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Visual and Performing Arts for Sustainable Development: Promoting Awareness, Participation, and Social Change

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ABSTRACT: This study investigates how visual and performing arts support sustainable development by transforming complex social, environmental, and heritage concerns into visible, meaningful, and publicly discussable issues. Employing a convergent mixed secondary-data design, the research analyzes museum visitor participation records, virtual museum user-experience data, intangible cultural heritage (ICH) elements, and cultural funding grants through descriptive statistics, index construction, heteroscedasticity-robust regression, and thematic coding. The findings reveal that while cultural institutions generate substantial engagement, they remain vulnerable to disruptions, emphasizing the need for resilient access strategies. Virtual museum indicators were generally moderate ($R^2 = 0.002$), showing that digital presence alone cannot drive meaningful engagement without clear interpretation, accessibility, and effective learning design. Examination of 562 ICH elements confirms the high prevalence of performance-related (92.3%), social continuity (85.2%), and environmental (64.6%) themes in sustaining collective memory. Furthermore, an analysis of 102 cultural grants shows that funding is primarily concentrated in performing arts (49.0%) and community participation (47.1%), reinforcing the role of creative practice as an empirically grounded pathway linking awareness formation, participatory engagement, and social change. Ultimately, this framework demonstrates how arts-based initiatives move beyond decorative communication to actively foster inclusive dialogue, community resilience, and long-term societal transformation. By connecting institutional support, digital innovation, and local cultural assets, the study offers actionable insights for policymakers, cultural managers, and educators seeking to harness creative practice for sustainable public value.

Keywords: visual and performing arts; sustainable development; museum participation; intangible cultural heritage; social change.

I. INTRODUCTION

Sustainable development is often framed through economic growth, environmental regulation, technological innovation, and institutional policy. These dimensions are necessary, but they do not fully explain how people recognize sustainability challenges, attach emotional meaning to them, or transform concern into shared forms of participation. Visual and performing arts offer an important cultural route to communicate, experience, question, and translate sustainability into public engagement. Exhibitions, murals, museums, theatre, dance, music, festivals, rituals, and digital cultural experiences can turn abstract problems into visible, memorable, and socially meaningful knowledge.

This topic matters because artistic practice can operate at the level of perception, emotion, identity, memory, and collective imagination. Many sustainability challenges are hard to communicate because they are complex, long-term, and experienced unevenly across communities. Technical indicators and policy statements may describe a problem's scale, but they do not always create recognition, empathy, or

responsibility. Artistic forms can make such problems tangible by connecting information with image, sound, movement, story, place, and embodied experience. In this sense, the arts are not external decoration for development campaigns; they are cultural spaces in which people interpret problems and imagine alternative futures.

Visual arts contribute to sustainable development by creating public ways of seeing. Museum exhibitions, public art, photography, installation, digital visualization, and community-based visual projects can frame environmental degradation, cultural loss, inequality, heritage identity, and social responsibility in ways that invite reflection. Visual forms can compress complex issues into symbolic and spatial experiences that remain accessible to diverse audiences. A public mural, museum object, installation, or exhibition pathway can create an encounter between personal memory and collective concern. Such encounters matter because awareness is not only cognitive; emotion, aesthetics, place, and social interpretation shape it.

Performing arts add an embodied and collective dimension to this process. Theatre, music, dance, ritual, storytelling, and festival practice create shared moments of attention in which audiences and participants encounter sustainability as a lived social experience rather than as a distant policy concept. Performance allows communities to rehearse social relations, voice marginal experiences, preserve heritage, represent conflict, and express solidarity through movement, rhythm, dialogue, and symbolic action. These forms matter most when sustainable development is understood as a process of participation, inclusion, cultural continuity, and social learning rather than a purely technical target.

The relationship between arts and sustainable development is also institutional. Cultural institutions and community organizations mediate the movement from creative expression to public participation. Museums, heritage centers, galleries, festivals, theatres, schools, public libraries, and local arts organizations can connect artists, audiences, educators, policymakers, and community groups. When these spaces are inclusive and responsive to local needs, they can strengthen public learning, dialogue, and civic trust. When they are inaccessible or disconnected from community needs, their developmental contribution becomes weaker. For this reason, researchers must examine the arts through both creative content and the structures that enable participation.

Despite this significance, research has examined the contribution of visual and performing arts to sustainable development less systematically than the roles of policy, technology, and economic instruments. In many studies, culture appears as a background value, symbolic resource, or broad policy aspiration rather than as an empirical field of participation and social learning. This creates a research gap: researchers should examine the contribution of arts-based activity through both conceptual interpretation and empirical evidence. A stronger approach must connect cultural theory with observable indicators of visitor participation, digital cultural engagement, heritage practice, and community-oriented artistic support.

This paper addresses that gap by developing a data-enhanced analysis of visual and performing arts in relation to sustainable development. It integrates evidence from cultural participation, virtual museum experiences, intangible heritage records, and descriptions of arts funding. This design lets the study examine three connected dimensions: awareness formation, participatory engagement, and pathways to social change. The argument is not that the arts automatically produce development outcomes. Rather, arts-based initiatives become developmentally meaningful when creative expression is connected to public learning, inclusive access, cultural identity, community involvement, and institutional support.

II. LITERATURE REVIEW

Recent studies show that culture is not a marginal component of sustainable development but a constitutive field through which communities produce meaning, identity, and collective responsibility. Soini and Birkeland mapped cultural sustainability as a scientific discourse [23], while Dessein et al. described culture as operating in, for, and as sustainable development [3]. Stylianou-Lambert et al. further linked cultural sustainability to stakeholders, policy forces, and institutional practice in museum-focused work [25]. Duxbury et al. later translated this discussion into four strategic policy paths, showing that cultural policy can support sustainability through heritage, creativity, participation, and territorial development [4].

Culture-led development studies also warn against treating the arts as a simple economic instrument. Sacco et al. criticized mono-causal culture-led development models and argued for more complex interpretations of cultural value [21]. Empirical work on European cities shows that cultural vitality can be

measured through cultural vibrancy, creative economy, and enabling environment indicators [15]. More recent creative-industry research similarly connects visual arts, performing arts, design, music, film, and publishing with sustainable urban development [10], while UNESCO's policy review frames creativity as a global public good that requires fair cultural ecosystems and public support [28].

Museums are strongly represented in the recent literature because they combine visual culture, heritage interpretation, education, and public participation. Pop and Borza proposed sustainability indicators for museums, supporting this paper's use of museum visitor data as a participation measure [19]. McGhie connected museum practice directly to the SDGs and emphasized education, inclusion, collections, and community engagement [12]. Hansson and Ohman described museums as public pedagogies for sustainability, suggesting that exhibitions can help audiences discuss climate change, migration, inequality, and other complex public issues [7]. Riva and Agostino's analysis of TripAdvisor reviews further showed that user-generated data and latent visitor perceptions can be used to study museum experience [20].

Participation bridges artistic experience and social change. Minkiewicz et al. showed that heritage visitors co-create experience value through personalization, engagement, and co-production [14]. Jancovich criticized superficial participation policies, arguing that participation must be meaningful, not symbolic [8]. Gross and Wilson framed cultural democracy through capabilities and ecological access, emphasizing that people should have real opportunities to create, interpret, and participate in culture [5]. Nowacki and Kruczek confirmed that co-creation shapes visitor emotions, satisfaction, and behavioral intentions in museums and heritage settings [18].

Community arts research supports this paper's social-change dimension. Skippington and Davis documented the opportunities and challenges of arts-based community development in rural and remote contexts [22]. Balfour et al. proposed an interactional framework in which rural arts-based development strengthens community identity, creativity, and civic engagement [1]. Spiegel and Parent's mixed-methods study of social circus showed that performing arts can create alternative spaces for participation, belonging, and community development [24]. These studies support the paper's interpretation of theatre, dance, music, and performance as participatory mechanisms rather than entertainment alone.

Digital cultural heritage studies are relevant because this paper includes data from virtual museum experiences. Mortara et al. reviewed serious games for cultural heritage learning, showing how digital play can support learning and interpretation [17]. Kiourt et al. developed a dynamic 3D virtual museum framework, demonstrating the importance of flexible digital exhibition design [9]. Tom Dieck et al. identified user requirements for wearable augmented-reality museum applications [26], while Bekele et al. mapped augmented, virtual, and mixed reality approaches across cultural heritage [2]. Later work on wearable AR, children's learning, and mixed-reality information visualization shows that digital tools can enhance access and engagement, but they require careful attention to usability, interpretation, and learning design [27], [16], [6].

Intangible cultural heritage and performing arts literature strengthens the connection between sustainability, identity, and cultural transmission. Meissner explained how intangible heritage practices can be valorized as cultural capital in sustainable development [13]. Ma et al. used indigenous peoples' diets and geographical indications to show how intangible heritage can connect cultural identity, local knowledge, and sustainable livelihoods [11]. These studies support the present paper's coding of rituals, festivals, music, dance, oral traditions, craftsmanship, and nature-related practices as sustainability-relevant heritage themes.

Overall, the studies indicate four major patterns. First, researchers increasingly treat culture and the arts as measurable, policy-relevant components of sustainable development. Second, museums and cultural institutions contribute through awareness, education, and participation. Third, performing arts and community arts can support inclusion, identity, and social transformation. Fourth, digital cultural tools can widen access but do not automatically create deep engagement. This literature justifies the present paper's mixed secondary-data design and its framework linking creative inputs, awareness, participation, and social change.

Table 1. Comparison of studies included in the literature review (2014-2022).

No.	Study	Method / Data	Main contribution to this paper
1	Balfour et al. (2018)	Rural arts interactional framework	Links arts-based development with community identity and engagement.
2	Bekele et al. (2018)	AR/VR/MR survey	Maps digital heritage technologies and their educational and interpretive uses.
3	Dessein et al. (2015)	COST Action synthesis	Presents culture as in, for, and as sustainable development.
4	Duxbury et al. (2017)	Cultural policy analysis	Provides strategic paths for culture in sustainable development.
5	Gross and Wilson (2020)	Cultural democracy theory	Strengthens the participation and capability dimension of the paper.
6	Hammady et al. (2020)	Mixed-reality museum acceptance study	Shows that digital engagement depends on visitor acceptance and design quality.
7	Hansson and Ohman (2022)	Museum education/public pedagogy	Frames museums as educational spaces for sustainability issues.
8	Jancovich (2017)	Cultural policy critique	Distinguishes genuine participation from symbolic participation.
9	Kiourt et al. (2016)	3D virtual museum framework	Demonstrates the role of dynamic digital museum design.
10	Lee et al. (2022)	Sustainable development assessment of CCIs	Connects visual arts, performing arts, and creative industries with urban sustainability.
11	Ma et al. (2022)	Case study of indigenous diet heritage	Connects intangible heritage, local knowledge, identity, and sustainable livelihoods.
12	McGhie (2019)	SDG museum guide	Links museums with SDG education, inclusion, and public engagement.
13	Meissner (2021)	Heritage valorization study	Shows how intangible heritage can become cultural capital for development.
14	Minkiewicz et al. (2014)	Heritage-sector co-creation analysis	Explains visitor engagement, personalization, and co-production in heritage experience.
15	Montalto et al. (2019)	Cultural/creative city indicators	Demonstrates empirical measurement of cultural vibrancy and creative capacity.
16	Moorhouse et al. (2019)	AR museum learning study	Shows AR can support children's museum learning when designed experientially.
17	Mortara et al. (2014)	Review of serious games	Shows how digital games can support learning about cultural heritage.
18	Nowacki and Kruczek (2021)	PLS-SEM visitor survey	Links co-creation, emotions, satisfaction, and behavioral intention in museums.
19	Pop and Borza (2016)	Museum sustainability indicators	Supports measuring museum participation and institutional sustainability.

No.	Study	Method / Data	Main contribution to this paper
20	Riva and Agostino (2022)	Topic modeling of TripAdvisor reviews	Validates use of online/user-generated museum data for experience analysis.
21	Sacco et al. (2014)	Meta-analytic critique	Warns against simplistic culture-led development and supports multidimensional analysis.
22	Skippington and Davis (2016)	Rural community arts study	Shows opportunities and challenges of arts-based community development.
23	Soini and Birkeland (2014)	Literature/discourse analysis	Frames cultural sustainability as a scientific discourse for sustainability research.
24	Spiegel and Parent (2018)	Critical mixed-methods social circus study	Shows performing arts as community development practice.
25	Stylianou-Lambert et al. (2014)	Museum policy/model analysis	Connects museums, stakeholders, and cultural policy to cultural sustainability.
26	Tom Dieck et al. (2016)	Visitor interviews/affinity analysis	Identifies user requirements for AR in museum and gallery contexts.
27	Tom Dieck et al. (2018)	Wearable AR learning study	Connects AR with visitor learning outcomes in galleries.
28	UNESCO (2022)	Global policy/data report	Supports culture and creativity as public goods requiring inclusive policy support.

III. RESEARCH GAP, CONCEPTUAL LOGIC, OBJECTIVES, AND RESEARCH QUESTIONS

1. RESEARCH GAP

The central research gap is that visual and performing arts are frequently discussed as cultural enrichment, while their measurable contribution to sustainable development remains insufficiently developed. Existing sustainability research often prioritizes policy instruments, economic indicators, environmental regulation, and technological systems. By contrast, cultural participation, artistic awareness, creative engagement, and heritage-based social learning are less often examined through integrated empirical evidence.

This gap is important because sustainable development depends not only on institutional plans but also on public understanding, community participation, and shared cultural meaning. Arts-based initiatives can influence these dimensions by creating spaces for interpretation, dialogue, identity formation, and collective responsibility. However, a stronger journal-level study needs more than a conceptual argument; it must link artistic practice to observable participation patterns, user-experience indicators, heritage themes, and evidence of community-oriented funding.

2. CONCEPTUAL AND ANALYTICAL LOGIC

The study's conceptual logic follows a pathway from creative inputs to awareness formation, participatory engagement, and social change. This pathway is not a simple linear causal chain; instead, it is an analytical sequence through which arts-based practices create conditions for learning, interaction, identity recognition, and community-oriented action. The logic also recognizes that access, institutional capacity, digital design, heritage continuity, and funding support shape these conditions.

Empirically, each evidence stream is aligned with a distinct research function. Museum visitor data examine institutional participation; virtual museum data examine digital engagement and experience

quality; intangible cultural heritage records examine cultural continuity and performing-arts sustainability; and funding descriptions examine community-oriented artistic action. This triangulation strategy allows the paper to interpret arts-based sustainable development across compatible evidence domains without forcing incompatible datasets into a single merged micro-level model.

3. STUDY OBJECTIVES

The study's main objective is to examine how visual and performing arts contribute to sustainable development by promoting awareness, participation, cultural continuity, and pathways for social change. The specific objectives are to assess museum visitor participation as an indicator of public engagement with visual and cultural institutions; examine virtual museum experience indicators related to digital cultural participation and satisfaction; identify sustainability-relevant themes within intangible cultural heritage elements; code cultural funding descriptions to evaluate community participation, social inclusion, environmental awareness, and arts-based action; and develop a framework that links creative expression with awareness, participation, and change-oriented community outcomes.

4. RESEARCH QUESTIONS

- **RQ1**: How do visual and performing arts support awareness of sustainability-related social, cultural, and environmental issues?
- **RQ2**: What do museum visitor and virtual museum data reveal about participation and engagement in cultural experiences?
- **RQ3**: Which sustainability themes appear most strongly in intangible cultural heritage and arts funding records?
- **RQ4**: How can empirical arts-related data be integrated into a framework for sustainable community development?

5. STUDY CONTRIBUTION

The study's contribution is threefold.

- First, it provides an empirical basis for discussing visual and performing arts as active components of sustainable development rather than as secondary cultural activities.
- Second, it combines quantitative analysis and thematic interpretation to capture both measurable participation and cultural meaning.
- Third, it proposes an arts-based sustainable development framework that links creative inputs, awareness, participation, and social change.

IV. MATERIALS AND METHODS

1. STUDY DESIGN

The study applies a convergent mixed secondary-data design that combines quantitative statistical analysis with qualitative thematic coding. The quantitative component examines museum participation patterns and virtual museum user-experience indicators, while the qualitative component codes intangible cultural heritage records and cultural funding descriptions according to sustainability-relevant arts themes. The design is convergent because it analyzes each evidence stream separately and then interprets them together through the conceptual pathway of awareness, participation, cultural continuity, and social change. This approach strengthens the paper by allowing empirical triangulation while avoiding inappropriate causal claims or invalid merging of datasets with different units of analysis.

2. DATASET SCREENING AND SELECTION

We guided dataset selection using five criteria: direct relevance to the visual or performing arts, availability of measurable participation or experience indicators, usefulness for sustainability interpretation, variable transparency, and compatibility with the study objectives. We retained four datasets because they covered complementary dimensions of the research problem: museum attendance, virtual cultural

experience, intangible cultural heritage, and funded arts initiatives. We excluded datasets focused on unrelated cultural markets or lacking a defensible connection to participation, awareness, heritage continuity, or community action from the main analysis.

We treated the retained datasets as secondary empirical evidence rather than a single merged micro-level file. This decision matters methodologically because the datasets differ in their unit of analysis. Museum attendance records describe institutional participation over time, virtual museum records describe individual user experience, intangible heritage records describe cultural elements, and funding records describe project-level support. The multi-source design therefore functions as triangulation: each dataset contributes evidence to a different part of the arts-based sustainability pathway.

3. VARIABLES AND STATISTICAL PROCEDURES

The virtual museum dataset included user age group, experience level, interaction time, navigation ease, textural realism, depth perception, auditory guidance use, satisfaction, aesthetic engagement, visual cognition, preferred mode, cost-effectiveness perception, and cultural/technological mode indicators. The museum visitor dataset included monthly attendance counts for cultural institutions. The intangible heritage dataset included element names, inscription information, list category, countries, links, and primary and secondary concepts. The cultural funding dataset included artist names, award values, fund composition, and grant-purpose descriptions.

The analytical procedures included descriptive statistics, index construction, Welch mean comparisons, Mann-Whitney U tests, ordinary least squares regression with heteroscedasticity-robust standard errors, and transparent, keyword-based thematic coding. We treated the satisfaction regression as an exploratory association model rather than a causal model because the dependent variable is perception-based and the available predictors do not fully capture interpretive learning, identity, or social meaning. We treated missing visitor counts as zero only when a museum record had a blank monthly attendance field; we applied this decision for aggregation and report it as a limitation.

4. VALIDITY, RELIABILITY, AND ROBUSTNESS PROCEDURES

Several validity safeguards were applied. First, we did not statistically merge the datasets because their units of analysis are incompatible. Second, we interpret the regression model in terms of adequacy and exploratory association rather than causal explanation. Third, we based thematic coding on predefined code families, transparent keyword rules, and manual plausibility review of coded categories. Fourth, we interpret the findings through cross-source triangulation so no single dataset carries the full evidentiary burden of the paper.

These procedures make the analysis more defensible for journal review by clarifying how numerical results, coded cultural themes, and conceptual interpretation connect. The study therefore does not claim that the datasets prove direct social transformation. Instead, it shows how arts-based practices provide measurable participation evidence and coded cultural conditions that can support awareness, inclusion, heritage continuity, and change-oriented community action.

5. ANALYTICAL EQUATIONS

The digital participation index summarizes digital interaction intensity, technology breadth, dual-mode preference, and auditory guidance use.

Equation (1). Digital Participation Index

$$DPI_i = 1/4[(T_i - Tmin)/(Tmax - Tmin) + D_i/6 + P_i + A_i]$$

The awareness-engagement score combined aesthetic engagement, satisfaction, visual cognition, and navigation ease, with visual cognition placed on an approximate 0-5 scale.

Equation (2). Awareness-Engagement Score

$$AES_i = (AE_i + SAT_i + VC_i/20 + NE_i)/4$$

Satisfaction was estimated using a robust OLS model.

Equation (3). Satisfaction Regression Model

$$SAT_i = \beta_0 + \beta_1 NE_i + \beta_2 TR_i + \beta_3 DP_i + \beta_4 AE_i + \beta_5 VC_i + \beta_6 \ln(T_i) + \beta_7 AG_i + \beta_8 CE_i + \beta_9 PM_i + \beta_{10} DC_i + \varepsilon_i$$

We calculated thematic proportions for each coded sustainability theme.

Equation (4). Thematic Proportion

$$P_k = n_k/N$$

V. RESULTS

1. MUSEUM PARTICIPATION TRENDS

The museum visitor dataset contained 90 monthly records and 3,273,985 recorded visits over the observed period. Before the disruption window, the average monthly attendance was 44,393 visitors, while the disruption window averaged 4,314 visitors, representing a 90.3% reduction. The Welch test confirmed a large difference between the two periods ($t = 15.30$, $p < .001$), and the Mann-Whitney U test reached the same conclusion ($p < .001$). A time-series regression with month controls explained 0.801 of visitor variation, with a significant negative disruption coefficient of -26,142 visitors per month ($p < .001$).

Table 2. Annual museum visitor participation trend.

Year	Months	Total visitors	Year-on-year change	Note
2014	12	642,727		
2015	12	627,972	-2.3%	
2016	12	508,208	-19.1%	
2017	12	519,561	2.2%	
2018	12	458,170	-11.8%	
2019	12	439,686	-4.0%	
2020	12	71,518	-83.7%	
2021	6	6,143	-91.4%	partial year

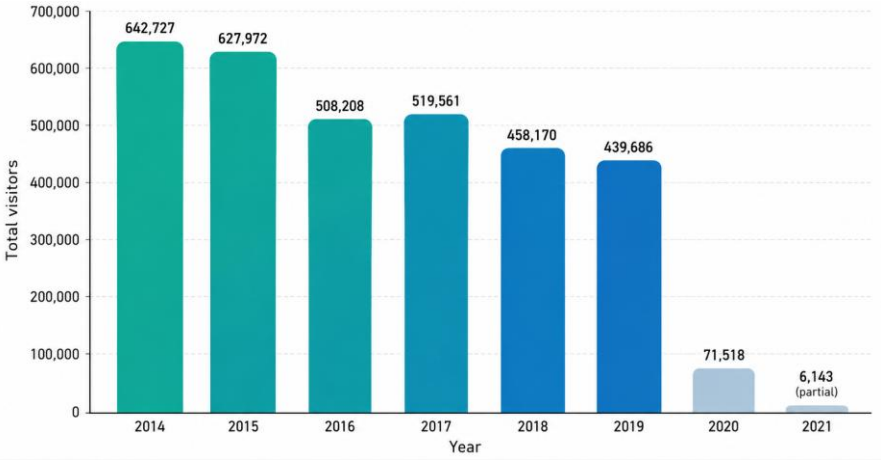


FIGURE 1. Annual museum visitor participation shows strong baseline attendance, followed by a major disruption in participation.

2. VIRTUAL MUSEUM EXPERIENCE AND DIGITAL PARTICIPATION

The virtual museum dataset contained 5,345 user records. The mean interaction time was 470.16 seconds, indicating that users engaged with the digital museum environment for several minutes on average. Scores for navigation ease, textural realism, depth perception, satisfaction, aesthetic engagement, and cost-effectiveness clustered around the midpoint of the 1-5 scale. This pattern indicates moderate experience quality rather than exceptionally high engagement. The digital participation index averaged 0.508 on a 0-1 scale, while the awareness-engagement score averaged 2.86.

Table 3. Descriptive statistics for virtual museum experience variables.

Variable	Mean	SD	Minimum	Maximum
Interaction Time (s)	470.16	252.94	30	899
Navigation Ease	2.99	1.42	1	5
Textural Realism	2.99	1.41	1	5
Depth Perception	3.07	1.43	1	5
Satisfaction Score	2.99	1.42	1	5
Aesthetic Engagement	3.01	1.40	1	5
Visual Cognition Score	49.42	29.06	0	99
Cost Effectiveness Perception	3.01	1.42	1	5
Digital participation index (0-1)	0.508	0.200	0.007	1.000
Awareness-engagement score	2.86	0.72	0.79	4.95

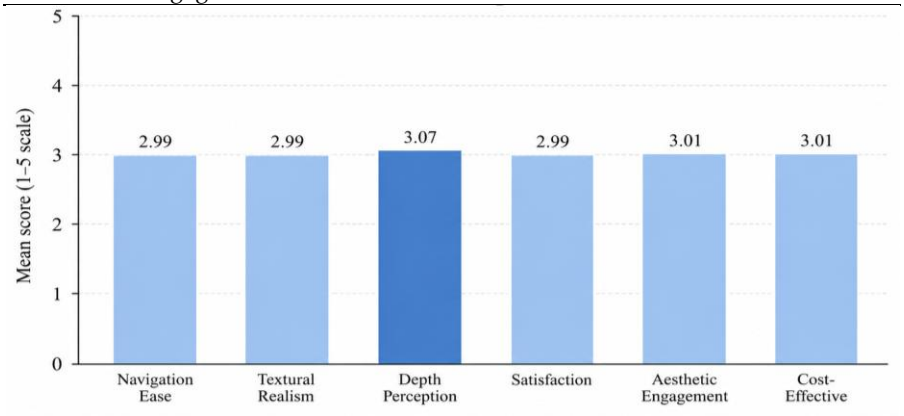


FIGURE 2. Virtual museum indicators show moderate levels across user-experience dimensions.

The robust OLS model predicting satisfaction had very limited explanatory power (R^2 = 0.002; adjusted R^2 = -0.000; p = 0.538). This result should be interpreted as evidence of model limitation rather than as evidence that digital museum experience is unimportant. The available interface and interaction indicators did not meaningfully explain satisfaction, suggesting that cultural interpretation, narrative quality, accessibility, prior interest, and learning design may matter more than technology presence alone. Consequently, evaluate the digital component of arts-based sustainable development by focusing on meaning, access, and participation rather than technical availability alone.

Table 4. Robust OLS regression predicting virtual museum satisfaction.

Predictor	b	Robust SE	Std. beta	p-value
Constant	2.657	0.189		0.000
Navigation ease	0.019	0.014	0.019	0.170
Textural realism	0.004	0.014	0.004	0.759
Depth perception	-0.003	0.014	-0.003	0.821
Aesthetic engagement	-0.004	0.014	-0.004	0.784
Visual cognition (0-5)	0.007	0.013	0.007	0.622
Log interaction time	0.041	0.025	0.022	0.101
Auditory guidance	0.003	0.039	0.001	0.929
Cost-effectiveness perception	-0.016	0.014	-0.016	0.237
Dual-mode preference	0.044	0.039	0.016	0.257
Digital mode count	0.015	0.016	0.013	0.342

3. INTANGIBLE CULTURAL HERITAGE AND PERFORMING ARTS THEMES

The UNESCO intangible cultural heritage dataset contained 562 records. Keyword coding identified 519 elements (92.3%) as performance-related through concepts such as rituals, music, dance, festivals, vocal music, instrumental music, performance, procession, and oral tradition. Environmental or nature-related concepts appeared in 363 elements (64.6%), and social/cultural sustainability terms appeared in 479 elements (85.2%). These findings do not prove direct development impact on their own, but they show that performing arts and heritage practices are strongly embedded in sustainability-relevant cultural transmission, identity, environmental knowledge, and community continuity.

Table 5. Thematic sustainability evidence from intangible heritage and cultural funding datasets.

Evidence category	Count	Share	Interpretation
Performance-related ICH elements	519/562	92.3%	Coded through terms such as dance, music, ritual, festival, vocal music, theatre, and performance.
Environment-related ICH elements	363/562	64.6%	Coded through terms related to nature, forests, water, drought, agriculture, mountains, and landscapes.
Social/cultural ICH elements	479/562	85.2%	Coded through social practices, identity, community, transmission, practitioners, and safeguarding terms.
Community participation grants	48/102	47.1%	Funding descriptions emphasizing public, community, neighborhood, youth, workshops, and collaborative participation.
Performing arts grants	50/102	49.0%	Funding descriptions emphasizing dance, theatre, music, performance, film, and musicians.
Visual/public arts grants	18/102	17.6%	Funding descriptions emphasizing murals, exhibitions, photography, public art, installations, and books.

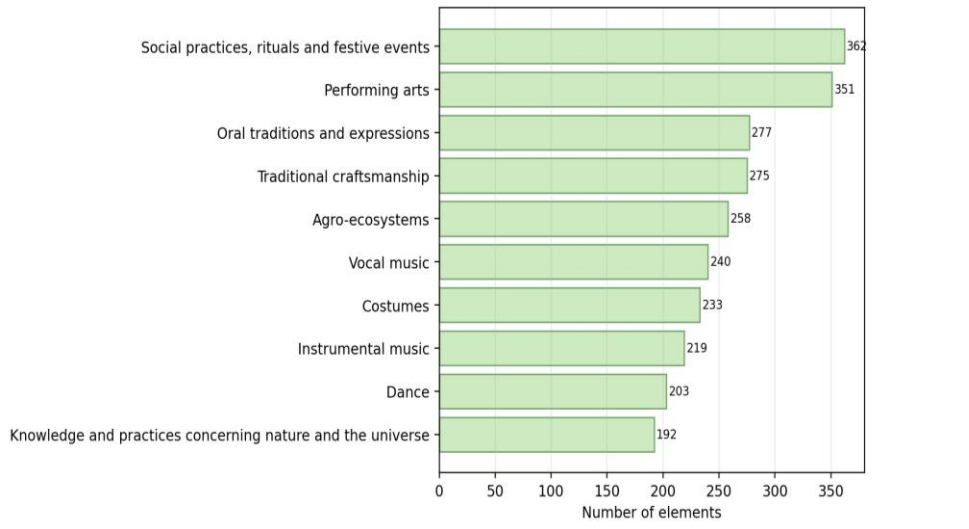


FIGURE 4. The most frequent intangible heritage concepts are strongly connected with social practices, performing arts, oral traditions, craftsmanship, music, dance, and festivals.

4. CULTURAL FUNDING, PARTICIPATION, AND SOCIAL CHANGE

The cultural funding dataset contained 102 grant records with a total recorded award value of $3,359,922.81. Community participation appeared in 48 grant descriptions (47.1%), while performing arts appeared in 50 descriptions (49.0%). Visual and public arts appeared in 18 descriptions (17.6%), cultural heritage and identity in 21 descriptions (20.6%), and social inclusion or justice in 10 descriptions (9.8%). The coding shows that arts funding supports not only aesthetic production but also community involvement, public cultural access, social communication, and heritage-based identity work.

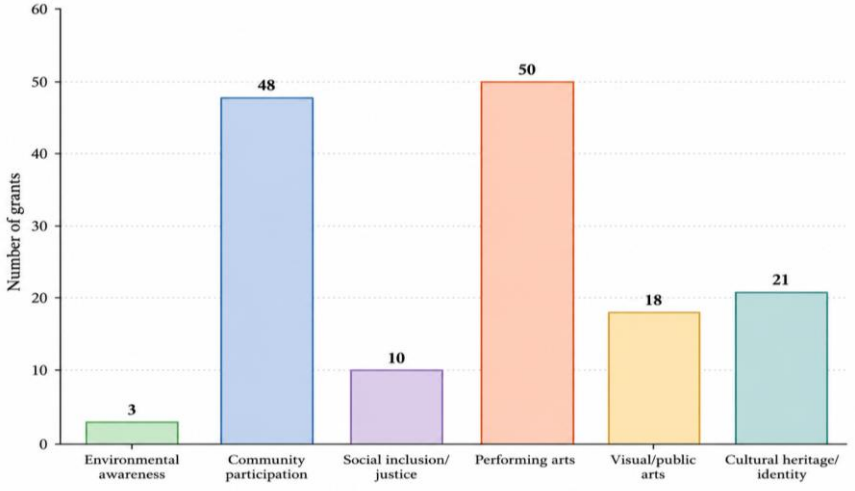


FIGURE 5. Community participation and performing arts were the most frequent themes in the cultural funding descriptions.

5. CROSS-SOURCE SYNTHESIS

Across the four evidence streams, the findings converge around a cautious but coherent interpretation. Museum attendance demonstrates that cultural institutions can function as large-scale participation spaces; virtual museum data show that digital cultural access requires interpretive quality rather than mere technological presence; intangible heritage records confirm that performing arts and rituals carry cultural continuity and community identity; and funding descriptions show that arts support frequently targets participation and performance-based activity. The combined evidence therefore supports the framework as a triangulated interpretation of arts-based sustainability pathways, while avoiding the stronger claim that secondary data alone can prove direct community transformation.

VI. DISCUSSION

The findings indicate that visual and performing arts support sustainable development most effectively when awareness, participation, and change-oriented community outcomes are connected. Evidence on museum attendance confirms that cultural institutions can attract substantial public participation, but it also shows that participation is vulnerable to disruption. Sustainable cultural development therefore requires more than artistic programming; it requires resilient access strategies, inclusive outreach, digital continuity, and community-centered recovery planning.

The virtual museum results provide a cautious but important contribution. The regression model did not identify strong predictors of satisfaction from basic technological and interaction variables. This means that digital cultural systems should not be evaluated only by interface features, immersion, or technology availability. For arts-based sustainability, the central question is whether digital environments create interpretive clarity, cultural connection, emotional engagement, and opportunities for participation. The finding therefore strengthens the paper by avoiding technological determinism and by showing the need for culturally meaningful design.

The intangible heritage results demonstrate that performing arts are deeply embedded in cultural sustainability. Rituals, festivals, music, dance, vocal practices, craftsmanship, and oral traditions appear as major heritage concepts. These practices transmit identity across generations, preserve social memory, and connect communities to place, environment, and collective values. Performing arts are therefore not limited to entertainment; they function as mechanisms of continuity, learning, community recognition, and intergenerational transmission.

The cultural funding analysis further supports the paper's social-change dimension, but indirectly. Many grant descriptions were coded as community participation, performing arts, heritage identity, visual or public arts, and social inclusion. This pattern confirms that arts-based initiatives often operate in the practical spaces where sustainable development becomes visible: community engagement, youth participation, public dialogue, environmental awareness, heritage identity, and public cultural access.

Taken together, the evidence supports a balanced interpretation. Arts do not automatically produce sustainable development, and digital cultural systems do not automatically create awareness. However, when artistic practice is intentionally connected to participation, inclusion, identity, public learning, and institutional support, visual and performing arts can provide cultural pathways that support sustainable community development. The paper therefore does not claim direct causality, but empirically demonstrates how multiple arts-related evidence streams can be organized into a defensible sustainability framework.

VII. INTEGRATED ARTS-BASED SUSTAINABLE DEVELOPMENT FRAMEWORK

The proposed framework operationalizes the analytical logic introduced earlier in the paper. It begins with creative inputs, including visual arts, museum exhibitions, public art, theatre, music, dance, festivals, rituals, and digital cultural experiences. These inputs become developmentally meaningful when they build awareness, foster participation, and create pathways to social change. Awareness refers to public understanding of social, cultural, and environmental issues. Participation refers to attendance, interaction, community co-creation, and dialogue. Social change refers to identity recognition, inclusion, responsibility, collective memory, and community resilience.

The framework is supported by four forms of empirical evidence. Museum visitor data represent participation in cultural institutions. Virtual museum data capture digital interaction and experience quality. Intangible cultural heritage data represent performing arts and cultural sustainability. Funding data represent community-oriented artistic action. The framework therefore connects conceptual theory with measurable and coded evidence and provides a structured basis for future arts-based sustainability research. Its main value is that it clarifies the conditions under which creative practice may contribute to sustainable development, while avoiding the assumption that artistic activity alone produces automatic social outcomes.

VIII. THEORETICAL AND PRACTICAL IMPLICATIONS

Theoretically, the study strengthens the position of arts and culture within sustainable development research by showing that creative practice can be examined through awareness, participation, heritage continuity, and social-change pathways. It also shows that researchers can study cultural sustainability through visitor evidence, user-experience indicators, heritage concepts, and project descriptions, rather than conceptual discussion alone.

Methodologically, the paper contributes a triangulated secondary-data approach for cultural sustainability research. Instead of forcing incompatible datasets into a single model, it treats each dataset as evidence for a different part of the analytical pathway. This approach suits arts research because cultural participation, digital engagement, heritage practice, and funding support often live in different data systems.

For cultural institutions and digital cultural platforms, the findings suggest that sustainability programs should combine artistic quality with public learning, accessibility, and interpretation. Exhibitions, performances, and virtual experiences should not only present sustainability themes but also offer pathways that help audiences understand, discuss, and connect these themes to community life.

For cultural managers, the weak satisfaction model suggests treating digital access as a design and interpretation challenge, not just a technological upgrade. Meaningful cultural engagement requires narrative structure, aesthetic quality, accessibility, and opportunities for audience interaction.

For policymakers and cultural funders, the study supports recognition of community arts, public art, theatre, dance, music, and heritage practices as part of sustainable development infrastructure. Funding criteria can explicitly include social inclusion, environmental awareness, cultural identity, public participation, intergenerational learning, and community resilience.

IX. CONCLUSION

This study examined visual and performing arts as active cultural instruments of sustainable development by integrating evidence from museum participation, virtual museum experience, intangible cultural heritage, and cultural funding records. The findings show that the arts contribute to sustainable development by building awareness, fostering public participation, supporting cultural continuity, and enabling social communication. Evidence on museum attendance demonstrates the importance of cultural institutions as public spaces for engagement, while also showing how participation can be vulnerable during periods of disruption. Virtual museum evidence indicates that digital cultural engagement is moderate and that satisfaction is not strongly explained by basic technology indicators alone. This result confirms that meaningful digital participation requires interpretive quality, accessibility, cultural relevance, and learning design rather than technological availability alone. Intangible heritage evidence confirms the centrality of performing arts, rituals, music, dance, festivals, oral traditions, and craftsmanship within cultural sustainability. These practices preserve identity, transmit memory, and connect communities to place, environment, and shared values. Cultural funding records further show that arts initiatives frequently support community participation, performing arts, public arts, heritage identity, and social inclusion. Together, these results indicate that the arts operate across multiple levels of sustainable development: they communicate problems, create shared experiences, preserve cultural knowledge, and support community-oriented action. The study does not claim that artistic activity automatically produces social change. Instead, it shows that visual and performing arts provide credible pathways to awareness, inclusion, participation, and resilient community development when connected to institutional support and public learning. Future work can strengthen this field by adding primary audience data, longitudinal evidence, validated qualitative coding, and direct links between cultural participation and local development outcomes.

X. DATA AVAILABILITY, ETHICS, FUNDING, AND COMPETING INTERESTS

Data availability: The study uses secondary datasets described in the Materials and Methods section and Appendix A. The manuscript reports dataset names, units of analysis, and analytical roles to support transparency and reproducibility.

Ethics statement: The study relies on public or anonymized secondary data and does not involve direct human-subject recruitment, intervention, or identifiable participant information.

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Competing interests: The author declares no competing interests.

Author Contributions

The author conducted the conceptualization, methodology, data analysis, investigation, writing, review, editing, and final approval of the manuscript.

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Data Availability

The dataset will be available from the author upon reasonable request.

Conflicts of Interest

The author declares no conflict of interest.

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