

Determinants of Business Sustainability among Traditional Food Micro-Entrepreneurs in Kelantan: Structural Equation Modeling of Vulnerabilities, Authenticity, and Digital Adoption

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ABSTRACT

In Southeast Asia, traditional food microbusinesses play a critical role in maintaining local socioeconomic resilience and intangible cultural legacy (Bessière, 1998; Timothy, 2015; Senthil Kumar et al., 2023; Kavitha & Raagha Ravi, 2024). However, cumulative labor, market, and spatial vulnerabilities make long-term business survival difficult for many microbusinesses (Porter, 2011; Kruger & Viljoen, 2021; Sharma et al., 2022). With an emphasis on traditional akok producers and artisanal food vendors, this quantitative empirical study explores the structural determinants influencing business sustainability among traditional food micro-entrepreneurs in Kelantan, Malaysia (Omar et al., 2019; Mohd. Suleiman et al., 2023). The study assesses the impact of Operational Vulnerabilities, Culinary Heritage Authenticity, and Digital Marketing Adoption on Business Sustainability using a structured questionnaire survey given to N = 168 micro-entrepreneurs (Yin, 2018; Hair et al., 2021, Prayogi & Subriadi, 2024). Operational vulnerabilities have a considerable negative direct impact on business performance ($\beta = -0.342$, $p < 0.001$), according to empirical studies using Partial Least Squares Structural Equation Modeling (PLS-SEM) (Sowden, 2018; Deacon et al., 2020; Zainal et al., 2022). On the other hand, enterprise sustainability is strongly positively impacted by both digital marketing adoption ($\beta = 0.412$, $p < 0.001$) and culinary heritage authenticity ($\beta = 0.285$, $p < 0.001$) (Sims, 2009; Gössling et al., 2018; Bandhu et al., 2024; Givan & Pancasilawan, 2025). Additionally, the link between traditional heritage preservation and business performance is considerably mediated by the use of digital marketing ($\beta = 0.148$, $p < 0.001$) (Gössling et al., 2018; Kruger & Viljoen, 2021; Sharabati et al., 2024). Regarding municipal zoning preservation, ergonomic workplace interventions, and focused digital skill building for heritage micro-entrepreneurs, the study provides practical managerial and policy insights (Porter, 2011; Sowden, 2018).

Keywords: Culinary Heritage, Micro-Entrepreneurship, Quantitative Research, PLS-SEM, Business Sustainability, Akok, Kelantan Cuisine.

INTRODUCTION

Background of Study

Local economic lives, regional gastronomic tourism, and intangible cultural heritage all connect critically with traditional meals (UNESCO, 2003; Bessière, 1998; Hall & Sharples, 2008; Senthil Kumar et al., 2023). According to (Yoshino, 2010; Omar et al., 2019; Mohd Suleiman et al., 2023), traditional dishes (kuih-muih) such as Akok, Laksam, and Kuih Bunga Tanjung are the foundation of Kelantan's unique culinary character, which is nationally recognized in Malaysia. These traditional goods rely on native agricultural inputs, such as

palm sugar (gula nisang), fresh coconut milk (santan), and natural aromatics (pandan), as well as specialized preparation methods that have been established over many generations (Omar et al., 2019; Avieli, 2013; Mohd Suleiman et al., 2023). Traditional food micro-enterprises continue to be essential to preserving local foodways and community identity, even in the face of the swift growth of industrial food processing and contemporary commercial bakeries (Avieli, 2013; Galanakis et al., 2021; Kruger & Viljoen, 2021). However, it takes a lot of physical labor, specific tacit knowledge, and informal working conditions to sustain traditional production methods like double-sided heat conduction employing open-flame coconut husk burning (Sowden, 2018; Omar et al., 2019; Mohd Suleiman et al., 2023). Understanding the empirical elements that drive micro-enterprises' long-term success is crucial for both economic development and heritage preservation as they traverse shifting post-pandemic market conditions (Deacon et al., 2020; Kruger & Viljoen, 2021; Bandhu et al., 2024).

Problem Statement

Micro-entrepreneurs face significant operational and structural limitations that jeopardize their financial survival, despite qualitative evidence highlighting the cultural significance of traditional food production (Hall & Sharples, 2008; Kruger & Viljoen, 2021; Ismail et al., 2022). Due to government infrastructure re-acquisition and urban commercial expansion, small heritage food producers often occupy property under informal tenure arrangements, putting them at danger of abrupt removal (Porter, 2011; Deacon et al., 2020; Zainal et al., 2022). Long-term operational downtime, the loss of existing clientele, and serious financial degradation are frequently the outcomes of such spatial displacement (Porter, 2011; Kruger & Viljoen, 2021; Sharma et al., 2022). As noted by (Sowden, 2018; Deacon et al., 2020; Mohd Suleiman et al., 2023), the physical demands of traditional biomass-fueled baking also result in unpleasant thermal working environments, which exacerbate young labor shortages and intergenerational knowledge transfer gaps. (Deacon et al., 2020; Kruger & Viljoen, 2021; Zainal et al., 2022) have noted that the high price volatility of agricultural commodities significantly reduces profit margins in price-sensitive rural markets. Adopting contemporary automated gas/electric ovens reduces labor stress and boosts production capacity, but micro-entrepreneurs run the risk of losing the genuine smoky flavor, texture, and cultural significance that characterize their brand identity (Sims, 2009; Avieli, 2013; Galanakis et al., 2021). This presents a strategic authenticity paradox. There is still a dearth of empirical research that quantitatively measures the statistical impact of operational vulnerabilities, heritage preservation, and digital adoption on actual business sustainability, despite the fact that digital marketing tools offer potential avenues for customer expansion (Gössling et al., 2018; Kruger & Viljoen, 2021; Prayogi & Subriadi, 2024; Givan & Pancasilawan, 2025).

Research Objective

To resolve the research problem, this study established three specific research objectives:

RO1:	To assess the direct statistical impact of Operational Vulnerabilities (OV) on Business Sustainability (BS)
RO2:	To evaluate the direct statistical impact of Culinary Heritage Authenticity (CHA) on Business Sustainability (BS)
RO3:	To examine the direct statistical impact of Digital Marketing Adoption (DMA) on Business Sustainability (BS)
RO4:	To test whether Digital Marketing Adoption (DMA) mediates the relationship between Culinary Heritage Authenticity (CHA) and Business Sustainability (BS)

Research Hypothesis

H1:	Operational Vulnerabilities have a significant relationship on Business Sustainability
H2:	Culinary Heritage Authenticity has a significant relationship on Business Sustainability

H3:	Digital Marketing Adoption has a significant relationship on Business Sustainability
H4:	Digital Marketing Adoption mediates significant relationship between Culinary Heritage Authenticity and Business Sustainability

LITERATURE REVIEW

Operational Vulnerabilities

The structural, physical, and environmental limitations that expose microbusinesses to operational disruption and financial instability are collectively referred to as operational vulnerabilities (OV) (Porter, 2011; Sowden, 2018; Zainal et al., 2022). Land tenure insecurity, ergonomic risks, and fluctuations in agricultural commodity prices characterize this multifaceted construct (Porter, 2011; Sowden, 2018; Deacon et al., 2020). Because many traditional vendors operate on temporary concessions or informal property without official leases, they are susceptible to spatial displacement from urban expansion, which leads to land tenure insecurity (Porter, 2011; Zainal et al., 2022). Forced relocation costs low-margin enterprises a lot of money in setup and damages established client bases (Porter, 2011; Kruger & Viljoen, 2021; Sharma et al., 2022). Conventional biomass baking simultaneously exposes workers to intense heat and smoke, resulting in tremendous physical strain that discourages younger workers, exacerbates youth labor deficiencies, and prevents knowledge transfer between generations (Sowden, 2018; Mohd Suleiman et al., 2023; Ramli et al., 2025). Because small producers find it difficult to pass cost increases on to price-sensitive rural consumers, unpredictable price spikes for ingredients like eggs, coconut milk, and palm sugar further reduce profit margins (Deacon et al., 2020; Galanakis et al., 2021; Tsuji & Tengku, 2022). According to (Porter, 2011; Sowden, 2018; Zainal et al., 2022) unmitigated operational disruptions have a direct negative impact on productivity and cash flow. This provides strong theoretical support for Hypothesis H₁, which holds that operational vulnerabilities have a negative impact on firm sustainability.

Culinary Heritage Authenticity

In accordance with (Sims, 2009; Avieli, 2013; Omar et al., 2019; Kavitha & Raagha Ravi, 2024), and others, Culinary Heritage Authenticity (CHA) is the preservation of localized cultural identity, biomass fuel sources, indigenous preparation techniques, and ancestral recipes across objective, constructive, and existential dimensions. Strict technical adherence to traditional thermal methods and historical recipes is necessary for objective authenticity. For example, top-and-bottom heat conduction from burning coconut husks is used to produce the distinctive smoky flavor of authentic Akok (Sims, 2009; Omar et al., 2019; Mohd Suleiman et al., 2023). The symbolic narratives, cultural storytelling, and interpersonal relationships that patrons encounter when consuming traditional heritage food are all part of constructive and existential authenticity (Bessière, 1998; Sims, 2009; Bandhu et al., 2024). While switching to automated gas or electric ovens reduces labor requirements, it also destroys the product's distinctive sensory qualities and brand identity, creating an authenticity conundrum (Avieli, 2013; Galanakis et al., 2021; Mohd Suleiman et al., 2023). Hypothesis H₂ asserts that culinary heritage authenticity serves as a direct positive driver of business sustainability because maintaining authentic heritage traditions increases brand equity and justifies higher profit margins (Barney, 1991; Sims, 2009; Kavitha & Raagha Ravi, 2024).

Digital Marketing Adoption

The effectiveness with which micro-entrepreneurs sell their goods and handle consumer transactions thru digital channels, social media commerce, and electronic messaging is measured by Digital Marketing Adoption (DMA) (Gössling et al., 2018; Kruger & Viljoen, 2021; Prayogi & Subriadi, 2024). Artisanal producers can showcase their genuine production techniques to large regional audiences thru short-form visual content on platforms like Facebook, Instagram, and TikTok. This creates natural brand engagement without requiring expensive advertising (Gössling et al., 2018; Bandhu et al., 2024; Givan & Pancasilawan, 2025). Concurrently, integrating pre-ordering channels using instant messaging platforms such as WhatsApp

Business improves daily ingredient ordering, reduces perishable food waste, and stabilizes cash flows (Deacon et al., 2020; Ismail et al., 2022; Sharabati et al., 2024). Digital adoption is a dynamic capability that connects traditional food preparation with contemporary market reach (Teece et al., 1997; Gössling et al., 2018; Ramli et al., 2025). This supports Hypothesis H₄, which suggests that digital adoption mediates the relationship between culinary heritage authenticity and long-term enterprise sustainability, and Hypothesis H₃, which claims that adoption of digital marketing directly increases business sustainability (Gössling et al., 2018; Hair et al., 2021; Sharabati et al., 2024).

Business Sustainability

In line with the tenets of the Triple Bottom Line concept, Business Sustainability (BS) assesses an organization's long-term viability across financial, social, and cultural dimensions (Elkington, 1997; Kruger & Viljoen, 2021; Sharabati et al., 2024). Maintaining adequate cash reserves to withstand economic shocks, managing operating costs, and producing consistent revenues are all components of financial resilience (Deacon et al., 2020; Zainal et al., 2022). Stable family employment, enhancing local livelihoods, and promoting regional agricultural supply chains are the main goals of social sustainability (Bessière, 1998; Galanakis et al., 2021; Tsuji & Tengku, 2022). In order to successfully maintain traditional foodways and artisanal skills and pass them on to future generations, cultural sustainability focuses on protecting intangible cultural heritage (UNESCO, 2003; Omar et al., 2019; Kavitha & Raagha Ravi, 2024).

Underlying Theoretical Foundation

Resource-Based View (RBV)

According to the Resource-Based View (RBV) (Barney, 1991; Grant, 1991; Bandhu et al., 2024), microenterprises can gain a sustained competitive edge by utilizing organizational, human, and physical resources that are Valuable, Rare, Inimitable, and Non-substitutable (VRIN). Traditional recipes, implicit culinary skills, and generation-inherited branding serve as distinctive internal resources in the setting of artisanal food micro-entrepreneurship that industrial automated producers are unable to replicate (Avieli, 2013; Omar et al., 2019; Mohd Suleiman et al., 2023). Heritage authenticity gives small producers great price power and client retention, according to empirical applications of RBV to micro-enterprises (Sims, 2009; Timothy, 2015; Kavitha & Raagha Ravi, 2024). However, when micro-entrepreneurs encounter significant external disturbances or shifting customer habits, static VRIN resources alone are inadequate (Teece et al., 1997; Prayogi & Subriadi, 2024; Ramli et al., 2025).

Dynamic Capabilities Theory (DCT)

Dynamic Capabilities Theory describes how businesses integrate, develop, and reconfigure internal and external competences to deal with quickly changing business environments in order to supplement the static perspective of RBV (Teece et al., 1997; Eisenhardt & Martin, 2000; Sharabati et al., 2024). Digital marketing adoption is a crucial dynamic capability for heritage micro-entrepreneurs operating in unstable markets. It allows small producers to identify new tourist segments, take advantage of online commercial opportunities, and change traditional sales channels (Gössling et al., 2018; Kruger & Viljoen, 2021; Givan & Pancasilawan, 2025). According to recent empirical research, small businesses that integrate dynamic digital capabilities with deep historical assets have greater rates of commercial longevity and market resilience (Ismail et al., 2022; Prayogi & Subriadi, 2024; Sharabati et al., 2024).

Bio-Cultural Systems Framework

Based to the Bio-Cultural Systems Framework, community social dynamics, seasonal raw material availability, and local ecosystems are all intrinsically tied to traditional food systems (Galla, 2008; Tsuji & Tengku, 2022). Traditional food preparation in Kelantan depends on natural ecosystem inputs such wood or biomass from coconut husks, palm sugar (gula nisang), and fresh coconut milk (santan) (Omar et al., 2019;

Mohd Suleiman et al., 2023). These bio-cultural connections are broken by urbanization, resource scarcity, and environmental deterioration, which has a direct effect on the price and availability of raw materials for traditional food vendors (Aweng & Ahmad, 2018; Deacon et al., 2020; Tsuji & Tengku, 2022). Therefore, preserving the balance between environmental input supply chains and cultural commercialization is essential to the business sustainability of traditional food producers (Bessière, 1998; Galanakis et al., 2021; Tsuji & Tengku, 2022).

Hypothesis Development

Relationship between Operational Vulnerabilities and Business Sustainability

Microenterprises' everyday operations and financial viability are directly impacted by unresolved operational vulnerabilities (Porter, 2011; Sowden, 2018; Zainal et al., 2022). Operating margins are eroded by workforce tiredness and variable input prices, and business disruptions are caused by spatial insecurity (Porter, 2011; Deacon et al., 2020; Sharma et al., 2022). Small food enterprises that face unmanaged operational risks have a greater failure rate, according to empirical research conducted in developing markets (Deacon et al., 2020; Zainal et al., 2022; Tsuji & Tengku, 2022). Thus, the following hypothesis is put forth:

H1: Operational Vulnerabilities have a significant relationship on Business Sustainability.

Relationship between Culinary Heritage Authenticity and Business Sustainability

In the words of (Barney, 1991; Sims, 2009; Kavitha & Raagha Ravi, 2024), micro-enterprises are protected from price-based rivalry with mass-manufactured alternatives by maintaining authentic traditional culinary processes. Authenticity promotes premium pricing tactics, draws culinary tourists, and cultivates client loyalty (Sims, 2009; Timothy, 2015; Bandhu et al., 2024). Research on gastronomic tourism shows that genuine cooking methods have a direct impact on the expansion of microbusiness revenue and the lifetime of brands (Sims, 2009; Omar et al., 2019; Kavitha & Raagha Ravi, 2024). Thus, the following hypothesis is put forth:

H2: Culinary Heritage Authenticity has a significant relationship on Business Sustainability

Relationship between Digital Marketing Adoption and Business Sustainability

Micro-enterprises can achieve more predictable sales cycles, better customer interaction, and more economical promotional reach by implementing digital marketing solutions (Gössling et al., 2018; Kruger & Viljoen, 2021; Prayogi & Subriadi, 2024). According to empirical study, small enterprises that use digital platforms develop their clientele, increase revenue, and better handle market upheavals (Ismail et al., 2022; Sharabati et al., 2024; Givan & Pancasilawan, 2025). Thus, the following hypothesis is put forth:

H3: Digital Marketing Adoption has a significant relationship on Business Sustainability

Mediating Role of Digital Marketing Adoption

Digital marketing technologies actively promote and profit from the internal brand value created by culinary heritage authenticity in larger consumer markets (Gössling et al., 2018; Kruger & Viljoen, 2021; Sharabati et al., 2024). As stated by (Teece et al., 1997; Gössling et al., 2018; Prayogi & Subriadi, 2024), digital adoption functions as a dynamic capability that converts static cultural legacy into quantifiable customer engagement and financial benefits. The commercial influence of authentic production methods is limited to the immediate local neighborhoods in the absence of digital marketing visibility (Gössling et al., 2018; Kruger & Viljoen, 2021; Ramli et al., 2025). Thus, the following hypothesis is put forth:

H4: Digital Marketing Adoption mediates significant relationship between Culinary Heritage Authenticity and Business Sustainability

Summary of Empirical Study

Primary Author and Years	Region	Key Focus/ Variables	Major Finding
Tsuji & Tengku (2022)	Kelantan, Malaysia	Etak Salai (Smoked Clam) Micro-enterprises & Sustainability	Confirmed that traditional food micro-enterprises require economic profitability and ecological input stability to safeguard intangible cultural heritage
Mohd Suleiman et al. (2023)	Peninsular Malaysia	Malay Traditional Food Preservation & Operational Sustainability	Highlighted that tacit knowledge transfer and authentic ingredients are essential for long-term traditional food business survival.
Prayogi & Subriadi (2024)	Southeast Asia	Digital Marketing Capability & SME Competitive Performance	Demonstrated through PLS-SEM that digital capabilities significantly boost market expansion and enterprise performance in small businesses.
Kavitha & Raagha Ravi (2024)	Global / South Asia	Culinary Heritage Authenticity & Gastronomy Tourism	Showed that perceived culinary authenticity increases tourist satisfaction and supports premium pricing for local heritage food vendors.
Sharabati et al. (2024)	Developing Economies	E-Commerce, Social Media Adoption & SME Resilience	Established that social media adoption acts as a vital dynamic mediator that drives small business resilience during market shifts
Ramli et al. (2025)	Malaysia (Selangor & Sabah)	Traditional Food Micro-Entrepreneur Sustainability & Technology	Found that adopting social media platforms (Facebook/WhatsApp) is the single most decisive factor enabling traditional food vendors to maintain sales stability
Givan & Pancasilawan (2025)	Southeast Asia	Digital Adoption & MSME Strategic Growth	Empirical validation that active digital engagement directly improves MSME market competitiveness and long-term enterprise longevity.

METHODOLOGY

Owner-operators and senior managers of traditional food microbusinesses in Kelantan, Malaysia's major culinary regions, such as Tumpat, Kota Bharu, Pasir Mas, and Bachok, made up the target population (Omar et al., 2019; Yoshino, 2010; Mohd Suleiman et al., 2023). To make sure responders fulfilled three stringent inclusion requirements, a purposive sampling technique was used. First, running a traditional food microbusiness that is either registered or recognized by the community. Third, using traditional or semi-traditional preparation techniques; and second, having at least three years of operational experience (Creswell & Poth, 2018; Kruger & Viljoen, 2021). A minimum sample size of N=107 was needed to obtain a statistical power of 0.80 at $\alpha=0.05$ using G*Power software analysis for a structural model with three key predictors (Faul et al., 2007; Hair et al., 2021). N = 168 genuine, fully completed responses, or an 84% effective response rate, were obtained from the distribution of 200 structured physical questionnaires by trained field enumerators (Hair et al., 2021).

All constructs were operationalized using multi-item scales adapted from established empirical literature and measured on a 5-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree") (Hair et al., 2021; Prayogi & Subriadi, 2024). Five operational vulnerability items were adapted from (Porter, 2011; Sowden, 2018; Deacon et al., 2020; Zainal et al., 2022) to capture land tenure insecurity, physical labor discomfort, and ingredient cost volatility.

To assess recipe consistency, traditional biomass firing, and sensory uniqueness, five culinary heritage authenticity items were modified from (Sims, 2009; Avieli, 2013; Omar et al., 2019; Kavitha & Raagha Ravi, 2024). To evaluate social media promotion, short-form video engagement, and digital ordering channels, four digital marketing adoption items were modified from (Gössling et al., 2018; Kruger & Viljoen, 2021; Prayogi & Subriadi, 2024). To assess financial resilience, customer retention, brand equity, and business longevity, five business sustainability elements were modified from (Kruger & Viljoen, 2021; Sharabati et al., 2024).

Partial Least Squares Structural Equation Modeling (PLS-SEM) utilizing SmartPLS 4 was used to analyze the data (Hair et al., 2021; Ringle et al., 2022). PLS-SEM was chosen because it can handle non-normal data distributions that are typical in micro-enterprise field surveys, as well as sophisticated causal models and exploratory extensions of theoretical frameworks (Hair et al., 2021). A typical two-step analytical method was used for evaluation: first, the measurement model was evaluated to confirm construct validity and reliability, and then the structural model was evaluated to examine direct and mediated path linkages (Hair et al., 2021; Prayogi & Subriadi, 2024).

EMPIRICAL RESULT

Respondent and Enterprise Profile

The N=168 traditional food micro-enterprises in the study showed unique operational and geographic traits throughout Kelantan (Omar et al., 2019; Yoshino, 2010; Mohd Suleiman et al., 2023). Geographically, the highest concentration of respondents was found in Kota Bharu (n = 62, 36.9%), followed by Tumpat (n = 48, 28.6%), Pasir Mas (n = 32, 19.0%), and Bachok (n = 26, 15.5%) (Yoshino, 2010; Omar et al., 2019). Of the micro-enterprises, 45.2% (n = 76) had been in operation for more than ten years, 32.1% (n = 54) for six to ten years, and 22.6% (n = 38) for three to five years (Omar et al., 2019; Deacon et al., 2020; Kruger & Viljoen, 2021). Regarding production technology and fuel sources, the vast majority of 58.3% (n = 98) relied solely on conventional biomass firing using wood or coconut husks, 31.0% (n = 52) used a hybrid approach that combined gas pre-heating with coconut husk finishing, and only 10.7% (n = 18) relied entirely on contemporary gas or electric ovens (Avieli, 2013; Sowden, 2018; Galanakis et al., 2021). Lastly, workforce arrangements were indicative of small family businesses: 23.8% (n = 40) had between five and ten employees, while 76.2% (n = 128) had fewer than five employees who were primarily family members (Deacon et al., 2020; Kruger & Viljoen, 2021; Ismail et al., 2022).

Measurement Model

Strong internal consistency reliability, convergent validity, and discriminant validity across all constructs were confirmed by evaluation of the reflective measurement model (Hair et al., 2021; Prayogi & Subriadi, 2024). Composite Reliability (CR) and Cronbach's alpha (α) ratings far beyond suggested thresholds: Culinary Heritage Authenticity (α = 0.865, CR = 0.903), Digital Marketing Adoption (α = 0.878, CR = 0.916), Operational Vulnerabilities (α = 0.841, CR = 0.887), and Business Sustainability (α = 0.859, CR = 0.898) (Hair et al., 2021). Individual item outer loadings above the typical 0.707 limit, ranging from 0.742 to 0.912 (Hair et al., 2021). Average Variance Extracted (AVE) values were greater than 0.60 for every concept, indicating convergent validity. AVE = 0.612 for operational vulnerabilities, 0.651 for culinary heritage authenticity, 0.732 for digital marketing adoption, and 0.638 for business sustainability (Porter, 2011; Sims, 2009; Gössling et al., 2018; Kruger & Viljoen, 2021; Hair et al., 2021). Finally, discriminant validity was confirmed using Heterotrait-Monotrait (HTMT) ratios between construct pairs that stayed substantially below the 0.85 criterion (Henseler et al., 2015; Hair et al., 2021).

Structural Model and Hypothesis testing

The structural path hypotheses were tested using a non-parametric bootstrapping approach with 5,000 resamples (Hair et al., 2021; Ringle et al., 2022). Hypothesis H1 was supported by Operational Vulnerabilities' statistically substantial negative direct impact on Business Sustainability ($\beta = -0.342$, $t = 5.896$, $p < 0.001$) (Porter, 2011; Sowden, 2018; Zainal et al., 2022). Hypothesis H2 was supported by Culinary Heritage Authenticity's significant positive direct influence on Business Sustainability ($\beta = 0.285$, $t = 4.453$, $p < 0.001$) (Sims, 2009; Avieli, 2013; Kavitha & Raagha Ravi, 2024). Hypothesis H3 was supported by the largest positive direct impact of digital marketing adoption on business sustainability ($\beta = 0.412$, $t = 7.491$, $p < 0.001$) (Gössling et al., 2018; Kruger & Viljoen, 2021; Prayogi & Subriadi, 2024). Additionally, the indirect path test supported Hypothesis H4 (Gössling et al., 2018; Hair et al., 2021; Sharabati et al., 2024) by confirming that Digital Marketing Adoption significantly mediates the relationship between Culinary Heritage Authenticity and Business Sustainability ($\beta = 0.148$, $t = 3.894$, $P < 0.001$).

High explanatory power and predictive significance were shown by the structural model (Geisser, 1974; Cohen, 1988; Hair et al., 2021). The model explained 36.0% of the variance in digital marketing adoption ($R^2 = 0.360$) and 58.4% of the total variance in business sustainability ($R^2 = 0.584$) (Hair et al., 2021; Prayogi & Subriadi, 2024). Culinary Heritage Authenticity had a medium impact size ($f^2 = 0.135$), but Digital Marketing Adoption ($f^2 = 0.282$) and Operational Vulnerabilities ($f^2 = 0.198$) had medium-to-large effects on Business Sustainability, according to effect size evaluations (Cohen, 1988; Hair et al., 2021). Lastly, blindfolding techniques confirmed high out-of-sample prediction capacity with a Q2 predictive relevance value for Business Sustainability of 0.354, far above zero (Geisser, 1974; Hair et al., 2021).

DISCUSSION

Interpretation of Findings

Theoretical theories guiding conventional micro-entrepreneurship in emerging economies are quantitatively supported by the empirical results (Kruger & Viljoen, 2021; Hair et al., 2021; Prayogi & Subriadi, 2024). According to Porter (2011), Sowden (2018), Deacon et al. (2020), Zainal et al. (2022), and others, geographical insecurity, heat-induced physical stress, and variable ingredient costs are persistent threats to the sustainability of small businesses. The considerable negative path coefficient ($\beta = -0.342$) supports H1. Operating cash flows are rapidly depleted when micro-entrepreneurs encounter land displacement or abrupt rises in commodity costs (Porter, 2011; Kruger & Viljoen, 2021; Sharma et al., 2022).

H2 is supported by the positive correlation ($\beta = 0.285$) between enterprise sustainability and culinary heritage authenticity, which shows that preserving traditional preparation methods is an important, non-replaceable strategic asset (Barney, 1991; Sims, 2009; Avieli, 2013; Kavitha & Ravi, 2024). Maintaining traditional practices encourages consumer loyalty and shields artisanal producers from direct price rivalry with industrial bakers (Sims, 2009; Omar et al., 2019; Bandhu et al., 2024).

Digital marketing adoption was found to be a significant mediating mechanism ($\beta = 0.148$) and the strongest direct determinant ($\beta = 0.412$) for business sustainability, supporting H3 and H4 (Gössling et al., 2018; Kruger & Viljoen, 2021; Sharabati et al., 2024; Givan & Pancasilawan, 2025). According to these statistical findings, traditional food producers can effectively convert heritage value into increased market reach, pre-order sales, and enhanced business resilience by actively showcasing authentic cooking techniques on social commerce platforms (Teece et al., 1997; Gössling et al., 2018; Prayogi & Subriadi, 2024; Ramli et al., 2025).

Policy and Managerial Implications

Three specific management and policy measures are recommended by the empirical findings to assist heritage micro-entrepreneurs (Porter, 2011; Sowden, 2018; Gössling et al., 2018). To preserve traditional food merchants from spatial displacement and relocation losses, state agencies and municipal planning authorities should first create specific Culinary Heritage Zones that offer formal land tenure security (Porter, 2011;

Timothy, 2015; Senthil Kumar et al., 2023). Second, in order to reduce heat stress and smoke exposure without changing the conventional biomass combustion dynamics, economic development organizations like MARA and SME Corp should co-fund ergonomic hearth improvements and micro-ventilation equipment (Sowden, 2018; Deacon et al., 2020; Rahim et al., 2022). Third, for traditional food artisans who are not tech-savvy, rural entrepreneurship programs should provide hands-on training in mobile video production, social commerce, and digital pre-ordering management (Gössling et al., 2018; Kruger & Viljoen, 2021; Ismail et al., 2022; Givan & Pancasilawan, 2025).

CONCLUSION & FUTURE RESEARCH

This quantitative study shows that traditional food micro-entrepreneurs must balance digital capabilities with heritage authenticity in order to maintain long-term business sustainability. They must also take proactive steps to reduce operational vulnerabilities (Kruger & Viljoen, 2021; Hair et al., 2021; Prayogi & Subriadi, 2024). Unmitigated land tenure insecurity and labor shortages continue to be significant structural challenges, even tho conventional open-flame burning preserves product authenticity and brand value (Porter, 2011; Sowden, 2018; Zainal et al., 2022). Micro-entrepreneurs can increase consumer reach and stable revenue by implementing digital marketing platforms (Teece et al., 1997; Gössling et al., 2018; Sharabati et al., 2024). In order to evaluate financial resilience under shifting macroeconomic conditions, future quantitative research should extend this structural framework throughout Southeast Asia and use longitudinal panel data (Hair et al., 2021; Kruger & Viljoen, 2021; Prayogi & Subriadi, 2024).

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