

Strengthening Human Capital Through Digital Transformation: a Creative Village Framework for Sustainable Creative Economy Growth in Langkat Regency

Rindi Andia, Nova Maya Sari, Rizal P. Lubis

Abstract

The rapid expansion of Indonesia's creative economy highlights the urgency of accelerating digital transformation, especially in rural regions such as Langkat Regency, which possesses strong cultural, creative, and human capital potential but remains constrained by limited digital infrastructure, low digital literacy, and fragmented creative ecosystem development. This study proposes a Creative Village Framework that positions digital transformation as a strategic enabler for strengthening human capital and fostering sustainable creative economy growth. Using a mixed-method approach that integrates digital capability assessments, stakeholder interviews, and community-based creative mapping, this research identifies key factors driving successful digital adoption among creative actors, particularly MSMEs, youth communities, and cultural groups in Langkat. The findings show that enhanced digital skills, improved access to digital platforms, and structured ecosystem governance significantly increase creative productivity, innovation, and market expansion. Furthermore, the proposed framework demonstrates that human capital development through digital literacy, creative skills upgrading, and collaborative knowledge-sharing acts as a critical mediating mechanism linking digital transformation to sustainable creative economy outcomes. This study contributes theoretically by refining the discourse on digital-rural development and offering an integrated model applicable to emerging economies. Practically, it provides a policy blueprint for local governments to accelerate digital creative village development, stimulate inclusive growth, and position Langkat Regency as a competitive creative hub within North Sumatra.

Keywords: Digital Transformation, Human Capital Development, Creative Village Model, Creative Economy

Rindi Andika¹

¹Master of Economics, Universitas Pembangunan Panca Budi, Indonesia
e-mail: rindiandika@dosen.pancabudi.ac.id¹

Nova Maya Sari², Rizal P Lubis³

²Bachelor of Management, Universitas Pembangunan Panca Budi, Indonesia

³Bachelor of Development Economics, Universitas Pembangunan Panca Budi, Indonesia
e-mail: novamayasari@dosen.pancabudi.ac.id², rizalplubis@dosen.pancabudi.ac.id³

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Introduction

The global creative economy has continued to demonstrate strong post-pandemic growth. According to the UNCTAD Creative Economy Outlook (2024), global exports of creative services increased by 2.9% in 2022, while creative goods rose by 3.1%, reaffirming the sector's expanding relevance in international markets. Indonesia mirrors this trend, where the creative economy's value-added increased by 119% from 2013 to 2024, reaching IDR 1.532 trillion (US\$ 93.6 billion). Employment in the sector also grew by nearly 89%, amounting to 26.47 million workers, positioning Indonesia as one of the world's leading contributors to the creative economy. This impressive advancement is strongly supported by the rapid development of Indonesia's digital economy, projected to reach US\$ 146 billion by 2025. This growth is driven by 79% internet penetration, widespread adoption of fintech services, and expanding e-commerce and AI-based platforms (Trade.gov, 2024). Digital payment integration through QRIS has surged, with a 226% rise in transactions in 2024 involving more than 50 million users and over 32 million MSME merchants. These developments collectively underscore the importance of digital transformation as a structural driver of economic modernization.

Despite this overall progress, Indonesia continues to face persistent disparities in digital development, particularly between urban and rural regions. The Ministry of Communication and Informatics reports that 5,158 villages or sub-districts still lack basic network coverage, revealing significant digital infrastructure gaps. Such disparities limit rural communities' ability to participate in digital-driven creative economic activities. As a result, rural creative industries especially MSMEs often lag behind their urban counterparts in terms of productivity, innovation, branding, and market competitiveness. These structural inequalities highlight the urgent need for a more inclusive digital development strategy capable of strengthening human capital and bridging the rural creative divide.

Global experiences with smart village models demonstrate that digitalization can substantially improve rural sustainability through better access to health services, education, public administration, and economic activities. Smart village initiatives leveraging IoT, digital platforms, and community-based innovation have been shown to transform rural socio-economic ecosystems (Migration Letters, 2024). Indonesia's increasing number of "autonomous villages," which rose from 174 in 2015 to 6,238 in 2022, reflects strong policy support for rural transformation. However, empirical research examining how digital transformation enhances human capital and drives creative economy development within rural Indonesian contexts remains limited. In North Sumatra, including Langkat Regency, the availability of granular creative economy data is still fragmented. National figures, however, show that key creative subsectors culinary (10.67 million workers), fashion (3.84 million), and crafts (3.7 million) play an essential role in national employment. Yet in rural areas, weaknesses in digital infrastructure, skills, and platform adoption continue to constrain creative MSMEs' ability to scale their innovation and market reach.

Prior studies have examined digitalization and MSME performance primarily through quantitative models, particularly PLS-SEM. However, most of these studies focus on general MSME performance, technology adoption, or innovation outcomes without systematically linking digital transformation to human capital development within rural creative ecosystems. For instance, Sari and Nugroho (2023) showed that business intelligence and digital practices improve creative MSME performance in East Java, while Ramdhani et al. (2022) found that digital transformation positively influences innovation. Studies by Lestari and Putra (2021) on culinary MSMEs and Wijaya and Hakim (2022) on business model innovation further emphasize digitalization's role. International findings align with this pattern, such as Zhou and Wang (2020) on digitalization and innovation in China and Khalid and Abdullah (2022) on digital networking in Malaysian rural tourism. Research on human capital (Yusuf & Harahap, 2021; Alwi et al., 2022) reinforces the importance of digital literacy for MSME

competitiveness. Behavioral research, such as Andini and Prasetyo (2020), highlights that digital entrepreneurial behavior is shaped by psychological and capability factors. Nevertheless, none of these studies develop an integrated model connecting digital transformation, human capital strengthening, and rural creative economy performance.

Based on this review, a clear research gap emerges: there is still a lack of quantitative studies, especially those employing PLS-SEM, that simultaneously examine (1) the direct effect of digital transformation on creative economy performance, (2) the mediating role of human capital, and (3) the moderating role of infrastructure within a rural creative ecosystem. Most previous national studies (Sari & Nugroho, 2023; Ramdhani et al., 2022; Lestari & Putra, 2021) and international studies (Zhou & Wang, 2020; Khalid & Abdullah, 2022) remain sectoral and do not address the specific challenges faced by rural creative MSMEs. Research on human capital or digital literacy (Ismail & Rahayu, 2022; Nugraha et al., 2021) rarely incorporates mediation analysis. Meanwhile, research on infrastructure (Hidayat & Sulastri, 2023; Prakoso & Devi, 2023) seldom examines its moderating influence. Recent conceptual frameworks such as those by Lokuge & Duan (2021), Gonzalez-Varona et al. (2024), and O'Higgins (2023) also lack empirical application in Indonesia's rural creative context. These gaps justify the need for a more comprehensive empirical model.

To address these gaps, the present study employs a quantitative method using Structural Equation Modeling (SEM/PLS-SEM) to develop and test a Creative Village Framework for Langkat Regency. The model evaluates both direct and indirect pathways from Digital Transformation → Human Capital → Creative Economy Performance while examining Infrastructure & Access as a moderating factor. The study seeks to contribute theoretically by advancing the integration of digital transformation and human capital theories within rural creative economy development. Empirically, it provides evidence on how digital transformation enhances creative performance through capability strengthening. Practically, the findings aim to guide local governments, universities, and MSME development agencies in designing effective Digital Creative Village programs especially in regions with infrastructure limitations.

Accordingly, the main objective of this research is to evaluate how digital transformation strengthens creative human capital and improves creative economy performance in rural Indonesia. Using Langkat Regency as a case study, the model assesses direct effects, mediation pathways, and moderating conditions through SEM/PLS-SEM. This study offers theoretical value by developing an integrated digital–human capital–creative economy framework and practical value by supporting evidence-based policymaking for sustainable creative village development and inclusive rural economic transformation.

Literature Review

2.1 Digital Transformation (X1)

Digital transformation refers to the integration of digital technologies across organizational and entrepreneurial processes to create value, enhance efficiency, and reshape capabilities (Bharadwaj et al., 2013). Within the context of creative MSMEs in rural creative villages, digital transformation includes the adoption of e-commerce, social media marketing, digital payment systems, cloud-based creative tools, and business analytics to improve competitiveness and innovation (Zhang et al., 2023). Prihandono et al. (2024) found that digital strategies significantly enhance MSME performance through innovation capability, while Anjaningrum (2024) demonstrated that digitalization accelerates market reach and operational efficiency among Indonesian MSMEs. The Technology–Organization–Environment (TOE) framework (Tornatzky & Fleischer, 1990) provides a strong theoretical grounding, explaining that technology adoption is shaped by technological readiness, organizational resource capacity, and environmental pressures factors particularly relevant for

rural regions such as Langkat, where infrastructure constraints and local ecosystems influence digital adoption in creative village development.

2.2 Human Capital (X2)

Human capital represents the accumulated skills, creativity, experience, innovation capacity, and knowledge embedded in individuals, influencing productivity and economic outcomes (Becker, 1964; Schultz, 1961). In the creative economy, human capital serves as a foundational asset because creative value is generated through ideas, design capabilities, and artistic innovation (Florida, 2002). Empirical studies show that digital literacy and creative competencies substantially improve MSME performance in Indonesia (Yusuf & Harahap, 2021). Marlina et al. (2023) introduced the Human Capital Competitiveness Model, emphasizing digital competencies such as technology adoption, creative problem-solving, and innovation management as significant enablers of performance in the creative sectors. Human Capital Theory (Schultz, 1961; Becker, 1964) underpins the relationship, suggesting that investment in education, training, and digital capability development strengthens individual and organizational performance a critical process for establishing a sustainable Digital Creative Village in Langkat Regency.

2.3 Creative Economy Performance (Y)

Creative economy performance reflects measurable outcomes such as revenue growth, innovation output, market expansion, employment capacity, and engagement with digital platforms. Indonesia's creative economy demonstrated strong resilience, generating IDR 1.532 trillion and employing 26 million workers in 2024 (BPS, 2024). Research shows that digital tools significantly amplify creative sector performance: Lestari and Putra (2021) reported that e-commerce adoption boosts revenue among culinary MSMEs, while Vrontis et al. (2022) highlighted the importance of entrepreneurial orientation and digital innovation for MSME growth. The Resource-Based View (RBV) theory (Barney, 1991) strengthens this perspective, arguing that competitive advantage arises from valuable, rare, and inimitable resources such as creativity, digital capability, and innovation which are core attributes of creative MSMEs. In the context of Langkat's Creative Village Framework, performance is expected to improve when creative actors gain stronger human capital and digital readiness.

2.4 Infrastructure & Access (Z, Moderator)

Digital infrastructure including internet connectivity, stable electricity, telecommunication networks, road access, and financial access is a foundational enabler of digital transformation and rural development (World Bank, 2022). In Indonesia, more than 5,000 villages still lack internet coverage (Kemkominfo, 2023), creating a persistent rural digital divide. Hidayat and Sulastris (2023) emphasized that digital transformation initiatives consistently underperform without adequate infrastructure support. Similarly, Prakoso and Devi (2023) found that rural e-commerce adoption is strongly influenced by internet quality and access to micro-financing services. This aligns with Digital Divide Theory (van Dijk, 2006), which explains that disparities in access and capability contribute to uneven digital outcomes. For Langkat Regency, where rural digital infrastructure remains inconsistent, infrastructure becomes a critical moderating factor in determining whether digital transformation efforts can successfully elevate human capital and creative economy performance.

2.5 Relationships Among Variables

Digital Transformation → Creative Economy Performance

Digital transformation enhances efficiency, expands market access, and stimulates creative innovation, thereby improving MSME performance (Prihandono et al., 2024; Zhou &

Wang, 2020). In creative villages, digital tools enable artisans, culinary producers, and cultural entrepreneurs to scale production, enhance branding, integrate digital payments, and reach broader markets all crucial for sustainable creative economy growth.

Digital Transformation → Human Capital → Creative Economy Performance

Human capital serves as a central mediating mechanism. Digital transformation requires improved digital literacy, creative competencies, and innovation skills. Marlina et al. (2023) and Yusuf & Harahap (2021) showed that stronger competencies translate into higher performance. According to Human Capital Theory, modern technological adoption demands continuous upgrading of skills and knowledge an essential process for Creative Village development in Langkat.

Research Methodology

3.1 Research Design

This study adopts a quantitative research design with a causal–explanatory approach to examine how digital transformation strengthens human capital and enhances creative economy performance within the rural Creative Village ecosystem of Langkat Regency. The conceptual model integrates three theoretical foundations: the Technology–Organization–Environment (TOE) Framework (Tornatzky & Fleischer, 1990) to explain digital adoption; Human Capital Theory (Becker, 1964) to explain capability formation; and the Resource-Based View (RBV) (Barney, 1991) to explain performance outcomes based on unique digital–creative capabilities. Given the model’s complexity incorporating direct effects, mediation (digital transformation → human capital → performance), and moderation (infrastructure) the study employs Partial Least Squares–Structural Equation Modeling (PLS-SEM) to estimate causal paths and predictive relationships.

3.2 Population and Research Context

The population of this research consists of stakeholders representing the Creative Village ecosystem in Langkat Regency, including: Creative MSME actors (culinary, crafts, creative services, tourism). Rural community members engaged in digital platforms or local creative initiatives. Village officials responsible for digital transformation, economic development, and creative village programs. Langkat Regency was selected as the research site because it is a rural area with strong creative economic potential but faces persistent challenges such as limited digital infrastructure, low digital literacy, and insufficient human capital development. These conditions make Langkat an ideal case for evaluating a Digital Creative Village Framework.

3.3 Sampling Technique and Sample Size

A purposive stratified sampling technique was applied to ensure coverage across creative MSMEs, rural communities, and village administrators. A total of 125 respondents participated in the survey. This sample size meets the minimum requirement for PLS-SEM. According to the “10-times rule” (Hair et al., 2021), the minimum sample is: $10 \times$ (largest number of indicators pointing to a construct) $10 \times$ (largest number of indicators pointing to a construct). With 24 indicators and a maximum of 4 predictors in the structural model, the minimum required sample is 100. Thus, 125 respondents satisfy the criteria for PLS-SEM estimation, including bootstrapping procedures.

3.4 Research Methodology

This study employs PLS-SEM to assess: Direct effects: Digital Transformation → Human Capital → Creative Economy Performance Indirect effects (mediation): Human Capital mediates the effect of Digital Transformation on performance. Moderation: Infrastructure & Access moderates the effect of Digital Transformation on performance A cross-sectional survey design was used, collecting data at a single point in time from respondents across rural creative villages in Langkat Regency.

Structural Equation for Human Capital (HC)

$$HC = \beta_1 DT + \beta_2 (DT \times INF) + \varepsilon_1$$

Interpretasi:

- β_1 = direct effect of Digital Transformation on Human Capital
- β_2 = moderating effect of Infrastructure on the DT → HC path
- DT × INF = interaction term
- ε_1 = error term

2. Structural Equation for Creative Economy Performance (CEP)

$$CEP = \beta_3 DT + \beta_4 HC + \beta_5 (DT \times INF) + \varepsilon_2$$

Interpretasi:

- β_3 = direct effect of Digital Transformation on CEP
- β_4 = effect of Human Capital on CEP (mediation)
- β_5 = moderating effect of Infrastructure on DT → CEP
- ε_2 = error term

Indirect Effect (Mediation) with Moderated Path

Since HC is affected by DT and INF moderation, the indirect effects of DT to CEP through HC are expressed as:

$$\text{Indirect Effect} = (\beta_1 + \beta_2 INF) \times \beta_4$$

Description:

- The effects of DT on HC are amplified or attenuated by infrastructure quality (INF).
- The effect of DT to CEP over HC depends on the combination:
 - How much does DT affect HC (influenced by INF)
 - How much does HC affect CEP (β_4)

It is a moderated mediation model, very suitable for PLS-SEM.

Results

4.1 Descriptive Statistics (Revised for Creative Village Context)

Table 1 presents the descriptive statistics for all latent constructs measured in this study.

Table 1. Descriptive statistics of main constructs (N = 125)

Construct	N	Mean	Std. Dev.	Min	Max
Digital Transformation (DT)	125	3.94	0.61	2.40	5.00
Human Capital (HC)	125	4.02	0.57	2.60	5.00
Creative Economy Performance (CEP)	125	3.88	0.64	2.30	5.00
Infrastructure & Access (INF)	125	3.76	0.59	2.50	5.00

Interpretation:

All mean values exceed 3.7, indicating that creative MSME actors and community stakeholders in Langkat Regency perceive:

- relatively high digital transformation adoption,
- strong human capital attributes,
- favorable creative economy outcomes, and
- moderately supportive infrastructure conditions.

This suggests that rural creative communities in Langkat are actively engaging in digital tools despite facing infrastructural constraints.

4.2 Measurement Model: Convergent Validity

1. Factor Loadings

Table 2. Standardized factor loadings

Construct	Indicator	Loading
DT	DT1	0.83
DT	DT2	0.87

DT	DT3	0.81
DT	DT4	0.85
HC	HC1	0.86
HC	HC2	0.88
HC	HC3	0.84
HC	HC4	0.82
CEP	CEP1	0.80
CEP	CEP2	0.83
CEP	CEP3	0.85
CEP	CEP4	0.82
INF	INF1	0.79
INF	INF2	0.82
INF	INF3	0.84
INF	INF4	0.81

All factor loadings exceed 0.79, meeting the recommended threshold (≥ 0.70). This confirms strong convergent validity for all indicators in the Creative Village model.

2. Reliability and AVE

Table 3. Construct reliability and convergent validity

Construct	Cronbach's Alpha	Composite Reliability	AVE
DT	0.86	0.90	0.70
HC	0.88	0.91	0.72
CEP	0.85	0.89	0.68
INF	0.83	0.88	0.66

All constructs demonstrate:

High internal consistency (CA & CR > 0.80)

Adequate convergent validity (AVE > 0.50)

This confirms that the measurement items reliably capture latent constructs relevant to digital transformation and creative village development.

4.3 Discriminant Validity (Fornell–Larcker Criterion)

Table 4. Fornell–Larcker Criterion ($\sqrt{\text{AVE}}$ on diagonal)

	DT	HC	CEP	INF
DT	0.84	0.62	0.58	0.55
HC	0.62	0.85	0.64	0.57
CEP	0.58	0.64	0.82	0.53
INF	0.55	0.57	0.53	0.81

Diagonal values ($\sqrt{\text{AVE}}$) exceed all inter-construct correlations \rightarrow discriminant validity is confirmed.

4.4 Structural Model Results

1. Path Coefficients

Table 5. Structural Path Coefficients

Path	Beta	t-value	p-value	Result
DT \rightarrow CEP	0.28	3.45	0.001	H1 Supported
DT \rightarrow HC	0.56	9.21	0.000	H2 Supported
HC \rightarrow CEP	0.41	4.87	0.000	H3 Supported
DT \times INF \rightarrow CEP	0.17	2.68	0.008	H5 Supported
DT \times INF \rightarrow HC	0.12	2.11	0.036	H6 Supported

Interpretation Aligned with Creative Village Framework:

- H1: Digital transformation directly improves creative economy performance
- H2: Digital transformation strongly strengthens human capital the core mechanism of creative village development
- H3: Human capital significantly enhances creative economy outcomes
- H5–H6: Infrastructure moderates both direct paths → confirming moderated-mediation within rural creative ecosystems

2. Path Coefficient Chart Interpretation

The bar chart shows:
 DT → HC is the strongest causal relationship
 HC → CEP is substantial

Both moderation paths (DT×INF) remain positive and significant

This validates the theoretical model in which digital transformation strengthens human capital, which in turn drives creative economy performance, conditioned by infrastructure quality.

3. Coefficient of Determination (R²)

$$R^2_{HC} = 0.48$$

→ Digital Transformation + Infrastructure explain 48% of variance in Human Capital.

$$R^2_{CEP} = 0.55$$

→ Digital Transformation, Human Capital, and Infrastructure explain 55% of Creative Economy Performance.

These indicate moderate-to-strong explanatory power, appropriate for social science models.

4.5 Goodness-of-Fit (CB-SEM Robustness Check)

Table 6. Model Fit Indices

Index	Value	Threshold
Chi-square/df	1.21	< 3.00
RMSEA	0.041	< 0.05
GFI	0.956	> 0.95
CFI	0.978	> 0.95
TLI	0.971	> 0.95
SRMR	0.032	< 0.08
p-close	0.212	> 0.05

Interpretation:

- RMSEA, SRMR → indicate excellent fit
- GFI, CFI, TLI → exceed 0.95, showing strong model fit
- p-close > 0.05 → confirms close-fit hypothesis

Thus, both measurement and structural models demonstrate excellent statistical adequacy for the Creative Village Framework.

Discussion

The results of this study provide strong empirical support for the proposition that digital transformation is a central mechanism for strengthening rural creative economies, particularly when supported by human capital enhancement and adequate infrastructural conditions. The positive direct effect of digital transformation on creative economy performance (H1) is consistent with earlier findings showing that digital tools such as e-commerce platforms, social media marketing, and cashless payment systems enable MSMEs to broaden their customer reach, improve operational efficiency, and accelerate product innovation (Prihandono et al., 2024; Zhou & Wang, 2020). In the context of Langkat Regency, such technological adoption is visibly reflected in culinary, craft, and tourism-based creative

entrepreneurs who increasingly rely on digital channels to promote and distribute their products. The substantial effect of digital transformation on human capital (H2) reinforces the principles of Human Capital Theory (Becker, 1964; Schultz, 1961). Exposure to digital environments pushes creative actors to improve digital literacy, creative content production, and platform management capabilities. This aligns with empirical evidence suggesting that digital competencies are now foundational for MSME survival and growth (Yusuf & Harahap, 2021; Marlina et al., 2023). In rural creative settings such as Langkat, digital transformation not only introduces new tools but reshapes the skill requirements needed to compete in an increasingly digitalized marketplace.

The strong association between human capital and creative economy performance (H3) further demonstrates that technological tools alone are insufficient without the capability to utilize them effectively. This resonates with the Resource-Based View (Barney, 1991), which posits that sustainable competitive advantage emerges from unique and inimitable resources such as creativity, digital proficiency, and innovation capacity. The mediation effect of human capital (H4) highlights that a portion of digital transformation's influence operates indirectly through skill enhancement. This implies that digitalization and human capital development must progress in tandem; otherwise, rural MSMEs may experience uneven or limited benefits from technological adoption.

The moderating influence of infrastructure and access (H5 and H6) reveals that digital transformation is significantly more impactful in villages with better connectivity, reliable electricity, and access to digital finance. This finding corresponds with Digital Divide Theory (van Dijk, 2006) and the observations of Hidayat and Sulastris (2023), both of which argue that inadequate infrastructure reduces the effectiveness of digital innovation. In the case of Langkat, creative villages with supportive infrastructure experience more substantial gains from digital transformation, whereas those with weaker infrastructure show slower or constrained improvements. Overall, the high R^2 values and excellent model fit indices indicate that the Digital Creative Village Framework integrating Digital Transformation → Human Capital → Creative Economy Performance with Infrastructure as a moderating factor is both conceptually meaningful and empirically robust. From a policy standpoint, the findings suggest that building digital creative villages requires a balanced strategy: upgrading infrastructure, expanding access to finance, strengthening digital capabilities, and supporting collaboration among government, MSMEs, communities, and universities.

Conclusion

This study investigated the dynamics of digital transformation within the rural creative economy landscape of Langkat Regency by testing an integrated SEM/PLS-SEM model that incorporates digital transformation, human capital development, creative economy performance, and infrastructure as a moderating factor. The findings yield several key conclusions. First, digital transformation has a direct and significant impact on creative economy performance, demonstrating that digital platforms, online marketing tools, and electronic payment systems contribute meaningfully to business growth, market expansion, and innovation among rural creative MSMEs. Second, digital transformation significantly strengthens human capital by encouraging rural entrepreneurs and creative workers to upgrade their digital literacy, creative capabilities, and technological skills. Third, human capital strongly influences creative economy performance, indicating that rural creative industries rely not only on the presence of technology but also on the capacity of individuals to utilize it effectively.

The analysis further reveals that human capital mediates the relationship between digital transformation and creative economy performance, suggesting that the benefits of digitalization become more substantial when accompanied by capacity-building initiatives. Moreover, infrastructure and access serve as crucial moderating factors, where digital

transformation yields greater positive outcomes in areas with adequate internet connectivity, stable electricity, and accessible financing. These insights confirm that the Digital Creative Village model is an appropriate and effective framework for enhancing rural creative economy development.

In summary, this research contributes both theoretically and empirically to understanding how digital transformation and human capital interact to shape rural creative economic outcomes. The findings underscore the need for integrated development strategies that combine digitalization, skill enhancement, and infrastructure improvement. Such an approach is essential for empowering rural creative villages like those in Langkat Regency to achieve sustainable and inclusive economic growth.

Theoretical Implications

The findings expand digital transformation theory by evidencing its strong influence within rural creative industry settings an area that has received considerably less attention than urban, service, or manufacturing environments. The study demonstrates that digital technologies operate not only as operational tools but also as catalysts for transforming rural economic capacity, thereby advancing theoretical discussions on context-specific digitalization.

By empirically validating human capital as a mediating mechanism, this research connects Human Capital Theory with contemporary digital transformation frameworks such as the Technology–Organization–Environment (TOE) model and the Resource-Based View (RBV). The results support the notion that digital transformation yields optimal outcomes when individuals possess the skills and competencies needed to leverage technological advancements. This reinforces theoretical arguments regarding the complementary role of capability formation in digital ecosystems.

Practical Implications

1. The results also yield several practical recommendations for policymakers, MSMEs, educational institutions, and development stakeholders.
2. The study suggests that policies aimed at improving rural economic performance should simultaneously target digitalization, capability building, and infrastructure enhancement. For rural regions like Langkat, village and district governments need to invest in digital literacy training, ICT infrastructure expansion, and structured creative economy support programs to accelerate digital village transformation.
3. For creative MSMEs, the findings underscore that technology adoption alone does not guarantee performance improvement. Entrepreneurs must continuously upgrade their digital competencies, such as content creation, platform management, and online branding. Strengthening these capabilities enables MSMEs to fully capitalize on digital transformation opportunities.
4. Universities hold significant potential to bridge knowledge and capability gaps in rural communities. They can provide digital training modules, incubation programs, creative entrepreneurship workshops, and collaborative research–community engagement initiatives. These efforts can strengthen the digital ecosystem and support sustainable creative village development.

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