








“Product innovation and digital marketing capabilities linking entrepreneurial orientation to sustainability in Indonesian artisanal food SMEs”

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PRODUCT INNOVATION AND DIGITAL MARKETING CAPABILITIES LINKING ENTREPRENEURIAL ORIENTATION TO SUSTAINABILITY IN INDONESIAN ARTISANAL FOOD SMEs

Abstract

Traditional food enterprises in emerging economies face intensifying pressures to balance authenticity preservation with modern market demands while achieving sustainable performance across economic, social, and environmental dimensions. This study examines how entrepreneurial orientation translates into business sustainability performance through product innovation and digital marketing capabilities among artisan tofu producers in North Sumatra, Indonesia. A structured survey collected data from 320 artisan tofu producers selected through purposive sampling targeting owner-operators with a minimum of three years of operation. Data were analyzed using partial least squares structural equation modeling to test parallel and serial mediation pathways. Results reveal that entrepreneurial orientation significantly influences product innovation capability ($\beta = 0.762, p < 0.001$) and digital marketing capability ($\beta = 0.308, p < 0.001$). Both capabilities mediate the entrepreneurial orientation–sustainability relationship, with innovation capability demonstrating stronger effects ($\beta = 0.311, p < 0.001$) than marketing capability ($\beta = 0.302, p < 0.001$). The analysis confirms asymmetric parallel mediation, with indirect effects through innovation capability ($\beta = 0.236$) exceeding those through marketing capability ($\beta = 0.093$). Serial mediation shows innovation capability enhances marketing capability ($\beta = 0.433, p < 0.001$), which subsequently affects sustainability performance ($\beta = 0.131$). The model explains 63.1% of the variance in business sustainability performance. These findings extend research on entrepreneurial orientation to resource-constrained traditional food contexts by demonstrating that capabilities operate both independently and sequentially. For artisan producers, systematic innovation documentation simultaneously enhances operational efficiency and generates substantive digital marketing content.

Keywords

entrepreneurship, innovation, digitalization, sustainability, performance, food, enterprises

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INTRODUCTION

Artisanal tofu enterprises represent a vital component of local food systems in many emerging economies. These small-scale producers sustain local economies, preserve traditional production techniques, and absorb labor in communities where formal employment opportunities remain limited (Ossowska et al., 2024; Teixeira & Ferreira, 2019). However, they increasingly face intensifying pressures related to quality standards, food safety regulations, and market digitalization that challenge their traditional operating models (Martín-Ríos, 2025). The tension between maintaining authenticity and adapting to modern market demands creates strategic dilemmas for producers who must balance tradition with innovation.

Consumers in craft and food markets increasingly value authenticity and quality narratives, driving producers to demonstrate process evidence and maintain social proximity in their market positioning (McKitterick et al., 2016). Simultaneously, these enterprises confront supply uncertainty, fluctuating input prices, and rapidly shifting consumer preferences toward health consciousness, safety assurance, and environmental responsibility (Malesios et al., 2018). The critical challenge becomes understanding how entrepreneurial spirit transforms into organizational capabilities that generate sustainable performance across economic, social, and environmental dimensions.

Despite their economic and social importance, traditional food enterprises remain underrepresented in management research, with scholarly attention focused predominantly on high-tech sectors or large-scale manufacturing contexts rather than micro-to-small-scale food producers, particularly when sustainability rather than purely financial outcomes becomes the focal performance metric (Martín-Ríos, 2025; Zaman et al., 2025). Understanding capability development pathways in resource-constrained traditional sectors requires examining how strategic orientations translate into functional capabilities and ultimately into multidimensional performance outcomes. This transformation mechanism holds practical significance for thousands of artisanal producers navigating the tension between preserving traditional methods and adapting to contemporary market imperatives.

Addressing this research need, this study develops and tests a model linking entrepreneurial orientation to business sustainability performance through product innovation and digital marketing capabilities operating both in parallel and in series. The empirical context focuses on artisanal tofu producers in North Sumatra, Indonesia, representing a traditional food sector facing modernization pressures. The contribution is twofold: conceptually, by integrating the resource-based view and the triple bottom line frameworks in an under-researched context; empirically, by providing evidence on capability-building pathways in traditional micro-enterprises, where resource constraints and informal operations create distinct strategic challenges.

1. LITERATURE REVIEW AND HYPOTHESES

Understanding how entrepreneurial orientation translates into sustainable outcomes requires examining both theoretical foundations and empirical evidence across resource-constrained enterprises.

The resource-based view provides a compelling lens for understanding competitive advantage, particularly when organizations possess resources that are simultaneously valuable, rare, difficult to imitate, and properly organized for exploitation (Barney & Hesterly, 2015). While some scholars have questioned the framework's boundaries (Kraaijenbrink et al., 2010), it retains considerable explanatory power in contexts demonstrating clear resource heterogeneity and immobility barriers. Artisanal food producers offer a particularly instructive example, as their tacit production knowledge and deep local market embeddedness create meaningful competitive barriers that larger,

more standardized competitors struggle to replicate (Ossowska et al., 2024).

However, possessing valuable resources represents only part of the story. Barney et al. (2011) emphasize that resources generate competitive advantage only when channeled through organizational routines that create value, remain rare among competitors, resist imitation, and lack strategic substitutes. Strategic orientations shape how organizations allocate resources toward capability development rather than generating outcomes directly (Wales et al., 2021). This distinction between resource possession and resource deployment proves crucial for understanding performance differences among similarly endowed organizations, particularly when considering dynamic capabilities that enable resource re-configuration (Teece, 2007).

Building on this foundation, strategic orientation scholarship suggests that orientations like entrepreneurial orientation function less as direct performance drivers and more as resource allocation

mechanisms that shape capability development (Wales et al., 2021). Strategic postures must translate into concrete organizational processes to generate measurable outcomes (Narver & Slater, 1990). Arunachalam et al. (2018) demonstrate this pattern empirically, finding that entrepreneurial orientation affects profitability entirely through innovation and marketing capabilities, with no significant direct pathway. Similarly, business model design mediates between resource endowments and performance through coordinated activity systems (Zott & Amit, 2010). The consistent pattern across these studies suggests that resources and orientations require organizational routines to generate competitive returns.

Dynamic capabilities complement this resource-based foundation by emphasizing organizational abilities to sense environmental changes, seize opportunities, and transform operations through resource reconfiguration (Teece, 2007). For small and medium enterprises, innovation capability encompasses several interconnected dimensions: systematic ideation, small-batch experimentation, learning documentation, and standardization (Saunila, 2020). Development acceleration occurs when organizations integrate supplier involvement with rigorous documentation practices (Najafi-Tavani et al., 2016), suggesting that capability-building benefits from both internal routines and external partnerships.

Contemporary understanding of business performance increasingly recognizes the inadequacy of purely financial metrics. Elkington's (1997) triple bottom line framework established that sustainability performance requires simultaneous assessment across economic, social, and environmental dimensions. This multi-dimensional approach has gained particular traction in the small and medium enterprise sector, though substantial measurement variation persists across contexts (Zaman et al., 2025).

Importantly, the relationship between sustainability practices and operational performance challenges traditional assumptions about inherent trade-offs. Evidence suggests that environmental and social initiatives can actually improve financial sustainability through waste reduction, productivity enhancements, and stronger stakeholder rela-

tionships (Mwenda et al., 2023). Corporate social responsibility initiatives and environmental strategies enhance economic performance through efficiency improvements and green innovation (Kraus et al., 2020). Yet measurement standardization and the availability of objective indicators remain persistent barriers, particularly in small-scale contexts where resource constraints limit tracking capabilities (Johnson & Schaltegger, 2016).

Some progress has emerged through methodological innovations. Combining validated social-environmental indicators with objective economic proxies reduces perceptual bias and improves the credibility of assessments (Trianni et al., 2019). When measurement incorporates both perceptual and objective indicators, dynamic capabilities demonstrate positive effects across all three sustainability dimensions (Eikelenboom & de Jong, 2019). Beyond individual firm boundaries, small enterprise sustainability practices generate spillover benefits, including regional employment stability and community development (Malesios et al., 2018).

Entrepreneurial orientation combines innovativeness, proactivity, and risk-taking into a coherent strategic posture enabling opportunity exploitation under uncertainty (Wales et al., 2023). Covin and Slevin (1989) established that these three dimensions form a strategic approach particularly valuable in hostile and dynamic competitive environments where established practices prove inadequate. Innovation speed represents a critical mechanism through which entrepreneurial orientation generates outcomes (Shan et al., 2016), though contemporary research reveals increasingly complex mediating pathways.

Recent empirical research across diverse contexts illuminates how entrepreneurial orientation operates through capability-building mechanisms. In Indonesian enterprises, information technology capabilities and organizational resilience mediate relationships between entrepreneurial orientation and sales performance (Prayogi et al., 2025). Green entrepreneurship orientation affects sustainable performance through green innovation capabilities, with environmental dynamism moderating the relationship strength (Appiah et al., 2023). Organizational innovation capability mediates strategic orientation-performance relation-

ships in lower middle-income countries, with particularly pronounced effects among resource-constrained enterprises (Maclean et al., 2023). These findings align with theoretical expectations that strategic orientations operate indirectly through capability development rather than generating performance directly.

Product innovation capability represents more than isolated problem-solving; it reflects institutionalized ability to design, test, and implement improvements repeatedly through established routines (Saunila, 2017). The capability develops through several mutually reinforcing processes. Knowledge sharing and absorptive capacity jointly enhance innovation performance by facilitating learning transfer and enabling practice standardization, even across organizational boundaries (Nasution et al., 2025). When combined with corporate social responsibility, green innovation transforms strategy into sustainable performance through simultaneous environmental efficiency gains and stakeholder relationship strengthening (Le, 2022).

The sustainability implications of product innovation capability extend beyond environmental dimensions. Corporate social responsibility initiatives combined with environmental strategies reduce waste and enhance productivity through green innovation (Kraus et al., 2020). When green innovation integrates with corporate social responsibility, it transforms strategy into sustainable performance through simultaneous environmental efficiency gains and stakeholder relationship strengthening (Le, 2022). Organizations implementing sustainability balanced scorecards can track these improvements and communicate progress, strengthening organizational legitimacy with diverse stakeholder groups (Mio et al., 2022). These measurement and communication mechanisms connect internal operational improvements to external legitimacy building in ways that purely financial metrics cannot capture.

Digital marketing capability encompasses the coordinated ability to orchestrate channels, manage content assets, and leverage analytics to increase reach and conversion (Herhausen et al., 2020). However, the capability extends beyond technical proficiency. Customer experience management in-

tegration across functions and touchpoints creates value by reducing friction and reinforcing messages throughout customer journeys (Homburg et al., 2017). Rather than operating solely through cost reductions, digital marketing capabilities enable customer value creation through improved market sensing and enhanced engagement (Matarazzo et al., 2021). These capabilities translate into shareholder value through both revenue growth from market expansion and cost efficiency from improved targeting (Homburg & Wielgos, 2022).

Effective capability development emerges from coordinated initiatives across organizational levels rather than isolated functional activities (Apasrawirote et al., 2022). Digital transformation impacts extend beyond marketing functions to fundamental business model reconfiguration, suggesting these capabilities function as catalysts for broader organizational change (Llopis-Albert et al., 2021). This integrative perspective aligns with growing recognition that digital capabilities reshape entire value creation architectures rather than simply automating existing processes.

For resource-constrained enterprises, digital marketing capability offers particular advantages. Digital transformation enables customer value creation through improved market sensing and enhanced engagement, which translates into both revenue growth and cost efficiency (Matarazzo et al., 2021). These capabilities deliver shareholder value through market expansion and improved targeting precision (Homburg & Wielgos, 2022). Digital transformation also improves organizational resilience through enhanced stakeholder communication and adaptive capacity, suggesting investments provide value extending beyond immediate performance metrics (Zhang et al., 2021). Process transparency strengthens community trust and enhances business legitimacy among stakeholders who increasingly prioritize responsible production practices, with transparent brand communication enhancing perceived authenticity and trust (Yang & Battocchio, 2021).

Craft and artisan markets present distinctive dynamics around authenticity and transparency. Consumers in these markets purposively select authentic cues to shape experienced outcomes, making process transparency particularly valuable

in information-asymmetric contexts (Beverland & Farrelly, 2010). Authentic production stories connecting consumers to makers and processes demonstrably influence purchase decisions and willingness to pay price premiums (Elliot, 2016). Transparent brand communication enhances perceived authenticity, subsequently influencing trust development and purchase intentions across product categories (Yang & Battocchio, 2021).

These authenticity dynamics create distinctive value propositions for artisan producers, emphasizing heritage and process integrity. Geographic isolation, combined with strong community ties, creates conditions for artisanal food enterprises to balance tradition with market adaptation (Rytkönen et al., 2023). Local knowledge constellations and dense social networks facilitate the diffusion of innovation while preserving traditional production characteristics that define authenticity and market positioning (Karevoll et al., 2024). Institutional actor–producer relationships and social proximity enable collective innovation while maintaining the authenticity perceptions that consumers value (McKitterick et al., 2016). When producers effectively convey production heritage and process authenticity claims, entrepreneurial artisan products can function as regional tourism competitiveness factors (Teixeira & Ferreira, 2019).

Documentation and certification strengthen this dynamics by providing verifiable quality signals that reduce consumer uncertainty in information-asymmetric markets (Dodd et al., 2021). Documented brand heritage enhances brand equity through improved image and heightened perceived ethicality, suggesting transparent history functions as a strategic asset (Iglesias et al., 2019). Marketing capabilities link to profit growth through relationship building, with effects strongest when supported by verifiable operational excellence that substantiates marketing claims (Morgan et al., 2009). However, certification and documentation requirements create both barriers and opportunities for small producers seeking market access in global value chains (Henson & Humphrey, 2010).

The relationship between product innovation capability and digital marketing capability deserves particular attention. Product innovation capabil-

ity functions near value creation, where operational improvements directly generate customer value through defect reduction and resource efficiency (Saunila, 2017). Digital marketing capability operates near value capitalization, where engagement captures innovation value. Entrepreneurial orientation affects profitability through both innovation and marketing capabilities, with no direct pathway between orientation and performance (Arunachalam et al., 2018). This spatial relationship suggests potential serial mediation pathways where documented innovation outcomes enrich marketing effectiveness. Marketing capabilities link most strongly to profit growth when supported by verifiable operational excellence that substantiates marketing claims (Morgan et al., 2009), yet such serial pathways have received minimal empirical attention despite their theoretical plausibility.

Broader evidence supports the importance of multiple capability pathways. Technological capability-building mediates relationships between strategic orientations and social business outcomes in inclusive innovation contexts (Peerally et al., 2019). Business model innovation mediates sustainability orientation–performance relationships, with different capability configurations yielding distinct patterns across economic, social, and environmental dimensions (Salvador et al., 2021). These complementary pathways suggest that entrepreneurial orientation affects performance through multiple simultaneous mechanisms rather than single direct effects.

Existing empirical evidence establishes that entrepreneurial orientation influences performance through capability-building mechanisms. Product innovation capability and digital marketing capability have received extensive research attention, though predominantly in resource-rich environments (Martín-Ríos, 2025). Serial mediation pathways where documented innovation outcomes enrich marketing effectiveness remain understudied. Meanwhile, sustainability performance measurement requires validated multi-dimensional indicators spanning economic, social, and environmental domains.

This study examines how entrepreneurial orientation translates into business sustainability performance through product innovation capability

and digital marketing capability operating both in parallel and in series within artisanal tofu enterprises in North Sumatra, Indonesia. The paper tests whether entrepreneurial orientation develops both capabilities simultaneously, whether each capability independently affects sustainability performance, and whether innovation outcomes documented through product innovation capability enrich the effectiveness of digital marketing capability. This approach addresses the need for understanding capability pathways in artisan food contexts where tacit knowledge and local embeddedness create distinctive competitive dynamics (Ossowska et al., 2024). Furthermore, it responds to calls for examining sustainability transitions through capability development in small, entrepreneurial food enterprises (Martín-Ríos, 2025). Based on this theoretical synthesis, the study advances ten hypotheses:

- H1: Entrepreneurial orientation has a positive effect on product innovation capability.*
- H2: Entrepreneurial orientation has a positive effect on digital marketing capability.*
- H3: Entrepreneurial orientation has a positive effect on business sustainability performance.*
- H4: Product innovation capability has a positive effect on digital marketing capability.*
- H5: Product innovation capability has a positive effect on business sustainability performance.*
- H6: Digital marketing capability has a positive effect on business sustainability performance.*
- H7: Product innovation capability mediates the relationship between entrepreneurial orientation and business sustainability performance.*
- H8: Digital marketing capability mediates the relationship between entrepreneurial orientation and business sustainability performance.*
- H9: Digital marketing capability mediates the relationship between product innovation capability and business sustainability performance.*

H10: There is a serial mediation effect in the pathway from entrepreneurial orientation through product innovation capability and digital marketing capability to business sustainability performance.

2. METHOD

2.1. Research design and sample

This study employs a quantitative cross-sectional design to test parallel and serial mediation pathways. The target population comprises micro-to-small-scale artisanal tofu enterprises, identified through local producer associations and business licensing registers. Business owners or managers completed structured surveys following a two-way back-translation procedure to maintain semantic equivalence. Ethical protocols included informed consent and confidentiality assurance (Hair et al., 2019).

Of 450 distributed questionnaires, 320 complete responses were obtained (71.1% response rate). Owner demographics reveal a mean age of 38.4 years (SD = 9.1), with male respondents comprising 68% of the sample. Educational attainment skews toward secondary and tertiary levels: senior high school graduates account for 44% of respondents, followed by diploma holders (24%), bachelor's degree holders (18%), elementary or junior high school graduates (12%), and postgraduate degree holders (2%).

Business characteristics show considerable variation. Median enterprise age reaches 7 years (IQR = 4–12 years), with a median workforce of 6 employees (IQR = 4–9). Monthly revenue is concentrated in the IDR 25–50 million range, the most common bracket. Halal certification has been obtained by 41% of enterprises. Geographic distribution spans urban (57%), peri-urban (29%), and rural (14%) locations, capturing operational diversity across market contexts.

2.2. Measurement of items

Entrepreneurial orientation is a strategic orientation that combines innovativeness, proactivity, and a propensity for risk-taking, driving organi-

zations to pursue new opportunities under uncertainty (Wales et al., 2021, 2023). The construct was measured using the nine-item Covin-Slevin scale (Covin & Slevin, 1989), which has demonstrated robust psychometric properties across diverse small and medium enterprise contexts (Wales et al., 2021). Representative items include frequently experimenting with products and methods, moving first to capture opportunities, initiating actions responded to by competitors, and making bold decisions when outcomes are uncertain.

Product innovation capability represents the institutionalized ability to design, test, and implement product and process updates through established routines (Saunila, 2017, 2020). Five items adapted from Najafi-Tavani et al. (2016) were refined for traditional food production contexts. These items capture systematic idea generation and screening, experimental testing of recipes and processes in controlled batches, rapid implementation of validated improvements, documentation of successful changes, and coordination of suppliers and resources.

Digital marketing capability encompasses the coordinated ability to manage multiple channels, content assets, and analytics to increase market reach, relevance, and conversion (Herhausen et al., 2020; Homburg & Wielgos, 2022). Seven items were developed drawing on established frameworks (Herhausen et al., 2020; Homburg & Wielgos, 2022; Matarazzo et al., 2021) and tailored to small-scale food enterprises. These items assess channel integration across owned, earned, and paid media; content calendar maintenance emphasizing process transparency and authenticity; analytics-driven targeting and resource allocation; online-offline touchpoint integration; platform adaptation capabilities; community interaction management; and translation of operational achievements into compelling digital narratives.

Business sustainability performance was operationalized through the triple bottom line framework (Elkington, 1997), employing ten perceptual indicators alongside one objective measure. This approach draws on validated measurement frameworks for resource-constrained enterprises (Eikelenboom & de Jong, 2019; Le, 2022; Trianni et al., 2019; Johnson & Schaltegger, 2016; Mio et

al., 2022). The social dimension comprises four indicators: fair and safe working conditions, local community contribution, employee training and involvement, and stakeholder transparency. Six environmental indicators assess production waste reduction, wastewater management practices, energy efficiency improvements, water conservation, packaging sustainability, and systematic environmental impact tracking. The annual revenue category serves as the objective economic indicator. This multi-method measurement strategy addresses common method variance concerns (Podsakoff et al., 2003).

All constructs were measured using seven-point Likert scales (1 = strongly disagree; 7 = strongly agree) unless otherwise noted. Instruments were adapted to the artisanal tofu enterprise context through expert review and pilot testing.

2.3. Bias mitigation

Common method bias was addressed through both procedural and statistical remedies (Fuller et al., 2016; Podsakoff et al., 2003). At the procedural level, the questionnaire incorporated several design features to minimize respondent bias: anonymity assurance, psychological separation between construct blocks, and consistent scale anchors throughout the instrument. Statistically, three complementary diagnostic tests were conducted following established protocols.

Harman's single-factor test was performed through exploratory factor analysis without rotation. The first factor explains 43.97% of total variance, below the conventional 50% threshold, suggesting that common method variance does not dominate the data structure (Podsakoff et al., 2003). Full collinearity assessment was conducted using variance inflation factors across all constructs. Values range from 1.86 for product innovation capability to 2.22 for business sustainability performance (entrepreneurial orientation = 2.01; digital marketing capability = 2.14). These values remain well below the 3.3 cutoff, indicating the absence of common method bias (Kock, 2015).

The marker variable technique provided additional verification using attitude toward local festivals (3 items), a construct theoretically unrelated to

the focal variables. Correlation and path coefficient correction following the procedure outlined by Lindell and Whitney (2001) and Richardson et al. (2009) shows a maximum change of $\Delta\beta = 0.02$, with significance levels remaining unaffected. Collectively, these procedural safeguards and statistical diagnostics provide confidence that common method bias does not substantially influence the findings.

2.4. Data analysis

Data analysis employed partial least squares structural equation modeling using SmartPLS version 4.0 software. This variance-based approach suits the study's focus on prediction rather than theory confirmation, particularly given the examination of dual mediation pathways (parallel and serial) with reflective constructs and a medium-sized sample. The method accommodates non-normal data distributions while maximizing explained variance in endogenous constructs (Hair et al., 2019, 2021).

Measurement model assessment established indicator and construct quality through outer loadings, composite reliability, and average variance extracted. The Fornell–Larcker criterion and heterotrait-monotrait ratio verified discriminant validity among constructs.

The structural model examined path coefficients, explained variance (R^2), and Q^2 statistics obtained through blindfolding. Variance inflation factors

remained below 3 for all predictors, confirming negligible multicollinearity.

Bootstrapping with 5,000 replications and 95% bias-corrected confidence intervals tested mediation hypotheses, following contemporary protocols that avoid distributional assumptions (Hair et al., 2021). Models were estimated hierarchically. The initial specification linked entrepreneurial orientation to product innovation capability. Digital marketing capability entered as an additional endogenous variable in the second specification. Business sustainability performance was added in the final specification, enabling tests of both parallel mediation (through each capability independently) and serial mediation (through both capabilities sequentially).

3. RESULTS

3.1. Measurement model evaluation

Measurement model diagnostics are presented in Table 1, confirming reliability and convergent validity across all constructs.

Outer loadings for all indicators exceed 0.70 ($p < 0.001$). Composite reliability ranges from 0.88 to 0.95, while average variance extracted spans 0.56 to 0.69. These values satisfy established thresholds for internal consistency and convergent validity. Discriminant validity was assessed through the Fornell–Larcker criterion and heterotrait-monotrait ratios, with results reported in Table 2.

Table 1. Measurement model assessment

Construct	Code	Items	Loadings	CA	CR	AVE
EO	EO1	Frequently experiments with new approaches	0.815	0.945	0.953	0.693
	EO2	Emphasizes the novelty of offerings	0.834			
	EO3	Supports creative ideas despite uncertainty	0.830			
	EO4	Moves first to capture opportunities	0.837			
	EO5	Initiates actions responded to by competitors	0.841			
	EO6	Leads market changes	0.822			
	EO7	Commits to reasonably risky projects	0.833			
	EO8	Makes bold decisions when outcomes are uncertain	0.840			
	EO9	Prefers aggressive steps for growth	0.840			
PIC	PIC1	Systematically develops new improvement ideas	0.761	0.834	0.883	0.601
	PIC2	Tests recipes/processes in small batches	0.817			
	PIC3	Rapidly implements valuable improvements	0.787			
	PIC4	Maintains documented standard procedures	0.740			
	PIC5	Coordinates effectively with suppliers	0.769			

Table 1 (cont.). Measurement model assessment

Construct	Code	Items	Loadings	CA	CR	AVE
DMC	DMC1	Orchestrates multiple marketing channels	0.745	0.871	0.900	0.564
	DMC2	Maintains content calendar showcasing processes	0.737			
	DMC3	Uses analytics for targeting decisions	0.735			
	DMC4	Integrates online-offline touchpoints	0.791			
	DMC5	Responds quickly to platform changes	0.776			
	DMC6	Manages community interactions effectively	0.746			
	DMC7	Converts process evidence into digital content	0.724			
BSP	BSP1	Maintains safe working conditions	0.827	0.922	0.934	0.588
	BSP2	Contributes to local community	0.770			
	BSP3	Invests in employee development	0.771			
	BSP4	Maintains transparency to stakeholders	0.748			
	BSP5	Reduces production waste	0.743			
	BSP6	Manages wastewater responsibly	0.769			
	BSP7	Improves energy efficiency	0.781			
	BSP8	Reduces water use	0.736			
	BSP9	Uses environmentally friendly packaging	0.773			
	BSP10	Works to minimize environmental impact	0.741			

Note: BSP = Business Sustainability Performance; DMC = Digital Marketing Capability; EO = Entrepreneurial Orientation; PIC = Product Innovation Capability.

Table 2. Discriminant validity

Construct	BSP	DMC	EO	PIC
BSP	0.767	0.688	0.712	0.727
DMC	0.766	0.751	0.636	0.666
EO	0.762	0.700	0.833	0.761
PIC	0.826	0.780	0.857	0.775

Note: BSP = Business Sustainability Performance; DMC = Digital Marketing Capability; EO = Entrepreneurial Orientation; PIC = Product Innovation Capability. Fornell–Larcker criterion (upper triangle): Discriminant validity is confirmed when the square root of AVE (diagonal, in bold) is greater than the corresponding inter-construct correlations (off-diagonal). HTMT ratio (lower triangle): HTMT values below 0.85 (conservative) or 0.90 (liberal) indicate satisfactory discriminant validity (Henseler et al., 2015). All constructs show $\sqrt{\text{AVE}}$ values exceeding inter-construct correlations and HTMT ratios below 0.90, thus meeting discriminant validity criteria.

The square root of average variance extracted for each construct exceeds its correlations with other constructs. Heterotrait-monotrait ratios remain below 0.90 for all construct pairs. These results confirm that constructs are empirically distinct and meet discriminant validity requirements.

3.2. Structural model evaluation

Direct and indirect path estimates from the structural model are reported in Table 3, including standardized coefficients, *t*-values, *p*-values, and bias-corrected confidence intervals.

All hypothesized direct relationships were supported at $p < 0.001$. The relationship between entrepreneurial orientation and product innovation capability emerged as the strongest ($\beta = 0.762$).

Product innovation capability influences both digital marketing capability ($\beta = 0.433$) and business sustainability performance ($\beta = 0.311$). The direct effect of entrepreneurial orientation on business sustainability performance ($\beta = 0.283$) remains significant but smaller than its total effect, indicating partial mediation through the capability constructs. Mediation effects were estimated through bootstrapping procedures, with results presented in Table 4.

Confidence intervals for all indirect effects exclude zero, confirming significant mediation. Product innovation capability and digital marketing capability function both as parallel mediators (H7 and H8) and in serial configuration (H10), channeling entrepreneurial orientation's influence on sustainability performance. The serial mediation path-

Table 3. Structural path coefficients

Direct Path	B	t-value	p-value	Remarks
H1: EO → PIC	0.762	31.202	<0.001	Supported
H2: EO → DMC	0.308	5.341	<0.001	Supported
H3: EO → BSP	0.283	5.103	<0.001	Supported
H4: PIC → DMC	0.433	7.914	<0.001	Supported
H5: PIC → BSP	0.311	5.620	<0.001	Supported
H6: DMC → BSP	0.302	7.024	<0.001	Supported

Note: BSP = Business Sustainability Performance; DMC = Digital Marketing Capability; EO = Entrepreneurial Orientation; PIC = Product Innovation Capability.

Table 4. Mediation effects

Path	β	t-value	95% BC CI	Remarks
H7: EO → PIC → BSP	0.236	5.512	[0.149; 0.317]	Supported
H8: EO → DMC → BSP	0.093	4.367	[0.057; 0.140]	Supported
H9: PIC → DMC → BSP	0.131	4.998	[0.084; 0.186]	Supported
H10: EO → PIC → DMC → BSP	0.099	4.996	[0.065; 0.142]	Supported

Note: BSP = Business Sustainability Performance; DMC = Digital Marketing Capability; EO = Entrepreneurial Orientation; PIC = Product Innovation Capability.

way through both capabilities sequentially (H10: $\beta = 0.099$) demonstrates that innovation outcomes documented through product innovation capability enhance digital marketing effectiveness, which subsequently contributes to sustainability performance. The structural model with standardized path coefficients is illustrated in Figure 1.

Model predictive performance indicators are reported in Table 5.

Adjusted R^2 values range from 0.480 to 0.631, indicating that the model explains substantial variance in endogenous constructs. Positive Q^2 values (0.267 to 0.370) confirm predictive relevance be-

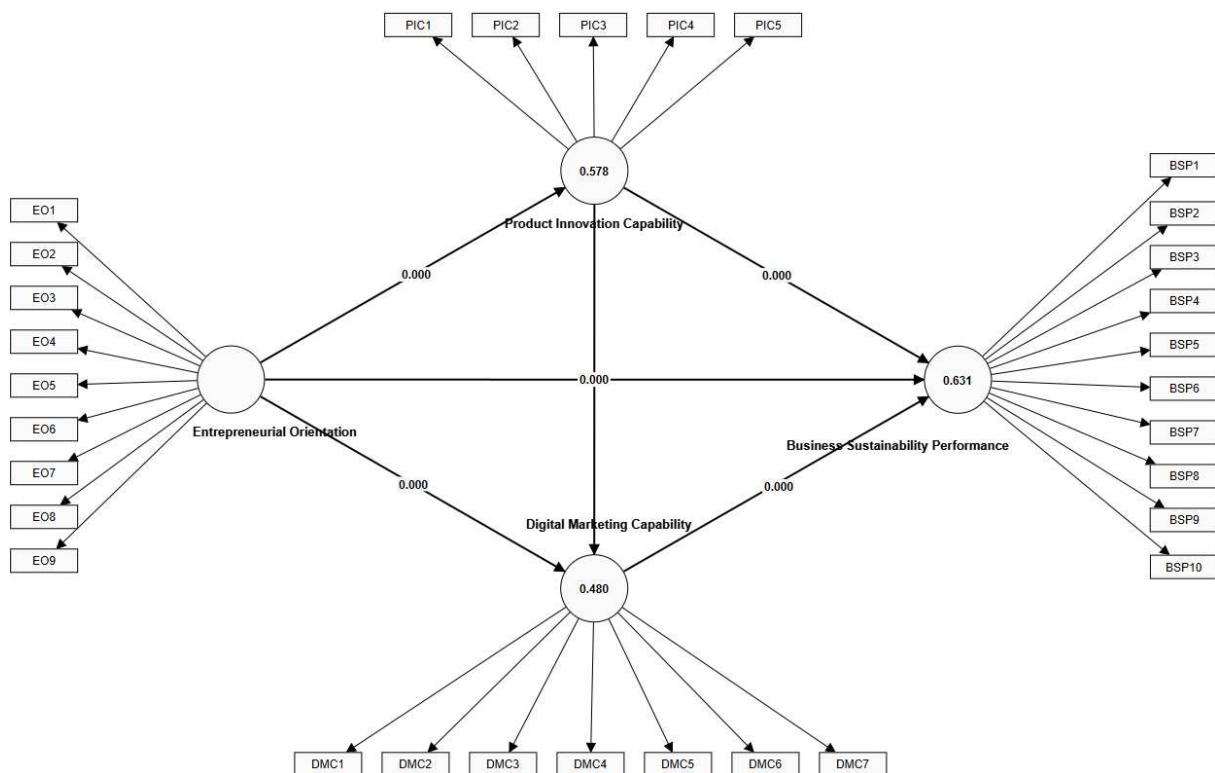


Figure 1. Structural model with standardized path coefficients (bootstrapping results)

Table 5. Model predictive performance

Construct	R-squared adjusted	Q ²
Business Sustainability Performance	0.631	0.370
Digital Marketing Capability	0.480	0.267
Product Innovation Capability	0.578	0.344

yond sample data. Variance inflation factors remained below 3 for all predictors, ruling out multicollinearity concerns.

4. DISCUSSION

The relationship between entrepreneurial orientation and product innovation capability (H1: $\beta = 0.762$, $p < 0.001$) reveals what entrepreneurial posture means concretely for artisan tofu producers. Producers who frequently experiment with new approaches and move first to capture opportunities translate this orientation into systematic innovation routines: they develop structured processes for testing new flavoring combinations in small batches, document successful recipe modifications, and standardize procedures with soybean suppliers. This capability-building pattern explains how entrepreneurial spirit becomes operational reality. Without these structured routines, entrepreneurial inclination remains intention rather than practice. This pattern aligns with findings that entrepreneurial orientation affects performance through innovation capabilities rather than directly (Arunachalam et al., 2018), though the coefficient magnitude is notably strong given the different performance outcome examined (profitability versus sustainability).

Entrepreneurial orientation also influences digital marketing capability directly (H2: $\beta = 0.308$, $p < 0.001$). Entrepreneurially oriented producers adopt digital channels faster and experiment with content approaches earlier than less entrepreneurial peers. They test Instagram marketing despite uncertainty about returns, try WhatsApp Business for customer communication, and explore Facebook groups for community building. This early adoption provides learning advantages that accumulate into marketing capability over time. Digital marketing capability has been conceptualized as encompassing channel orchestration, content management, and analytics (Herhausen et al., 2020), yet the organizational

antecedents driving capability development have received limited attention. These findings address this gap: entrepreneurial orientation provides the risk tolerance and proactivity enabling digital experimentation, which, through repeated trials, becomes systematic capability. This reveals why some producers develop strong digital marketing capabilities while others do not.

Entrepreneurial orientation directly affects business sustainability performance (H3: $\beta = 0.283$, $p < 0.001$) alongside the capability pathways. In artisan tofu production, entrepreneurially oriented owners may achieve sustainability gains through personal networks and reputation. A producer known for trying new methods may attract community support, secure waste management partnerships, or gain access to better suppliers based on proactive reputation alone, independent of documented innovation processes. The entrepreneurial posture itself signals legitimacy to local stakeholders who value initiative. Research on artisan food producers has shown that institutional actor-producer relationships and social proximity enable collective innovation through informal networks (McKitterick et al., 2016). These results extend this insight: while network effects operate (evidenced by the direct effect), formal capabilities remain the primary transmission mechanism (evidenced by the larger indirect effects).

Product innovation capability influences digital marketing capability (H4: $\beta = 0.433$, $p < 0.001$). When producers systematically test recipe improvements and document quality enhancements, they generate specific content for digital marketing: photographs of small-batch experiments, data on waste reduction percentages, certifications of hygiene compliance. A producer who implements a new wastewater filtration system and documents the process creates marketing material showing environmental responsibility. Without this documented innovation foundation, digital marketing relies on generic claims that lack credibility. The relationship operates in one direction because in-

novation creates verifiable evidence, whereas marketing capability alone cannot generate operational improvements. Research on craft markets has established that consumers purposively select authentic cues to shape their experiences (Beverland & Farrelly, 2010). However, what organizational processes generate these authentic cues remained unexamined. These results address this: innovation routines create the substantive achievements, providing these authentic cues. This explains why some artisan producers struggle with digital marketing despite understanding its importance: they lack the innovation documentation that would make their marketing claims substantive rather than aspirational.

Product innovation capability influences business sustainability performance (H5: $\beta = 0.311$, $p < 0.001$). For tofu producers, systematic innovation routines reduce production waste through optimized soybean-to-tofu conversion ratios, decrease water consumption by refining coagulation processes, and improve working conditions by standardizing safety procedures. A producer who documents these improvements can track environmental impact reductions and demonstrate social responsibility to employees and community members. The relationship is substantial because innovation capability directly addresses all three sustainability dimensions: economic efficiency through waste reduction, environmental performance through resource optimization, and social contribution through improved worker safety and training. Research has shown that green innovation transforms strategy into sustainable performance through simultaneous environmental efficiency gains and stakeholder relationship strengthening (Le, 2022). These results confirm that this transformation occurs through systematic capability deployment rather than ad hoc improvements.

Digital marketing capability influences business sustainability performance (H6: $\beta = 0.302$, $p < 0.001$). Effective digital marketing expands market reach, reducing dependence on local wholesalers and enabling better prices that support economic sustainability. Community engagement through social media strengthens local relationships and enhances social legitimacy. Process transparency communicated through digital channels builds

trust with environmentally conscious consumers, creating demand that justifies investments in sustainable practices. A producer who showcases waste reduction efforts through Instagram posts or documents halal certification on Facebook attracts customers who value these practices, generating revenue that funds further sustainability improvements. Digital marketing capabilities have been shown to enable customer value creation through improved market sensing and enhanced engagement (Matarazzo et al., 2021). These results extend this by revealing a bidirectional mechanism in artisan contexts: digital capabilities help producers sense which sustainability practices matter to customers, while simultaneously communicating existing practices to attract value-aligned customers. This bidirectional flow creates a reinforcing cycle where digital marketing both identifies sustainability investment priorities and generates the revenue to fund them.

Product innovation capability mediates the relationship between entrepreneurial orientation and business sustainability performance (H7: $\beta = 0.236$, $p < 0.001$), while digital marketing capability also serves as a mediator (H8: $\beta = 0.093$, $p < 0.001$). The indirect effect through product innovation capability exceeds twice the magnitude of the digital marketing pathway, indicating asymmetric mediation strength. For resource-constrained artisan producers, product innovation capability contributes more strongly to sustainability because it directly reduces waste, improves efficiency, and enhances quality. A tofu producer who optimizes coagulation processes immediately sees reduced soybean waste, lower water bills, and fewer customer complaints. Digital marketing capability amplifies and monetizes these improvements but cannot create them. For small producers operating on thin margins, operational improvements that reduce costs and waste provide more immediate sustainability gains than marketing sophistication.

Beyond operating as parallel pathways, the capabilities also connect directly. Digital marketing capability mediates the relationship between product innovation capability and business sustainability performance (H9: $\beta = 0.131$, $p < 0.001$). When producers document innovation achievements, these achievements become

marketing assets that attract sustainability-conscious customers, creating additional revenue streams beyond the direct cost savings from operational improvements.

This interconnection between capabilities reveals a sequential mechanism not tested in prior entrepreneurial orientation research. While innovation and marketing capabilities have been examined as parallel mediators (Arunachalam et al., 2018), whether these capabilities connect sequentially has not been tested. The serial mediation pathway (H10: $\beta = 0.099$, $p < 0.001$) shows entrepreneurial orientation flows into product innovation capability, which enhances digital marketing capability, which contributes to business sustainability performance. This sequential pathway exposes a critical dependency that parallel mediation models miss: marketing capability's effectiveness depends on having innovation documentation to communicate. The serial pathway effect, while smaller in magnitude than the direct capability effects, demonstrates that innovation capability must enhance marketing capability before marketing capability can affect sustainability. This finding extends capability research by showing that capabilities are not merely parallel pathways but can operate in sequence, with upstream capabilities enabling downstream capabilities.

Practical implications emerge from these capability formation patterns. Small-scale producers should prioritize establishing innovation routines: systematic ideation, controlled experimentation, documentation practices, and supplier coordination. These routines simultaneously improve operations and generate marketing content. The findings indicate these domains require integrated development, with innovation routines preceding and enabling marketing effectiveness. Producers cannot effectively market sustainability achievements that they have not systematically created and documented.

Policy interventions could support this integration through dual-function programs. Production capability development spaces that provide experimentation facilities also serve as documentation training venues. Digital capability support programs that teach channel orchestration and analytics can incorporate content development modules emphasizing operational evidence translation. Certification schemes gain additional value by creating verifiable documentation that enhances both legitimacy and marketing narratives. Regional programs facilitating collective waste management or energy tracking generate data that individual producers can leverage for both sustainability improvement and stakeholder communication.

CONCLUSION

This study examined how entrepreneurial orientation translates into business sustainability performance in artisan food enterprises. The focus centered on understanding mechanisms through which strategic postures become operational advantages in resource-constrained traditional sectors where sustainability integrates economic viability, social contribution, and environmental responsibility.

Analysis of 320 artisan tofu producers in North Sumatra reveals that entrepreneurial orientation operates through capability pathways rather than directly. Product innovation capability demonstrates stronger mediation than digital marketing capability, reflecting how resource constraints make operational improvements more critical than market sophistication. The capabilities function both independently and in sequence, with innovation capability generating documented achievements that enable marketing effectiveness. This sequential relationship exposes dependencies overlooked when capabilities are examined only as parallel mediators.

Capability development in resource-constrained settings requires integration rather than isolation. Entrepreneurial posture transforms into sustainable performance when producers systematically document operational improvements, simultaneously enhancing efficiency and creating substantive digital content. For traditional food enterprises, sustainability emerges from disciplined capability deployment

rather than entrepreneurial spirit alone. This extends capability theory by showing resource constraints alter which capabilities matter most and that capabilities can operate sequentially, with upstream capabilities enabling downstream ones. Policymakers can support this integration through programs combining production capability development with digital training, recognizing that these functions interconnect in resource-constrained settings.

These findings carry interpretive boundaries. Measuring all variables simultaneously means the sequential pathway, while theoretically logical, cannot establish that innovation capability develops before marketing capability. Producers may build both concurrently, with innovation documentation creating retrospective marketing opportunities. All constructs rely on owner perceptions, capturing their lived experience but potentially missing operational realities. A producer rating innovation capability highly may have informal rather than systematic processes, while another underrating their capability may have strong routines they fail to recognize. The pattern showing innovation capability as more important than marketing capability emerges in North Sumatra's artisan tofu context, where standardized production processes make incremental innovation accessible. Artisan products requiring specialized fermentation or aging may show different patterns where innovation barriers are higher, and marketing sophistication becomes more critical for differentiation.

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