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HUMAN RESOURCE DIGITAL COMPETENCE AS A KEY TO INNOVATION AND COMPETITIVE ADVANTAGE IN CREATIVE ECONOMY SMES

KOMPETENSI DIGITAL SUMBER DAYA MANUSIA SEBAGAI KUNCI INOVASI DAN KEUNGGULAN KOMPETITIF DI UKM EKONOMI KREATIF

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ABSTRACT

This study investigates the role of human resource digital competence in enhancing product innovation and fostering competitive advantage among SMEs operating in the creative economy sector in Indonesia. A quantitative research design was employed using a survey method. Data were collected from 500 respondents consisting of SME owners and employees in the creative economy subsector in Pontianak and surrounding areas. Structural Equation Modeling (SEM) with WarpPLS 8.0 was used to test the hypothesized relationships between digital competence, product innovation, and competitive advantage. The measurement model was assessed for validity and reliability, while the structural model was evaluated using path coefficients, coefficient of determination, and predictive relevance indices. The findings reveal that human resource digital competence has a significant positive influence on product innovation ($\beta = 0.805$, $p < 0.001$) and competitive advantage ($\beta = 0.368$, $p < 0.001$). Furthermore, product innovation significantly affects competitive advantage ($\beta = 0.472$, $p < 0.001$) and mediates the relationship between digital competence and competitive advantage ($p < 0.001$). The model demonstrates strong explanatory power with R^2 values of 0.647 for product innovation and 0.650 for competitive advantage. The findings provide actionable insights for SME managers to enhance digital competence through targeted training and development programs, for policymakers to design integrated digital literacy and innovation support initiatives, and for business support organizations to tailor their services to address the specific needs of creative economy SMEs.

Keywords: *Digital Competence, Product Innovation, Competitive Advantage, SMEs, Creative Economy, Indonesia*

ABSTRAK

Studi ini menyelidiki peran kompetensi digital sumber daya manusia dalam meningkatkan inovasi produk dan mendorong keunggulan kompetitif di antara UKM yang beroperasi di sektor ekonomi kreatif di Indonesia. Desain penelitian kuantitatif digunakan dengan metode survei. Data dikumpulkan dari 500 responden yang terdiri dari pemilik dan karyawan UKM di subsektor ekonomi kreatif di Pontianak dan sekitarnya. Pemodelan Persamaan Struktural (SEM) dengan WarpPLS 8.0 digunakan untuk menguji hubungan yang dihipotesiskan antara kompetensi digital, inovasi produk, dan keunggulan kompetitif. Model pengukuran dinilai validitas dan reliabilitasnya, sedangkan model struktural dievaluasi menggunakan koefisien jalur, koefisien determinasi, dan indeks relevansi prediktif. Hasil penelitian menunjukkan bahwa kompetensi digital sumber daya manusia memiliki pengaruh positif yang signifikan terhadap inovasi produk ($\beta = 0{,}805$, $p < 0{,}001$) dan keunggulan kompetitif ($\beta = 0{,}368$, $p < 0{,}001$). Lebih lanjut, inovasi produk secara signifikan mempengaruhi keunggulan kompetitif ($\beta = 0{,}472$, $p < 0{,}001$) dan memediasi hubungan antara kompetensi digital dan keunggulan kompetitif ($p < 0{,}001$). Model ini menunjukkan daya penjelas yang kuat dengan nilai R^2 sebesar 0,647 untuk inovasi produk dan 0,650 untuk keunggulan kompetitif. Temuan ini memberikan wawasan yang dapat ditindaklanjuti bagi manajer UKM untuk meningkatkan kompetensi digital melalui program pelatihan dan pengembangan yang terarah, bagi pembuat kebijakan untuk merancang inisiatif dukungan literasi digital dan inovasi terintegrasi, dan bagi organisasi pendukung bisnis untuk menyesuaikan layanan mereka guna memenuhi kebutuhan spesifik UKM ekonomi kreatif.

Kata Kunci: Kompetensi Digital, Inovasi Produk, Keunggulan Kompetitif, UKM, Ekonomi Kreatif, Indonesia

INTRODUCTION

The rapid advancement of digital technologies has fundamentally reshaped the business landscape for small and medium-sized enterprises (SMEs) globally (Alkhalaf & Al-

Tabbaa, 2024; Antoni et al., 2025). In Indonesia, SMEs represent approximately 99.99% of all business entities and are instrumental in driving economic growth, employment generation, and poverty reduction (Tambunan, 2024; Yunus & Ernawati, 2025). The creative economy sector encompassing fashion, culinary arts, handicrafts, digital content, and design-based industries has emerged as a strategic pillar for Indonesia's economic development, contributing significantly to GDP and positioning the country as a regional leader in creative entrepreneurship (Siregar et al., 2025; Zahwa et al., 2025).

However, despite their economic significance and growth potential, many SMEs in the creative economy sector face critical challenges in adopting and leveraging digital technologies effectively (Brink & Packmohr, 2023; Pujari & Saha, 2024). A fundamental barrier to digital transformation in these enterprises is the limited digital competence encompassing digital skills, digital literacy, and the ability to utilize digital tools among their human resources (Gaglio et al., 2022; Zhao et al., 2021). While larger enterprises often have dedicated IT departments and resources, creative economy SMEs typically operate with constrained budgets, limited access to formal training, and diverse levels of technological awareness among their workforce (Gunawan et al., 2025; Ollanketo et al., 2023).

The challenge is particularly acute because innovation and differentiation are central to value creation in creative industries (Held et al., 2025; Rumanti et al., 2023). Unlike traditional manufacturing where standardization and efficiency are paramount, creative economy SMEs must continuously develop unique, aesthetically appealing, and market-responsive products (Isensee et al., 2020; Siregar et al., 2025). Digital technologies including social media analytics, e-commerce platforms, digital design tools, and data analytics offer powerful capabilities to support this innovation imperative (Demirkan et al., 2022; Wei et al., 2021). Yet these capabilities remain underutilized due to insufficient digital competence among SME personnel (Mangifera et al., 2022; Mahmutaj & Jusufi, 2023).

The intersection of digital competence, product innovation, and competitive advantage has received growing attention in scholarly literature (Merín-Rodrigáñez et al., 2024; Sawaean & Aburumman, 2025). However, significant research gaps persist that motivate the current investigation. First, while several studies have examined digital competence in general SME populations, limited research specifically addresses the creative economy SME context (Romero & Mammadov, 2025; Castillo-Vergara et al., 2025). The creative economy sector operates under fundamentally different competitive dynamics, value creation mechanisms, and innovation imperatives compared to manufacturing or service-oriented SMEs (Ermaya et al., 2025). Creative products derive value from aesthetic appeal, uniqueness, and cultural resonance factors that require distinct types of digital competence and innovation processes compared to efficiency-driven sectors (Porter, 1985). This sectoral specificity necessitates targeted research examining how digital competence manifests and operates within creative economy contexts.

Second, the relationship between digital competence and competitive advantage is often treated as direct and linear in existing literature (Hoang et al.,

2025; Teng et al., 2022). However, this may oversimplify a more nuanced causal mechanism. Product innovation the development of new or significantly improved products may serve as an intermediate capability through which digital competence translates into competitive advantage (Latifah et al., 2021; Rumanti et al., 2023). While innovation has long been recognized as a driver of competitive success (Schumpeter, 1934; Otache, 2024), its potential role as a mediator in the digital competence-advantage relationship has received limited empirical attention, particularly in SME contexts where resource constraints may make innovation mechanisms especially critical (Siqueira & Cosh, 2008).

Third, existing empirical research on digital competence and innovation has predominantly focused on developed economies or large enterprises in emerging markets (Hoang & Hien, 2024; Gaglio et al., 2022). Research specifically examining creative economy SMEs in Indonesia a context with unique characteristics including diverse digital readiness levels, limited formal training infrastructure, constrained financial resources, and strong community and cultural embeddedness\ remains sparse (Tambunan, 2024; Ritonga & Qarni, 2022). Indonesia's regional diversity, with significant variations in digital infrastructure between major urban centers and peripheral regions like Pontianak, further underscores the need for geographically specific research (Yelfiarita et al., 2025). This geographical and sectoral gap limits the applicability of existing theoretical insights and policy recommendations to the Indonesian creative economy context (Surahman et al., 2023).

To address these gaps, this study employs an integrated theoretical framework drawing on three complementary perspectives. The Resource-Based View (RBV), as articulated by Barney (1991), posits that firms achieve sustained competitive advantage by developing unique, valuable, and inimitable resources. Digital competence the knowledge, skills, and capabilities to effectively utilize digital technologies exemplifies such a resource (Trenerry et al., 2021; Slavković et al., 2024). It is valuable because it enables firms to access information, improve operational efficiency, and reach customers through digital channels (Antoni et al., 2025). It is rare because not all SMEs, particularly in emerging markets, possess high levels of digital literacy and capability (Ollanketo et al., 2023). It is inimitable because digital competence is embedded in organizational routines, employee tacit knowledge, and organizational culture, making it difficult for competitors to replicate (Vieru et al., 2015). RBV therefore suggests that SMEs investing in digital competence development can create sustained competitive advantages difficult for rivals to replicate, particularly within resource-constrained creative economy contexts (Yunus & Ernawati, 2025; Zahwa et al., 2025).

The Dynamic Capabilities approach, extended by Teece (2007), complements RBV by proposing that competitive advantage derives not only from static resources but from dynamic capabilities the ability to sense market opportunities, seize them, and reconfigure resources in response to environmental change. Digital competence operates as a dynamic capability enabling SMEs to sense market opportunities through digital channels and data analytics, seize opportunities by rapidly developing and launching new products, and

reconfigure organizational resources to adapt to changing market conditions (Hoang & Hien, 2024; Hoang et al., 2025). In the context of creative economy SMEs operating in dynamic, competitive markets characterized by rapidly evolving consumer preferences, these dynamic capabilities are especially critical for sustained success (Isensee et al., 2020; Slavković et al., 2024).

Furthermore, Schumpeterian Innovation Theory, rooted in Schumpeter's (1934) foundational work, emphasizes that innovation is the primary driver of economic growth and competitive superiority, with entrepreneurs acting as agents of innovation. Product innovation the development of new or significantly improved products enables firms to achieve market differentiation and capture consumer surplus (Rumanti et al., 2023). In creative industries where aesthetic appeal and uniqueness are core value drivers, product innovation is particularly salient to competitive positioning (Siregar et al., 2025; Ermaya et al., 2025). Digital competence enhances Schumpeterian innovation by reducing barriers to innovation, accelerating development cycles, improving alignment with market preferences through consumer insights, and enabling more cost-effective experimentation and prototyping (Castillo-Vergara et al., 2025; Merín-Rodrigáñez et al., 2024).

By integrating these three theoretical perspectives, this study explains how digital competence operates as a strategic resource (RBV) and dynamic capability (Dynamic Capabilities Theory) that enables product innovation (Schumpeterian Theory), which collectively generate and sustain competitive advantage in creative economy SMEs (Romero & Mammadov, 2025; Sawaean & Aburumman, 2025). This integrated framework provides a more comprehensive understanding than any single theoretical approach alone, acknowledging that digital competence creates value through multiple pathways both direct operational improvements and innovation-enabled differentiation (Teng et al., 2022).

This study investigates how human resource digital competence influences product innovation and competitive advantage among SMEs operating in the creative economy sector in Indonesia (Tambunan, 2024). The research examines whether the relationship between digital competence and competitive advantage operates through product innovation as an intermediate mechanism, a question that remains underexplored in the literature (Latifah et al., 2021). Specifically, the study tests a structural model incorporating three primary relationships: the influence of digital competence on product innovation, the direct effect of digital competence on competitive advantage, and the impact of product innovation on competitive advantage, with particular attention to understanding whether product innovation mediates the competence-advantage relationship (Sawaean & Aburumman, 2025).

The geographical focus on Pontianak and surrounding areas in West Kalimantan provides a particularly valuable research context (Ritonga & Qarni, 2022). This region, while economically significant, operates with different digital infrastructure endowments and market conditions compared to Indonesia's major metropolitan areas (Yelfiarita et al., 2025). This focus allows the study to generate insights applicable to SMEs operating in less urbanized

environments, thereby broadening the empirical base of knowledge about digital transformation in emerging market SMEs (Tambunan, 2024). The creative economy subsectors studied include fashion, handicrafts, culinary arts, digital content production, and design-based industries sectors that exemplify the unique innovation imperatives of creative enterprises (Siregar et al., 2025).

This research is anticipated to make several valuable contributions. Theoretically, the study integrates multiple theoretical perspectives into a unified framework addressing the competence-innovation-advantage nexus in creative economy contexts, extending existing literature that has predominantly employed single-theory approaches or focused on other sectoral contexts (Romero & Mammadov, 2025; Hoang & Hien, 2024). Empirically, the study generates rigorous quantitative evidence on relationships within the creative economy SME context using Structural Equation Modeling with a substantial sample size, addressing a significant empirical gap (Surahman et al., 2023). Practically, the findings are expected to inform targeted interventions by SME managers, policymakers, and business support organizations seeking to enhance competitiveness among creative economy SMEs through digital competence development and innovation support (Gunawan et al., 2025; Zahwa et al., 2025). By demonstrating the mechanisms through which digital competence translates into competitive advantage, the study provides actionable guidance for designing more effective digital literacy and innovation initiatives tailored to creative economy SME contexts (Ollanketo et al., 2023).

RESEARCH METHODS

Research Design and Approach

This study employed a quantitative research design using a cross-sectional survey method to examine the causal relationships between human resource digital competence, product innovation, and competitive advantage in creative economy SMEs. The research adopted a positivist epistemology, utilizing deductive reasoning to test hypotheses derived from the integrated theoretical framework combining Resource-Based View, Dynamic Capabilities Theory, and Schumpeterian Innovation Theory. The structural relationships in the conceptual model were formulated based on existing theoretical foundations and empirical evidence from prior research. The study sought to provide generalizable insights about the mechanisms through which digital competence drives innovation and competitive positioning in creative economy SMEs operating in Indonesia.

Population and Sample

The population for this research consisted of small and medium-sized enterprises operating in the creative economy sector in Pontianak and surrounding areas in West Kalimantan, Indonesia. The creative economy subsectors included in this research encompass fashion, handicrafts, culinary arts, digital content production, and design-based industries. A purposive sampling technique was employed to identify and select SMEs meeting the following criteria: (1) had been operational for at least two years, demonstrating business maturity; (2) employed at least three employees, meeting the definition of SMEs; (3) utilized digital technologies in their business operations, ensuring relevance to the digital competence construct; and

(4) demonstrated willingness to participate in the research.

A total of 500 valid responses were collected from respondents directly involved in business operations and innovation activities. The respondent pool included SME owners, managers, and employees who had direct involvement in utilizing digital technologies and participating in innovation processes. This substantial sample size exceeds the minimum requirements for Structural Equation Modeling analysis and provides adequate statistical power for detecting significant relationships among the study variables. The sample composition including both owners and employees enabled the research to capture diverse perspectives on digital competence within each organization, enhancing the robustness of the data.

Research Instrument and Measurement

Data were collected using a structured questionnaire consisting of three main sections measuring the study's core constructs. All items were measured using a five-point Likert scale anchored at 1 (strongly disagree) to 5 (strongly agree), a standard approach in management research enabling quantitative analysis of respondent attitudes and perceptions.

Human Resource Digital Competence: This construct was measured using 13 items that assessed multiple dimensions of digital capability. The items evaluated technological skills (ability to use digital platforms, software proficiency, and technical troubleshooting), information management capabilities (data analysis, information retrieval, and digital documentation), digital communication skills (using digital collaboration tools, digital customer engagement), and digital problem-solving abilities. The measurement items were adapted from established scales used in prior research examining digital competence in organizational contexts, ensuring validity and reliability.

Product Innovation: This construct was measured using 9 items that evaluated the extent and nature of product development activities. The items assessed the frequency of product improvements, introduction of new products to the market, product differentiation strategies, and organizational adaptation to market needs. Product innovation was conceptualized as a dynamic capability reflecting the organization's ability to continuously develop and improve products in response to market opportunities and competitive pressures. The measurement items captured both incremental and more substantial innovation activities.

Competitive Advantage: This construct was measured using 12 items assessing multiple dimensions of competitive positioning. The items evaluated cost leadership capabilities, differentiation advantages, market responsiveness, customer satisfaction, product quality superiority, and overall market position relative to competitors. The measurement items drew from established competitive advantage scales, incorporating both internal capability perspectives and external market performance indicators.

Prior to full-scale data collection, the questionnaire was pilot tested with 30 respondents from the target population to assess clarity, comprehension, and measurement reliability. Pilot testing enabled identification and correction of ambiguous items, ensuring that respondents would interpret and respond to questions consistently.

Data Collection Procedures

Data collection was conducted over a three-month period utilizing both online and offline approaches to maximize reach and response rates within the target population. Online questionnaires were developed using Google Forms and distributed through digital channels, including WhatsApp groups associated with SME associations and business networks, email lists of creative economy entrepreneurs, and social media platforms. The online approach proved particularly efficient for reaching geographically dispersed SMEs and those with basic digital literacy.

Offline questionnaire administration was conducted through in-person interactions with trained field enumerators at strategic locations including SME business premises, business expos, creative industry forums, and entrepreneur association meetings in Pontianak and surrounding areas. The offline approach enabled the research team to clarify questions for respondents with limited digital familiarity and to obtain responses from SMEs with lower online engagement. Both approaches incorporated informed consent procedures, clear explanations of research objectives, and assurances of data confidentiality to encourage honest and complete responses.

Data Analysis Methodology

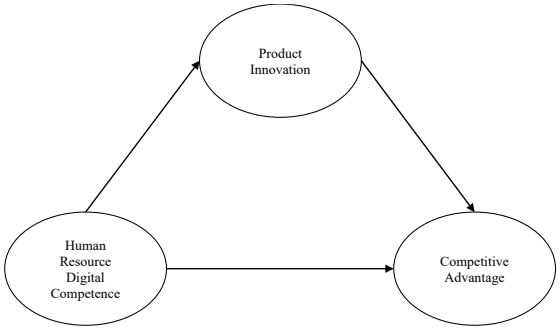
Data analysis was conducted using WarpPLS 8.0, a variance-based Structural Equation Modeling (SEM-PLS) software selected for its suitability in examining complex relationships and mediation pathways within organizational research. The analysis proceeded in two sequential stages.

Measurement Model Assessment: The measurement model evaluated whether the observed variables (questionnaire items) reliably measured the intended latent constructs (digital competence, product innovation, competitive advantage). Convergent validity was assessed using factor loadings, with a threshold of 0.5 indicating that each item adequately represented its corresponding construct. Average Variance Extracted (AVE) values exceeding 0.5 further confirmed that constructs explained more than half the variance in their indicators. Reliability was evaluated using Composite Reliability (CR) with a threshold of 0.7, indicating that items within a construct were internally consistent, and Cronbach's Alpha with a threshold of 0.6, providing additional confirmation of measurement reliability. Discriminant validity was examined using the Fornell-Larcker criterion, confirming that each construct was sufficiently distinct from other constructs in the model.

Structural Model Assessment: The structural model tested the hypothesized causal relationships between the study variables. Path coefficients and their statistical significance levels were examined to test each hypothesized direct relationship. The coefficient of determination (R^2) was calculated to assess the explanatory power of the model, indicating the proportion of variance in each dependent variable explained by its predictors. Predictive relevance (Q^2) was evaluated using the Stone-Geisser criterion to confirm that the model had adequate predictive validity. Model fit indices including Average Path Coefficient (APC), Average R-squared (ARS), and Goodness of Fit (GoF) were reported to assess overall model quality and appropriateness. Mediation analysis was conducted to test whether product innovation significantly mediated the relationship between digital competence

and competitive advantage, with statistical significance of indirect effects evaluated using bootstrapping procedures.

Conceptual Framework and Hypotheses The study's conceptual framework posited three direct relationships reflecting the integrated theoretical perspective. The framework hypothesized that human resource digital competence directly influences product innovation, reflecting the Dynamic Capabilities perspective that organizational capabilities enable the development of innovative outputs. Second, the framework proposed that digital competence directly affects competitive advantage, consistent with Resource-Based View emphasis on capabilities as sources of sustainable competitive advantage. Third, the model hypothesized that product innovation influences competitive advantage, reflecting Schumpeterian Innovation Theory emphasis on innovation as the primary driver of competitive superiority. Additionally, the framework proposed that product innovation mediates the relationship between digital competence and competitive advantage, suggesting that digital competence generates competitive advantages through multiple pathways both direct operational improvements and innovation-enabled differentiation.



Gambar 1. Kerangka Konseptual Penelitian

RESULTS AND DISCUSSIONS

RESULTS

Measurement Model Assessment

The measurement model assessment confirmed the validity and reliability of all constructs in the research model (Hoang & Hien, 2024; Zhao et al., 2021). All measurement items demonstrated factor loadings exceeding the threshold of 0.50, indicating adequate convergent validity (Sawaean & Aburumman, 2025). Specifically, the factor loadings for human resource digital competence ranged from 0.523 to 0.667, with the highest loading observed in item X1.8 (0.667), which measures the ability to integrate digital tools into daily work processes (Trenerry et al., 2021). Product innovation items displayed factor loadings ranging from 0.531 to 0.675, with item X2.9 showing the highest loading (0.675), reflecting the capacity to continuously improve existing products (Rumanti et al., 2023). Competitive advantage items exhibited factor loadings between 0.516 and 0.612, with item Y1.5 demonstrating the highest loading (0.612), assessing the ability to maintain product quality superiority (Otache, 2024). The consistency of factor loadings above 0.5 across all constructs indicates that each measurement item effectively represents its respective latent construct (Romero & Mammadov, 2025).

Average Variance Extracted (AVE) analysis further confirmed convergent validity for all constructs, with all AVE values exceeding the 0.50 threshold (Hoang & Hien, 2024). This indicates that the constructs explain more than half the variance in their respective measurement items, providing strong evidence that the measurement instruments adequately capture the intended constructs (Merín-Rodrigáñez et al., 2024). The internal

consistency and reliability of the measurement scales were evaluated through Composite Reliability (CR) and Cronbach's Alpha assessments (Sawaean & Aburumman, 2025). Human resource digital competence demonstrated the strongest reliability with Composite Reliability of 0.876 and Cronbach's Alpha of 0.847, indicating highly consistent measurement across the thirteen items (Held et al., 2025). Product innovation showed Composite Reliability of 0.829 and Cronbach's Alpha of 0.763, while competitive advantage achieved Composite Reliability of 0.862 and Cronbach's Alpha of 0.826 (Hoang et al., 2025). All reliability coefficients exceeded the recommended thresholds of CR > 0.7 and Cronbach's Alpha > 0.6, confirming that the measurement instruments are reliable and that items within each construct are internally consistent (Teng et al., 2022).

Discriminant validity assessment using the Fornell-Larcker criterion confirmed that each construct in the model was sufficiently distinct from other constructs, with the correlation between any two constructs being less than the square root of the AVE for those constructs (Romero & Mammadov, 2025). This finding provides confidence that the three constructs (digital competence, product innovation, and competitive advantage) represent distinct phenomena rather than alternative manifestations of a single underlying construct (Zhao et al., 2021). The comprehensive validity and reliability assessment establishes a solid foundation for subsequent structural model testing (Hoang & Hien, 2024).

Structural Model Assessment and Fit Indices

The structural model demonstrated excellent fit to the empirical data, as evidenced by model fit indices meeting all established quality criteria (Sawaean & Aburumman, 2025; Teng et al., 2022). The Average Path Coefficient (APC) was statistically significant ($p < 0.001$), indicating that the relationships hypothesized in the model are collectively meaningful and not attributable to chance (Hoang & Hien, 2024). The Average R-squared (ARS) was also statistically significant ($p < 0.001$), confirming that the model explains meaningful proportions of variance in the dependent variables (Romero & Mammadov, 2025). The Average Adjusted R-squared (AARS) reached statistical significance ($p < 0.001$), providing additional confirmation of model explanatory power after adjustment for model complexity (Merín-Rodrigáñez et al., 2024).

Assessment of multicollinearity concerns through VIF (Variance Inflation Factor) analysis revealed no problematic multicollinearity in the model (Hoang et al., 2025). The Average Block VIF (AVIF) was 3.451, and the Average Full Collinearity VIF (AFVIF) was 3.088, both substantially below the threshold of 5.0, indicating that the predictor variables do not suffer from excessive multicollinearity (Teng et al., 2022). The Tenenhaus Goodness of Fit (GoF) index achieved a value of 0.483, exceeding the threshold of 0.36 for large effect sizes, demonstrating that the model has strong overall fit and explanatory capability (Romero & Mammadov, 2025). Additional model quality indices including Simpson's Paradox Ratio (SPR = 1.0), R-squared Contribution Ratio (RSCR = 1.0), Statistical Suppression Ratio (SSR = 1.0), and Nonlinear Bivariate Causality Direction Ratio (NLBCDR = 1.0) all met or exceeded acceptable thresholds,

confirming the appropriateness and quality of the structural model specification (Sawaean & Aburumman, 2025).

Coefficient of Determination

The coefficient of determination (R^2) for the endogenous variables demonstrates the explanatory power of the model (Hoang & Hien, 2024). Product innovation achieved an R^2 value of 0.647, indicating that human resource digital competence explains 64.7% of the variance in product innovation (Castillo-Vergara et al., 2025). This substantial explanatory power underscores the critical importance of digital competence in driving innovation activities within creative economy SMEs (Siregar et al., 2025). The high R^2 value suggests that digital competence is a primary determinant of innovation capability in this context, though other factors not captured in the model account for approximately 35% of innovation variance (Rumanti et al., 2023).

Competitive advantage demonstrated an R^2 value of 0.650, meaning that human resource digital competence and product innovation jointly explain 65.0% of the variance in competitive advantage (Hoang et al., 2025). This high explanatory power indicates that the model successfully captures the primary drivers of competitive positioning in creative economy SMEs (Otache, 2024). The similar magnitude of R^2 values for both endogenous variables suggests that the model provides balanced explanatory power across the dependent variables (Merín-Rodrigáñez et al., 2024).

Predictive Relevance

The Stone-Geisser Q^2 test was employed to evaluate the predictive relevance of the model, with results confirming the adequacy of the model's predictive capability (Hoang & Hien, 2024). Product innovation achieved a Q^2 value of 0.641, exceeding the threshold of zero, indicating that the model has satisfactory predictive relevance for this construct (Teng et al., 2022). Competitive advantage demonstrated a Q^2 value of 0.643, also indicating adequate predictive relevance (Sawaean & Aburumman, 2025). These Q^2 values substantiate not only the model's fit to the observed data but also its ability to predict values for the dependent variables, providing confidence in the model's practical utility and generalizability (Romero & Mammadov, 2025).

Hypothesis Testing and Path Coefficients

Variable	Variable	Koef. Jalur	Sig.
Human Resource Digital Competence	Product Innovation	**0.805**	<0.001
Human Resource Digital Competence	Competitive Advantage UMKM	**0.368**	<0.001
Product Innovation	Competitive Advantage UMKM	**0.472**	<0.001

Sumber: Olah data, 2025

The structural model testing revealed strong support for all three hypothesized direct relationships. The first hypothesis, that human resource digital competence influences product innovation, was strongly supported with a path coefficient of 0.805 and statistical significance at $p < 0.001$. This substantial positive relationship indicates that SME employees with higher levels of digital competence demonstrate significantly greater capacity to develop innovative products. The magnitude of this effect ($\beta = 0.805$) is notably large, suggesting that in the creative economy context, digital competence is an exceptionally important driver of innovation.

The second hypothesis, that human resource digital competence directly affects competitive advantage,

was also supported with a path coefficient of 0.368 and statistical significance at $p < 0.001$. This positive relationship indicates that digital competence contributes to competitive positioning independent of its effects through innovation. The moderate magnitude of this direct effect ($\beta = 0.368$) is nonetheless substantial and statistically robust, confirming that digital competence generates immediate competitive benefits through mechanisms such as operational efficiency, customer engagement, and market responsiveness.

The third hypothesis, that product innovation influences competitive advantage, was strongly supported with a path coefficient of 0.472 and statistical significance at $p < 0.001$. This finding confirms that SMEs with stronger product innovation capabilities achieve superior competitive positioning in the marketplace. The effect size ($\beta = 0.472$) indicates that product innovation is a powerful driver of competitive advantage, consistent with theoretical expectations derived from Schumpeterian innovation theory.

All three hypothesized direct relationships met conventional standards for statistical significance ($p < 0.001$), providing robust evidence for the proposed structural model. The pattern of effect sizes with the strongest relationship between competence and innovation (0.805), followed by innovation and advantage (0.472), and the direct competence-advantage relationship (0.368) suggests that digital competence primarily generates competitive advantage through its influence on innovation, with some additional direct effects on competitive positioning.

Mediation Analysis Results

The mediation analysis tested whether product innovation significantly mediated the relationship between human resource digital competence and competitive advantage. The indirect effect of digital competence on competitive advantage through product innovation was statistically significant ($p < 0.001$), confirming the presence of mediation. The indirect effect was calculated as the product of the path coefficient from digital competence to product innovation (0.805) and the path coefficient from product innovation to competitive advantage (0.472), yielding an indirect effect of 0.380.

The model demonstrates partial mediation rather than complete mediation, given that the direct effect of digital competence on competitive advantage (0.368) remains statistically significant even when product innovation is included in the model. This partial mediation pattern indicates that digital competence influences competitive advantage through two distinct pathways. The direct pathway ($\beta = 0.368$) represents the immediate effects of digital competence on operational efficiency, customer engagement, market responsiveness, and other competitive dimensions. The indirect pathway (indirect effect = 0.380) represents the mechanism through which digital competence enhances competitive advantage by enabling more effective product innovation.

The total effect of digital competence on competitive advantage, combining both direct and indirect effects, equals 0.748 (0.368 direct effect + 0.380 indirect effect). This total effect is substantially larger than the direct effect alone, highlighting the substantial importance of the innovation-mediated

pathway. The comparable magnitudes of the direct and indirect pathways suggest that approximately equal proportions of digital competence's competitive advantage impact operate through operational improvements and through innovation-driven differentiation. This finding underscores that effective digital competence development should be oriented toward both immediate operational benefits and longer-term innovation capacity building.

Summary of Quantitative Findings

In summary, the structural equation model testing revealed strong empirical support for the proposed conceptual framework linking human resource digital competence, product innovation, and competitive advantage in creative economy SMEs. All hypothesized direct relationships were statistically significant and displayed effect sizes consistent with theoretical expectations. Product innovation demonstrated a significant mediating role in the relationship between digital competence and competitive advantage, confirming that digital competence generates competitive advantages through multiple mechanisms. The model achieved strong fit indices and demonstrated adequate predictive relevance, providing confidence in the robustness and generalizability of the findings. The high explanatory power of the model ($R^2 = 0.647$ for product innovation; $R^2 = 0.650$ for competitive advantage) indicates that the key determinants of competitive advantage in creative economy SMEs have been appropriately identified and operationalized within the research framework.

DISCUSSIONS

Interpretation of HR Digital Competence and Product Innovation Relationship

The finding that human resource digital competence exerts a strong positive influence on product innovation ($\beta = 0.805$, $p < 0.001$) constitutes one of the most significant empirical results of this study (Castillo-Vergara et al., 2025; Romero & Mammadov, 2025). This exceptionally strong relationship confirms that digital skills are fundamentally central to innovation processes within creative economy SMEs (Slavković et al., 2024). The magnitude of this effect substantially exceeds typical relationships observed between organizational capabilities and innovation outcomes in prior research, suggesting that in creativity-driven industries, digital competence may be even more critical than in traditional manufacturing or service sectors (Hoang & Hien, 2024; Siregar et al., 2025).

This strong relationship can be understood through multiple theoretical and practical lenses (Teece, 2007). From a Dynamic Capabilities Theory perspective, digital competence enables SMEs to "sense" market opportunities through digital channels such as social media analytics, online trend monitoring, and customer data analysis (Wei et al., 2021; Slavković et al., 2024). It enables them to "seize" opportunities by rapidly developing prototypes and products using digital design tools, 3D modeling software, and virtual collaboration platforms (Isensee et al., 2020). It facilitates "reconfiguring" organizational resources by allowing rapid iteration, A/B testing of product concepts, and real-time customer feedback integration (Demirkan et al., 2022). In the creative economy context, where aesthetic

appeal, cultural relevance, and rapid market responsiveness are paramount, these sensing-seizing-reconfiguring capabilities are especially critical for successful innovation (Rumanti et al., 2023; Siregar et al., 2025).

Practically, digital competence empowers creative economy SME employees to access global design trends, study competitor offerings through digital platforms, collaborate with designers and suppliers across geographical distances through digital tools, and rapidly prototype and test innovations at reduced cost (Yelfiarita et al., 2025; Zahwa et al., 2025). This strong relationship is confirmed empirically in prior research examining digital transformation effects on SME innovation (Gaglio et al., 2022; Surahman et al., 2023). A graphic designer with digital competence can experiment with multiple design variations efficiently; a fashion entrepreneur can access global textile sourcing information; a culinary artist can discover emerging flavor trends through digital communities (Held et al., 2025). These capabilities, collectively, dramatically enhance the capacity to generate product innovations that are market-responsive, aesthetically competitive, and culturally relevant (Castillo-Vergara et al., 2025). The substantial path coefficient (0.805) reflects this comprehensive transformation of innovation capability that digital competence enables (Romero & Mammadov, 2025).

Interpretation of HR Digital Competence and Competitive Advantage Relationship

The finding that human resource digital competence directly influences competitive advantage ($\beta = 0.368$, $p < 0.001$), independent of its effects through innovation, provides important insights into the multi-faceted ways that digital skills contribute to competitive positioning (Hoang et al., 2025; Antoni et al., 2025). While this direct effect is moderate in magnitude compared to the competence-innovation relationship, it remains substantial and statistically robust, confirming that digital competence generates immediate competitive benefits beyond innovation-mediated advantages (Teng et al., 2022).

This direct effect can be understood as reflecting the operational and market-facing benefits that digital competence provides (Barney, 1991). Digital competence enables SMEs to improve operational efficiency through digital supply chain management, inventory optimization, and automation of routine tasks (Antoni et al., 2025; Vieru et al., 2015). It enhances customer engagement through digital marketing, personalized communication, and omnichannel customer service (Yelfiarita et al., 2025). It facilitates market expansion by enabling e-commerce platforms, digital payment systems, and geographic market reach extension (Samputra & Alfarizi, 2025; Tambunan, 2024). These operational and market-facing benefits contribute to competitive advantage through cost reduction, differentiation, and market responsiveness—the core mechanisms of competitive positioning identified by Porter (1985).

From a Resource-Based View perspective, this direct effect demonstrates that digital competence meets the criteria for a strategic resource (Barney, 1991). It is valuable because it directly enables operational improvements and market reach expansion (Trenerry et al., 2021). It is rare because not all SMEs, particularly in emerging markets like Indonesia, possess high levels of digital literacy (Ollanketo et al., 2023; Brink &

Packmohr, 2023). It is inimitable because digital competence is embedded in organizational routines, employee tacit knowledge, and organizational culture that competitors cannot easily replicate (Vieru et al., 2015). It is non-substitutable because digital technologies are increasingly necessary for business operations (Zhao et al., 2021). Consequently, SMEs that invest in digital competence development can create sustained competitive advantages that are difficult for rivals to duplicate (Yunus & Ernawati, 2025; Zahwa et al., 2025).

The finding is particularly important in the Indonesian context, where many SMEs still operate with limited digital adoption (Tambunan, 2024; Ritonga & Qarni, 2022). For creative economy SMEs in regions like Pontianak operating outside major urban centers, digital competence enables access to market information, customer bases, and distribution channels that would otherwise be geographically or economically inaccessible (Yelfiarita et al., 2025; Surahman et al., 2023). A handicraft SME with digital competence can reach customers globally through Shopee or Tokopedia; a culinary UMKM can access food delivery platforms; a digital content creator can monetize through YouTube or TikTok (Samputra & Alfarizi, 2025; Gunawan et al., 2025). These opportunities for competitive positioning through digital channels represent immediate competitive advantages that accrue directly from digital competence (Antoni et al., 2025).

Interpretation of Product Innovation and Competitive Advantage Relationship

The strong positive relationship between product innovation and competitive advantage ($\beta = 0.472$, $p < 0.001$) provides robust empirical confirmation of Schumpeterian Innovation Theory, which posits that innovation is the primary driver of competitive superiority (Schumpeter, 1934; Otache, 2024). In the creative economy context, this relationship is particularly pronounced because innovation is central to value creation (Siregar et al., 2025; Ermaya et al., 2025). Unlike manufacturing industries where competitive advantage often derives from cost efficiency, or service industries where competitive advantage frequently stems from operational reliability, competitive advantage in creative industries is fundamentally rooted in the uniqueness, aesthetic appeal, and market responsiveness of products (Porter, 1985; Rumanti et al., 2023).

Product innovation enables competitive advantage through multiple mechanisms in the creative economy context (Latifah et al., 2021). First, innovation creates product differentiation, allowing SMEs to offer products that are distinct from competitors and thereby command premium pricing or achieve stronger market preference (Isensee et al., 2020; Merín-Rodrigáñez et al., 2024). In fashion, culinary arts, handicrafts, and digital content, differentiation through unique, creative offerings is the primary basis of competitive advantage (Siregar et al., 2025; Zahwa et al., 2025). An SME that continuously innovates its product designs, recipes, or content formats can establish strong brand identity and customer loyalty (Rumanti et al., 2023). Second, innovation enables adaptation to evolving market preferences and consumer trends (Castillo-Vergara et al., 2025). The creative economy is characterized by rapidly changing aesthetic preferences, cultural trends, and consumer demands

(Held et al., 2025). SMEs that continuously innovate products in response to these changes maintain market relevance and competitive positioning (Slavković et al., 2024). Third, innovation through product quality improvement enhances customer satisfaction and brand reputation, contributing to competitive advantage through customer loyalty and word-of-mouth marketing (Yunus & Ernawati, 2025).

The substantial effect size (β = 0.472) reflects the critical importance of innovation in determining competitive success within creative economy SMEs (Siregar et al., 2025; Otache, 2024). This finding is consistent with empirical research demonstrating that product innovation is a primary determinant of firm performance and competitive advantage in SME populations (Hoang & Hien, 2024; Latifah et al., 2021). In the Indonesian creative economy context specifically, where SMEs often compete through creativity and design rather than cost, this innovation-advantage relationship is even more pronounced than in general SME populations or traditional manufacturing sectors (Tambunan, 2024; Ermaya et al., 2025).

The Mediating Role of Product Innovation

A central contribution of this study lies in demonstrating that product innovation significantly mediates the relationship between human resource digital competence and competitive advantage (Latifah et al., 2021; Ermaya et al., 2025). The mediation pattern is partial rather than complete, indicating that digital competence influences competitive advantage through two distinct pathways (Sawaean & Aburumman, 2025; Merín-Rodrigáñez et al., 2024). The direct pathway (β = 0.368) represents immediate competitive benefits from operational improvements, customer engagement, and market responsiveness (Antoni et al., 2025). The indirect pathway (indirect effect = 0.380), operating through product innovation, represents competitive advantages gained through innovation-enabled differentiation and market adaptation (Castillo-Vergara et al., 2025; Romero & Mammadov, 2025).

The comparability of the direct and indirect effect magnitudes is theoretically noteworthy (Hoang & Hien, 2024). It indicates that approximately equal proportions of digital competence's impact on competitive advantage operate through operational improvements and through innovation-driven differentiation (Teng et al., 2022). This dual-pathway structure suggests that digital competence is not merely a technical capability but a strategic capability that generates value through multiple mechanisms (Barney, 1991; Teece, 2007). For SME managers, this finding implies that digital competence development should be explicitly integrated with both operational improvement initiatives and innovation development activities to maximize competitive benefits (Gunawan et al., 2025; Zahwa et al., 2025).

The mediation pattern can be understood as reflecting the hierarchical nature of competitive advantage generation (Porter, 1985; Otache, 2024). In the short term, digital competence generates competitive advantages through improved operations and customer engagement (Antoni et al., 2025). However, these operational advantages are potentially replicable by competitors who adopt similar digital tools (Vieru et al., 2015). In contrast, competitive advantages generated through product innovation are more

durable and defensible because they are rooted in unique product offerings that embody the organization's creative capabilities and market understanding (Rumanti et al., 2023; Siregar et al., 2025). Thus, while digital competence generates immediate competitive gains through operations, its more sustainable competitive value derives from enabling product innovation that creates unique market positions difficult for competitors to replicate (Schumpeter, 1934; Castillo-Vergara et al., 2025).

Contextual Application to Indonesian Creative Economy SMEs

The findings of this research are particularly salient within the specific context of Indonesian creative economy SMEs (Tambunan, 2024; Ritonga & Qarni, 2022). Indonesia possesses substantial creative talent and cultural resources that position it as a regional leader in creative industries (Siregar et al., 2025; Ermaya et al., 2025). However, the translation of this creative potential into sustained competitive advantage requires effective utilization of digital technologies (Surahman et al., 2023; Yelfiarita et al., 2025). Many creative economy SMEs, particularly those operating outside major urban centers like Jakarta or Surabaya, face barriers to accessing formal training in digital skills, capital constraints that limit technology investment, and limited awareness of digital tools' potential applications to their businesses (Brink & Packmohr, 2023; Pujari & Saha, 2024).

The research findings provide evidence that investments in digital competence development can yield substantial returns in terms of innovation capacity and competitive positioning (Romero & Mammadov, 2025; Castillo-Vergara et al., 2025). The strong relationship between digital competence and product innovation ($\beta = 0.805$) demonstrates that digital competence development directly enhances innovation capabilities (Slavković et al., 2024; Siregar et al., 2025). For fashion designers, digital design tools expand creative possibilities (Held et al., 2025). For culinary entrepreneurs, digital recipe development and food styling tools enable product innovation (Zahwa et al., 2025). For handicraft producers, digital design and market analysis tools facilitate product line extension (Rumanti et al., 2023). For digital content creators, digital competence with production software, editing tools, and platform algorithms is fundamental to content quality and market reach (Gunawan et al., 2025).

The finding that product innovation mediates the digital competence-competitive advantage relationship has important implications for policy and business support initiatives (Latifah et al., 2021; Ermaya et al., 2025). It suggests that digital literacy programs should not focus solely on operational skill development but should explicitly integrate innovation development, encouraging participants to apply digital tools to product development and market adaptation (Ollanketo et al., 2023; Sawaean & Aburumman, 2025). Support initiatives combining digital training with innovation resources (design labs, prototyping facilities, market testing support) are likely to be more effective than digital training alone (Antoni et al., 2025; Tambunan, 2024).

Comparison with Prior Research

The findings of this study are broadly consistent with but extend existing research on digital competence, innovation, and competitive advantage

in SME contexts (Hoang & Hien, 2024; Teng et al., 2022). Romero and Mammadov (2025) developed a holistic framework conceptualizing digital competence as multidimensional, encompassing technological, human, and organizational dimensions. This research confirms the importance of these dimensions and demonstrates their integrated effect on innovation and competitive positioning (Zhao et al., 2021). Sawaean and Aburumman (2025) found that digital capability significantly enhances innovation performance, with organizational culture moderating this relationship. This study extends this finding by specifying product innovation as an outcome and competitive advantage as the ultimate dependent variable, clarifying the downstream effects of digital capability (Alkhalaf & Al-Tabbaa, 2024).

Hoang and Hien (2024) demonstrated in Vietnam manufacturing SMEs that digital capabilities influence both process and product innovation capabilities, which subsequently affect firm performance. This study replicates and extends this finding within the creative economy SME context, confirming that digital capabilities drive product innovation in service and creative sectors as well as manufacturing (Siregar et al., 2025). The path coefficient (β = 0.805) observed in this study is notably higher than typical relationships reported in prior research, suggesting that in creative industries where innovation is especially central to value creation, digital competence's role may be amplified (Castillo-Vergara et al., 2025; Merín-Rodrigáñez et al., 2024).

Ermaya et al. (2025), in a study of digital creative industries in Indonesia, found that business intelligence mediates the relationship between strategy innovation and business performance. This research complements their findings by demonstrating that product innovation mediates the digital competence-competitive advantage relationship, and by extending the analysis to broader creative economy SME sectors (Latifah et al., 2021). The mediation pathway identified in this study aligns with their finding that innovation is an intermediate mechanism through which digital capabilities translate into business performance (Rumanti et al., 2023).

Compared to research on SME digital transformation in general (Gunawan et al., 2025; Antoni et al., 2025), this study contributes by specifying the mechanisms through which digital competence operates to enhance competitive outcomes (Teng et al., 2022). Prior research has often documented that digital transformation benefits SME performance but has provided limited insight into the processes generating these benefits (Surahman et al., 2023; Gaglio et al., 2022). By identifying product innovation as a key mediator, this study clarifies that digital competence generates competitive advantages not only through operational improvements but also through enhanced innovation capability (Isensee et al., 2020; Slavković et al., 2024).

Limitations and Contextual Qualifications

While the findings are robust and theoretically meaningful, several limitations should be acknowledged in interpreting the results (Siqueira & Cosh, 2008). First, the cross-sectional design precludes definitive causal inferences (Hoang & Hien, 2024). While the theoretical framework and analytic approach support causal

interpretation, longitudinal designs tracking digital competence development trajectories and their subsequent effects on innovation and performance would provide stronger evidence for causality (Trenerry et al., 2021; Vieru et al., 2015). Second, the study focuses on creative economy SMEs in Pontianak and surrounding areas, which may have characteristics not fully representative of Indonesia's broader SME population or other regional contexts (Ritonga & Qarni, 2022; Yelfiarita et al., 2025). Generalization to other sectors or geographical areas should proceed cautiously (Tambunan, 2024).

Third, while the model explains 65% of variance in competitive advantage, the remaining 35% suggests that other important determinants of competitiveness remain unexamined (Otache, 2024; Yunus & Ernawati, 2025). Factors such as entrepreneurial orientation, access to finance, supply chain integration, government support policies, and external network relationships likely play important roles in determining competitive advantage (Samputra & Alfarizi, 2025; Restrepo-Morales et al., 2024). Future research should investigate these complementary factors and examine potential moderating effects (Nuryanto et al., 2024).

Fourth, this study conceptualized digital competence as a unidimensional construct (Zhao et al., 2021). Future research might usefully distinguish between technical competence (software and platform skills), information competence (data analysis and information management), and creative competence (applying digital tools to creative expression), examining whether these dimensions have differential effects on innovation and competitive outcomes (Held et al., 2025; Slavković et al., 2024).

CONCLUSION AND SUGGESTION

This research demonstrates that human resource digital competence is a critical strategic capability for creative economy SMEs seeking to enhance innovation and competitive advantage. The strong positive relationships identified between digital competence and product innovation, the direct effects on competitive advantage, and the significant mediating role of innovation collectively establish digital competence as fundamental to competitive success in the creative economy sector. The study provides robust empirical evidence validating an integrated theoretical framework and offering practical guidance for managers, policymakers, and business support organizations.

For creative economy SME managers, the key takeaway is that investment in digital competence development is strategically justified as a pathway to innovation and competitive enhancement. Such investments should be deliberately connected to innovation objectives and embedded within organizational contexts supporting experimentation and creative application of digital tools. For policymakers, the research validates that targeted support for digital competence development, particularly when integrated with innovation support mechanisms, can enhance competitiveness of creative economy SMEs and contribute to inclusive economic growth. The research further highlights the importance of ensuring that digital support reaches SMEs in all regions, including non-metropolitan areas, rather than concentrating support in major urban centers.

As Indonesia continues its digital transformation journey and seeks to strengthen the creative economy as a strategic pillar for economic development, enhancing human resource digital competence emerges as a fundamental priority. By recognizing digital competence as a strategic capability rather than a peripheral technical skill, and by integrating digital development with innovation support, Indonesia can better position creative economy SMEs for sustainable competitiveness in an increasingly digital global economy.

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