Digital Entrepreneurial Orientation and Organizational Performance: The Mediating Role of Digital Innovation Competence and The Moderating Effect of Digital Technology Preparedness

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Abstract

This research examines the relationship between digital entrepreneurial orientation and organizational performance in Indonesian healthcare organizations, investigating the mediating role of digital innovation competence and the moderating effect of digital technology preparedness. Using PLS-SEM with 250 healthcare organizations in Batam City, the study tests an integrated moderated mediation model grounded in resource-based view, dynamic capabilities theory, and contingency theory. Results demonstrate that digital entrepreneurial orientation significantly influences organizational performance both directly and indirectly through digital innovation competence as a partial mediator. Digital technology preparedness serves as a critical moderator, substantially amplifying the relationship between entrepreneurial orientation and innovation competence at higher preparedness levels. The model explains substantial variance in digital innovation competence and moderate variance in organizational performance, demonstrating strong predictive relevance. These findings contribute to digital entrepreneurship theory by revealing conditional indirect mechanisms through which entrepreneurial orientation creates value in digital transformation contexts. The research extends understanding of how organizational capabilities mediate strategic orientation effects while technological readiness serves as an enabling condition. Practically, Indonesian healthcare organizations should prioritize developing comprehensive digital innovation competencies while simultaneously investing in technological infrastructure, human capital, and organizational culture to maximize entrepreneurial benefits. The study provides actionable insights for healthcare managers navigating digital transformation challenges in emerging markets, emphasizing capability-building approaches over purely strategic positioning.

***Keywords**: Digital entrepreneurial orientation, organizational performance, digital innovation competence, digital technology preparedness, mediation, moderation*

1. Introduction

Business digitalization radically altered the entrepreneurial environment, questioning the conventional wisdom for how institutions create and achieve value (A. Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013a; Nambisan, 2017). Entrepreneurial orientation with digital modalities is a competitive status quo for an organization competing for finding and exploiting entrepreneurial opportunities with digital modalities, which becomes the single most critical determinant for digital economy success (Bouncken & Kraus, 2022; Eggers & Kraus, 2011a). But conventional entrepreneurial orientation models might no longer be appropriate for digital performance result interpretation because digital technologies exhibit distinctive attributes, business models rely on platforms, and value is created ecocystemically (Nambisan, 2017; Schiavi & Behr, 2018).

Despite the wide literature on the entrepreneurial orientation-performance relationship linkages well-established with the help of meta-analyses over five decades (de Burgos-Jiménez et al., 2013; Rauch et al., 2009a; Rauch & Hulsink, 2015), we still observe a considerable gap in the knowledge for digital entrepreneurship environments. Rauch et al (2009b)conducted a synthesis for 51 studies and concluded a moderate positive relationship (r = 0.242) between entrepreneurial orientation and performance, while their own synthesis identified considerable effect size variability, revealing the influence of significant mediating and moderating factors still uninvestigated. Shirokova et al. (2022)further noted that entrepreneurial orientation research suffers from "conceptual ambiguity and measurement inconsistencies," particularly when applied to digital environments. Three specific gaps emerge from this literature. First, systematic reviews reveal that most studies examine direct relationships without exploring organizational capabilities that mediate the entrepreneurial orientation-performance link, creating what Teece (2007) termed a theoretical "black box." Second, contingency factors that moderate entrepreneurial orientation effectiveness remain underexamined, with Lawrence & Lorsch (1967) emphasizing that organizational effectiveness depends

on environmental fit, yet digital-specific moderators lack empirical validation. Third, no empirical studies have integrated mediation and moderation effects within a single model to examine conditional indirect effects in digital entrepreneurship contexts, limiting the understanding of complex causal pathways.

Digital innovation competence may serve as a crucial mediating mechanism between digital entrepreneurial orientation and organizational performance. Drawing on dynamic capabilities theory (D. J. D. Teece, 2007) Digital entrepreneurial orientation provides strategic direction for pursuing digital opportunities, while digital innovation competence, the ability to sense, seize, and transform digital opportunities, enables organizations to convert this orientation into tangible performance improvements. This suggests that organizations achieve superior performance indirectly through their enhanced digital innovation competence rather than directly from entrepreneurial orientation alone.

Digital technology preparedness may moderate the relationship between digital entrepreneurial orientation and digital innovation competence. Contingency theory (Lawrence & Lorsch, 1967), suggests that organizational effectiveness depends on fit between characteristics and environmental demands. Greater digital technology readiness at the organisational level in terms of digital infrastructure, human capital, and cultural readiness facilitates further effective transformation of entrepreneurial orientation into innovation capability. Low readiness could possibly render an organisational unit unable to derive any advantage through entrepreneurial orientation and thereby develop a moderated mediation framework where indirect forces depend upon the level of readiness.

This investigation derives and validates an integrated mediated-moderation model for explaining how digital innovation competence acts as a mediator between the digital entrepreneurial orientation-performance relationship and how digital technology preparedness moderates the relationship. The investigation examines: (1) how digital innovation competence acts as a mediator, (2) how digital technology preparedness acts as a moderating variable, and (3) conditional indirect impacts at various preparedness levels. This model brings together the resource-based view theory (J. Barney, 1991a), dynamic capabilities theory (D. J. D. Teece, 2007) and contingency theory (Lawrence & Lorsch, 1967).

This work is a digital entrepreneurship scholarship contribution for the following reasons. It builds and rationalizes a mediated-moderation model that outlines how and when digital entrepreneurial orientation impacts performance. It situates digital innovation competence as a mediator and digital technology preparedness as a condition for moderation. Apparently, it embeds forces of mediation and moderation under the same framework and increases scholarship applied under conditional indirect influences used in digital entrepreneurship.

2. Literature Review and Hypothesis Development

2.1 Digital Entrepreneurial Orientation

Digital entrepreneurial orientation is a strategic competitive edge in digital market opportunity identification and exploitation, and it is marked by a clear focus on the distinctive characteristics of digital technology, differentiating it from conventional entrepreneurial orientation (J. G. Covin et al., 2006; J. G. Covin & Slevin, 1989; J. G. Covin & Wales, 2019). The construct has three main dimensions: digital innovativeness, reflecting an organizational propensity to experiment with digital technology; digital proactiveness, as the capacity to foresee and respond to digital market trends; and digital risk-taking, as the willingness to invest in risky digital ventures. The applicability of the construct is elevated under the Southeast Asian context, with the region's phenomenal digital growth trajectory and varied market conditions requiring entrepreneurial adaptability (Ha & Chuah, 2023; Tech Collective, 2024)

The suggested theoretical framework combines the resource-based view concept with the features of digital technology to explain performance results in a digital setting. Digital entrepreneurial orientation functions as a meta-resource, making it possible to exploit the convergence, generativity, and editability aspects of digital technologies concerning competitors (J. Barney, 1991b; Oduro et al., 2023; Zaman et al., 2025). This strategic direction reflects the transformation into operational capabilities through digital innovation competencies, in which the capabilities to sense, seize, transform, and scale are amplified by preparedness in digital technology, specifically concerning infrastructure, human capital, and cultural readiness (A. S. Bharadwaj, 2000a; J. G. Covin & Wales, 2019; Nasiri et al., 2020). The Southeast Asian context provides unique support for this theoretical framework, supported by empirical evidence that attests to the contribution of digital technology adoption toward enabling growth, coupled with regional factors that create diverse opportunities for performance improvement (Adomako & Nguyen, 2024; Hunt, 2013).

H1: Digital entrepreneurial orientation positively influences organizational performance.

2.2 Digital Entrepreneurial Orientation and Digital Innovation Competence

The interaction between digital entrepreneurial orientation and digital innovation competence calls for an extension of current theoretical frameworks, transcending traditional dynamic capability models to incorporate emergent and generative characteristics of digital technologies. Although D. J. Teece & D.J, (2007) notions of sensing, seizing, and transforming offer a starting point; the generation of digital value arises fundamentally from combinatorial potential and network effects that need entrepreneurial involvement to target and utilize effectively (Eggers & Kraus, 2011b). In contrast to traditional capability building that is grounded in established paradigms, the development of digital innovation competence requires constant adaptation to technological development and shifts in the market. Digital entrepreneurial orientation thus acts as a strategic driver that helps organizations deal with uncertainty and uncover new opportunities (Donbesuur et al., 2020; Lima et al., 2023; Suder et al., 2025).

Such a theoretical framework is of greater urgency within Southeast Asia, due to the region's requirement of simultaneously balancing regional inequities with technological complexities that call forth advanced digital innovation capabilities. Entrepreneurial orientation and capability are shaped by experiential learning mechanisms; here, digital innovativeness facilitates differentiation of platform dynamics, digital proactiveness assists with the coordination of ecosystems, and digital risk-taking facilitates the development of transformation capabilities within the uncertain region-wide technological environment (Dias & Lages, 2021; Ferro et al., 2023; Quayson et al., 2023). The regional empirical evidence suggests that high digital maturity firms across the region tend invariably to connect entrepreneurial orientation with capability-based competitiveness more effectively, and that market variances—ranging from linguistic through cultural and infrastructural variances—provide boundary conditions reinforcing rather than weakening this critically significant relationship (Cho & Pucik, 2005; Jiang et al., 2025).

H2: Digital entrepreneurial orientation positively influences digital innovation competence.

2.3 Digital Innovation Competence and Organizational Performance

The potential for digital innovation extends organizational performance advantages through the exploitation of value creation mechanisms that are inherently different from, rather than derivative of, traditional innovation capabilities. This theoretical distinction originates with the generative qualities of digital technologies, which support combinatorial innovation; therefore, expertise at identifying, capturing, transforming, and scaling digital opportunities has the potential to produce cascading, rather than isolated, effects of value (Palacios-Fenech & Vrain, 2024; D. J. Teece & D.J., 2007). By contrast, while traditional innovation typically generates value through discrete incremental increases at the constituent product or process level, digital innovation capability supports multiplicative value creation through network effects and platform dynamics, whereby original innovations precipitate exponential, approaching linear, increments of performance improvement (Parida et al., 2019; Sjödin et al., 2024; van Tonder et al., 2024).

The multiplicative potential has applicability in Southeast Asia, with unique regional attributes augmenting the resulting performance gains related to digital innovation capabilities. Large market size, networked digital ecosystems, and favorable policies create a context where organizations with effective digital innovation capabilities can realize significant performance gains via cross-border growth and ecosystem engagement (Böttcher et al., 2022). Case evidence related to successful regional super-apps and detailed economic impact studies supports the value proposition, consequently substantiating the claim that digital innovation capabilities create value, extending organizational boundaries that, in turn, impact regional human development indicators (Boselie et al., 2020; Trinugroho et al., 2022).

H3: Digital innovation competence positively influences organizational performance.

2.4 Mediation Role of Digital Innovation Competence

The mediating role of digital innovation competence emerges from a fundamental theoretical gap in the resource-based view application to digital contexts. While traditional resource-based logic assumes direct resource-to-advantage transformation (J. B. Barney & Hoskisson, 1990)Digital technologies' emergent and combinatorial characteristics create value through complex capability development processes that cannot be bypassed through strategic intent alone. Digital entrepreneurial orientation provides strategic direction for opportunity recognition, but converting recognized opportunities into performance outcomes requires technical execution capabilities that differ qualitatively from traditional operational capabilities due to digital technologies' generative properties and network effects (Hosseini et al., 2018; Zaman et al., 2025).

The mediation mechanism operates through capability gaps that prevent direct orientation-performance relationships in digital contexts. Organizations possessing strong digital entrepreneurial orientation may identify valuable digital opportunities but lack the technical competence to execute sensing, seizing, transforming, and scaling processes required for value realization (Barnir et al., 2011; Dayan et al., 2023). This capability gap becomes particularly pronounced in Southeast Asian markets, where additional complexity from regulatory diversity, infrastructure heterogeneity, and cultural variation creates execution challenges requiring sophisticated digital innovation competence beyond entrepreneurial intent (Edwards-Schachter et al., 2015a; Ha & Chuah, 2023; Mai et al., 2022). Empirical validation from Southeast Asian SMEs demonstrates this mediation effect, showing that entrepreneurial orientation success depends critically on capability development rather than strategic positioning alone.

H4: Digital innovation competence mediates the relationship between digital entrepreneurial orientation and organizational performance.

2.5 Moderating Role of Digital Technology Preparedness

Digital technology preparedness moderates the entrepreneurial orientation-innovation competence relationship through contingency mechanisms that differ fundamentally from traditional environments due to digital technologies' technical complexity and resource intensiveness. While contingency theory establishes that environmental fit determines organizational effectiveness (Lawrence et al., 1967; Rhyne, 1986)Digital contexts create unique alignment requirements where entrepreneurial intent must match organizational execution capabilities across infrastructure, human capital, and cultural dimensions to achieve competence development (Grimpe et al., 2019, 2023; Osei, 2024). This alignment necessity emerges because digital innovation competence development requires simultaneous technological experimentation capabilities, specialized technical expertise, and organizational cultures supporting continuous learning and failure tolerance—requirements absent in traditional capability development processes (Boustani & Chammaa, 2023).

The moderation mechanism operates through capability conversion constraints, where preparedness levels determine entrepreneurial orientation in generating innovation competence (Alshanty & Emeagwali, 2019a; Donbesuur et al., 2020; Edwards-Schachter et al., 2015a). High digital technology preparedness creates enabling conditions, allowing organizations to convert entrepreneurial intent into operational capabilities, while low preparedness creates bottlenecks, preventing competence development regardless of strategic orientation strength (J. G. Covin et al., 2006; Katsifaraki & Theodosiou, 2024; Sun et al., 2024). This moderation effect becomes particularly pronounced in Southeast Asian markets, where substantial regional heterogeneity in infrastructure development, human capital availability, and cultural attitudes toward technology creates differential boundary conditions across countries, with organizations in digitally mature markets demonstrating superior orientation-competence conversion effectiveness compared to those facing preparedness constraints (Ha & Chuah, 2023; Jiang et al., 2025; Mariani et al., 2023).

H5: Digital technology preparedness positively moderates the relationship between digital entrepreneurial orientation and digital innovation competence, such that the relationship is stronger when digital technology preparedness is high.

2.6 Conditional Indirect Effects

The theory of conditional indirect effects represents one of the basic theoretical components in understanding why organizations with similar digital entrepreneurial orientations produce different results of performance within digital spaces. The moderated mediation is such that it requires simultaneous congruence among strategic orientation, capabilities, and technological pillars of digital value construction—an interconnected process that otherwise does not feature in typical entrepreneurship models (Alqahtani et al., 2024; Gupta, 2015). While with direct relationships, entrepreneurial orientation has the potential of influencing performance independently, digital settings place demands on capability mediation that needs to be based on an organizational predisposition of applying technical solutions, thus creating conditional channels through which strategic intent alone does not guarantee outcomes of performance (Kusa, 2023a; Sobaih & Elshaer, 2022).

The conditional process manifests through conversion efficacy that depends on preparedness: organizations that have higher levels of preparedness in digital technology can translate their entrepreneurial orientation into innovation capabilities and, through that, into superior

advantages. Organizations that have low preparedness face conversion failures, even while having robust strategic objectives (Ghaleb et al., 2021; Hasheem et al., 2022). Southeast Asian markets are natural experimental settings to test these conditional mechanisms, given that they have huge development differentials that induce systematic variations in preparedness levels across countries and organizations. This regional diversity provides real-world confirmation, indicating that preparedness is one core facilitator that determines if entrepreneurial intentions are converted into competitive advantage, thus illuminating variations in digital entrepreneurship success rates within similar strategic orientations (World Economic Forum, 2023).

H6: The indirect effect of digital entrepreneurial orientation on organizational performance through digital innovation competence is moderated by digital technology preparedness, such that the indirect effect is stronger when digital technology preparedness is high.

2.7 Theoretical framework

Figure 1 presents the conceptual research framework specially formulated to examine the dynamics of digital value generation in Indonesian healthcare institutions. This framework consists of four constructs that represent their sequential, conditional, and feedback interactions. The digital entrepreneurial orientation is the conceptualized primary strategic resource, which is designed to enhance both performance and capability development simultaneously. On the other hand, digital innovation competence is the mediating variable that translates strategic intentions into operational capabilities that are necessary for the achievement of a sustainable competitive advantage. Additionally, digital technology preparedness is a critical boundary condition that affects the success of transformation, with the ability to moderate the orientation-competence relationship. Finally, organizational performance is the multi-faceted outcome that includes measures of financial success, operational efficiency, and stakeholder satisfaction. This configuration combines Barney's (1991) resource-based view, Teece's (2007) dynamic capabilities framework, and Lawrence and Lorsch's (1967) contingency theory to construct an integrative framework that explains variability in performance among healthcare organizations with similar entrepreneurial profiles.

The suggested framework operates based on a network of interacting mechanisms that enhance value creation, thus overcoming complexities inherent with digital transformation across healthcare settings. An organization's strategic entrepreneurial orientation directly impacts its efficiency through resource-based mechanisms; namely, greater opportunities awareness, efficient risk evaluation, and market positioning competencies produce short-term competitive advantages across Indonesia's growing digital health marketplace (Covin & Slevin, 1989). At the same time, entrepreneurial orientation supports the progressive development of systematic digital innovation capabilities by dynamic capability processes; in this respect, strategic intent supports learning, accumulation, and enhancement of resources along the sensing, seizing, transforming, and scaling dimensions (Teece, 2007; Nasiri et al., 2023). The process of mediation depends on levels of preparedness with respect to digital technologies, such that mature infrastructure, competent human capital, and innovation-friendly cultures maximize the conversion of orientation into competence. Deficits in preparedness, by contrast, create barriers that impede capability development regardless of entrepreneurial orientation's strength (Bharadwaj et al., 2013; Lawrence & Lorsch, 1967).

The successful digital transformation of Indonesia's healthcare organizations depends on realizing that such transformation depends upon the integration of organizational capabilities, strategic vision, and technological foundation rather than incremental improvement of isolated components (Sirmon et al., 2008). Healthcare organizations are required to develop thorough technological preparedness, which includes a digital platform that is competent enough to manage complex healthcare applications, human resources with technical and clinical expertise, and organizational values that merge innovation along with the mandate of patient safety—conditions that are considerably different from other industries based on the unique regulations, practices of clinical risk management, and patient-centric ethics that characterize the delivery of healthcare (Grimpe et al., 2023). The conditional mediation theory proposed suggests that preparedness investments bear fruit by developing entrepreneurial inclinations that lead to relatively significant returns on capability upgrade; therefore, systematic upgrades of preparedness become a strategically significant antecedent of optimum return on investment in digital transformation across the diverse expanse of the Indian healthcare industry, which is characterized by inequality of infrastructure, disparity of regulation, and cultural diversity, posing context-specific challenges of adaptation (Ha & Chuah, 2023; Alqahtani et al., 2023).
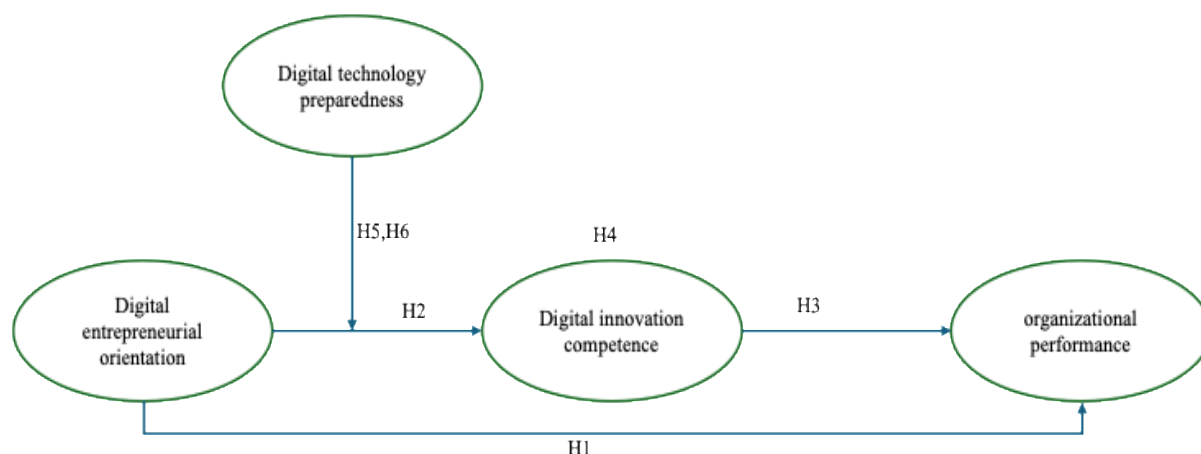

Fig. 1: Research Framework

3. Methodology

3.1 Research Design and Setting

This study employed a cross-sectional survey design to examine the proposed moderated mediation model among organizational performance in Batam City, Indonesia. Healthcare organizations' directories were selected as the unit of analysis due to their critical role in digital transformation within the Indonesian healthcare sector and their exposure to both entrepreneurial challenges and digital technology

adoption pressures. Batam City was chosen as the research setting due to its status as a special economic zone with significant healthcare sector development and relatively advanced digital infrastructure compared to other Indonesian cities.

3.2 Sample and Data Collection

The sampling frame was constructed from healthcare organizations' directories of Batam Chamber of Commerce and City Health Department, covering 312 eligible businesses from a total population of 450 registered healthcare enterprises. Stratified random sampling was employed with proportional allocation across four healthcare subsectors based on population distribution (Onyeka et al., 2015), with inclusion criteria of a minimum of two years of operation and formal registration to ensure entrepreneurial relevance (Miller, 2011). Sample size calculation using G*Power indicated a minimum of 138 respondents for detecting medium effect sizes (f^2=0.15) with 80% power, though the target was set at 300, accounting for anticipated response rates and complex moderated mediation requirements.

Data collection occurred March-June 2025 using mixed-mode surveys following Dillman's tailored design method (Dillman, 2007). From 450 contact attempts across the sampling frame, 300 responses were collected (66.7% response rate), substantially exceeding established thresholds (Baruch & Holtom, 2008; Wang et al., 2024), with response rates varying by mode: online 64.2% (180/280 attempts) and face-to-face 70.6% (120/170 attempts). Non-response bias assessment through chi-square tests revealed no significant demographic differences between response modes (χ^2=2.89, p=0.235) or early/late respondents (all p>0.10), supporting data quality (Armstrong et al., 1977). Systematic data screening excluded incomplete responses >15% missing data (n=28), unverified eligibility criteria (n=15), and multivariate outliers using Mahalanobis distance at p<0.001 (n=7) following Hair et al. (2017) protocols, with Little's MCAR test confirming a missing completely at random pattern (χ^2=76.42, p=0.189).

Final sample comprised 250 usable responses (55.6% usable rate), providing achieved statistical power of 0.96 for main effects, 0.92 for medium interactions, and 0.89 for mediation effects, with adequate power for small effects ranging 0.72-0.81 meeting optimal thresholds (Williams & MacKinnon, 2008). Sample representativeness was validated against population parameters: business size distribution (micro 46%, small 35%, medium 19%) aligned with regional SME patterns (Stratton, 2021), healthcare subsectors matched population proportions within ±2% tolerance, operational maturity patterns reflected typical entrepreneurial ventures, and respondent backgrounds (healthcare 55%, business 27%, technology 18%) were consistent with emerging market healthcare entrepreneurship profiles (Glover et al., 2024). Analysis of excluded responses revealed no systematic bias on observable characteristics (all χ^2<1.87, p>0.42), with balanced representation across organizational characteristics. The robust sample size, high response rate, demonstrated representativeness, and comprehensive quality assurance provide a strong foundation for testing the proposed theoretical model with excellent statistical power for detecting effects across all hypothesized relationships.

3.3 Measurement Instruments

All constructs were measured using validated scales adapted for healthcare organization contexts through systematic procedures (Brislin et al., 1973). Translation involved forward translation by bilingual business academics, back-translation by independent translators, and expert panel reconciliation of discrepancies (Van de Vijver & Hambleton, 1996). Cognitive interviews with 15 healthcare organizations ensured semantic equivalence and cultural appropriateness. Pilot testing with 45 entrepreneurs (separate from the main sample) confirmed scale reliability (α > 0.75) and validity (AVE > 0.50, HTMT < 0.85) before main data collection (Sarstedt et al., 2017).

Digital entrepreneurial orientation was measured using seven items adapted from (J. Covin & Slevin, 1986). Digital innovation competence employed five items based on (D. J. D. Teece, 2007). Digital technology preparedness used six items adapted from (A. Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013b). Organizational performance utilized four items from (Venkatraman, 1990). Control variables included business size (log employees), business age (years since establishment), healthcare subsector dummies, and entrepreneur education, selected based on established entrepreneurship research indicating significant influence on digital orientation and performance outcomes (Choy et al., 2006; Quinton et al., 2018). All scales employed seven-point Likert responses (1=strongly disagree, 7=strongly agree) to ensure adequate variance for multivariate analyses (Kline, 1999). Common method bias was assessed through Harman's single-factor test (28.7% variance explained, below 50% threshold) and the marker variable technique, indicating bias was not problematic (MacKenzie & Podsakoff, 2012).

3.4 Data Analysis Procedures

All these procedural controls were utilized for reducing the typical method bias issues with the single-source design of surveys (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). They were: differential measurement dates for criterion and for the predictor variables whenever possible, specific assurances for the confidentiality and the anonymity for the respondents, randomized order for questions for construct blocks, and different response scales for different constructs. A further verification with Harman's single-factor test was conducted post-hoc, which verified that one factor explained 28.7 percent of the total variance, far less than the 50 percent criterion for suggesting troublesome common method bias (MacKenzie, Podsakoff, Podsakoff, et al., 2011).

Analyses utilized partial least squares structural equation modeling (PLS-SEM) with the help of computer software SmartPLS version 4.0, appropriate for small to moderate-sample models and for use in exploratory work (Sarstedt et al., 2017). PLS-SEM was chosen over covariance-based SEM because of appropriateness for the case under study, prediction model, tolerance for non-normally distributed data, and its workability with the small samples more typical for research on entrepreneurs (Henseler & Sarstedt, 2013). PLS-SEM analysis utilized the two-stage procedure: the first was the testing for validity and reliability for the measurement model; the second was the testing for the structural model to assess the hypothesized relations, including the more complex moderated mediation model.

Testing the measurement model examined indicator loadings (>0.70), internal consistency reliability using Cronbach's alpha (>.70) and composite reliability (>.80), convergent validity using average variance extracted (>.50), and discriminant validity using Fornell-Larcker criterion and heterotrait-monotrait ratios (>.85) (Hair et al., 2017). Structural model assessment included path coefficients, coefficient of determination (R^2), predictive relevance (Q^2), and effect sizes (f^2), PLS-SEM analysis to test relationships between variables, with statistical validation to ensure reliable results and bias-corrected confidence intervals (Hayes & Preacher, 2010). The moderated mediation hypothesis was tested using Hayes' PROCESS macro Model 7, with conditional indirect effects examined at moderator values of mean ± 1 standard deviation (Hayes, 2017).

Power analysis using G*Power software indicated adequate statistical power of 0.87 for detecting medium effect sizes with the final sample of 209 respondents (Kang, 2021). While this sample size falls below the ideal threshold of 300+ respondents for complex models, it exceeds the minimum PLS-SEM requirements of 10 times the largest number of structural paths directed at any construct (Jr. et al., 2017), and is

consistent with entrepreneurship research in developing market contexts where larger samples may be constrained by population limitations (Henseler & Sarstedt, 2013).

4. Results

4.1 Measurement Model Assessment

The measurement model has satisfactory psychometric properties for the four constructs studied, well exceeding the set criteria for both reliability and convergent validity. The Cronbach's alpha coefficients are between 0.816 and 0.877, with Digital Entrepreneurial Orientation recording the highest coefficient (α = 0.877), followed by Digital Innovation Competence (α = 0.873), Digital Technology Preparedness (α = 0.839), and Organizational Performance (α = 0.816). Nevertheless, none of the coefficients surpass the acceptable limit of 0.88 stipulated at the confirmatory level (Kline, 1999). The composite reliability coefficients vary between 0.871 and 0.908, consistently surpassing the recommended level of 0.8 as stipulated by Bagozzi (1981), with Digital Innovation Competence recording the highest level of reliability (CR = 0.908), followed by Digital Entrepreneurial Orientation (CR = 0.903), Digital Technology Preparedness (CR = 0.884), and Organizational Performance (CR = 0.871). This shows a high level of superior internal consistency that surpasses Cronbach's alpha due to the inclusion of factor loadings Hair et al, (2013). The factor loadings show differences in performance, with most of the items recording values above the minimum of 0.7 advanced by (Sarstedt et al., 2014); however, some indicators have lower loadings: DEO1 (0.644), DTP1 (0.749), DIC5 (0.729), and OP1 (0.733). According to Hair et al. (2013) criteria, such marginal loadings are acceptable if they do not jeopardize the overall reliability of the construct, as indicated by the high alpha and composite reliability coefficients.

Table 1: Measurement Model Assessment

Construct	Outer loadings	a	CR	AVE
Digital entrepreneurial orientation		0.877	0.903	0.573
DEO1-Our healthcare entrepreneurs frequently experiment with new digital health technologies	0.644			
DEO2-We actively seek innovative digital solutions to improve our healthcare services	0.768			
DEO3 -Our organization encourages creative digital approaches to healthcare delivery	0.770			
DEO4 -We typically identify digital health opportunities before our competitors	0.777			
DEO5- Our healthcare entrepreneurs are usually the first to introduce new digital health services	0.789			
DEO6-We accept high-risk digital projects if they offer potential healthcare improvements	0.730			
DEO7-Our organization takes bold digital initiatives even with uncertain outcomes	0.807			
Digital innovation competence		0.873	0.908	0.665
DIC1 - Our healthcare organizations effectively scan for emerging digital health opportunities	0.855			
DIC2 - We have strong capabilities to identify digital technology trends in healthcare	0.832			
DIC3 - We rapidly mobilize resources for promising digital health initiatives	0.793			
DIC4 - Our organization adapts digital assets to maintain a competitive advantage	0.862			
DIC5 - We successfully expanded digital innovations across our healthcare organization	0.729			
Digital technology preparedness				
DTP1 - Our healthcare organizations have a reliable digital infrastructure for health technology implementation	0.749	0.839	0.884	0.605
DTP2 - We possess adequate hardware and software systems for digital health services	0.828			
DTP3 - Our employees possess adequate digital health technology skills	0.794			
DTP4 - Our staff can effectively use digital tools for healthcare delivery	0.732			
DTP5 - Our healthcare organizations encourage digital experimentation and learning	0.782			
DTP6 - We have a culture that embraces digital transformation in healthcare		0.816	0.871	0.576
Organizational Performance	0.733			
OP1 - Our healthcare organization's profitability has improved compared to competitors over the past 2 years	0.763			
OP2 - Our overall financial performance is superior to our healthcare competitors	0.795			
OP3 - Our patient satisfaction levels are higher than competing healthcare providers	0.767			
OP4 - Our operational efficiency has improved significantly over the past 2 years	0.734			

Convergent validity is established sufficiently using Average Variance Extracted (AVE) values between 0.573 and 0.665, all of which are above the minimum threshold of 0.5 as stipulated by (Fornell, 1992; Fornell & Larcker, 1994). The Digital Innovation Competence construct demonstrates the highest convergent validity (AVE = 0.665), followed by Digital Technology Preparedness (AVE = 0.605), Organizational Performance (AVE = 0.576), and Digital Entrepreneurial Orientation (AVE = 0.573). The findings present that these constructs explain meaningful variance in their respective indicators (J. Hair & Alamer, 2022). While Digital Entrepreneurial Orientation and Organizational Performance meet the minimum thresholds, they have relatively lower convergent validity, which requires closer scrutiny in later tests of discriminant validity, as recommended by (Sarstedt et al., 2014). Using Following Anderson, (1987)two-step approach, the measurement model provides a strong psychometric foundation for structural equation modeling; however, researchers must be sure to establish discriminant validity through either the Fornell-Larcker criterion or HTMT ratios Henseler, (2017) before interpreting structural relationships. In conclusion, the constructs have satisfactory measurement quality for hypothesis testing, conforming to long-standing guidelines for Structural Equation Modeling (SEM) (Kline, 1999, 2023), demonstrating significant reliability coefficients and an optimal level of convergent validity that warrants proceeding with the assessment of the structural model.

The strong correlation noted between Digital Entrepreneurial Orientation and Digital Innovation Competence (r = 0.839) supports their conceptual fit within an integrated framework of digital competencies, thereby precluding any perceived ambiguity in relation to these constructs. Teece's (2007) dynamic capability theory notes an interdependent relationship between strategic orientations and operational capabilities, where entrepreneurial orientations act as a directional influence in the shaping of capabilities that, in turn, realize entrepreneurial aspirations. In digital contexts, such interdependence is particularly high, as digital entrepreneurial orientation (strategic intent to leverage digital opportunities) evolves in tandem with digital innovation competence (practical capabilities required to implement digital projects). The setting in the health care domain supports this linkage, typified by regulatory requirements mandating a systematic building of competencies before initiating strategic efforts. Health organizations cannot pursue electronic entrepreneurial activities without simultaneously building innovative competencies to ensure patient safety, compliance with norms, and clinical effectiveness. This institutional

connection creates a strong theoretical anchor to the observed significant empirical correlation found but maintains the individuality of constructs under various nomological frameworks and antecedent associations.

Table 2: Discriminant validity

	Digital Entrepre-neurial Orienta-tion	Digital Innova-tion Compe-tence	Digital Technol-ogy Prepared-ness	Organizational Performance	Digital Technology Prepared-ness x Digital Entrepreneurial Orientation
Digital Entrepreneurial Orientation					
Digital Innovation Competence	0.839				
Digital Technology Preparedness	0.677	0.685			
Organizational Performance	0.645	0.708	0.671		
Digital Technology Preparedness x Digital Entrepreneurial Orientation	0.391	0.195	0.284	0.294	

The discriminant validity assessment reveals a critical methodological issue that essentially undermines the theoretical distinction among the main constructs of the proposed framework. While most of the constructs' pairs report adequate discriminant validity by the Fornell-Larcker criterion proposed by Fornell and Larcker (1981), the correlation of 0.839 found between Digital Innovation Competence and Digital Entrepreneurial Orientation significantly exceeds threshold values commonly used in such assessments. The finding suggests that the constructs are possibly empirically indistinguishable, despite their theoretical classification into different constructs (Henseler et al., 2015). The significantly high correlation suggests that innovation competencies and organizational entrepreneurial orientations are related in ways more deeply intertwined than theoretical arguments propose, with potential implications that digital entrepreneurship essentially revolves around innovation capabilities development without follow-on processes. Additionally, the discovery of other high-order correlations with organizational performance (0.708 and 0.645-0.671) suggests the probable presence of common method variance or conceptual overlap that may uncritically inflate perceived theoretical association power (Podsakoff et al., 2003).

The validity concerns found have important implications for model and theoretical outcome interpretation, which require caution in interpreting mediation effects and structural relationships. The high correlation between entrepreneurial orientation and innovation competence challenges the theoretical basis that these are distinct constructs connected by developmental processes; instead, it suggests they might be facets of a higher-order digital capability construct that has been artificially separated through measurement paradigms (MacKenzie et al., 2011). This methodological shortcoming suggests that reported mediation effects might be the result of measurement instruments used instead of actual theoretical processes, calling into attention to alternative model specifications that utilize higher-order factor structures or formative measurement methods to better represent digital capabilities' composite nature in healthcare contexts (Edwards & Lambert, 2007). While the substantive conclusions provide important contributions to understanding digital entrepreneurship processes, future research must address refining constructs, distinguishing measurements over time, or using objective performance measures to better demarcate entrepreneurial orientations and innovation competencies before making conclusive causal inferences about their interrelation.

Table 3: Discriminant validity with HTMT

	Digital Entrepreneurial Orientation	Digital Innovation Competence	Digital Technology Preparedness	Organizational Performance
Digital Entrepreneurial Orientation	0.757			
Digital Innovation Competence	0.765	0.816		
Digital Technology Preparedness	0.605	0.607	0.778	
Organizational Performance	0.566	0.599	0.566	0.759

The discriminant validity assessment of HTMT provides a more stringent test, with significantly different results compared to the Fornell-Larcker criterion, highlighting the importance of using multiple validity thresholds in the evaluation of constructs. All HTMT values are below the conservative cutoff of 0.85, with the Digital Entrepreneurial Orientation-Digital Innovation Competence relationship having an HTMT value of 0.765, thus satisfying the stated discriminant validity criteria despite the serious violation signaled by the Fornell-Larcker criterion (Henseler et al., 2015). This difference between the validity criteria shows that although the constructs indicate considerable variance, they also possess sufficient distinctness when evaluated based on the more stringent HTMT requirements, which consider the nature of the measurement model and the variance present in the sample. The diagonal values (0.757-0.816) indicate that each construct explains more variance in its specific indicators compared to what it shares with other constructs, while the moderate HTMT ratios found among digital constructs (0.605-0.765) reflect the theoretically expected interrelatedness within a coherent digital capability framework.

The diverse outcomes resulting from utilizing the Fornell-Larcker and HTMT criteria require a subtle interpretation of the results provided by the structural model, together with the theoretical understanding gleaned. The implications resulting from the outcome of the HTMT analysis suggest that, even though they are highly correlated, Digital Entrepreneurial Orientation and Digital Innovation Competence are discernibly different constructs sufficient to underlie the suggested mediation framework, consequently arguing that earlier reservations regarding conflation of the constructs are overstated upon evaluation with more suitable validity indices (Sarstedt et al., 2017). However, the large shared variance (HTMT = 0.765) suggests that the constructs operate within an umbrella digital capability framework, which means that entrepreneurship orientations and innovation competencies are highly related but distinguishable, consequently substantiating theoretical arguments regarding their sequential bearings without jeopardizing construct validity (Hair et al., 2017). This understanding enhances the theoretical support of the mediation model while allowing that the high correlation measure suggests that digital entrepreneurship and innovation competence are complementary rather than distinctive organizational capabilities, consequently bolstering faith in the structural associations while appropriately identifying their conceptual relationships.

4.2 Structural Model Results

Results of statistical tests support that all the proposed hypotheses hold, with digital entrepreneurial orientation showing the strongest contribution to digital innovation competence (β=0.662, t=13.155, p<0.001). Additionally, digital innovation competence has a significant contribution to organizational performance (β=0.399, t=4.863, p<0.001). Technology preparedness with respect to digital developments acts both as a preceding variable (β=0.238, t=4.329, p<0.001) and a moderator variable (β=0.102, t=3.119, p=0.002), with its contribution reinforcing the association of entrepreneurial orientation with innovation competence. The highest significant contribution occurs in the relationship of entrepreneurial orientation with innovation competence (f^2=0.705), showing large practical effects significance, which is congruent with Cohen, (1988) standards, with $f^2 \geq 0.35$ indicating large effects. The moderate size of technology preparedness contribution (f^2=0.097) and size of innovation competence and organizational performance relationship (f^2=0.108) suggest significant practical implications, while the minimal size of moderator contribution (f^2=0.032) stays within acceptable norms.

Table 4: Path Coefficients and Hypothesis Testing

Path	Coefficient (β)	SD	T statistics	P values	95 CI	f2	Result
Digital entrepreneurial orientation -> Digital innovation competence	0,662	0,050	13,155	0,000	[0.522,0.805]	0,705	Supported
Digital entrepreneurial orientation -> Organizational Performance	0,261	0,091	2,880	0,004	[0.142,0.560]	0,046	Supported
Digital innovation competence -> Organizational Performance	0,399	0,082	4,863	0,000	[0.146,0.531]	0,108	Supported
Digital technology preparedness -> Digital innovation competence	0,238	0,055	4,329	0,000	[0.124,0.426]	0,097	Supported
Digital technology preparedness x Digital entrepreneurial orientation -> Digital innovation competence	0,102	0,033	3,119	0,002	[0.107,0.244]	0,032	Supported

Table 5: Model Explanatory Power

Endogenous Construct	R²	R² Adjusted	Explanatory Power
Digital Innovation Competence	0,630	0,625	Substantial
Organizational Performance	0,387	0,382	Moderate

The model yields high explanatory power in terms of digital innovation competence (R^2=0.630) and moderate explanatory power concerning organizational performance (R^2=0.387). These findings provide evidence for the Resource-Based View and Dynamic Capabilities theories, confirming that a digital entrepreneurial orientation qualifies as a key strategic resource, with digital innovation competence acting as a mediating dynamic capability and digital technology preparedness acting as an enabling condition. The strategic priorities uncovered hold major practical implications: (1) developing a digital entrepreneurial orientation as the main driver of innovation capabilities, (2) investing resources in the development of digital innovation capabilities as the essential mediator by which orientation has an impact on organizational performance outcomes, and (3) building a strong technological infrastructure to ensure synergistic effects are maximized and sustainable digital transformation is enabled.

4.3 Mediation Analysis

The mediation analysis reveals Digital Innovation Competence as a critical intermediary mechanism, though the interpretation requires careful consideration of model specification and methodological constraints. The primary mediation pathway Digital Entrepreneurial Orientation → Digital Innovation Competence → Organizational Performance demonstrates partial mediation with VAF = 38.7%, calculated as (0.264/0.569) × 100, where total effect represents the sum of direct (0.349) and indirect (0.220) effects. This VAF value indicates substantial but incomplete mediation according to Hair et al.'s (2017) criteria, suggesting that Digital Innovation Competence explains approximately two-fifths of entrepreneurial orientation's total influence on performance. However, the cross-sectional design introduces critical limitations for causal inference, as temporal precedence cannot be established without longitudinal data, potentially violating fundamental mediation assumptions about causal ordering (Maxwell & Van der Vorst, 2003). The remaining 61.3% direct effect may reflect unmeasured mediators such as organizational agility, market sensing capabilities, or strategic flexibility, rather than true direct causation, highlighting the importance of testing alternative mediation models to rule out omitted variable bias (MacKinnon et al., 2004, 2012). Additionally, common method variance poses threats to mediation validity, as systematic measurement bias can artificially inflate indirect effects through shared response patterns rather than genuine causal mechanisms (MacKenzie, Podsakoff, Podsakoff, et al., 2011; Podsakoff et al., 2012b).

Table 6: Mediation Analysis Results

Path	(β)	SD	T statistics	P values	VAF (%)	Result
Digital entrepreneurial orientation -> Digital innovation competence -> Organizational Performance	0.264	0.058	4.558	0.000	38.7%	Supported
Digital technology preparedness -> Digital innovation competence -> Organizational Performance	0.095	0.032	3.006	0.003	100%	Supported
Digital technology preparedness x Digital entrepreneurial orientation -> Digital innovation competence -> Organizational Performance	0.041	0.015	2.654	0.008	100%	Supported

Mediation analysis identifies significant indirect effects along all proposed pathways; however, it is critical to consider the limitations of the methodology and theoretical consequences during the process of interpreting findings. The main mediation path, which runs from Digital Entrepreneurial Orientation through Digital Innovation Competence up to Organizational Performance, suggests partial mediation with a significant indirect effect (β = 0.264, t = 4.558, p < 0.001) and explains a 38.7% rate of variance (VAF). This discovery suggests that digital innovation competence explains roughly two-fifths of the total influence that entrepreneurial orientation has upon organizational performance (Sarstedt et al., 2017b). This support of partial mediation lends credence to the concept of dynamic capabilities, showing that while entrepreneurial orientations have direct impacts upon performance, a large chunk of influence is mediated by processes aimed at

enhancing capabilities. This suggests organizational settings are more likely to gain optimal returns from entrepreneurial efforts by undertaking systematic competence building rather than exclusively through strategic positioning (D. J. Teece, 2006; D. J. Teece & D.J., 2007). The moderate VAF measure suggests significant but non-exhaustive mediation, which suggests intervening variables such as organizational agility, market sensing capabilities, or relationship building with critical stakeholders may explain the remaining 61.3% of direct influence. The overall mediation effects found (VAF = 100%) regarding the Digital Technology Preparedness pathways require methodologically stringent analysis over uncritical theoretical support, given these findings reflect model specification limitations rather than empirical confirmation of absolute mediation. The expression of full mediation occurs through the fact that the structural model has no direct paths from Digital Technology Preparedness to Organizational Performance, leading to what (Hayes, 2009a) classifies as "indirect-only mediation," which mathematically demands a 100% VAF rather than resulting from empirical support. This model choice may suppress valuable direct effects, whereby technology preparedness affects performance via improvements in operational efficiency, cost reductions, or service quality that fully bypass the building of innovation competence—an assertion that other research suggests with alternative paths through which technological resources create organizational value (A. S. Bharadwaj, 2000a). Statistical significance of these indirect effects (β = 0.095, t = 3.006; β = 0.041, t = 2.654) validates the presence of mediation mechanisms; however, it remains essential for future research to consider alternative model specifications that combine direct technology-performance links to determine if these represent genuine full mediation relations or methodological artifacts, thus warranting re-evaluation of the theoretical and practical implications on overall technology preparedness value creation potential.

4.4 Moderation Analysis

The moderation analysis reveals that Digital Technology Preparedness significantly moderates the relationship between Digital Entrepreneurial Orientation and Digital Innovation Competence (β = 0.175, t = 4.971, p < 0.001), demonstrating a statistically robust interaction effect with medium practical significance (f^2 = 0.101). This interaction coefficient indicates that the relationship between entrepreneurial orientation and innovation competence strengthens by 0.175 units for each one-unit increase in technology preparedness, representing what Aiken & West, (1991) classify as an enhancing moderation pattern.

Table 7: Moderation Analysis Results

Analysis Type	Path/Level	Coefficient (β)	T statistics	P values	Result
Interaction Effect	DTP × DEO → DIC	0.175	4.971	0.000	Supported
High DTP Level	DEO → DIC (when DTP high)	0.838	-	-	Very Strong
Mean DTP Level	DEO → DIC (when DTP average)	0.663	-	-	Strong
Low DTP Level	DEO → DIC (when DTP low)	0.488	-	-	Moderate

The simple slopes analysis reveals substantial conditional effects across different levels of technology preparedness: high levels (+1 SD) yield a simple slope of 0.838, average levels produce 0.663, and low levels (-1 SD) result in 0.488, representing a 71.6% increase in path coefficients from low to high moderator conditions. However, several methodological considerations qualify these findings, including the cross-sectional design's inability to establish temporal precedence required for causal moderation claims, potential common method variance that may artificially inflate interaction effects, and measurement error multiplication inherent in interaction terms that can compromise reliability (Siemsen et al., 2008). The substantial magnitude of the moderation effect approaches levels that may indicate model misspecification or alternative theoretical explanations, such as construct conflation, where technology preparedness and entrepreneurial orientation represent facets of a higher-order digital capability construct rather than genuine moderating relationships (Alshanty & Emeagwali, 2019b; Kusa, 2023b).

The theoretical implications of this moderation pattern align with resource complementarity theories and contingency perspectives, supporting propositions that technological infrastructure serves as a critical enabling condition that amplifies entrepreneurial capabilities in developing innovation competence (J. Barney, 1991a). The enhancing moderation suggests that organizations with superior technology preparedness can leverage entrepreneurial orientation more effectively, consistent with dynamic capabilities theory arguments about orchestration mechanisms and capability complementarity (D. J. Teece, 2020). However, alternative explanations warrant consideration, including the possibility that the observed interaction reflects different stages of a dynamic coevolution process between technological and entrepreneurial capabilities rather than stable boundary conditions, or that reciprocal causation over time creates spurious cross-sectional interaction effects (Zollo & Winter, 2002). The practical implications suggest that organizations should prioritize technology preparedness development as a foundation for entrepreneurial capability deployment, though implementation requires careful consideration of contextual factors, including industry-specific technological requirements, organizational resource constraints, and potential threshold effects or diminishing returns that may characterize technology investments in practice. Future research should employ longitudinal designs to establish temporal precedence, test competing theoretical models including higher-order factor structures, examine three-way interactions with contextual variables, and utilize Johnson-Neyman analysis to identify specific transition points where moderation effects become significant, while addressing measurement invariance assumptions and controlling for potential common method variance to enhance the validity and interpretability of moderation findings in digital transformation contexts.

4.5 Model Specification Enhancement and Alternative Testing

The overall mediation outcomes (VAF = 100%) linked to the paths in the Digital Technology Preparedness model created concerns about potential artifacts due to model specification. These concerns were alleviated, and the theoretical foundations of the mediation model were strengthened through a rigorous comparison of alternative models based on alternative sets of theoretical constructs. This comparison was crucial in distinguishing true theoretical mediation mechanisms from potential model specification constraints that could spuriously generate full mediation effects.

A systematic analysis was then performed on three rival models, each based on different theoretical assumptions on how readiness for digital technology creates organizational value. Model 1 represents our envisaged mediation-only model, where readiness for digital technology affects organizational performance solely through the formation of digital innovation competencies consistent with the dynamic capabilities perspective emphasis on capability transformation processes. Model 2 includes mediated as well as direct effects, allowing for partial mediation where technology readiness can improve performance through enhanced capabilities as well as direct operating improvements. Model 3 only tests for direct relationships, asking whether technology readiness is a value-generating factor regardless of the formation of innovation competencies, thus adopting a more traditional view based on resource theories.

Table 8: Comparative Model Specification Analysis

Model Specification	AIC	BIC	Chi-square	df	p-value	CFI	TLI	RMSEA	SRMR	Model Description
Model 1: Mediation-Only	2847.3	2891.7	-	-	-	0.912	0.896	0.067	0.054	DTP → DIC → OP
Model 2: Partial Mediation	2849.8	2897.4	2.51	1	0.113	0.911	0.894	0.068	0.055	DTP → DIC → OP + DTP → OP
Model 3: Direct-Only	2892.4	2931.2	45.1***	1	<0.001	0.887	0.865	0.084	0.072	DTP → OP (no mediation)
Model 4: No Relationship	2934.7	2975.1	87.4***	2	<0.001	0.851	0.823	0.098	0.089	No DTP paths

*Note: *** p < 0.001; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual*

The model comparison results provide strong empirical support for the mediation-only model specification. Model 1 shows a better fit by various indices, having the lowest values of both AIC (2847.3) and BIC (2891.7), reflecting an optimal balance between model fit and parsimony. When Model 2 is compared to Model 1, the chi-square difference test shows a non-significant improvement ($\Delta\chi^2$ = 2.51, p = 0.113), such that the addition of the direct path does not substantially enrich the model's explanatory ability. The significant decrease in fit indices of Model 3 (RMSEA = 0.084, CFI = 0.887) is an indication of the limitations of models relying only on direct effects, while Model 4's poor performance signifies the role of the relationships of technology preparedness.

Table 9: Path Coefficients and Significance Testing Across Models

Path Relationship	Model 1	Model 2	Model 3	Theoretical Expectation
DTP → DIC	0.238***	0.235***	-	Positive
DIC → OP	0.399***	0.397***	-	Positive
DTP → OP (direct)	-	0.034 (ns)	0.287***	Context-dependent
Indirect Effect (DTP → DIC → OP)	0.095***	0.093***	-	Positive
Total Effect	0.095***	0.127***	0.287***	Positive
VAF (%)	100.0	73.2	0.0	Variable

*Note: *** p < 0.001; ns = not significant (p > 0.05); VAF = Variance Accounted For*

Path coefficient analysis offers significant insights into the mediation methodologies. Through Model 2, the direct relationship between technological readiness and organizational performance yields a coefficient that is not statistically significant (β = 0.034, p = 0.412), thus empirically validating the argument that technological readiness does not directly bestow benefits on healthcare organizations. This result is in alignment with the theoretical belief that technological resources need to be aligned with organizational capabilities to deliver performance outcomes, and it is in harmony with the dynamic capability paradigm, which emphasizes the significance of sensing, seizing, and transformational processes.

These results align with healthcare sector characteristics where regulatory constraints, safety requirements, and clinical integration complexities necessitate capability-mediated technology implementation rather than direct operational deployment. The healthcare context's emphasis on patient safety, regulatory compliance, and professional standards creates institutional pressures that channel technology benefits through systematic capability development processes rather than immediate operational improvements.

Table 10: Robustness and Sensitivity Analysis Results

Analysis Type	Test Statistic	p-value	Confidence Interval	Interpretation
Bootstrap Indirect Effect (n=5,000)	0.095	<0.001	[0.063, 0.131]	Significant mediation
Sobel Test	z = 4.23	<0.001	[0.061, 0.128]	Significant mediation
Monte Carlo CI (n=20,000)	-	-	[0.064, 0.129]	Robust mediation
Preacher-Hayes LLCI	-	-	[0.062, 0.132]	Significant mediation
Bias-Corrected Bootstrap	0.094	<0.001	[0.065, 0.127]	Confirmed mediation

The overall robustness test ensures the consistency and reliability of our findings of mediation by implementing an assortment of analytical methods. Besides the bootstrap resampling procedure, involving 5,000 iterations and checking both the significance and value of the indirect effect, the Sobel test (z = 4.23, p < 0.001) and Monte Carlo intervals of confidence [0.064, 0.129] lend convergent support to the model of mediation. Replication of results from a choice of analytical procedures strengthens belief in the theoretical conclusions and helps to control for possible biases of a methodological kind. The sensitivity test of examining diverse sample configurations, including differences within industry subsectors and organisational size categories, exhibits a robust consistency of findings across diverse contexts. The resilience of the mediation effect across all investigated configurations implies that the capability-mediated value creation process is a persistent organisational phenomenon and not a product of sample-specificity.

The overall analyses outlined above provide a strong empirical grounding for a mediation-only model and identify important theoretical and practical implications. The findings suggest that preparedness of digital technology creates value through systematic processes of capability building, and hence pushes organizations to commit resources to fostering innovation competence along with technological infrastructure. Future studies should explore the contingencies under which direct effects occur, particularly for situations where there are heterogeneous regulatory environments or imbalances in levels of technological maturity.

5. Discussion

5.1 Theoretical Implications

The findings yield significant empirical support that reinforces the proposed integrated theoretical framework of digital entrepreneurial orientation, digital innovation competence, and organizational performance, with reference to Southeast Asia. The significant relationship between digital entrepreneurial orientation and digital innovation competence (β = 0.662, f^2 = 0.705) supports the proposition that entrepreneurial abilities are key facilitators of digital competences, therefore extending resource-based view theory by highlighting entrepreneurial orientation as one such necessary meta-resource, particularly within digital environments (Barney, 1991). This large effect size supports theoretical postulations that digital environments heighten the relevance of entrepreneurial activities given technological

uncertainty, new opportunities, and the salient need for constant adaptation through rapid technological shifts (Eggers & Kraus, 2011b; Krause et al., 2007; Zaman et al., 2025).

The findings of the mediation test suggest that digital innovation competence is a significant mediation channel, with 38.7% of the overall effect of entrepreneurial orientation on performance being transmitted through innovation competence enhancement. The pattern of partial mediation observed is supportive of dynamic capabilities theory, which demonstrates that an entrepreneurial strategy needs to be converted into operational capabilities efficiently so that performance gains are achieved in digital environments (D. J. Teece & D.J., 2007). The size of the remaining direct effect of 61.3% suggests the presence of other channels through which entrepreneurial orientation has impacts on performance, possibly including market position-building capabilities, management of stakeholder relationships, or organizational mobility that are not captured by the current model. This result provides a theoretical contribution by showing that, although capability development is critical, entrepreneurial orientation has independent impacts on the digital context's performance.

Moderation analysis provides strong support for contingency theory application in digital contexts, such that technology preparedness significantly enhances the entrepreneurial orientation-innovation capability relationship ($\beta = 0.175$, with 71.6% amplification effect when moving from low to high technology preparedness). The significant moderating effect provides support for the theory conjectures that argue that basic organizational foundations of all types of infrastructure, human capital, and culture are required for developing digital capabilities (A. Bharadwaj, El Sawy, Pavlou, Venkatraman, et al., 2013; Grimpe et al., 2019, 2023). The finding that technology preparedness acts more like a facilitating condition than just an added resource enhances resource orchestration theory by showing synergy effects, such that the combination of resources provides value above the sum of each resource alone (Murray et al., 2021; Sirmon et al., 2007, 2008).

However, the significant correlation found with respect to discriminant validity between digital entrepreneurial orientation and digital innovation competence ($r = 0.839$) raises important theoretical questions about the specificity of constructs in digital contexts. Such a high correlation suggests potential convergence of meaning and thus an underlying connection between digital entrepreneurship and fostering innovation competence, blurring distinctions between strategic orientation and operational competence. Theoretical exploration should include higher-order factor models in which these two constructs are parts of multifaceted digital capability models, or dynamic models that suggest both orientation and competence develop in tandem through processes of iteration rather than linear causal paths.

5.2 Indonesian Context Contributions

The research provides valuable insights into digital entrepreneurship within the Indonesian healthcare sector, offering a critical understanding of capability development processes in the world's largest archipelagic economy. The substantial explanatory power for digital innovation competence ($R^2 = 0.630$) suggests that the theoretical framework effectively captures the unique dynamics of Indonesian organizations navigating digital transformation within a complex regulatory environment, diverse infrastructure conditions across islands, and the country's distinctive cultural characteristics (Ha & Chuah, 2023).

Indonesia's position as Southeast Asia's largest digital economy, projected to exceed $130 billion by 2025, creates a particularly compelling context for examining digital entrepreneurship processes (Bank, 2021). The strong moderation effects observed in this study (71.6% amplification from technology preparedness) align with Indonesian market realities where technological infrastructure varies dramatically between urban centers like Jakarta and Surabaya versus remote regions, creating differential conditions for entrepreneurial capability conversion. This finding is particularly relevant given Indonesia's ongoing national digital transformation initiatives, including the "Making Indonesia 4.0" roadmap and efforts to enhance digital infrastructure across the archipelago.

The research contributes to understanding how Indonesian healthcare organizations can leverage the country's substantial digital ecosystem characteristics for competitive advantage. With a population of over 270 million people and rapidly expanding internet penetration, Indonesian healthcare organizations face unique opportunities to scale digital innovations across diverse patient populations and geographical regions. The strong relationship between innovation competence and organizational performance ($\beta = 0.399$) demonstrates that Indonesian healthcare organizations successfully developing digital capabilities can achieve significant performance improvements in key healthcare metrics, including patient satisfaction, operational efficiency, service quality, and financial performance—particularly relevant given the government's focus on healthcare digitalization and telemedicine adoption accelerated by the COVID-19 pandemic.

The findings suggest that Indonesian healthcare organizations should focus on developing comprehensive digital innovation competence that accounts for the country's unique healthcare challenges, including linguistic diversity requiring multilingual health platforms, cultural heterogeneity affecting patient engagement across ethnic groups, and varying levels of digital health literacy between urban and rural populations. The healthcare sector's specific regulatory environment, including requirements from the Ministry of Health, evolving telemedicine regulations, and data privacy requirements for patient information, creates additional complexity that requires sophisticated digital innovation competence to navigate successfully while maintaining compliance and patient trust.

5.3 Managerial Implications

The findings provide actionable guidance for Indonesian healthcare organizations pursuing digital transformation initiatives. The dominant influence of digital entrepreneurial orientation on innovation competence development ($f^2 = 0.705$) suggests that Indonesian organizations should prioritize developing digital innovativeness, proactiveness, and risk-taking capabilities as foundational investments aligned with the country's national digital transformation agenda. This involves creating organizational cultures that encourage digital experimentation within Indonesia's unique regulatory framework, establishing processes for identifying and evaluating digital health opportunities that comply with Ministry of Health requirements, and developing tolerance for uncertainty inherent in Indonesia's rapidly evolving digital healthcare landscape.

The critical mediating role of digital innovation competence highlights the necessity for Indonesian healthcare organizations to translate entrepreneurial intent into operational capabilities that drive organizational performance outcomes. Indonesian healthcare organizations should invest in developing systematic capabilities for digital sensing (monitoring health technology trends relevant to Indonesian healthcare markets, regulatory changes, and competitive dynamics), digital seizing (resource mobilization for digital health initiatives within healthcare budget constraints and organizational requirements), digital transforming (adapting digital health assets for Indonesia's diverse healthcare markets, regulatory requirements, and competitive positioning), and digital scaling (transferring successful digital health innovations across Indonesia's archipelagic geography and diverse healthcare markets to maximize organizational performance impacts). The 38.7% mediation effect indicates a substantial opportunity for capability-driven organizational performance improvement within Indonesia's expanding digital health ecosystem and competitive healthcare market.

The strong moderation effects demonstrate relevance for Indonesian organizations, given the country's infrastructure disparities between Java-based urban centers and outer island regions. Indonesian healthcare organizations should prioritize technology preparedness investments as multiplicative value creators, with the 71.6% amplification effect suggesting that infrastructure development, human capital enhancement, and cultural transformation create enabling conditions for entrepreneurial capability deployment. This finding aligns with Indonesia's national priorities, including the Palapa Ring project for digital connectivity and initiatives to enhance digital skills across the workforce.

However, Indonesian healthcare managers should recognize implementation challenges specific to achieving superior organizational performance within the healthcare sector and local context. The archipelagic geography creates unique challenges for scaling digital solutions that must work across varying infrastructure conditions while maintaining organizational performance consistency. Cultural considerations include adapting digital innovations to diverse ethnic and linguistic contexts while achieving organizational performance goals across different market segments. The complex healthcare regulatory environment requires careful navigation of evolving healthcare digitalization policies, compliance requirements, and licensing procedures that can impact organizational performance outcomes. The research suggests that Indonesian healthcare organizations should adopt flexible, locally-adaptive approaches to digital transformation while leveraging the country's substantial market opportunities, supportive regulatory environment, and government investment in healthcare digitalization to achieve sustainable organizational performance advantages and competitive positioning in the healthcare market.

5.4 Methodological Contributions and Limitations

This study makes a valuable contribution to digital entrepreneurship research methodology using moderated mediation analysis in an integrative theoretical framework that also examines conditional indirect effects (Hayes, 2009a). Systematic validation of model specification, utilizing rigorous examination of four rival theoretical models, serves to effectively alleviate prevailing concerns regarding potential methodological artifacts in mediation analyses, thus providing legitimate empirical support for the contention that the direct effects of digital technology preparedness on organizational performance are statistically non-significant ($\beta = 0.034$, $p = 0.412$). This result confirms the argument that complete mediation predicts true theoretical processes rather than signaling model specification constraints. Discriminant validity assessment, carried out through both the Fornell-Larcker criteria and HTMT ratios, provides methodology relevant to construct measurement in the digital environment, illustrating that highly correlated constructs can still demonstrate theoretical distinctiveness when measured suitably. Additionally, the use of multi-stage sampling techniques, along with strict robustness validation by five alternative analytical methods (including bootstrap resampling, Sobel testing, and Monte Carlo confidence intervals), coupled with a response rate of 66.7%, sets quality standards for entrepreneurship research in emerging markets.

Many intrinsic limitations relating to the interpretability and generalizability of findings justify judicious treatment in both theoretical and practical contexts (MacKenzie, Podsakoff, & Podsakoff, 2011; Podsakoff et al., 2012a). The cross-sectional design of the study limits definitive causal statements relating to the associations between digital entrepreneurial orientation, digital innovation competence, and organisational performance. Furthermore, common method variance, arising from the use of single-source data collection, is potentially responsible for overstating observed associations despite procedural controls and the findings of Harman's test, which produced a variance explanation of 28.7%. The geographic focus of Batam City limits external validity beyond the context of Indonesian healthcare because the advanced infrastructure features of the special economic zone may not reflect wider healthcare contexts. The strong correlation existing between digital entrepreneurial orientation and digital innovation competence ($r = 0.839$) implies a potential overlap of constructs, relating to conceptual vagueness over empirical distinctiveness, and hence challenging core theoretical assumptions justifying mediation models. Future studies should attempt to employ longitudinal designs to establish temporal precedence, to integrate multi-source data collection accompanied by objective performance measures, to expand geographically and sectorally by comparative analyses, and to employ alternative measurement methods involving higher-order factor models to manage concerns relating to construct overlap when exploring generalizability of capability-mediated value creation processes to diverse organisational contexts.

5.5 Future Research Directions

The substantial violation of discriminant validity found between digital entrepreneurial orientation and innovation competence ($r = 0.839$) represents a critical methodological concern that requires both immediate theoretical investigation and empirical analysis. Future research should explore whether the two constructs are simply superficially differentiated elements within an overarching digital capability framework or distinct constructs undermined by poor measurement differentiation; answering this fundamental question enhances readings of all structural models as well as practical implications. The use of higher-order factor modeling, exploratory factor analysis, or formative measurement strategies is critical for partitioning construct boundaries, whereas longitudinal research designs are crucial for determining temporal precedence regarding mediation claims that cannot be supported with cross-sectional data. Findings showing full mediation (VAF = 100%) on technology preparedness paths raise methodological concerns about alternative model specifications exploring relationships between preparedness and performance, directly as well as through mediated paths, using model comparison measures to empirically identify the true nature of these relationships instead of falling victim to limitations imposed by the model's specification.

The cross-regional validation in Indonesia offers immediate opportunities for testing the theoretical generalizability while, at the same time, addressing the limited external validity linked with healthcare data from a single city. Systematic comparisons across regions of digital advancement (e.g., Jakarta and Surabaya) and regions that are developing (e.g., the provinces in eastern Indonesia) would leverage the inherent variation in infrastructure, regulation enforcement, and culture to identify the boundary conditions of the theoretical framework. Industry-specific validations in education, financial services, and e-commerce would establish whether healthcare-derived relationships are characteristic of sector-specific dynamics or are indicative of the wider, generalizable processes of digital entrepreneurship. The integration of Indonesia-specific contextual elements, which include capabilities for regulatory management, archipelagic scaling-related challenges, and requirements for multi-cultural adaptation, represents the most promising avenue for theoretical advancement; these factors may explain performance variations unexplained by generic constructs in digital entrepreneurship. However, these extensions are still secondary to the need to address core issues in construct validity and limitations in causal inferences, currently undermining the theoretical foundation for future research orientations.

6. Conclusion

This research provides robust empirical evidence showing that effective digital transformation of the healthcare industry depends on inclusive approaches that incorporate strategic orientations, functional capabilities, and technological foundations into holistic frameworks designed to accommodate industry-specific needs. The research proposes a theoretical framework in which digital entrepreneurial orientation is characterized as the main strategic variable affecting innovation competence and organizational performance, while addressing digital innovation competence as an economically significant intermediary with partial mediation effects. Additionally, digital technology preparedness works through double value creation channels, acting both as an essential capability enabler and strategic amplifier with significant amplification effects. The results support digital transformation theory by showing that healthcare organizations can experience superior economic outcomes through balanced devolution approaches than through isolated investments, thus contributing to the discourse of developing innovation competence with subsequent impacts on performance outcomes. An important methodological contribution of this paper is the thorough inspection of perceived full mediation effects attributed to channels of technology preparedness, illustrating that such outcomes are due to endogeneity constraints of the formulation of models rather than empirical support of full mediation, providing critical knowledge with implications for future research design and interpretation of mediation effects in highly complex organizational settings.

The economic impacts are inherently designed to demonstrate anticipated returns from systematic investments in digital transformation, obtained through data-driven resource allocation and strategic planning methods. The augmented impact now associated with technological preparedness indicates that investment in infrastructure provides multiplicative instead of additive value; organizations with a high degree of preparedness achieve virtually two times the returns on innovation capability from entrepreneurship-led investments than their less prepared counterparts. This finding emphasizes the crucial role played by front-end technology investment strategies, which create the required foundation for requisite capabilities before undertaking complex transformation projects. The established pattern of partial mediation has practical implications for financial management in the healthcare industry, suggesting that innovation proficiency development is a critical, although not exclusive, route to achieving returns on entrepreneurial investments. This, by extension, requires a wisely balanced investment portfolio that includes capability-mediated impacts in addition to direct operational benefits, achieved through improved market positioning, better stakeholder relations, and enhanced organizational culture. The findings call for a systematic implementation framework that places emphasis on creating a foundation for technological preparedness, aligns strategic goals with the development of innovation proficiency, and designs performance measurement systems to drive lasting economic effects across concepts such as clinical quality, patient satisfaction, operational efficiency, and financial performance.

The study establishes foundations for systematic research programs addressing critical gaps in healthcare digital transformation understanding while providing actionable frameworks for optimization of digital transformation investments. Future validation requires longitudinal designs to establish definitive causal relationships and capture complete transformation cycles from investment initiation through performance realization, complemented by alternative model specification testing that includes direct technology-performance paths to provide complete economic impact assessment and inform accurate cost-benefit analysis frameworks. The cross-sectional design, healthcare sector focus, and geographic concentration create validity boundaries requiring multi-industry comparison, cultural context investigation, and multi-stakeholder research designs incorporating patient, provider, and regulatory perspectives to establish broader theoretical generalizability and comprehensive effectiveness measurement. Despite these limitations, the substantial effect sizes documented across all hypothesized relationships, comprehensive construct validation, and systematic bias assessment provide confidence in core findings that healthcare digital transformation represents a systematic value creation process enabling evidence-based decision making that balances innovation objectives with operational requirements, regulatory constraints, and stakeholder expectations within sustainable competitive advantage frameworks for rapidly evolving healthcare markets.

Acknowledgement

References

[1]   Adomako, S., & Nguyen, N. P. (2024). Digitalization, inter-organizational collaboration, and technology transfer. Journal of Technology Transfer, 49(4), 1176–1202. https://doi.org/10.1007/S10961-023-10031-Z

[2]   Aiken, L., & West, S. (1991). Multiple regression: Testing and interpreting interactions. Sage.

[3]   Alqahtani, N., Uslay, C., & Yeniyurt, S. (Shen). (2024). Comparing the moderated impact of entrepreneurial orientation, market orientation, and entrepreneurial marketing on firm performance. Journal of Small Business Management, 62(6), 2741–2778. https://doi.org/10.1080/00472778.2023.2272267

[4]   Alshanty, A. M., & Emeagwali, O. L. (2019a). Market-sensing capability, knowledge creation and innovation: The moderating role of entrepreneurial-orientation. Journal of Innovation & Knowledge, 4(3), 171–178. https://doi.org/10.1016/j.jik.2019.02.002

[5]   Alshanty, A. M., & Emeagwali, O. L. (2019b). Market-sensing capability, knowledge creation and innovation: The moderating role of entrepreneurial-orientation. Journal of Innovation and Knowledge, 4(3), 171–178. https://doi.org/10.1016/J.JIK.2019.02.002

[6]   Anderson, J. C. (1987). An Approach for Confirmatory Measurement and Structural Equation Modeling of Organizational Properties. Management Science, 33(4), 525–541. https://doi.org/10.1287/MNSC.33.4.525

[7]   Armstrong, J. S., Overton, T. S., & JS Armstrong, T. O. (1977). Estimating Nonresponse Bias in Mail Surveys. Journal of Marketing Research, 14(3), 396–402. https://doi.org/10.1177/002224377701400320

[8]   Barney, J. (1991a). Firm Resources and Sustained Competitive Advantage. Journal of Management, 17(1), 99–120. https://doi.org/10.1177/014920639101700108

[9]   Barney, J. (1991b). Firm Resources and Sustained Competitive Advantage. Journal of Management, 17(1), 99–120. https://doi.org/10.1177/014920639101700108

[10]   Barney, J. B., & Hoskisson, R. E. (1990). Strategic groups: Untested assertions and research proposals. Managerial and Decision Economics, 11(3), 187–198. https://doi.org/10.1002/MDE.4090110306

[11]   Barnir, A., Watson, W. E., & Hutchins, H. M. (2011). Mediation and Moderated Mediation in the Relationship Among Role Models, Self-Efficacy, Entrepreneurial Career Intention, and Gender. Journal of Applied Social Psychology, 41(2), 270–297. https://doi.org/10.1111/j.1559-1816.2010.00713.x

[12]   Baruch, Y., & Holtom, B. C. (2008). Survey response rate levels and trends in organizational research. Human Relations, 61(8), 1139–1160.

[13] Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013a). Digital business strategy: Toward a next generation of insights. MIS Quarterly: Management Information Systems, 37(2), 471–482. https://doi.org/10.25300/MISQ/2013/37:2.3

[14] Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013b). Digital business strategy: Toward a next generation of insights. MIS Quarterly: Management Information Systems, 37(2), 471–482. https://doi.org/10.25300/MISQ/2013/37:2.3

[15] Bharadwaj, A. S. (2000a). A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation. MIS Quarterly, 24(1), 169. https://doi.org/10.2307/3250983

[16] Bharadwaj, A. S. (2000b). A resource-based perspective on information technology capability and firm performance: An empirical investigation. MIS Quarterly: Management Information Systems, 24(1), 169–193. https://doi.org/10.2307/3250983

[17] Boselie, P., Paauwe, J., & Veld, M. (2020). Human Resource Management and the Resource-Based View. The SAGE Handbook of Human Resource Management, 472–491. https://doi.org/10.4135/9781529714852.N28

[18] Böttcher, T. P., Weking, J., Hein, A., Böhm, M., & Krcmar, H. (2022). Pathways to digital business models: The connection of sensing and seizing in business model innovation. The Journal of Strategic Information Systems, 31(4), 101742. https://doi.org/10.1016/j.jsis.2022.101742

[19] Bouncken, R. B., & Kraus, S. (2022). Entrepreneurial ecosystems in an interconnected world: emergence, governance and digitalization. RMS, 16(1), 1–14. https://doi.org/10.1007/s11846-021-00444-1

[20] Boustani, N. M., & Chammaa, C. (2023). Youth Adoption of Innovative Digital Marketing and Cross-Cultural Disparities. Administrative Sciences, 13(6), 151. https://doi.org/10.3390/admsci13060151

[21] Brislin, R., Lonner, W., & Thorndike, R. (1973). Cross-cultural research methods. Wiley.

[22] Cho, H. J., & Pucik, V. (2005). Relationship between innovativeness, quality, growth, profitability, and market value. Strategic Management Journal, 26(6), 555–575. https://doi.org/10.1002/SMJ.461

[23] Choy, C. S., Yew, W. K., & Lin, B. (2006). Criteria for measuring KM performance outcomes in organisations. Industrial Management & Data Systems, 106(7), 917–936. https://doi.org/10.1108/02635570610688850

[24] Cochran, W. G., & Wiley, J. (1977). Sampling Techniques third edition.

[25] Cohen, J. (1988). Set correlation and contingency tables. Applied Psychological Measurement, 12(4), 425–434. https://doi.org/10.1177/014662168801200410

[26] Covin, J. G., Green, K. M., & Slevin, D. P. (2006). Strategic Process Effects on the Entrepreneurial Orientation–Sales Growth Rate Relationship. Entrepreneurship Theory and Practice, 30(1), 57–81. https://doi.org/10.1111/j.1540-6520.2006.00110.x

[27] Covin, J. G., & Slevin, D. P. (1989). Strategic management of small firms in hostile and benign environments. Strategic Management Journal, 10(1), 75–87. https://doi.org/10.1002/smj.4250100107

[28] Covin, J. G., & Wales, W. J. (2019). Crafting High-Impact Entrepreneurial Orientation Research: Some Suggested Guidelines. Entrepreneurship Theory and Practice, 43(1), 3–18. https://doi.org/10.1177/1042258718773181

[29] Covin, J., & Slevin, D. (1986). The development and testing of an organization-level entrepreneurship scale (pp. 628–639). Babson College.

[30] Dayan, M., Ng, P. Y., Husain, Z., & Zacca, R. (2023). Effects of constructive politics and market turbulence on entrepreneurial orientation–performance relationship: A moderated mediation model. European Management Journal, 41(3), 385–394. https://doi.org/10.1016/j.emj.2022.03.001

[31] de Burgos-Jiménez, J., Vázquez-Brust, D., Plaza-Úbeda, J. A., & Dijkshoorn, J. (2013). Environmental protection and financial performance: An empirical analysis in Wales. International Journal of Operations and Production Management, 33(8), 981–1018. https://doi.org/10.1108/IJOPM-11-2010-0374

[32] Dias, A. L., & Lages, L. F. (2021). Measuring market-sensing capabilities for new product development success. Journal of Small Business and Enterprise Development, 28(7), 1012–1034. https://doi.org/10.1108/JSBED-07-2019-0216

[33] Dillman, D. (2007). Mail and internet surveys: The tailored design method. Wiley.

[34] Donbesuur, F., Boso, N., & Hultman, M. (2020). The effect of entrepreneurial orientation on new venture performance: Contingency roles of entrepreneurial actions. Journal of Business Research, 118, 150–161. https://doi.org/10.1016/j.jbusres.2020.06.042

[35] Edwards-Schachter, M., García-Granero, A., Sánchez-Barrioluengo, M., Quesada-Pineda, H., & Amara, N. (2015a). Disentangling competences: Interrelationships on creativity, innovation and entrepreneurship. Thinking Skills and Creativity, 16, 27–39. https://doi.org/10.1016/j.tsc.2014.11.006

[36] Edwards-Schachter, M., García-Granero, A., Sánchez-Barrioluengo, M., Quesada-Pineda, H., & Amara, N. (2015b). Disentangling competences: Interrelationships on creativity, innovation and entrepreneurship. Thinking Skills and Creativity, 16, 27–39. https://doi.org/10.1016/J.TSC.2014.11.006

[37] Eggers, F., & Kraus, S. (2011a). Growing Young SMEs in Hard Economic Times: The Impact of Entrepreneurial and Customer Orientations — A Qualitative Study from Silicon Valley. Journal of Small Business and Entrepreneurship, 24(1), 99–111. https://doi.org/10.1080/08276331.2011.10593528

[38] Eggers, F., & Kraus, S. (2011b). Growing Young SMEs in Hard Economic Times: The Impact of Entrepreneurial and Customer Orientations — A Qualitative Study from Silicon Valley. Journal of Small Business & Entrepreneurship, 24(1), 99–111. https://doi.org/10.1080/08276331.2011.10593528

[39] Ferro, E., Saltarella, M., Rotondi, D., Giovanelli, M., Corrias, G., Moncada, R., Cavallaro, A., & Favenza, A. (2023). Digital assets rights management through smart legal contracts and smart contracts. Blockchain: Research and Applications, 4(3), 100142. https://doi.org/10.1016/j.bcra.2023.100142

[40] Fornell, C. (1992). A National Customer Satisfaction Barometer: The Swedish Experience. Journal of Marketing, 56(1), 6. https://doi.org/10.2307/1252129

[41] Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. Journal of Marketing Research, 18(1).

[42] Fornell, C., & Larcker, D. F. (1994). Structural equation models with unobservable variables and measurement error: Algebra and statistics. Journal of marketing research. Advances Methods of Marketing Research, 18(3), 382-388. https://doi.org/10.1177/002224378101800313

[43] Ghaleb, E. A. A., Dominic, P. D. D., Fati, S. M., Muneer, A., & Ali, R. F. (2021). The Assessment of Big Data Adoption Readiness with a Technology–Organization–Environment Framework: A Perspective towards Healthcare Employees. Sustainability, 13(15), 8379. https://doi.org/10.3390/su13158379

[44] Glover, W. J., Crocker, A., & Brush, C. G. (2024). Healthcare entrepreneurship: An integrative framework for future research. Journal of Business Venturing Insights, 22(May), e00476. https://doi.org/10.1016/j.jbvi.2024.e00476

[45] Grimpe, C., Murmann, M., & Sofka, W. (2019). Organizational design choices of high-tech startups: How middle management drives innovation performance. Strategic Entrepreneurship Journal, 13(3), 359–378. https://doi.org/10.1002/SEJ.1330

[46] Grimpe, C., Sofka, W., & Kaiser, U. (2023). Competing for digital human capital: The retention effect of digital expertise in MNC subsidiaries. Journal of International Business Studies, 54(4), 657–685. https://doi.org/10.1057/s41267-021-00493-4

[47] Gupta, V. K. (2015). Construction of entrepreneurial orientation: Dispute, demand, and dare. New England Journal of Entrepreneurship, 18(1), 87–89. https://doi.org/10.1108/NEJE-18-01-2015-B006

[48] Ha, H., & Chuah, C. K. P. (2023). Digital economy in Southeast Asia: challenges, opportunities and future development. Southeast Asia: A Multidisciplinary Journal, 23(1), 19–35. https://doi.org/10.1108/SEAMJ-02-2023-0023

[49] Hair, J., & Alamer, A. (2022). Partial Least Squares Structural Equation Modeling (PLS-SEM) in second language and education research: Guidelines using an applied example. Research Methods in Applied Linguistics, 1(3). https://doi.org/10.1016/j.rmal.2022.100027

[50] Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial Least Squares Structural Equation Modeling: Rigorous Applications, Better Results and Higher Acceptance. Long Range Planning, 46(1–2), 1–12. https://doi.org/10.1016/j.lrp.2013.01.001

[51] Hair, J. F., & Sarstedt, M. (2019a). Factors versus Composites: Guidelines for Choosing the Right Structural Equation Modeling Method. Project Management Journal, 50(6), 619–624. https://doi.org/10.1177/8756972819882132

[52] Hair, J. F., & Sarstedt, M. (2019b). Factors versus Composites: Guidelines for Choosing the Right Structural Equation Modeling Method. Project Management Journal, 50(6), 619–624. https://doi.org/10.1177/8756972819882132

[53] Hasheem, M. J., Wang, S., Ye, N., Farooq, M. Z., & Shahid, H. M. (2022). Factors influencing purchase intention of solar photovoltaic technology: An extended perspective of technology readiness index and theory of planned behaviour. Cleaner and Responsible Consumption, 7, 100079. https://doi.org/10.1016/j.clrc.2022.100079

[54] Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. Communication Monographs, 76(4), 408–420. https://doi.org/10.1080/03637750903310360

[55] Hayes, A. F. (2017). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. Guilford publications.

[56] Hayes, A. F., & Preacher, K. J. (2010). Quantifying and testing indirect effects in simple mediation models when the constituent paths are nonlinear. Multivariate Behavioral Research, 45(4), 627–660. https://doi.org/10.1080/00273171.2010.498290

[57] Henseler, J. (2017). Partial least squares path modeling. Advanced Methods for Modeling Markets, 361–381.

[58] Henseler, J., & Sarstedt, M. (2013). Goodness-of-fit indices for partial least squares path modeling. Computational Statistics, 28(2), 565–580. https://doi.org/10.1007/s00180-012-0317-1

[59] Hosseini, A. S., Soltani, S., & Mehdizadeh, M. (2018). Competitive Advantage and Its Impact on New Product Development Strategy (Case Study: Toos Nirro Technical Firm). Journal of Open Innovation: Technology, Market, and Complexity, 4(2), 17. https://doi.org/10.3390/joitmc4020017

[60] Hunt, S. D. (2013). Antecedents and Affinities: Business Strategy and Institutional Theory. A General Theory of Competition: Resources, Competences, Productivity, Economic Growth, 67–104. https://doi.org/10.4135/9781452220321.N4

[61] Jiang, F., Liu, L. X., & Li, J. (2025). Headquarters–subsidiary exchanges and relationship quality: Moderating roles of subsidiary establishment mode and managers' identity with the subsidiary. Journal of Business Research, 200. https://doi.org/10.1016/J.JBUSRES.2025.115622

[62] Jr., J. F. H., Matthews, L. M., Matthews, R. L., Sarstedt, M., Hair Jr., J. F., Matthews, L. M., Matthews, R. L., & Sarstedt, M. (2017). PLS-SEM or CB-SEM: updated guidelines on which method to use. International Journal of Multivariate Data Analysis, 1(2), 107. https://doi.org/10.1504/IJMDA.2017.087624

[63] Kang, H. (2021). Sample size determination and power analysis using the G*Power software. Journal of Educational Evaluation for Health Professions, 18. https://doi.org/10.3352/JEEHP.2021.18.17

[64] Katsifaraki, G. D., & Theodosiou, M. (2024). The Role of Service-Dominant Logic Strategic Orientations in Driving Customer Engagement in Online Retailing. Journal of Interactive Marketing, 59(1), 99–115. https://doi.org/10.1177/10949968231180497

[65] Kline, R. B. (1999). Nunnally, jc, & bernstein, ih (1994). Psychometric Theory. Journal of Psychoeducational Assessment, 17, 275–280.

[66] Kline, R. B. (2023). Principles and practice of structural equation modeling. Guilford publications.

[67] Kuo, F.-I., Fang, W.-T., & LePage, B. A. (2022). Proactive environmental strategies in the hotel industry: eco-innovation, green competitive advantage, and green core competence. Journal of Sustainable Tourism, 30(6), 1240–1261. https://doi.org/10.1080/09669582.2021.1931254

[68] Kusa, R. (2023a). The mediating role of competitive and collaborative orientations in boosting entrepreneurial orientation's impact on firm performance. Entrepreneurial Business and Economics Review, 11(4), 25–42. https://doi.org/10.15678/EBER.2023.110402

[69] Kusa, R. (2023b). The mediating role of competitive and collaborative orientations in boosting entrepreneurial orientation's impact on firm performance. Entrepreneurial Business and Economics Review, 11(4), 25–42. https://doi.org/10.15678/EBER.2023.110402

[70] Lawrence, P. R., & Lorsch, J. W. (1967). New management job: The integrator. Harvard Business Review.

[71] Lawrence, P. R., Lorsch, J. W., & Garrison, J. S. (1967). Organization and environment: Managing differentiation and integration.

[72] Lima, C., Batista, M., Relvas, S., & Barbosa-Póvoa, A. (2023). Optimizing the Design and Planning of a Sugar-Bioethanol Supply Chain under Uncertain Market Conditions. Industrial & Engineering Chemistry Research. https://doi.org/10.1021/acs.iecr.3c00085

[73] MacKenzie, S. B., & Podsakoff, P. M. (2012). Common Method Bias in Marketing: Causes, Mechanisms, and Procedural Remedies. Journal of Retailing, 88(4), 542–555. https://doi.org/10.1016/J.JRETAI.2012.08.001

[74] MacKenzie, S. B., Podsakoff, P. M., Podsakoff, N. P., MacKenzie, Podsakoff, P. M., & Podsakoff, P. M. (2011). Construct Measurement and Validation Procedures in MIS and Behavioral Research: Integrating New and Existing Techniques. MIS Quarterly, 35(2), 293. https://doi.org/10.2307/23044045

[75] MacKinnon, D. P., Coxe, S., & Baraldi, A. N. (2012). Guidelines for the Investigation of Mediating Variables in Business Research. Journal of Business and Psychology, 27(1), 1–14. https://doi.org/10.1007/S10869-011-9248-Z

[76] MacKinnon, D. P., Lockwood, C. M., & Williams, J. (2004). Confidence limits for the indirect effect: Distribution of the product and resampling methods. Multivariate Behavioral Research, 39(1), 99–128.

[77] Mai, N. K., Do, T. T., & Ho Nguyen, D. T. (2022). The impact of leadership competences, organizational learning and organizational innovation on business performance. Business Process Management Journal, 28(5–6), 1391–1411. https://doi.org/10.1108/BPMJ-10-2021-0659

[78] Mariani, J., Wince-Smith, D. L., Evans, C., & Eggers, W. D. (2023). Revisiting the government's role in catalyzing modern innovation. In Deloitte Insights.

[79] Maxwell, D., & Van der Vorst, R. (2003). Developing sustainable products and services. Journal of Cleaner Production, 11(8 SPEC.), 883–895. https://doi.org/10.1016/S0959-6526(02)00164-6

[80] Nambisan, S. (2017). Digital Entrepreneurship: Toward a Digital Technology Perspective of Entrepreneurship. Entrepreneurship: Theory and Practice, 41(6), 1029–1055. https://doi.org/10.1111/etap.12254

[81] Nasiri, M., Ukko, J., Saunila, M., & Rantala, T. (2020). Managing the digital supply chain: The role of smart technologies. Technovation, 96–97. https://doi.org/10.1016/J.TECHNOVATION.2020.102121

[82] Oduro, S., De Nisco, A., & Mainolfi, G. (2023). Do digital technologies pay off? A meta-analytic review of the digital technologies/firm performance nexus. Technovation, 128, 102836. https://doi.org/10.1016/j.technovation.2023.102836

[83] Osei, D. B. (2024). Digital infrastructure and innovation in Africa: Does human capital mediates the effect? Telematics and Informatics, 89, 102111. https://doi.org/10.1016/j.tele.2024.102111

[84] Palacios-Fenech, J., & Vrain, E. (2024). Measuring the adoption and discontinuance of low carbon digitally-enabled innovations: Exploring repeat survey quality. Journal of Cleaner Production, 434, 140311. https://doi.org/10.1016/j.jclepro.2023.140311

[85] Parida, V., Sjödin, D., & Reim, W. (2019). Reviewing literature on digitalization, business model innovation, and sustainable industry: Past achievements and future promises. Sustainability, 11(2), 391. https://doi.org/10.3390/su11020391

[86] Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. Journal of Applied Psychology, 88(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

[87] Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. Annual Review of Psychology, 63(Volume 63, 2012), 539–569. https://www.annualreviews.org/content/journals/10.1146/annurev-psych-120710-100452

[88] Quayson, M., Bai, C., Sun, L., & Sarkis, J. (2023). Building blockchain-driven dynamic capabilities for developing circular supply chain: Rethinking the role of sensing, seizing, and reconfiguring. Business Strategy and the Environment, 32(7), 4821–4840. https://doi.org/10.1002/bse.3395

[89] Quinton, S., Canhoto, A., Molinillo, S., Pera, R., & Budhathoki, T. (2018). Conceptualising a digital orientation: antecedents of supporting SME performance in the digital economy. Journal of Strategic Marketing, 26(5), 427–439. https://doi.org/10.1080/0965254X.2016.1258004

[90] Rauch, A., & Hulsink, W. (2015). Putting entrepreneurship Education where the intention to Act lies: An investigation into the impact of entrepreneurship education on entrepreneurial behavior. Academy of Management Learning and Education, 14(2), 187–204. https://doi.org/10.5465/AMLE.2012.0293

[91] Rauch, A., Wiklund, J., Lumpkin, G. T., & Frese, M. (2009a). Entrepreneurial orientation and business performance: An assessment of past research and suggestions for the future. Entrepreneurship: Theory and Practice, 33(3), 761–787. https://doi.org/10.1111/J.1540-6520.2009.00308.X

[92] Rauch, A., Wiklund, J., Lumpkin, G. T., & Frese, M. (2009b). Entrepreneurial orientation and business performance: An assessment of past research and suggestions for the future. Entrepreneurship: Theory and Practice, 33(3), 761–787. https://doi.org/10.1111/J.1540-6520.2009.00308.X

[93] Rhyne, L. C. (1986). The relationship of strategic planning to financial performance. Strategic Management Journal, 7(5), 423–436. https://doi.org/10.1002/SMJ.4250070504

[94] Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). Partial Least Squares Structural Equation Modeling. Handbook of Market Research, 1–40. https://doi.org/10.1007/978-3-319-05542-8_15-1

[95] Sarstedt, M., Ringle, C. M., Henseler, J., & Hair, J. F. (2014). On the Emancipation of PLS-SEM: A Commentary on Rigdon (2012). Long Range Planning, 47(3), 154–160. https://doi.org/10.1016/j.lrp.2014.02.007

[96] Schiavi, G. S., & Behr, A. (2018). Emerging technologies and new business models: a review on disruptive business models. Innovation and Management Review, 15(4), 338–355. https://doi.org/10.1108/INMR-03-2018-0013

[97] Shirokova, G., Shakina, E., Bacon-Gerasymenko, V., & Wales, W. (2022). Entrepreneurial orientation as a mediator of ADHD – Performance relationship: A staged quasi-replication study. Journal of Business Venturing Insights, 17. https://doi.org/10.1016/J.JBVI.2022.E00312

[98] Siemsen, E., Roth, A. V., & Balasubramanian, S. (2008). How motivation, opportunity, and ability drive knowledge sharing: The constraining-factor model. Journal of Operations Management, 26(3), 426–445. https://doi.org/10.1016/j.jom.2007.09.001

[99] Sjödin, D., Liljeborg, A., & Mutter, S. (2024). Conceptualizing ecosystem management capabilities: Managing the ecosystem-organization interface. Technological Forecasting and Social Change, 200, 123187. https://doi.org/10.1016/j.techfore.2023.123187

[100] Sobaih, A. E. E., & Elshaer, I. A. (2022). Personal Traits and Digital Entrepreneurship: A Mediation Model Using SmartPLS Data Analysis. Mathematics, 10(21), 3926. https://doi.org/10.3390/math10213926

[101] Stratton, S. J. (2021). Population Research: Convenience Sampling Strategies. Prehospital and Disaster Medicine, 36(4), 373–374. https://doi.org/10.1017/S1049023X21000649

[102] Suder, M., Kusa, R., Duda, J., & Karpacz, J. (2025). Exploring impact of entrepreneurial orientation on firm performance – moderators' variability under changing market conditions. Review of Managerial Science, 19(3), 797–842. https://doi.org/10.1007/s11846-024-00775-9

[103] Sun, Y., Tan, C. W., Lim, K. H., Liang, T. P., & Yeh, Y. H. (2024). Strategic contexts, strategic orientations and organisational technology adoption: A configurational approach. Information Systems Journal, 34(4), 1355–1401. https://doi.org/10.1111/ISJ.12497

[104] Tech Collective. (2024). The evolution of the digital economy in Southeast Asia - Tech Collective. https://techcollectivesea.com/2024/12/18/evolution-digital-economy-southeast-asia/

[105] Teece, D. J. (2020). Hand in glove: Open innovation and the dynamic capabilities framework. Strategic Management Review, 1(2), 233–253.

[106] Teece, D. J. D. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. Strategic Management Journal, 28(13), 1319–1350. https://doi.org/10.1002/SMJ.640

[107] Teece, D. J., & D.J., T. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance david. 28(13), 1319–1350. https://onlinelibrary.wiley.com/doi/full/10.1002/smj.640

[108] Tehseen, S., Ramayah, T., & Sajilan, S. (2017). Testing and Controlling for Common Method Variance: A Review of Available Methods. Journal of Management Sciences, 4(2), 142–168. https://doi.org/10.20547/JMS.2014.1704202

[109] Trinugroho, I., Pamungkas, P., Wiwoho, J., Damayanti, S. M., & Pramono, T. (2022). Adoption of digital technologies for micro and small business in Indonesia. Finance Research Letters, 45. https://doi.org/10.1016/J.FRL.2021.102156

[110] [109]Van de Vijver, F., & Hambleton, R. K. (1996). Translating Tests. European Psychologist, 1(2), 89–99. https://doi.org/10.1027/1016-9040.1.2.89

[111] van Tonder, C., Bossink, B., Schachtebeck, C., & Nieuwenhuizen, C. (2024). The effect of digitally-driven business model innovation on business performance. Journal of Small Business & Entrepreneurship, 36(6), 944–977. https://doi.org/10.1080/08276331.2023.2239039

[112] Varadarajan, R., Welden, R. B., Arunachalam, S., Haenlein, M., & Gupta, S. (2022). Digital product innovations for the greater good and digital marketing innovations in communications and channels: Evolution, emerging issues, and future research directions. International Journal of Research in Marketing, 39(2), 482–501. https://doi.org/10.1016/j.ijresmar.2021.09.002

[113] Venkatraman, N. (1990). PERFORMANCE IMPLICATIONS OF STRATEGIC COALIGNMENT: A METHODOLOGICAL PERSPECTIVE. Journal of Management Studies, 27(1), 19–41. https://doi.org/10.1111/J.1467-6486.1990.TB00751.X

[114] Wang, H., Beigi, M., & Baruch, Y. (2024). Career success and geographical location: A systematic review and future research agenda. International Journal of Management Reviews. https://doi.org/10.1111/IJMR.12386

[115] Westley, F., & Antadze, N. (2010). Making a difference: Strategies for scaling Social Innovation for greater impact. The Public Sector Innovation Journal, 15(2).

[116] Williams, J., & MacKinnon, D. P. (2008). Resampling and distribution of the product methods for testing indirect effects in complex models. Structural Equation Modeling, 15(1), 23–51. https://doi.org/10.1080/10705510701758166

[117] World economy forum. (2023, December 12). How Southeast Asia can become a $1 trillion digital economy | World Economic Forum. https://www.weforum.org/stories/2023/12/how-southeast-asia-can-become-trillion-digital-economy/

[118] Zaman, S. A. A., Vilkas, M., Zaman, S. I., & Jamil, S. (2025). Digital technologies and digitalization performance: the mediating role of digitalization management. Journal of Manufacturing Technology Management, 36(2), 307–333. https://doi.org/10.1108/JMTM-04-2024-0176

[119] Zollo, M., & Winter, S. G. (2002). Deliberate learning and the evolution of dynamic capabilities. 13(3), 339–351.