activities like annotating spatial memories, interpreting Li and Miao ethnic patterns, and expressing aesthetic preferences. Through this approach, public art evolves from "expert-curated works" into a "social aesthetic education practice space." This transformation signifies a shift in the role of public art, emphasizing its potential as a dynamic educational tool that fosters community engagement and cultural exchange. By leveraging digital platforms, participants are empowered to contribute actively to the artistic process, thereby

enhancing their understanding and appreciation of diverse cultural narratives. This participatory model not only democratizes art creation but also enriches the cultural fabric of free trade ports, promoting a more inclusive and interactive form of aesthetic education.

The highly mobile demographic structure and institutional innovation potential of free trade ports provide a unique testing ground for symbiotic development models. Short-term resident migrant groups can rapidly establish cultural connections through digital co-creation, while the "streamlining administration, delegating powers, and improving services" reform reserves policy flexibility for mechanism innovation. Most crucially, this approach expands the social service dimensions of environmental art design education—university faculty and students can serve as "co-creation facilitators" in shaping physical spaces, implementing the "design for the people" philosophy through industry-education integration. This integration not only enhances the educational experience by providing real-world applications but also strengthens the relationship between academic institutions and the community. By acting as facilitators, educators and students can bridge the gap between theoretical knowledge and practical implementation, fostering a collaborative environment that benefits both the educational sector and the broader community. This model encourages a continuous exchange of ideas and skills, ultimately leading to more innovative and responsive urban design solutions that reflect the needs and aspirations of diverse populations.

Future research could further explore the quantitative correlation between platform behavioral data and aesthetic education outcomes, facilitating the integration of high-quality collaborative achievements into local aesthetic education curricula in primary and secondary schools, thereby fostering an interconnected aesthetic education ecosystem both within and beyond schools. This study provides actionable and educationally valuable innovative solutions for enhancing the "soft environment" of free trade ports, while also offering Hainan's practical reference for transitioning public art from mere "spatial decoration" to "social empowerment" in the digital era. By examining the impact of digital co-creation on educational outcomes, future studies can identify best practices for incorporating these platforms into formal education settings, thereby enriching the learning experience and promoting lifelong engagement with the arts. Additionally, the insights gained from this research can inform policy development, ensuring that aesthetic education remains relevant and responsive to the evolving needs of society. As digital platforms continue to transform the landscape of public art, they hold the potential to redefine the role of art in education, making it a more integral and impactful component of personal and community development.

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