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Mechanisms Linking University Music-and-Art Resources to Local Cultural Co-development: A Quantitative Study of Pu'er University

Yingying Yang[1] and Shaowen Wang[2]

[1, 2]International Chinese College, Panyapiwat Institute of Management, Thailand

E-mail: 274236340@qq.com, ORCID ID: https://orcid.org/0009-0003-7646-7336

E-mail: 64364814@qq.com, ORCID ID: https://orcid.org/0009-0007-4295-6042

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Abstract

Background and Aims: Local universities in multi-ethnic frontier regions are increasingly expected to convert music-and-art resources into tangible outcomes for local cultural development. Prior studies have discussed pathways such as curriculum embedding and practice platforms, but quantitative evidence remains limited regarding which university capabilities matter most, how collaborative processes transmit these effects, and whether different outcome dimensions are driven by different capability configurations. This study aims to test a driver–linkage–outcome framework that explains how university capabilities relate to local cultural co-development outcomes, and how capability conditions are translated into outcomes through collaborative linkage.

Methodology: A cross-sectional online survey was conducted among participants engaged in Pu'er University's music-and-art-related learning, teaching, dissemination, and coordination activities. Of 481 returned questionnaires, 448 were valid (93% valid rate). Eight constructs were measured using 41 items on five-point Likert scales. Data analyses included reliability testing, Pearson correlations, multiple regression with control variables (gender, identity type, participation duration, and core role), and mediation analysis via collaborative linkage strength.

Results: Reliability was satisfactory (overall Cronbach's α = 0.875; construct α = 0.842–0.907). Correlations showed that the four university drivers were positively associated with collaborative linkage strength and with two outcomes (strategy identification and ecosystem maturity), while perceived collaboration barriers were negatively associated with key variables and outcomes. Regression results (with controls) indicated that all four drivers significantly predicted both outcomes; strategy identification was more strongly associated with practice-carrier effectiveness and technological empowerment, whereas ecosystem maturity was more strongly associated with practice carriers, resource integration, and collaborative support. Mediation tests supported collaborative linkage strength as a significant transmission mechanism linking university drivers to both outcomes. This pattern is consistent with partial mediation.

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Conclusion: Findings support a capability–relationship–outcome pathway. University capabilities translate into co-development outcomes partly by strengthening collaborative linkages. The study further reveals differentiated driver patterns: acceptance-oriented outcomes rely more on participatory carriers and digital empowerment, while ecosystem formation relies more on integration and institutional support.

Keywords: University Music-and-Art Resources; Local Cultural Development; University–Community Collaboration; Strategy Identification; Ecosystem Maturity; Mediation

Introduction

Digital dissemination and collaborative cultural governance have expanded expectations for local universities to contribute to local cultural development, particularly in multi-ethnic frontier regions where culture supports identity formation, social cohesion, and regional visibility. Research on local universities suggests that music and art education can facilitate the inheritance and development of local cultural elements by embedding them into curricula and practice systems (Yang, 2019; Zhang, 2021). In this context, university participation involves not only resource input, but also the conversion of institutional capabilities into collaborative cultural action. Practice-oriented studies further argue that university artistic activities and performance platforms can strengthen public engagement and cultural visibility through repeated participation-based events (Li, 2019; Luo, 2016).

However, prior work also emphasizes that "resource availability" does not automatically translate into "development outcomes." Fragmented governance, weak coordination, and limited transformation mechanisms reduce efficiency and restrict spillover beyond campuses (Liu, 2013). This indicates that the key issue is not only whether universities possess resources, but also whether they can form effective collaborative relationships. In parallel, digital technologies and new media can expand reach and improve dissemination efficiency (Ma, 2018; He, 2020), while broader discussions of digitalised higher education highlight governance and organizational implications for resource management and public service capacity (Komljenovic, 2025; Carmo, 2025). Yet, digital tools alone may not generate sustained outcomes if collaboration and governance linkages remain weak.

Despite these insights, existing studies still provide limited quantitative evidence regarding (a) how university capabilities relate to measurable co-development outcomes, (b) whether collaboration quality transmits these effects, and (c) whether distinct outcomes are driven by distinct capability configurations. To address these gaps, this study proposes and tests a driver–linkage–outcome framework, focusing on four university drivers—resource integration capability, practice-carrier effectiveness, collaborative support level, and technological empowerment

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level—and two outcomes—strategy identification and ecosystem maturity—while examining collaborative linkage strength as a mediating mechanism. This framework is intended not only to test direct associations, but also to clarify how capability conditions are translated into differentiated co-development outcomes through collaborative linkage.

Literature Review

1. University drivers for cultural co-development

This study interprets these drivers from a capability-to-relationship perspective, assuming that institutional conditions affect co-development outcomes partly through the quality of collaborative connection they can support. Resource integration reflects a university's capacity to coordinate dispersed artistic resources across departments and projects. Prior research argues that fragmented management leads to inefficient utilization and constrains transformation into social impact (Liu, 2013). Higher integration capability should therefore facilitate sustainable cooperation and ecosystem building.

Practice carriers (performance platforms, immersion programs, student organizations, community projects) turn cultural resources into visible and participatory experiences. Research on university art practice and performance platforms indicates that participatory carriers enhance repeated engagement and strengthen public visibility (Luo, 2016; Li, 2019). In local music education contexts, participatory practice is also central to sustaining local cultural inheritance (Yang, 2019; Zhang, 2021). Compared with resource integration, practice carriers are more directly connected with visibility, public participation, and stakeholder recognition.

Collaborative support captures institutional arrangements and governance mechanisms that stabilize cooperation. Without support, collaboration may remain ad hoc; with stronger support, cooperation becomes routinized and platform-based, supporting long-term ecosystem formation (Luo, 2016). This suggests that collaborative support functions less as a single activity input than as a governance condition that stabilizes repeated cooperation over time.

Technological empowerment reflects digital management and new-media dissemination capacities. Research on new media environments suggests digitization can expand reach, increase efficiency, and improve resource preservation and reuse (Ma, 2018; He, 2020). Digital transformation scholarship further notes that digitalised higher education can reshape governance and operational capacity (Komljenovic, 2025; Carmo, 2025), implying potential benefits for cultural co-development outcomes, although such effects are likely to depend on how digital capacity is connected to governance and collaboration processes.

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2. Collaborative linkage strength as a transmission mechanism

Collaborative linkage strength reflects the quality of cooperation networks, such as interaction frequency and cooperation tightness. Collaboration research in music-related education contexts emphasizes that stable collaboration supports shared action and capability spillovers (Gaunt & Westerlund, 2021). Accordingly, collaborative linkage strength is treated here not merely as a contextual feature, but as the relational channel through which institutional capabilities can be translated into coordinated action. Thus, university drivers may influence outcomes partly by strengthening collaborative linkages that transmit capabilities into coordinated practices and shared products.

3. Two outcomes: strategy identification vs. ecosystem maturity

This study distinguishes two outcomes: strategy identification (stakeholder acceptance and recognition of co-development strategies) and ecosystem maturity (institutionalization and sustainability of the co-development system). The distinction matters because the former mainly reflects recognition and alignment at the stakeholder level, whereas the latter reflects the degree to which collaboration becomes organized, durable, and reproducible at the system level. The literature implies that acceptance may be more proximal to participatory visibility and dissemination efficiency (practice carriers and technology), whereas ecosystem formation depends more on system-level coordination and institutional support (resource integration and collaborative support) (Liu, 2013; Luo, 2016; Ma, 2018). This distinction also helps position the present study within a broader debate on whether cultural co-development should be assessed mainly through short-term recognition outcomes or through longer-term system formation.

Research Hypotheses

1. Direct effects

H1a: Resource integration capability positively affects strategy identification.

H1b: Practice-carrier effectiveness positively affects strategy identification.

H1c: Collaborative support level positively affects strategy identification.

H1d: Technological empowerment level positively affects strategy identification.

H2a: Resource integration capability positively affects ecosystem maturity.

H2b: Practice-carrier effectiveness positively affects ecosystem maturity.

H2c: Collaborative support level positively affects ecosystem maturity.

H2d: Technological empowerment level positively affects ecosystem maturity.

2. Mediation via collaborative linkage strength

H3a: Resource integration capability positively affects collaborative linkage strength.

H3b: Practice-carrier effectiveness positively affects collaborative linkage strength.

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H3c: Collaborative support level positively affects collaborative linkage strength.

H3d: Technological empowerment level positively affects collaborative linkage strength.

H4a: Collaborative linkage strength positively affects strategy identification.

H4b: Collaborative linkage strength positively affects ecosystem maturity.

H5a: Collaborative linkage strength mediates the relationships between university drivers and strategy identification.

H5b: Collaborative linkage strength mediates the relationships between university drivers and ecosystem maturity.

3. Differentiated (comparative) effects

H6: Practice-carrier effectiveness and technological empowerment have comparatively stronger positive effects on strategy identification than resource integration capability and collaborative support.

H7: Resource integration capability and collaborative support have comparatively stronger positive effects on ecosystem maturity than technological empowerment.

Methodology

1. Research Design

This study employed a quantitative cross-sectional survey to test a driver–linkage–outcome framework of university music-and-art resources and local cultural co-development. Data were collected using a structured online questionnaire with eight constructs (41 items) measured on five-point Likert scales (1 = strongly disagree to 5 = strongly agree). As a cross-sectional design, the study is intended to identify patterned associations among variables at a specific point in time rather than to establish strong causal inference.

The framework examines the associations between four university drivers (resource integration capability, practice-carrier effectiveness, collaborative support level, and technological empowerment level), collaborative linkage strength (mediator), and two outcomes (strategy identification and ecosystem maturity). The questionnaire items were organized by construct in line with the proposed framework, covering university capability conditions, collaborative linkage, perceived barriers, and two co-development outcomes.

2. Research Sample

An online survey yielded 481 responses. After removing 31 invalid questionnaires, 448 valid cases were retained (valid rate = 93%). Respondents represented multiple participation positions (e.g., learning experience, teaching implementation, performance and dissemination, policy/management, local coordination, and resource collection/translation). The final sample was therefore treated as a valid participant-based dataset for testing the proposed associations

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in the Pu'er University context. To reduce potential confounding, gender, identity type, participation duration, and core role were included as control variables in regression-based hypothesis testing. The relatively high proportion of female respondents may partly reflect the gender composition of the music-and-art participation field in this context, although possible sampling concentration should also be acknowledged.

3. Analytical Methods

Data were analyzed using SPSS 27.0. Descriptive statistics were first used to summarize the respondent profile before reliability, association, and regression-based analyses were conducted.

First, internal consistency was assessed via Cronbach's α (overall α = 0.875; construct α = 0.842–0.907). Where available, item-level screening and construct validity evidence should also be reported to support the adequacy of measurement. Second, Pearson correlations were computed to examine bivariate associations among constructs. Correlation analysis was used as a preliminary assessment of direction and strength of association prior to regression modelling. Third, multiple regression models (with controls) tested direct effects of the four drivers on strategy identification and ecosystem maturity. Finally, mediation analysis evaluated whether collaborative linkage strength transmitted the effects of university drivers to the two outcomes, reporting key path coefficients and changes in model explanatory power.

Results

1. Frequency Analysis

A total of 481 questionnaires were collected. After excluding 31 invalid responses, 448 valid cases were retained (valid rate = 93%).

Table 1 reports the respondent profile. The sample was dominated by females (79.24%). Identity type was primarily university and senior secondary students (54.91%), followed by "others" (28.79%) and university administrators/teachers (9.60%). Participation duration was mostly under one year (59.15%). Regarding core roles, learning experience was the most common (68.30%), followed by teaching implementation (18.75%). Overall, the sample mainly reflects university-side and learning-oriented participation. The relatively small proportion of local culture-tourism/ICH/government staff (2.01%) suggests that the descriptive results should be interpreted more as evidence of internal university participation patterns than as a fully balanced representation of all external stakeholder perspectives. The high proportion of female respondents may also reflect the participant composition of the music-and-art activity context, although it should be borne in mind when interpreting the overall profile of the sample.

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Table 1 Frequency analysis of respondent characteristics

Variable	Category	n	%
Gender	Male	93	20.76
	Female	355	79.24
Identity type	University administrators/teachers	43	9.60
	Primary/secondary collaborating teachers	21	4.69
	University & senior secondary students	246	54.91
	Local culture-tourism/ICH/government staff	9	2.01
	Others	129	28.79
Participation duration	< 1 year	265	59.15
	1–3 years	92	20.54
	3–5 years	39	8.71
	> 5 years	52	11.61
Core role	Learning experience	306	68.30
	Teaching implementation	84	18.75
	Performance & dissemination	25	5.58
	Policy-making/management	19	4.24
	Local coordination	9	2.01
	Resource collection/translation	5	1.12

2. Reliability Analysis

Cronbach's alpha was used to assess internal consistency. As shown in Table 2, construct reliability ranged from 0.842 to 0.907, and overall reliability was 0.875.

Table 2 Reliability results (Cronbach's **α**)

Construct	**α**
Resource integration capability	0.862
Practice-carrier effectiveness	0.851
Collaborative support level	0.872
Technological empowerment level	0.842
Collaborative linkage strength	0.851
Perceived collaboration barriers	0.907
Strategy identification	0.882
Ecosystem maturity	0.878
Overall scale	**0.875**

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3. Correlation Analysis

Table 3 reports Pearson correlations. The four university drivers were positively associated with collaborative linkage strength (r = .535–.574, p < .001) and with both outcomes. For example, technological empowerment correlated with strategy identification (r = .513, p < .001) and ecosystem maturity (r = .486, p < .001). Perceived collaboration barriers were negatively correlated with collaborative linkage strength (r = −.582, p < .001) and with strategy identification (r = −.517, p < .001) and ecosystem maturity (r = −.523, p < .001).

Table 3 Correlation matrix (Pearson r)

Variable	1	2	3	4	5	6	7	8
1. Collaborative linkage strength	1							
2. Resource integration capability	.561***	1						
3. Practice-carrier effectiveness	.574***	.508***	1					
4. Collaborative support level	.565***	.534***	.557***	1				
5. Technological empowerment level	.535***	.539***	.558***	.541***	1			
6. Perceived collaboration barriers	-.582***	-.556***	-.582***	-.582***	-.572***	1		
7. Strategy identification	.500***	.468***	.500***	.474***	.513***	-.517***	1	
8. Ecosystem maturity	.521***	.492***	.511***	.505***	.486***	-.523***	.432***	1

Note: *** p < .001.

4. Regression Analysis (Direct Effects)

Multiple regression analyses were conducted to test the direct effects of the four university drivers on (a) strategy identification and (b) ecosystem maturity while controlling for gender, identity type, participation duration, and core role.

As shown in Table 4, all four drivers significantly predicted strategy identification. Technological empowerment (β = 0.218, p < .001) and practice-carrier effectiveness (β = 0.204, p < .001) showed the largest standardized effects. Resource integration (β = 0.154, p < .01) and

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collaborative support (β = 0.141, p < .01) were also significant. For ecosystem maturity, practice carriers (β = 0.230, p < .001), collaborative support (β = 0.208, p < .001), and resource integration (β = 0.203, p < .001) exhibited stronger effects, while technological empowerment remained positive and significant (β = 0.147, p < .01). Model explanatory power was substantial (adjusted R^2 = 0.358 for strategy identification; 0.378 for ecosystem maturity).

Table 4 Multiple regression results (standardized β)

Predictors	Strategy identification (β)	Ecosystem maturity (β)
Resource integration capability	0.154**	0.203***
Practice-carrier effectiveness	0.204***	0.230***
Collaborative support level	0.141**	0.208***
Technological empowerment level	0.218***	0.147**
Adjusted R^2	0.358	0.378
F	32.119***	34.891***

5. Mediation Effect (Collaborative Linkage Strength)

Mediation analysis examined whether collaborative linkage strength served as an intervening transmission mechanism between university drivers and co-development outcomes. The mediation summary indicates that university drivers positively predicted collaborative linkage strength, with coefficients ranging approximately from 0.138 to 0.241. Collaborative linkage strength, in turn, significantly predicted strategy identification (β = 0.162, p < .01) and ecosystem maturity (β = 0.192, p < .01). The inclusion of the mediator corresponded with adjusted R^2 values of approximately 0.370 (strategy identification) and 0.393 (ecosystem maturity).

Table 5 Mediation summary

Path	Effect
Drivers ⟶ linkage strength (range)	0.138–0.241
Linkage strength ⟶ strategy identification	0.162**
Linkage strength ⟶ ecosystem maturity	0.192**
Adjusted R^2 (with mediator): strategy identification	0.370
Adjusted R^2 (with mediator): ecosystem maturity	0.393

Note: ** p < .01.

6. Hypothesis Testing Summary

Table 6 provides a one-to-one mapping between each hypothesis and its empirical evidence, following the supported/not supported convention. The summary also highlights that

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support was obtained not only for the direct-effect hypotheses, but also for the comparative-effect and mediation-related hypotheses, thereby reinforcing the differentiated structure of the proposed framework.

Table 6 Hypothesis testing summary

Hypothesis	Evidence	Decision
H1a: Integration ⟶ Strategy (+)	Table 4: β = 0.154**	Supported
H1b: Practice ⟶ Strategy (+)	Table 4: β = 0.204***	Supported
H1c: Support ⟶ Strategy (+)	Table 4: β = 0.141**	Supported
H1d: Technology ⟶ Strategy (+)	Table 4: β = 0.218***	Supported
H2a: Integration ⟶ Ecosystem (+)	Table 4: β = 0.203***	Supported
H2b: Practice ⟶ Ecosystem (+)	Table 4: β = 0.230***	Supported
H2c: Support ⟶ Ecosystem (+)	Table 4: β = 0.208***	Supported
H2d: Technology ⟶ Ecosystem (+)	Table 4: β = 0.147**	Supported
H3a–H3d: Drivers ⟶ Linkage (+)	Table 5: 0.138–0.241	Supported
H4a: Linkage ⟶ Strategy (+)	Table 5: β = 0.162**	Supported
H4b: Linkage ⟶ Ecosystem (+)	Table 5: β = 0.192**	Supported
H5a: Mediation for Strategy	Table 5: Drivers⟶Linkage + Linkage⟶Strategy; Adj. $R^2 \approx 0.370$	Supported
H5b: Mediation for Ecosystem	Table 5: Drivers⟶Linkage + Linkage⟶Ecosystem; Adj. $R^2 \approx 0.393$	Supported
H6: Practice & Tech stronger for Strategy	Table 4: β(Tech=0.218) & β(Practice=0.204) > β(Integration=0.154) & β(Support=0.141)	Supported (comparative)
H7: Integration & Support stronger for Ecosystem	Table 4: β(Integration=0.203) & β(Support=0.208) > β(Tech=0.147)	Supported (comparative)

Conclusion

This study examined how university music-and-art resources are associated with local cultural co-development outcomes by testing a driver–linkage–outcome framework in the context of Pu'er University. Beyond reporting empirical associations, the study suggests that local cultural co-development should be understood as a capability-to-relationship process rather than as a simple resource-to-outcome process. Using a valid sample of 448 respondents and

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quantitative analyses (reliability, correlation, regression, and mediation tests), the findings provide consistent evidence for three main conclusions.

First, the results confirm that university capability conditions are significantly and positively associated with co-development outcomes. Resource integration capability, practice-carrier effectiveness, collaborative support level, and technological empowerment level all showed significant positive relationships with both strategy identification and ecosystem maturity after controlling for stakeholder characteristics. This indicates that university contributions to local cultural development can be understood as a multidimensional capability configuration rather than a single-factor effect.

Second, the study reveals a differentiated driver pattern across two outcome dimensions. Strategy identification was more strongly associated with practice carriers and technological empowerment, suggesting that participatory visibility and digital dissemination are particularly salient for acceptance-oriented outcomes. In contrast, ecosystem maturity was more strongly associated with resource integration and collaborative support (together with practice carriers), implying that system-oriented outcomes rely more on coordinated governance and institutionalized support mechanisms. Conceptually, this means that strategy identification and ecosystem maturity should not be treated as interchangeable indicators, because they represent different levels of co-development, namely stakeholder recognition and system formation.

Third, mediation evidence suggests that collaborative linkage strength serves as a key relational mechanism through which university capabilities become effective in local cultural co-development. University drivers were positively related to stronger collaborative linkages, which in turn significantly predicted both outcomes, improving model explanatory power. This supports the interpretation that university capabilities translate into co-development outcomes partly through strengthening the quality and tightness of university–community collaboration networks.

Discussion

This study provides empirical support for a driver–linkage–outcome framework explaining how university music-and-art resources contribute to local cultural co-development. The positive effects of resource integration, practice carriers, collaborative support, and technological empowerment on both strategy identification and ecosystem maturity are consistent with prior research emphasizing the role of practice platforms and institutional coordination in cultural development (Luo, 2016; Liu, 2013; Yang, 2019). This suggests that local cultural co-development is better understood as a multidimensional capability configuration than as the outcome of any single university input.

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The differentiated effect pattern further refines existing discussions. Strategy identification was more strongly associated with practice carriers and technological empowerment, suggesting that acceptance-oriented outcomes depend more on participatory visibility and digital dissemination, in line with new-media perspectives (Ma, 2018; He, 2020). In contrast, ecosystem maturity was more strongly associated with resource integration and collaborative support, reinforcing arguments that sustainable development requires coordinated governance and institutionalized cooperation (Liu, 2013; Gaunt & Westerlund, 2021).

Moreover, the mediation results indicate that collaborative linkage strength partially translates university capabilities into co-development outcomes, suggesting that university resources do not operate in a direct or self-sufficient manner, but become more effective when embedded in stable university–community interaction networks. Overall, the findings extend earlier qualitative claims with quantitative evidence and suggest that future studies should adopt longitudinal and multi-source designs to further clarify causal mechanisms.

Recommendation

Based on the empirical findings, several practical recommendations are proposed. First, universities should prioritize improving practice carriers and technological empowerment to enhance stakeholders' participation experiences and strengthen strategy identification. Second, local governments and universities are encouraged to establish integrated resource management and institutionalized coordination mechanisms to promote ecosystem maturity. Third, attention should be given to strengthening collaborative linkage networks and reducing coordination barriers through regular communication platforms and joint management arrangements.

By aligning capability development with collaboration governance, universities and local partners may more effectively transform music-and-art resources into sustainable cultural co-development outcomes.

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