Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2, 686-712
2026
Publisher: Learning Gate
DOI: 10.55214/2576-8484.v10i2.12200

Digital transformation capabilities moderate the effects of entrepreneurial resources on MSMEs performance: A multigroup analysis in Makassar city, Indonesia

Muh Syulhasbiullah[1,2*], Wirawan Endro Dwi Radianto[3], Damelina Basauli Tambunan[4]
[1]Management and Entrepreneuship, Universitas Ciputra Surabaya, Indonesia; msyulhasbiullah@student.ciputra.ac.id (M.S.).
[2]Department of Management, Sekolah Tinggi Ilmu Ekonomi Ciputra Makassar, Indonesia.
[3]School of Business Management, Universitas Ciputra Surabaya, Indonesia.
[4]Innovation Management and Entrepreneurship, School of Business Management, Universitas Ciputra Surabaya, Indonesia.

Abstract: Digital transformation is reshaping MSMEs' value-creation logics and shifting coordination toward platform ecosystems, yet it remains unclear when Digital Transformation Capabilities (DTC) strengthen entrepreneurial resources into performance. Accordingly, this study tests DTC as a boundary condition moderating the effects of Entrepreneurial Network (EN), Entrepreneurial Orientation (EO), and Entrepreneurial Competence (EC) on MSMEs' performance (SMEP) among MSMEs in Makassar, Indonesia. Survey data from 254 MSME owners and managers were analyzed using PLS-SEM, with MICOM-based measurement invariance assessment and multigroup analysis by business age. The results show that EN, EO, and EC contribute positively to SMEP and remain stable across both age groups. DTC does not moderate the EO–performance or EC–performance relationships. In contrast, the EN×DTC interaction is negative in the overall sample and is significant in enterprises older than 3 years, while it is not detected in enterprises aged 0–3 years. These findings imply that DTC functions as a selective conversion capability that can introduce network-coordination frictions at certain maturity stages; therefore, digital strategy should prioritize relationship orchestration rather than network expansion alone. The study's originality lies in integrating bundled entrepreneurial resources with DTC and conducting invariance-supported cross-group comparisons in the context of MSMEs in Makassar, Indonesia.

Keywords: *Digital transformation capabilities, Entrepreneurial capabilities, Entrepreneurial network, Entrepreneurial orientation, MSMEs performance.*

1. Introduction

Digital transformation is organizational change driven by digital technology diffusion, requiring strategic redesign of value creation, processes, and resources [1, 2]. It is a managerial agenda that reshapes performance metrics and growth as enterprises move into platform ecosystems and interconnected value networks, Verhoef et al. [3] and Plekhanov et al. [4]. Kraus et al. [5] note fast-growing yet fragmented research, so boundary conditions for how and when it improves performance, especially for micro, small, and medium enterprises (MSMEs), remain underspecified. Warner and Wäger [6] likewise show that transformation capabilities rest on dynamic micro-foundations shaped by contingencies. In emerging economies, MSMEs face resource constraints and turbulence and follow heterogeneous paths, including digital acceleration, sales digitalization for survival, or dependence on digitally capable partners when literacy is limited [7, 8]. In Indonesia, relational capital and entrepreneurial capability still matter for performance, yet their effects depend on how MSMEs orchestrate resources and digital channels [9]. In Makassar city of Indonesia, as an emerging market, entrepreneurial networks, entrepreneurial orientation, and entrepreneurial competence are reported to

History: Received: 2 December 2025; Revised: 22 January 2026; Accepted: 27 January 2026; Published: 20 February 2026
* Correspondence: msyulhasbiullah@student.ciputra.ac.id

improve MSMEs' performance, making it a relevant setting to test digital capability-based boundary conditions [10].

Entrepreneurial networking research treats networks as access devices for information, resources, and market interfaces that support opportunity recognition and commercialization, especially when value is co-created with actors in digital ecosystems Verhoef et al. [3] and Plekhanov et al. [4]. Cenamor et al. [11] report that digital platform-related capabilities strengthen network capability and enhance innovation and value capture in interconnected ecosystems, while [12] shows that networking practices in MSMEs build marketing capability and resource acquisition, yet effects may be non-linear because they depend on how ties are configured and mobilized. Thus, entrepreneurial networking is a central antecedent of MSMEs' performance, but the conditions that make it more productive in digitalized markets remain open [2]. For entrepreneurial orientation, the orientation-performance link varies with context and operationalization [13] and may improve performance through relevant capability or competence pathways rather than a uniform direct effect [14]. For entrepreneurial competence, competence is positively associated with MSMEs performance, especially when tied to strategy execution and uncertainty management [15], and particular competence or capability bundles help explain superior resource-to-performance conversion [16].

In much entrepreneurship research, entrepreneurial network (EN), entrepreneurial orientation (EO), and entrepreneurial competence (EC) are treated as strategic assets, relational, behavioral, and managerial capabilities that are assumed to enhance performance by expanding access to information, opportunities, and productive resources; hence, antecedent to performance links are often modeled as relatively direct [11, 13, 15]. Digital transformation scholarship, however, stresses that digitalization reshapes value creation architecture, processes, and ecosystem coordination, so resource ownership or access does not automatically lead to performance without the ability to integrate and reconfigure resources to fit digital channel logics and cross-actor governance [1-3, 6]. From a dynamic capabilities perspective, performance in fast-changing environments depends on sensing, seizing, and transforming or reconfiguring to capture digital opportunities, mobilize commitments, and redesign operational and relational configurations [6, 17]. This sharpens a theoretical tension: if resource-based logic is sufficient, EN, EO, and EC should show relatively stable positive effects. Conversely, dynamic capabilities predict contingency, with stronger effects when MSMEs possess digital transformation capabilities that convert entrepreneurial assets into valuable digital strategy execution [1, 6, 17]. Variation in the EO performance relationship [13] and platform-oriented MSME evidence show that similar networks produce different outcomes depending on digital capabilities [3, 11]. Support positioning digital transformation capability as a moderator to clarify how networking, orientation, and competence translate into performance in digitalized markets [1, 2].

Cross-context empirical evidence increasingly associates digital initiatives and capabilities with MSMEs' performance, yet prevailing designs still privilege direct effects or single mediating mechanisms. Heredia et al. [18] report that digital capability affects business performance, with technological capability mediating the relationship in a data-driven new normal across 27 countries. For innovative MSMEs, Merín-Rodrigáñez et al. [19] find that digital transformation improves performance through business model innovation as a partial mediator and highlight MSME heterogeneity, making boundary conditions salient. Complementarily, Freitas et al. [20] indicate that digital capability affects business performance and suggest ecosystem orchestration capability as an antecedent to other capabilities, helping explain why MSMEs differ in extracting value from digital channels. These studies reinforce a mechanism gap: evidence of digital transformation effects exists, but the process through which entrepreneurial resources, namely networks, orientation, and competence, translate into performance via digital capability orchestration remains insufficiently integrated at the explanatory model level [21].

In entrepreneurship research, strategic antecedent-performance links are widely tested but often evolve in parallel streams without a coherent integrated framework. Basco et al. [22] document cross-country variation in the entrepreneurial orientation-performance relationship, while [23] shows that

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

network capability enables scaling when strategic orientations are translated into actions that expand resource access. Ibidunni et al. [24] link entrepreneurial competence to small-firm performance in developing economies but rarely specify how competence attaches to digital channel architecture and resource recombination, and Kusa et al. [25] highlight equifinality, implying that universal paths can mask heterogeneous mechanisms. This boundary-condition gap is sharper in digitalized markets: studies model conditions that strengthen or weaken digital capability effects, yet seldom connect them to the bundled resources of networks, orientation, and competence in one design. Hassan et al. [26] find that digital diffusion relates to MSME innovation performance, and absorptive capacity strengthens the link, whereas [27] reports that digital dynamic capabilities drive digital transformation and transformation costs weaken its effect on MSME environmental performance. Methodologically, group comparisons in PLS-SEM require measurement invariance [28], yet few studies design capability-based heterogeneity tests via multigroup analysis that satisfy invariance prerequisites [29].

Therefore, several gaps remain. First, evidence on EN, EO, and EC as predictors of MSMEs' performance is substantial, yet the capability architecture explaining how these resources are converted into performance through digital channels is still rarely modeled explicitly and integratively. Second, cross-context variation in entrepreneurial antecedent effects implies contingency, requiring boundary-condition tests consistent with dynamic capabilities arguments about resource reconfiguration rather than universal-effect assumptions. Third, because EN, EO, and EC, and digital transformation capability are often examined partially or in isolation, the literature still lacks a coherent explanation of MSMEs' value creation, and evidence remains limited for Makassar, Indonesia, as an emerging economy [30]. Fourth, testing coefficient heterogeneity across MSME subgroups requires adequate measurement invariance so observed differences reflect structural heterogeneity rather than measurement artifacts. Building on these gaps, this study tests an integrated framework in which EN, EO, and EC affect MSME performance and evaluates when these effects strengthen or weaken via digital transformation capability as a boundary condition. The resulting research questions ask: (RQ1) to what extent do EN, EO, and EC explain performance variation among MSMEs in Makassar; (RQ2) does digital transformation capability strengthen or weaken each effect; and (RQ3) do effects differ across MSME groups by enterprise age using MGA preceded by invariance testing, given that enterprise age proxies life-cycle stage and accumulated experience or capability [31, 32].

This study contributes to the literature in four ways. First, it brings together entrepreneurial networking, entrepreneurial orientation, and entrepreneurial competence as bundled entrepreneurial resources and tests their simultaneous effects in explaining MSMEs' performance in a digitalized market context. Second, it advances a dynamic capabilities account by examining digital transformation capability as a boundary condition that clarifies whether and how entrepreneurial resources translate into MSMEs' performance. Third, it offers a methodological contribution by assessing structural heterogeneity via PLS-SEM multigroup analysis (MGA) with adequate measurement invariance procedures (MICOM), ensuring subgroup inferences are not reduced to average effects. Fourth, it provides contextual evidence from MSMEs in Makassar, Indonesia, enriching the understanding of entrepreneurial resources and digital transformation capability under resource constraints and intensifying digital competition.

2. Literature Review

2.1. Theoretical Framework

Resource-based view (RBV), introduced by Wernerfelt [33] and formalised by Barney [34], explains performance differences through heterogeneity in firm-controlled resources and capabilities because some resources are valuable and difficult to imitate or transfer. Within this logic, EN, EO, and EC constitute bundled entrepreneurial resources, respectively relational, behavioral-strategic, and managerial capabilities, that can enhance MSMEs' performance when effectively bundled and mobilized to broaden access to information and opportunities, coordinate across actors, and strengthen strategic execution [35]. RBV is particularly relevant for MSMEs in emerging economies because regulatory

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

and market uncertainty, combined with limited tangible assets, shifts strategic emphasis toward intangibles such as human capital and social capital [10, 35]. However, synthesis evidence indicates that the EO-performance relationship, although positive, is sensitive to contextual variation and measurement operationalisation, implying that average effects may conceal unstable mechanisms across MSMEs' configurations [13]. Similarly, EC is associated with MSMEs' performance in developing-country settings, yet the effect strength varies across competence dimensions, underscoring the need to specify when competence becomes most productive [15].

Digital transformation research frames digital transformation as organizational change beyond technology adoption, involving shifts in value creation logic, processes, and resource configurations as firms operate through platform architectures and value networks [1, 3, 5]. Because this change is dynamic and often non-linear, an RBV-only account risks a mechanism gap in which entrepreneurial resources do not automatically convert into performance [1, 21]. Therefore, dynamic capabilities, rooted in Teece et al. [36] and articulated as sensing, seizing, and transforming, emphasise sensing opportunities, seizing them through resource commitments, and transforming or reconfiguring the resource base and cross-actor orchestration in turbulent environments [6, 17]. For MSMEs, heterogeneous transformation paths and constraints such as IT security, scarce talent, external specialists, and uneven implementation capability imply that DTC functions as a boundary condition for execution quality and digital value realization [7, 37]. Accordingly, the model treats EN, EO, and EC as RBV-based antecedents and positions DTC as a dynamic-capabilities-based moderator, operating as a conversion mechanism that can strengthen or weaken entrepreneurial resource productivity in digital architectures [6, 11, 17, 34, 38].

2.2. Micro, Small, and Medium Enterprises Performance

Micro, Small, and Medium Enterprises (MSMEs) performance is a multidimensional outcome that captures how effectively micro, small, and medium enterprises convert resources and strategies, including entrepreneurial and digital initiatives, into observable operational, market, innovation, relational, and continuity results [39-41]. Consistent with contemporary MSME research, we do not reduce performance to a single financial metric because strategic and digital effects may emerge unevenly across dimensions [9]. In emerging economies, non-financial outcomes such as innovation contribution, customer satisfaction, and resilience are substantively important under resource constraints, demand volatility, and competitive pressure [42, 43]. Operationally, MSMEs' performance is measured using a perceptual, relative-performance benchmark against main competitors, an approach suitable when objective data are inaccessible, sectorally heterogeneous, or non-standardized [9, 23]. Accordingly, the construct is captured through five indicators: operational efficiency; sales growth; the revenue contribution of product, service, and process innovation; customer satisfaction and repeat purchase propensity; and continuity or resilience reflected in cash flow stability and adaptability to market change [39-42].

2.3. Entrepreneurial Network

Entrepreneurial network (EN) is defined as MSMEs' relational capability to build and activate external ties that provide resources, market information, and commercial opportunities beyond internal reach, as value coordination increasingly occurs across actors in digitalized ecosystems [10, 44]. EN reflects relationship management rather than connection volume and comprises routines to initiate, develop, and orchestrate interactions so networks function as channels for market learning and resource mobilization into business action [45]. For MSMEs in emerging markets shaped by platform logics, EN also entails leveraging ties for strategic collaboration and value co-creation because platform and digital capabilities can interact with network capability in shaping access and commercialization effectiveness [46]. Operationally, EN is captured through partner access, value co-creation collaboration, interaction frequency, customer closeness for feedback and preference sensing, and network diversification across actors and channels [11, 12, 44, 47]. Furthermore, an activatable EN

provides mechanisms to access and orchestrate information, partners, and market interfaces that support MSMEs' multidimensional outcomes, including operational efficiency, sales growth, innovation contribution, customer satisfaction, and continuity [48, 49]. Empirical evidence indicates that network capability improves business outcomes by enhancing information quality and expanding resource access for strategy execution, with stronger potential as ecosystems digitalize, as reported by Syulhasbiullah et al. [10], Zacca [46], and Riaz et al. [50]. Therefore, we propose the following hypothesis:

H_1: Entrepreneurial Network positively affects MSMEs' Performance.

2.4. Entrepreneurial Orientation

Entrepreneurial orientation (EO) is defined as an MSME's strategic posture expressed through innovative, proactive, and risk-taking behaviors when identifying, evaluating, and exploiting business opportunities in increasingly digitalized and turbulent environments [51, 52]. For online trading-oriented MSMEs in Makassar, EO is treated as an action pattern guiding offer renewal and competitive moves rather than a general attitude, so its operationalization should capture behaviors closest to strategy execution [10, 53, 54]. Accordingly, EO is measured with five indicators: introducing valuable new or improved products/services, acting earlier than competitors to seize opportunities, committing resources to high-uncertainty decisions with attractive returns, continuously monitoring market change and adjusting decisions, and responding quickly by adapting products, channels, or promotions before opportunities dissipate [55-57]. Conceptually, EO reflects the extent to which MSMEs initiate renewal, anticipate change, and tolerate risk to create value, and should improve marketable outcomes through faster market timing, more frequent renewal, and timely resource commitments under uncertainty, thereby strengthening the conversion of entrepreneurial strategy into multidimensional performance [56-59]. Prior studies report positive EO-performance associations across innovation and business outcomes, as reported by Ibarra-Cisneros and Hernandez-Perlines [53], Kusa et al. [54], Kohtamäki et al. [55], Ferreras-Méndez et al. [56], and Prasannath et al. [57]. Therefore, we propose the following hypothesis:

H_2: Entrepreneurial Orientation positively affects MSMEs' Performance.

2.5. Entrepreneurial Competencies

Entrepreneurial Competence (EC) is the capability of owners or managers of MSMEs to execute entrepreneurial activities through technical, managerial, innovation, strategic decision-making, and human resource management competencies that orchestrate limited resources into business action [15, 24, 60]. In emerging economies, where tangible assets are constrained and adaptation pressures are high, EC functions as an "ability to execute," linking entrepreneurial intent and strategy to operational and market results [24, 58]. Accordingly, EC is operationalized through five behavioral domains capturing process quality and efficiency, disciplined operations control, renewal creation and commercialization, investment prioritization under uncertainty, and people management for goal attainment [15, 60] consistent with evidence that competence configurations underpin innovation and sustained performance outcomes for MSMEs under environmental change [61]. Empirical work links EC and related entrepreneurial knowledge and skills to MSMEs' performance because competence improves investment decision quality, supports consistent opportunity execution, and strengthens resource management and business resilience, as reported by Ibidunni et al. [24], Tehseen et al. [60], and Soomro et al. [62], with further evidence associating EC with innovation contribution and resilience or continuity in manufacturing-SMEs as reported by Mokbel Al Koliby et al. [61]. Therefore, we propose the following hypothesis:

H_3: Entrepreneurial Competencies positively affect MSMEs' Performance.

2.6. Digital Transformation Capabilities

Digital Transformation Capability (DTC) is defined as an MSME capability that enables digital-based transformation by sensing digital opportunities and threats, organizing resources and implementation governance, and restructuring or reconfiguring processes and value configurations to fit turbulent markets [27, 63-65].

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

Beyond technology use, digitalization success depends on transformation routines and orchestration, because transformation paths are heterogeneous, DTC helps explain why firms with similar entrepreneurial resources achieve different outcomes [66-68]. Operationally, DTC is measured through digital sensing, digital organizing, digital restructuring, data and analytics capability, and digital ecosystem integration [11, 27, 63, 64, 67]. Accordingly, DTC links technological connectivity to valuable organizational change and underpins tests of its moderating role in strengthening the conversion of entrepreneurial resources into MSME performance [27, 64, 65].

Micro, Small, and Medium Enterprises' performance is a multidimensional outcome (operational, market, innovation, relational, and continuity). It should not be reduced to a single financial indicator because strategic and digital effects often emerge unevenly across domains [39]. Entrepreneurial Network expands access to information, resources, and market interfaces, yet in digital ecosystems, its value depends on mobilizing cross-actor interaction into executable coordination and learning [44]. Digital transformation capabilities, captured by digital sensing, digital organizing, digital restructuring/reconfiguring, data analytics capability, and digital ecosystem integration, provide routines that convert relational connectivity into decisions and actions aligned with platform and channel logics [63]. When firms can sense, seize, and transform digitally, networks become value-orchestration mechanisms supporting efficiency, sales growth, monetized innovation, customer satisfaction, and resilience [1, 6, 17, 27]. Empirical evidence is consistent. Platform-oriented digital capabilities enhance performance via stronger network capability, as reported by Warner and Wäger [6]. Platform-based digital connectivity relates positively to performance under environmental turbulence, as reported by Rajala and Hautala-Kankaanpää [69], and platform network ties associate with innovation performance through empowerment and network bricolage as reported by Han and Xie [70]. Complementarily, big data analytics capability strengthens networking capabilities that transmit effects to supply chain innovation and financial performance, as reported by Bhatti et al. [71], and digitalisation affects economic and environmental performance through network capability and business model innovation, as reported by Li et al. [72]. Hence, stronger Digital Transformation Capabilities should increase the performance returns to the Entrepreneurial Network [65]. Therefore, we propose the following hypothesis:

H_4. Digital Transformation Capabilities positively moderate the effect of Entrepreneurial Network on MSMEs Performance.

From a dynamic capabilities perspective, digital transformation capabilities (DTC), reflected in digital sensing, digital organizing, and digital restructuring/reconfiguring, together with data analytics and digital ecosystem integration, operate as a conversion mechanism that conditions how effectively EO becomes a digital-channel advantage [73-75]. EO promotes opportunity exploration and strategic experimentation, yet its payoff is contingent because it depends on orchestrating information, resources, and processes so initiatives translate into execution in increasingly digitalized and turbulent environments [74, 76]. Thus, Micro, Small, and Medium Enterprises' performance should improve more strongly when DTC accelerates opportunity-to-action and reduces conversion loss. Digital sensing and analytics sharpen launch timing, promotion adjustment, and micro-targeting, helping EO actions secure opportunities [74, 77]. Digital organizing supports EO-related risk-taking by aligning resources and implementation governance, increasing the likelihood that uncertain digital initiatives yield efficiency and sales growth [74]. Digital restructuring or reconfiguring can also make EO's innovativeness more productive by enabling scalable renewal and business model adjustment through recombined processes and structures [19]. Prior evidence indicates positive moderation: digitalization strengthens EO effects on market performance during crises and on innovation performance via significant interaction terms as reported by Samsami et al. [73] and Suder et al. [76]. Social media use similarly amplifies EO payoffs as reported by Susanto et al. [78] and EO-IT capability synergy is positively associated with firm performance, including during COVID-19 turbulence as reported by

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

Campos-Núñez and Serrano-Malebrán [74] and Martins [75]. Therefore, we propose the following hypothesis:

H_5: Digital Transformation Capabilities positively moderate the effect of Entrepreneurial Orientation on MSMEs Performance.

Entrepreneurial Competencies (EC) capture MSME owners' and managers' ability to execute through technical, managerial, innovation, strategic decision-making, and human resource management skills that mobilize constrained resources into performance. In emerging economies, EC functions as an execution mechanism linking entrepreneurial intent and strategy to operational and market results [24, 62]. Because MSME performance is multidimensional, EC should be more productive when these competencies are embedded in digital processes and channels that reshape value creation and capture [79]. Digital Transformation Capabilities (DTC) provide such embedding via digital sensing, digital organizing, and digital restructuring/reconfiguring, keeping execution aligned with technological and market turbulence [63, 64, 80, 81]. Evidence suggests that digital skills and digitalization competences complement work specialization, helping managerial and technical competence translate into productivity [82]. Mechanistically, sensing and analytics sharpen strategic choices, organizing reduces implementation frictions, and restructuring supports scalability, thereby increasing EC's performance returns [80, 83]. Consistent with this contingency logic, Martins [75] reported that higher digitalization amplifies the performance effects of dynamic capabilities in emerging-market small and medium enterprises, and Djou et al. [84] find that this strengthens the entrepreneurial posture-performance relationship in manufacturing MSMEs. Kumar et al. [85] find that Digital Transformation Capability also strengthens the contribution of entrepreneurial orientation to economic sustainability. Accordingly, DTC is a theoretically coherent boundary condition that should enhance EC's contribution to multidimensional performance in digitalized ecosystems [79]. Therefore, we propose the following hypothesis:

H_6: Digital Transformation Capabilities positively moderate the effect of Entrepreneurial Competencies on MSMEs Performance.

3. Methods and Material

This study applies a quantitative approach to test the hypotheses in the empirical model [86, 87]. The population comprises Micro, Small, and Medium Enterprises (MSMEs) operating in Makassar, Indonesia, with the enterprise as the unit of analysis and primary data obtained from enterprise actors performing managerial roles [88]. Using non-probability purposive sampling, respondents must be MSME owner-entrepreneurs actively involved in running the enterprise, embodying entrepreneurial spirit in managing operations as key informants with decision-making authority and the best knowledge of organizational practices and performance outcomes [89, 90]. To ensure relevance to digital transformation capabilities, participating enterprises must have implemented business digitalization, such as adopting digital tools in managerial or operational processes or using digital channels or platforms for market activities, enabling a valid assessment of sensing, organizing, reconfiguring, and their performance implications [91]. Following Hair et al. [92], the target sample consists of 125-250 respondents across five constructs, with 25 indicators. Data are collected offline via paper questionnaires and online through Google Forms. The questionnaire includes informed consent, screening, anonymized demographic profiles, and items measuring EN, EO, EC, MSMEs' performance, and DTC.

Fifteen enumerators collected data online and offline after training on study objectives, the questionnaire, field conditions, and survey procedures. Each enumerator covered one of Makassar's 15 subdistricts, yielding 254 valid responses, all meeting the inclusion criteria. Although the total exceeded the target, the full sample was analyzed because larger samples improve estimation stability, parameter precision, and statistical power [93]. A robustness assessment employed multigroup analysis (MGA) [94-96]. Business age (years since establishment) was used for segmentation because challenges and failure mechanisms vary across life-cycle stages, shaping capability constraints, managerial experience,

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

and organizational efficiency, which may alter antecedent-performance relationships [32]. Consistent with liability of newness and smallness arguments, determinants differ between new ventures and older small businesses; therefore, respondents were split into 0-3 years and more than 3 years to capture early formation-survival versus more established phases [32, 97, 98]. After confirming measurement invariance, MGA compared path coefficients across two equal groups, each consisting of 127 samples.

Before data collection, this study received ethical clearance [99, 100] from the Research Ethics Committee of Universitas Mahasaraswati Denpasar (UNMAS Denpasar), Indonesia. Procedures followed core social research principles and involved no intervention, deception, or manipulation; physical risk was absent, and psychological risk was minimal and comparable to routine online surveys. Participation was voluntary. The first questionnaire page presented informed consent describing the study's purpose, question types, estimated duration (approximately 10-15 minutes), risks and benefits, incentive scheme, confidentiality, and the right to withdraw at any time without consequences; only consenting respondents continued. Inclusion followed the sampling criteria; vulnerable groups (including minors) were screened out; recruitment was designed to be fair and non-discriminatory. The instrument requested only non-identifying demographic information and assessments of entrepreneurial network (EN), entrepreneurial orientation (EO), entrepreneurial competencies (EC), digital transformation capabilities (DTC), and MSMEs performance. Data were collected and stored on password-protected media accessible only to authorized researchers; technical identifiers were used solely for quality control, not linked to personal identities, and retained for up to 15 months for audit and replication before secure disposal. To reduce common method bias, the survey stated that there were no right or wrong answers, applied item randomization and attention checks, used non-intimidating wording, and allowed requests for data deletion before analysis; incentives were limited to a small appreciation and a thank-you message at completion. The study did not access private content or closed platforms and reported results only in aggregate, without units that could enable identification of individuals or communities.

Furthermore, this study tests five constructs: MSMEs Performance as the dependent variable, Entrepreneurial Network (EN), Entrepreneurial Orientation (EO), and Entrepreneurial Competencies (EC) as independent variables, and Digital Transformation Capabilities (DTC) as the moderating variable. Each construct is measured using its respective indicators, operationalized into survey items assessed on a five-point Likert scale [101]. To ensure instrument quality, a pre-test with 71 pilot respondents was conducted [86], and all indicators, corresponding items, and pre-test results are reported in Table 1. The measurement results indicate satisfactory convergent validity and internal consistency: outer loadings (OL) exceed 0.70, Cronbach's alpha (CA) exceeds 0.70, composite reliability (CR) rho-a exceeds 0.70, and average variance extracted (AVE) exceeds 0.50. Although DTC shows very high reliability (CA and CR above 0.90), values remain below 0.95, suggesting limited risk of semantic redundancy; this issue is nonetheless rechecked rigorously in the main sample [93, 102].

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

Table 1.
Construct Indicators and Pre-test Estimates.

Construct – Item	Source	Pre-Test			
		OL	CA	CR	AVE
Micro, Small, and Medium Enterprises Performance (SEMP)					
SEMP1 (Operational efficiency): Compared with our main competitors, our enterprise is more efficient in operational process time and cost; SEMP2 (Sales growth): Compared with our main competitors, our enterprise's sales growth shows a stronger trend; SEMP3 (Innovation contribution): Our product, service, and process innovations contribute materially to revenue and business results; SEMP4 (Satisfaction & repeat purchase): Our customers tend to be satisfied and show a high propensity to repurchase; SEMP5 (Continuity/resilience): Our enterprise maintains cash flow stability and adapts when market changes occur.	Aisjah et al. [9], Presutti and Odorici [23], Salfore et al. [40]; Oduro [42], Pilav–Velic et al. [43]	SEMP1: 0.799; SEMP2: 0.811; SEMP3: 0.836; SEMP4: 0.775; SEMP5: 0.812.	0.866	0.867	0.651
Entrepreneurial Network (EN)					
EN1 (Strategic partner access): Our enterprise can readily reach relevant strategic partners to support business activities; EN2 (Value co-creation collaboration): We actively collaborate with external parties to create value (e.g., products, services, market access); EN3 (Interaction frequency): We interact regularly with external partners to coordinate and develop business activities; EN4 (Customer closeness): We maintain close customer relationships, enabling easy feedback and understanding of their preferences; EN5 (Network diversification): We do not rely on a single actor or channel; our external ties span several parties and channels.	Gliga and Evers [12], Mitrega et al. [44], Acosta et al. [47], Majid et al. [48], Farida and Nuryakin [49]	EN1: 0.774; EN2: 0.779; EN3: 0.803; EN4: 0.822; EN5: 0.732.	0.841	0.845	0.612
Entrepreneurial Orientation (EO)					
EO1 (Innovative): We actively introduce valuable new or improved products/services; EO2 (Proactive): We act earlier than key competitors to seize market opportunities; EO3 (Risk-taking): We commit resources to high-uncertainty decisions when potential returns are substantial; EO4 (Market monitoring & adjustment): We consistently track market shifts and adjust business decisions accordingly; EO5 (Responsiveness): We respond quickly by adapting products, channels, and promotions before opportunities fade.	Ritala et al. [51], Kusa et al. [54], Kohtamäki et al. [55], Ferreras-Méndez et al. [56], Prasannath et al. [57]	EO1: 0.774; EO2: 0.763; EO3: 0.748; EO4: 0.737; EO5: 0.832.	0.829	0.834	0.595
Entrepreneurial Competencies (EC)					
EC1 (Technical competence): We have adequate technical skills to ensure work process quality and efficiency; EC2 (Managerial competence): We plan, organize, and control operations with discipline; EC3 (Innovation competence): We design and commercialize relevant product, service, or process improvements; EC4 (Strategic decision-making): Under uncertainty, we set investment priorities and business directions accurately; EC5 (Human resource management): We manage recruitment, training, motivation, and retention to support business goals.	Sakib et al. [15], Ibidunni et al. [24], Tehseen et al. [60], Soomro et al. [62]	EC1: 0.810; EC2: 0.732; EC3: 0.809; EC4: 0.785; EC5: 0.779.	0.843	0.847	0.614
Digital Transformation Capabilities (DTC)					

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

DTC1 (Digital sensing): Our enterprise systematically monitors digital technology trends and relevant shifts in digital market behavior; DTC2 (Digital organizing): Our enterprise aligns resources, roles, and governance so digital initiatives are implemented effectively; DTC3 (Digital restructuring): Our enterprise redesigns workflows and business activity configurations to fit digital channel requirements; DTC4 (Data & analytics): Our enterprise uses data and analytics to support decisions and evaluate initiative performance; DTC5 (Digital ecosystem integration): Our enterprise integrates interactions with digital platforms/partners (e.g., marketplaces, payments, logistics, marketing) to strengthen value creation and capture.	Rahman et al. [27], Li et al. [63], Sousa-Zomer et al. [64], Saeedikiya et al. [65], Matarazzo et al. [67]	DTC1: 0.914; DTC2: 0.916; DTC3: 0.833; DTC4: 0.863; DTC5: 0.767.	0.911	0.919	0.741

Data were analyzed using variance-based structural equation modeling with the partial least squares approach (PLS-SEM) in SmartPLS 4 [93]. The analysis first evaluated the measurement model by assessing reliability, convergent validity, and discriminant validity. Next, the structural model was assessed using the standardized root mean square residual (SRMR), predictive relevance (Q^2), the coefficient of determination (R^2), and path coefficient significance, applying one-tailed tests because the hypotheses are directional. For multigroup analysis, measurement invariance was established using the Measurement Invariance of Composite Models (MICOM) procedure, which tests configural invariance, compositional invariance, and equality of composite means and variances before comparing structural paths across groups. Figure 1 presents the study's empirical model.

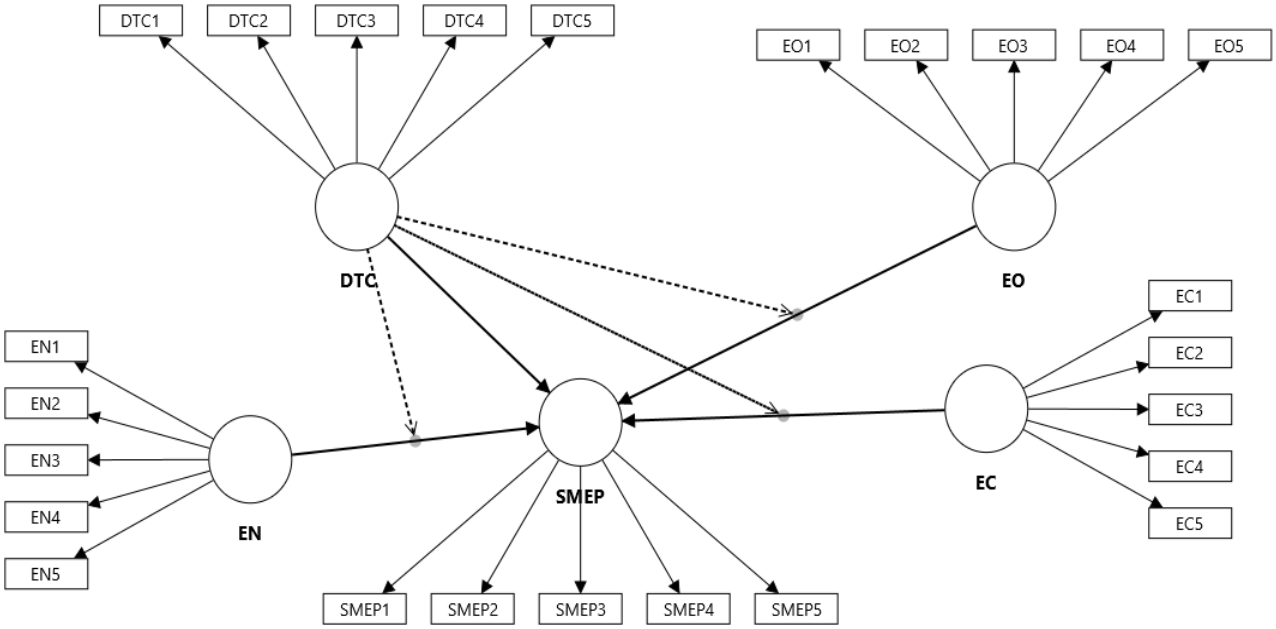

Figure 1.
Empirical Model.

4. Result

4.1. Entrepreneur and Business Characteristics

Table 2 reports the characteristics of entrepreneurs and their businesses. The sample comprises 254 MSMEs with an even split by enterprise age: 127 enterprises aged 0-3 years and 127 enterprises aged

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

more than 3 years. Overall, gender composition is 141 male entrepreneurs (55.51%) and 113 female entrepreneurs (44.49%), but the pattern differs by group: the 0-3-year group is near balanced (49.61% male; 50.39% female), whereas the older group is more male-dominated (61.42% male; 38.58% female). Most respondents are aged 20-30 years (56.69%), followed by more than 30-40 years (28.35%) and more than 40 years or older (14.96%), with broadly similar distributions across enterprise-age groups. The sample spans eight product categories, led by herbal and health (16.14%), accessories and jewelry (14.96%), electronic accessories (14.57%), home living and decoration (12.99%), and cosmetics and personal care (10.63%), with visible group differences in several lines. Non-legal-entity status dominates overall (48.43%), higher among younger enterprises (55.12%) than older enterprises (41.73%). Monthly turnover also differs, with younger enterprises more common below IDR 5 million (17.32%) and IDR above 10-25 million (18.11%), while older enterprises concentrate in IDR above 25-50 million (21.26%) and above 50-100 million (18.90%).

Table 2.
Entrepreneur and Business Characteristics.

Criteria		**Overall**	**0-3 yrs**	**>3 yrs**
Entrepreneur's	Male	141	63	78
Gender	Female	113	64	49
Entrepreneur's	20 – 30	144	71	73
Age	> 30 – 40	72	39	33
(years old)	> 40	38	17	21
Business	Accessories and Jewelry	38	21	17
Type	Electronic Accessories	37	14	23
	Fashion and Apparel Products	26	11	15
	Herbal and Health Products	41	21	20
	Hobby and Craft Products	23	12	11
	Home Living and Decoration Products	33	16	17
	Cosmetics and Personal Care	27	18	9
	Food and Beverages (packaged F&B)	29	14	15
Legal-entity	Limited Liability Company (*Perseroan Terbatas* – PT)	46	23	23
status	Limited Partnership (*Commanditaire Vennootschap* – CV)	44	18	26
	Sole Proprietorship (*Usaha Dagang* – UD)	41	16	25
	Non-legal-entity form	123	70	53
Business	< 1 year	67	67	–
Age	1 – 3 years	60	60	
	>3 – 5 years	63	–	63
	>5 years	64		64
Monthly	< 5,000,000	33	22	11
Turnover	5,000,000 – 10,000,000	30	15	15
(in IDR)	> 10,000,000 – 25,000,000	37	23	14
	> 25,000,000 – 50,000,000	42	15	27
	> 50,000,000 – 100,000,000	39	15	24
	> 100,000,000 – 500,000,000	41	22	19
	> 500,000,000	32	15	17

4.2. Measurement Invariance of Composite Models (MICOM) Analysis

Table 3 reports the Measurement Invariance of Composite Models (MICOM) assessment to ensure that multigroup comparisons between enterprises aged 0-3 years and more than 3 years in PLS-SEM are not biased by measurement non-equivalence, which can render group differences misleading [28]. Step 1 confirmed configural invariance because both groups used identical measurement specifications, indicator sets, data treatment, and estimation settings, ensuring comparable composite formation. Step 2 supported compositional invariance, with near-perfect cross-group composite correlations (MSMEP = 0.999; EN = 0.999; EO = 0.999; EC = 0.998; DTC = 1.000) and permutation p-values above 0.05, indicating no significant deviation from 1. Step 3a showed equality of composite means, as all mean

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

differences fell within the 95% confidence interval and all p-values exceeded 0.05 (MSMEP = 0.383; EN = 0.904; EO = 0.718; EC = 0.917; DTC = 0.671). Step 3b likewise supported equality of composite variances, with all variance differences within the 95% interval and p-values above 0.05 (MSMEP = 0.496; EN = 0.301; EO = 0.482; EC = 0.210; DTC = 0.146). Collectively, MICOM indicates full measurement invariance, supporting interpretable multigroup analysis [29].

Table 3.
MICOM Estimate.

Construct	Step 2			Step 3a			Step 3b		
	C=1	Cls.	Prob.	Diff.	Cls.	Prob.	Diff.	Cls.	Prob.
SMEP	0.999	(0.999; 0.999)	0.361	0.109	(-0.248; 0.247)	0.383	-0.219	(-0.613; 0.622)	0.496
EN	0.999	(0.998; 0.999)	0.629	0.016	(-0.242; 0.248)	0.904	-0.195	(-0.385; 0.355)	0.301
EO	0.999	(0.996; 0.999)	0.596	0.045	(-0.246; 0.246)	0.718	0.124	(-0.349; 0.336)	0.482
EC	0.998	(0.993; 0.997)	0.508	0.012	(-0.249; 0.247)	0.917	-0.219	(-0.349; 0.351)	0.210
DTC	1.000	(0.999, 1.000)	0.486	0.054	(-0.235; 0.250)	0.671	-0.439	(-0.567; 0.580)	0.146

4.3. Measurement Model and Descriptive Statistic Analyses

Descriptive statistics in Table 4 show that mean scores for SMEP are relatively higher than those for the entrepreneurial resource constructs, while DTC also records high means with lower dispersion; EN, EO, and EC concentrate in the moderate-to-high range with greater response variability, aligning with PLS-SEM reporting that summarizes central tendency and dispersion before measurement-model evaluation [103]. Across enterprise-age groups, the 0-3-year group reports slightly higher means on four of the five SMEP indicators, with SMEP2 identical across groups. For the entrepreneurship constructs, mean differences are small and mixed: the younger group is marginally higher on EN1 and EN4; it is higher on EO2 and EO5, whereas the older group is slightly higher on EO4. For EC, the older group is higher on EC2 and EC4, while the younger group is higher on EC3. Overall, cross-group differences remain subtle and do not dominate the general descriptive pattern.

Table 4.
Outer Loading (OL), Variance Inflation Factor (VIF), and Descriptive Statistic.

Construct/ Indicator	Overall				0 – 3 years				> 3 years			
	Mean	St. Dev	OL	VIF	Mean	St. Dev	OL	VIF	Mean	St. Dev	OL	VIF
Micro, Small, and Medium Entreprises Performance (SMEP)												
SMEP1	4.024	0.726	0.745	1.586	4.071	0.701	0.723	1.499	3.976	0.747	0.760	1.691
SMEP2	4.173	0.722	0.775	1.633	4.173	0.700	0.743	1.479	4.173	0.743	0.803	1.828
SMEP3	3.843	0.798	0.799	1.800	3.898	0.741	0.787	1.688	3.787	0.848	0.808	1.951
SMEP4	3.732	0.704	0.740	1.588	3.780	0.675	0.706	1.451	3.685	0.729	0.764	1.761
SMEP5	3.520	0.708	0.748	1.533	3.528	0.719	0.750	1.496	3.512	0.697	0.754	1.620
Entrepreneurial Network (EN)												
EN1	3.531	0.912	0.806	1.920	3.591	0.890	0.763	1.638	3.472	0.929	0.846	2.406
EN2	3.531	0.899	0.791	1.811	3.535	0.903	0.790	1.735	3.528	0.895	0.796	1.914
EN3	3.543	0.924	0.845	2.199	3.512	0.912	0.837	2.086	3.575	0.935	0.856	2.456
EN4	3.567	0.861	0.792	1.786	3.598	0.816	0.769	1.670	3.535	0.903	0.810	1.924
EN5	3.579	0.900	0.772	1.717	3.543	0.858	0.747	1.652	3.614	0.939	0.792	1.794
Entrepreneurial Orientation (EO)												
EO1	3.547	0.907	0.802	1.831	3.559	0.953	0.812	1.897	3.535	0.858	0.795	1.925
EO2	3.520	0.925	0.781	1.803	3.598	0.941	0.781	1.830	3.441	0.902	0.780	1.842
EO3	3.488	0.864	0.780	1.723	3.480	0.877	0.783	1.800	3.496	0.850	0.775	1.719
EO4	3.571	0.901	0.820	1.940	3.559	0.911	0.811	1.929	3.583	0.891	0.828	2.053
EO5	3.618	0.905	0.801	1.896	3.638	0.919	0.827	1.996	3.598	0.890	0.775	1.882
Entrepreneurial Capabilities (EC)												
EC1	3.547	0.903	0.779	1.712	3.567	0.857	0.782	1.672	3.528	0.946	0.778	1.749
EC2	3.594	0.890	0.759	1.722	3.543	0.911	0.772	1.734	3.646	0.865	0.759	1.776
EC3	3.583	0.896	0.793	1.868	3.669	0.842	0.808	1.937	3.496	0.938	0.785	1.869
EC4	3.598	0.903	0.818	1.846	3.551	0.858	0.791	1.798	3.646	0.944	0.839	1.923
EC5	3.567	0.829	0.787	1.688	3.583	0.768	0.745	1.528	3.551	0.885	0.816	1.877

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

Digital Transformation Capabilities (DTC)												
DTC1	3.972	0.630	0.873	3.317	3.976	0.568	0.850	2.780	3.969	0.687	0.888	3.893
DTC2	3.780	0.686	0.882	3.165	3.819	0.594	0.820	2.280	3.740	0.766	0.921	4.392
DTC3	3.331	0.603	0.817	2.174	3.339	0.605	0.820	2.151	3.323	0.600	0.824	2.279
DTC4	4.094	0.657	0.874	2.779	4.087	0.589	0.852	2.338	4.102	0.719	0.889	3.244
DTC5	3.591	0.632	0.801	2.107	3.622	0.588	0.761	1.810	3.559	0.672	0.829	2.465

Table 4 reports outer-model variance inflation factor (VIF) values to diagnose indicator collinearity. In PLS-SEM, VIF values below 3.3 are commonly interpreted as low collinearity, while values up to 5.0 are typically acceptable. VIFs in the 3.0-5.0 range are often tolerable when indicators are conceptually close and reliability and validity are satisfied. In this study, all VIFs remain below 5.0 across the overall sample and both subgroups, with the maximum 4.392 for DTC2 in the >3 years subgroup. The comparatively higher VIFs for DTC indicators are plausible because DTC facets are closely related within a capability domain, and collinearity can be more visible when moderation terms are specified. Interaction-term construction can add shared variance with constituent constructs, yielding moderate VIF levels that remain within conventional bounds. Overall, the VIF pattern provides no evidence of problematic indicator collinearity [104]. Tables 4 and 5, together with Figure A1 (Overall sample), Figure A2 (0-3 years subgroup), and Figure A3 (>3 years subgroup), indicate that the reflective measurement model is stable across groups. All indicators meet the outer loading (OL) ≥0.70 benchmark, and none requires deletion. Average variance extracted (AVE) exceeds 0.50 for all constructs, and Cronbach's alpha (CA) and composite reliability (CR) rho-a are above 0.70, supporting convergent validity and internal consistency.

Table 5.
AVE and Reliability Test.

Construct	Overall			0 – 3 years			> 3 years		
	AVE	CA	CR	AVE	CA	CR	AVE	CA	CR
SMEP	0.580	0.819	0.820	0.551	0.796	0.800	0.606	0.837	0.838
EN	0.642	0.860	0.862	0.611	0.840	0.843	0.673	0.878	0.880
EO	0.635	0.856	0.858	0.645	0.863	0.867	0.625	0.850	0.854
EC	0.620	0.847	0.854	0.609	0.839	0.840	0.634	0.857	0.877
DTC	0.722	0.903	0.907	0.675	0.879	0.881	0.759	0.920	0.926

Moreover, discriminant validity was assessed using several tests. Firstly, the heterotrait-monotrait ratio (HTMT) in Table 6 for the full sample and the two enterprise-age subgroups (0-3 years; >3 years). All HTMT values were below 0.90, and most pairs were below 0.85, consistent with PLS-SEM guidance for conceptually close constructs [93]. In the full sample, core pairs were generally <0.85; the highest ratios involved SMEP but remained <0.90, suggesting no threatening overlap. The 0-3-year subgroup showed the same pattern, with no violations of <0.90, while in the >3-year subgroup, all pairs also stayed <0.90, with values nearest 0.85-0.90 mainly in interaction constructs.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

Table 6.
HTMT Matrix.

Construct	DTC	EC	EN	EO	SMEP	DTC x EC	DTC x EN	DTC x EO
Overall								
DTC								
EC	0.525							
EN	0.570	0.181						
EO	0.608	0.189	0.179					
SMEP	0.881	0.585	0.751	0.699				
DTC x EC	0.526	0.284	0.337	0.330	0.539			
DTC x EN	0.476	0.330	0.341	0.340	0.574	0.775		
DTC x EO	0.496	0.343	0.360	0.336	0.577	0.791	0.803	
0 – 3 years								
DTC								
EC	0.485							
EN	0.576	0.144						
EO	0.558	0.153	0.091					
SMEP	0.897	0.540	0.731	0.639				
DTC x EC	0.354	0.140	0.175	0.131	0.284			
DTC x EN	0.422	0.167	0.222	0.322	0.447	0.637		
DTC x EO	0.480	0.144	0.359	0.278	0.506	0.578	0.712	
> 3 years								
DTC								
EC	0.552							
EN	0.569	0.239						
EO	0.662	0.241	0.307					
SMEP	0.869	0.618	0.763	0.761				
DTC x EC	0.610	0.367	0.428	0.474	0.678			
DTC x EN	0.504	0.423	0.412	0.372	0.651	0.817		
DTC x EO	0.504	0.463	0.366	0.396	0.626	0.858	0.837	

Secondly, the Fornell-Larcker criterion compares each construct's square root of AVE (diagonal) with its inter-construct correlations (off-diagonal), as reported in Table 7. In the overall sample, all diagonal values exceeded the corresponding correlations, indicating no material construct overlap. The >3-year business-age group showed the same pattern. In the 0-3-year business-age group, the criterion was generally satisfied; however, the SMEP-DTC pair displayed higher empirical proximity than expected. This specific diagnostic note should be interpreted solely as a measurement-model evaluation, given evidence that Fornell-Larcker can be insufficiently sensitive and that HTMT is recommended for discriminant validity diagnosis in such cases [105].

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

Table 7.
Fornell-Larcker Matrix.

Construct	DTC	EC	EN	EO	SMEP
Overall					
DTC	0.850				
EC	0.465	0.787			
EN	0.505	0.141	0.801		
EO	0.536	0.169	0.153	0.797	
SMEP	0.759	0.495	0.632	0.587	0.761
0 – 3 years					
DTC	0.821				
EC	0.418	0.780			
EN	0.497	0.090	0.782		
EO	0.490	0.118	0.036	0.803	
SMEP	0.754	0.448	0.606	0.531	0.742
> 3 years					
DTC	0.871				
EC	0.504	0.796			
EN	0.514	0.191	0.820		
EO	0.588	0.219	0.268	0.791	
SMEP	0.766	0.540	0.656	0.646	0.778

Lastly, cross-loadings in Table 8 indicated that every indicator loaded highest on its assigned construct in the full sample and both subgroups, with no cross-loading exceeding its primary loading. Overall, the discriminant validity checks were acceptable for the full sample and both subgroups. subgroups, with no cross-loading exceeding its primary loading. Overall, the discriminant validity checks were acceptable for the full sample and both subgroups.

Table 8.
Cross Loading Matrix.

Indicator	Overall					0 – 3 years					> 3 years				
	DTC	EC	EN	EO	SMEP	DTC	EC	EN	EO	SMEP	DTC	EC	EN	EO	SMEP
DTC1	0.873	0.405	0.392	0.436	0.629	0.850	0.371	0.391	0.362	0.604	0.888	0.435	0.393	0.512	0.649
DTC2	0.882	0.412	0.452	0.484	0.695	0.820	0.305	0.445	0.408	0.619	0.921	0.489	0.460	0.561	0.750
DTC3	0.817	0.405	0.365	0.441	0.597	0.820	0.396	0.321	0.394	0.616	0.824	0.419	0.408	0.493	0.585
DTC4	0.874	0.431	0.488	0.456	0.682	0.852	0.363	0.498	0.414	0.665	0.889	0.485	0.482	0.507	0.698
DTC5	0.801	0.320	0.441	0.458	0.615	0.761	0.277	0.377	0.435	0.585	0.829	0.356	0.493	0.486	0.638
EC1	0.369	0.779	0.092	0.135	0.392	0.314	0.782	0.076	0.069	0.380	0.409	0.778	0.106	0.197	0.403
EC2	0.322	0.759	0.095	0.029	0.313	0.300	0.772	0.095	-0.008	0.316	0.349	0.759	0.097	0.075	0.321
EC3	0.317	0.793	0.087	0.108	0.350	0.323	0.808	0.093	0.109	0.341	0.312	0.785	0.085	0.104	0.354
EC4	0.436	0.818	0.155	0.149	0.443	0.343	0.791	0.060	0.097	0.341	0.509	0.839	0.238	0.206	0.535
EC5	0.368	0.787	0.117	0.214	0.424	0.347	0.745	0.033	0.181	0.362	0.384	0.816	0.184	0.245	0.474
EN1	0.363	0.001	0.806	0.115	0.499	0.348	0.024	0.763	-0.009	0.467	0.376	-0.016	0.846	0.240	0.524
EN2	0.366	0.192	0.791	0.055	0.491	0.387	0.158	0.790	-0.042	0.501	0.353	0.228	0.796	0.161	0.486
EN3	0.428	0.177	0.845	0.115	0.536	0.432	0.134	0.837	0.042	0.505	0.433	0.217	0.856	0.198	0.571
EN4	0.438	0.081	0.792	0.174	0.515	0.389	0.035	0.769	0.060	0.469	0.475	0.124	0.810	0.288	0.551
EN5	0.425	0.113	0.772	0.152	0.490	0.385	-0.017	0.747	0.103	0.422	0.460	0.227	0.792	0.207	0.550
EO1	0.443	0.116	0.101	0.802	0.486	0.420	0.092	0.017	0.812	0.463	0.473	0.141	0.185	0.795	0.514
EO2	0.403	0.071	0.165	0.781	0.431	0.317	0.012	0.037	0.781	0.362	0.480	0.131	0.286	0.780	0.495
EO3	0.406	0.146	0.089	0.780	0.467	0.351	0.125	0.002	0.783	0.407	0.458	0.163	0.170	0.775	0.525
EO4	0.461	0.200	0.132	0.820	0.497	0.415	0.142	0.008	0.811	0.430	0.505	0.254	0.245	0.828	0.564
EO5	0.419	0.133	0.127	0.801	0.451	0.447	0.091	0.081	0.827	0.457	0.402	0.170	0.169	0.775	0.446
SMEP1	0.542	0.357	0.458	0.436	0.745	0.523	0.297	0.374	0.425	0.723	0.558	0.413	0.532	0.449	0.760
SMEP2	0.581	0.430	0.501	0.473	0.775	0.525	0.369	0.468	0.445	0.743	0.627	0.486	0.530	0.506	0.803
SMEP3	0.591	0.366	0.488	0.502	0.799	0.571	0.371	0.425	0.442	0.787	0.605	0.368	0.541	0.564	0.808
SMEP4	0.570	0.353	0.405	0.451	0.740	0.520	0.253	0.369	0.373	0.706	0.611	0.440	0.437	0.534	0.764
SMEP5	0.605	0.374	0.547	0.370	0.748	0.646	0.356	0.588	0.293	0.750	0.579	0.393	0.511	0.459	0.754

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

4.4. Structural Model Analysis

Model adequacy in the overall sample and the two enterprise-age subgroups was evaluated using SRMR (approximate residual fit), Q^2 (blindfolding-based predictive relevance), and R^2 (explanatory power of the endogenous construct), consistent with reporting guidance emphasizing reading fit, prediction, and explanation together rather than relying on a single index [106]. The goodness-of-fit tests are provided in Table 9. For SRMR, values below 0.08 are typically considered adequate, and values below 0.10 are acceptable under a more lenient criterion; the overall sample and both age groups met these thresholds, indicating no material global misfit. For Q^2, values greater than 0 indicate predictive relevance, with 0.25 and 0.50 often used to denote medium and large predictive accuracy; all three estimations fell in the strong prediction range, with the older group slightly higher than the younger group. For R^2, the 0.25/0.50/0.75 benchmarks are commonly interpreted as weak, moderate, and substantial. All three models showed substantial explanatory power for the performance construct, with the overall estimate between the two groups and the older group marginally higher than the younger group. Taken together, acceptable SRMR and strong Q^2 and R^2 support proceeding to structural testing and multigroup comparisons without global model-adequacy concerns.

Table 9.
Goodness of Fit Test.

Indicator	Overall	0 – 3 years	> 3 years
SRMR	0.054	0.063	0.065
Q^2	0.786	0.746	0.805
R^2	0.793	0.774	0.819

Structural model evaluation in PLS-SEM focuses on the significance and practical relevance of path coefficients (β), with standard errors and p-values obtained from 5,000 bootstrap resamples. Therefore, Table 10 is interpreted by coefficient direction and statistical significance for the overall sample and the two enterprise-age subgroups, and also supported by Figure A1 in Appendix A1 for the overall group, Figure A2 in Appendix A2 for the 0 – 3 years subgroup, and Figure A3 in Appendix A3 for the > 3 years subgroup. In the overall sample, direct effects on SMEP are positive and significant for EN (β= 0.402, p<0.001), EO (β=0.334, p<0.001), EC (β=0.246, p<0.001), and DTC (β=0.206, p<0.001). Only EN×DTC is significant and negative (β=-0.053, p=0.021), whereas EO×DTC (β=-0.033, p=0.155) and EC×DTC (β=0.012, p=0.351) are not significant. For enterprises aged 0-3 years, direct effects remain positive and significant for EN (β=0.434, p<0.001), EO (β=0.347, p<0.001), EC (β=0.265, p<0.001), and DTC (β=0.216, p=0.001), while none of the interaction terms is significant (EN×DTC: β=-0.040, p=0.165; EO×DTC: β=-0.053, p=0.147; EC×DTC: β=0.030, p=0.225). For enterprises older than 3 years, direct effects are again positive and significant (EN: β=0.366, p<0.001; EO: β=0.332, p<0.001; EC: β=0.247, p<0.001; DTC: β=0.175, p=0.004), and EN×DTC is significant and negative (β=-0.071, p=0.033), whereas EO×DTC (β=0.004, p=0.465) and EC×DTC (β=-0.023, p=0.320) remain non-significant. Thus, moderation is supported only for EN×DTC in the overall and older groups, with a robust negative interaction sign.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

Table 10.
Structural Path Estimates for Overall Group, 0 – 3 years Group, and > 3 years Group.

Path	Overall			0 – 3 years			> 3 years		
	β	T stat.	Prob.	β	T stat.	Prob.	β	T stat.	Prob.
EN → SMEP	0.402	10.365	<0.001	0.434	7.283	<0.001	0.366	7.214	<0.001
EO → SMEP	0.334	8.746	<0.001	0.347	6.228	<0.001	0.332	6.175	<0.001
EC → SMEP	0.246	6.716	<0.001	0.265	4.969	<0.001	0.247	4.679	<0.001
EN×DTC → SMEP	-0.053	-2.036	0.021	-0.040	-0.975	0.165	-0.071	-1.843	0.033
EO×DTC → SMEP	-0.033	-1.014	0.155	-0.053	-1.049	0.147	0.004	0.087	0.465
EC×DTC → SMEP	0.012	0.383	0.351	0.030	0.755	0.225	-0.023	-0.467	0.320
DTC → SMEP	0.206	4.292	<0.001	0.216	2.978	0.001	0.175	2.661	0.004

5. Discussion

Our findings indicate that entrepreneurial network (EN), entrepreneurial orientation (EO), and entrepreneurial competence (EC) each positively affect MSMEs' performance (SMEP). Therefore, H1, H2, and H3 are supported in the overall model and in both business-age subgroups (1-3 years and >3 years). The EN-SMEP link reinforces networking as an entrepreneurial resource convertible into performance via information access, complementary resources, and cross-actor coordination as value creation shifts toward platform architectures and value networks [1-3, 5, 7]. The EO-SMEP effect supports the argument that innovative, proactive, and risk-taking postures yield payoffs. In MSMEs, EO is tightly coupled with digital channel execution [22, 38]. The EC-SMEP effect indicates that owner-manager competence operates as an ability-to-execute mechanism that helps transform constrained resources into operational, market, innovation, and resilience outcomes [15, 38]. The positive signs across overall and both business-age groups imply that these bundled entrepreneurial resources remain productive across enterprise development stages. This stability aligns with evidence that MSME digital transformation trajectories are heterogeneous, yet EN, EO, and EC remain inputs for market learning and resource orchestration [7, 10, 22, 23] and with the dynamic capabilities view that performance stems from repeated strategic renewal and reconfiguration [23, 107]. Consistent with cross-group EO-performance evidence, stability across business age suggests that MSMEs' businesses in the Makassar context enable similar EO mechanisms for newer and established enterprises [14, 22].

Furthermore, the moderation results show that Digital Transformation Capabilities (DTC) weaken the effect of EN on MSMEs' performance (SMEP) overall and among MSMEs with business age >3 years, but not for MSMEs with business age 0-3 years; thus, H4 is rejected for all groups. In platform ecosystems, network productivity is constrained by coordination complexity and value capture governed by rules [2, 4, 11]. DTC can raise integration, standardization, and partner frictions, lowering the marginal return to EN in networks [1, 64], consistent with evidence that over-embeddedness reduces performance through overload and rigidity [108, 109] and that platform connectivity can trade off against efficiency via process complexity and rule dependence [69]. Implementation costs, IT security, and scarce digital talent can make orchestration expensive, so high DTC may amplify costs and weaken the EN-SMEP link [110]. The pattern is stage-contingent, with moderation concentrated in mature MSMEs [111] scilicet interdependent portfolios intensify asymmetries and conflict risk [45], routines reinforce path dependence and make DTC-driven reconfiguration disruptive [23], and financing digital change can force resource reallocation or partner selection that reduces network benefits [32, 68]. In early-stage MSMEs, transformation is often partial and platform-supported [7, 63], so network effects may operate indirectly via capability formation and adoption or be substituted by tools, leaving no detectable EN×DTC interaction [112, 113].

By contrast, DTC did not moderate EO-SMEP across overall group and business age subgroups (0-3 years; >3 years); thus, H5 was rejected, and MGA comparisons remain interpretable because measurement invariance is a prerequisite for cross-group inference [73]. This null interaction implies that EO's payoff in online-trading MSMEs does not depend on DTC as a boundary condition, so sensing-seizing-transforming does not amplify the direct EO-performance path [17]. The result aligns

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

with evidence that EO-performance effects are generally positive but sensitive to context, operationalization, and market conditions, so digitalization does not reliably emerge as a consistent moderator [13, 76]. EO may already embed behaviors central to digital execution, leaving limited incremental explanatory power for DTC on the direct link [51]. Moreover, EO often operates through intermediate mechanisms, including business model renewal, which can render EO×DTC non-salient when mediation dominates [19, 56]. Boundary conditions may also be more proximal to learning capabilities, given EO's interaction with absorptive capacity in shaping agility and profit outcomes [55]. The persistence of non-moderation across business age groups is also plausible in platform settings where standardized routines compress DTC variance, and digital value materializes through mediated pathways and process improvements [64, 66, 67, 69, 77]. Institutional and execution frictions in emerging economies may further limit digital returns [114], and EO effects may transmit via knowledge management [115].

In line with the EO moderation test, DTC does not moderate EC-SMEP in the pooled sample; H6 is rejected overall, despite DTC being framed as a sensing-organizing-reconfiguring conversion capability [63, 64]. EC may already embody the ability-to-execute routines (planning, control, innovation, strategic decisions, and human resource management), limiting incremental leverage from DTC [60]. Because transformation paths depend on leader characteristics and journey design, DTC may contribute mainly or indirectly, consistent with evidence that digital capabilities work through technology or process mediators and that digital transformation can raise performance partly via business model innovation [18, 19, 68]. Implementation frictions and resource gaps can also shift DTC toward stand-alone adaptation and defensive use oriented to continuity [37, 66]. In emerging-market SMEs, EC can remain the dominant execution engine, while heterogeneous digitalisation outcomes dilute interaction effects [35, 82]. Moreover, the null moderation is stable across MSMEs with business age 0-3 years and >3 years [7, 32]. DTC development depends on managerial capability and overcoming inertia, grounded in contextual micro-foundations; in platform ecosystems, returns may hinge on integrative orchestration and where value is created rather than on the EC×DTC slope [3, 21, 65, 83]. Given environment-sensitive competence-performance links, yet direct competence effects, and selective digitalisation capability moderation by mechanism, the consistent MGA result is plausible and supported [24, 29, 62, 69].

6. Conclusions

Overall, the findings indicate that MSMEs in Makassar are driven by a bundle of entrepreneurial resources: network access and orchestration, an innovative, proactive risk-taking posture, and managerial execution capacity. This bundle remains productive across business age, supporting RBV arguments on intangible resource leverage in an emerging market setting. DTC is better interpreted as an advanced organizational capability that contributes mainly by strengthening sensing, organizing, and reconfiguring processes and value architecture, rather than acting as a universal amplifier. The most distinctive implication is the EN×DTC interaction that tends to weaken EN's contribution to performance in more mature enterprises, implying that higher digital connectivity can reduce marginal network returns through coordination frictions, platform governance, and ecosystem dependence, making orchestration quality more decisive than network expansion [69, 112]. This refines the RBV versus dynamic capabilities tension: entrepreneurial resources yield stable gains, yet digitalization can generate value heterogeneity and implementation paradoxes, where transformation pathways and capability configurations shape resource-to-performance conversion [68, 82]. MGA with composite measurement invariance supports these conclusions and suggests aligning DTC with relationship architecture and enterprise maturity, rather than increasing digitalization intensity [28, 29].

The main limitation is the specific setting of MSMEs in Makassar, which limits transferability to other sectors, cities, and digital ecosystem configurations; replications across locations and industries are needed to capture variation in digital transformation, value-creation, and value-capture architectures [3, 7]. The cross-sectional design also restricts inference about capability dynamics and

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

reconfiguration, suggesting longitudinal or mixed-method designs that trace routine micro-foundations [64, 66]. Reliance on single key-informant surveys and perceptual performance indicators may introduce common method bias and endogeneity; future work should use multi-informant and objective data and stronger causal identification. Although MICOM-based MGA was conducted, splitting business age into two groups may mask finer heterogeneity; future studies could expand age staging, strengthen invariance checks, and apply multigroup or latent-class approaches [28, 29]. Finally, the DTC operationalization warrants refinement by separating sensing, organizing, and reconfiguring, and linking these sub-dimensions to ecosystem and platform logics to test whether DTC operates mainly via mediation or orchestration rather than universal moderation [21, 63].

Abbreviations:

AVE	: Average Variance Extracted
C=1	: The composite inter-group correlation is not significantly different from 1 (perfect correlation)
CA	: Cronbach's Alpha
Cls.	: Confidence Limits
CR	: Composite Reliability
Diff.	: Original Difference between Groups
DTC	: Digital Transformation Capabilities
EC	: Entrepreneurial Competence
EN	: Entrepreneurial Network
EO	: Entrepreneurial Orientation
H	: Hypothesis
HTMT	: Heterotrait–Monotrait Ratio
IDR	: Indonesian Rupiah
MICOM	: Measurement Invariance of Composite Models
MGA	: Multigroup Analysis
MSME(s)	: Micro, Small, and Medium Enterprise(s)
OL	: Outer Loadings
PLS-SEM	: Partial Least Squares Structural Equation Modeling
Prob.	: *probability/p*-value
Q^2	: Predictive Relevance (Q-squared)
R^2	: Coefficient of Determination
RBV	: Resource-Based View
SMEP	: MSMEs Performance
SRMR	: Standardized Root Mean Square Residual
VIF	: Variance Inflation Factor

Institutional Review Board Statement:

Ethical clearance for this study was granted by the Research Ethics Committee (*Komite Etik Penelitian*, KEP) of Universitas Mahasaraswati Denpasar (UNMAS Denpasar), Indonesia (Ethical Approval No. 03.0131/KEP-Unmas/I/2026).

Data Availability Statement:

The data presented in this study are available on request from the corresponding author due to privacy and ethical restrictions (i.e., the dataset contains confidential information provided by MSME respondents).

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

Acknowledgments:

During the preparation of this manuscript, the authors acknowledge that ChatGPT (OpenAI) is used exclusively for English translation and academic English proofreading/paraphrasing to improve language clarity and readability to a reputable international journal standard. The authors reviewed and edited all AI-assisted outputs and take full responsibility for the content of this publication.

References

[1] G. Vial, "Understanding digital transformation: A review and a research agenda," *Managing Digital Transformation*, vol. 28, no. 2, pp. 13-66, 2021. https://doi.org/10.1016/j.jsis.2019.01.003

[2] A. Hanelt, R. Bohnsack, D. Marz, and C. Antunes Marante, "A systematic review of the literature on digital transformation: Insights and implications for strategy and organizational change," *Journal of Management Studies*, vol. 58, no. 5, pp. 1159-1197, 2021. https://doi.org/10.1111/joms.12639

[3] P. C. Verhoef *et al.*, "Digital transformation: A multidisciplinary reflection and research agenda," *Journal of Business Research*, vol. 122, pp. 889-901, 2021. https://doi.org/10.1016/j.jbusres.2019.09.022

[4] D. Plekhanov, H. Franke, and T. H. Netland, "Digital transformation: A review and research agenda," *European Management Journal*, vol. 41, no. 6, pp. 821-844, 2023. https://doi.org/10.1016/j.emj.2022.09.007

[5] S. Kraus, S. Durst, J. J. Ferreira, P. Veiga, N. Kailer, and A. Weinmann, "Digital transformation in business and management research: An overview of the current status quo," *International Journal of Information Management*, vol. 63, p. 102466, 2022. https://doi.org/10.1016/j.ijinfomgt.2021.102466

[6] K. S. Warner and M. Wäger, "Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal," *Long Range Planning*, vol. 52, no. 3, pp. 326-349, 2019. https://doi.org/10.1016/j.lrp.2018.12.001

[7] A. Priyono, A. Moin, and V. N. A. O. Putri, "Identifying digital transformation paths in the business model of SMEs during the COVID-19 pandemic," *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 6, no. 4, p. 104, 2020. https://doi.org/10.3390/joitmc6040104

[8] A. S. Gomezel and D. Aleksić, "The relationships between technological turbulence, flow experience, innovation performance and small firm growth," *Journal of Business Economics and Management*, vol. 21, no. 3, pp. 760-782, 2020. https://doi.org/10.3846/jbem.2020.12280

[9] S. Aisjah, I. W. E. Arsawan, and D. Suhartanto, "Predicting SME's business performance: Integrating stakeholder theory and performance based innovation model," *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 9, no. 3, p. 100122, 2023. https://doi.org/10.1016/j.joitmc.2023.100122

[10] M. Syulhasbiullah, W. E. D. Radianto, and D. B. Tambunan, "The impact of entrepreneurial networks, orientation, and competence on online trading SMEs performance in Makassar City," *International Journal of Artificial Intelligence Research*, vol. 9, no. 1.1, pp. 222–234, 2025.

[11] J. Cenamor, V. Parida, and J. Wincent, "How entrepreneurial SMEs compete through digital platforms: The roles of digital platform capability, network capability and ambidexterity," *Journal of Business Research*, vol. 100, pp. 196-206, 2019. https://doi.org/10.1016/j.jbusres.2019.03.035

[12] G. Gliga and N. Evers, "Marketing capability development through networking–An entrepreneurial marketing perspective," *Journal of Business Research*, vol. 156, p. 113472, 2023. https://doi.org/10.1016/j.jbusres.2022.113472

[13] M. d. C. Soares and M. G. Perin, "Entrepreneurial orientation and firm performance: an updated meta-analysis," *RAUSP Management Journal*, vol. 55, no. 2, pp. 143-159, 2020. https://doi.org/10.1108/RAUSP-01-2019-0014

[14] J. Aftab, M. Veneziani, H. Sarwar, and M. I. Ishaq, "Entrepreneurial orientation and firm performance in SMEs: The mediating role of entrepreneurial competencies and moderating role of environmental dynamism," *International Journal of Emerging Markets*, vol. 19, no. 10, pp. 3329-3352, 2024. https://doi.org/10.1108/IJOEM-07-2021-1151

[15] M. N. Sakib, M. R. Rabbani, I. T. Hawaldar, M. A. Jabber, J. Hossain, and M. Sahabuddin, "Entrepreneurial competencies and SMEs' performance in a developing economy," *Sustainability*, vol. 14, no. 20, p. 13643, 2022. https://doi.org/10.3390/su142013643

[16] H. S. Ng, D. M. H. Kee, and T. Ramayah, "Examining the mediating role of innovativeness in the link between core competencies and SME performance," *Journal of Small Business and Enterprise Development*, vol. 27, no. 1, pp. 103-129, 2020. https://doi.org/10.1108/JSBED-12-2018-0379

[17] D. J. Teece, "Business models and dynamic capabilities," *Long Range Planning*, vol. 51, no. 1, pp. 40-49, 2018. https://doi.org/10.1016/j.lrp.2017.06.007

[18] J. Heredia, M. Castillo-Vergara, C. Geldes, F. M. C. Gamarra, A. Flores, and W. Heredia, "How do digital capabilities affect firm performance? The mediating role of technological capabilities in the "new normal"," *Journal of Innovation & Knowledge*, vol. 7, no. 2, p. 100171, 2022. https://doi.org/10.1016/j.jik.2022.100171

[19] J. Merín-Rodrigáñez, À. Dasí, and J. Alegre, "Digital transformation and firm performance in innovative SMEs: The mediating role of business model innovation," *Technovation*, vol. 134, p. 103027, 2024. https://doi.org/10.1016/j.technovation.2024.103027

[20] J. C. d. S. Freitas, A. C. G. Maçada, and R. A. Brinkhues, "Digital capabilities on business performance: Does it matter?," *BAR-Brazilian Administration Review*, vol. 21, no. 4, p. e230128, 2024. https://doi.org/10.1590/1807-7692bar2024230128

[21] C. E. Helfat and R. S. Raubitschek, "Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems," *Research Policy*, vol. 47, no. 8, pp. 1391-1399, 2018. https://doi.org/10.1016/j.respol.2018.01.019

[22] R. Basco, F. Hernández-Perlines, and M. Rodríguez-García, "The effect of entrepreneurial orientation on firm performance: A multigroup analysis comparing China, Mexico, and Spain," *Journal of Business Research*, vol. 113, pp. 409-421, 2020. https://doi.org/10.1016/j.jbusres.2019.09.020

[23] M. Presutti and V. Odorici, "Linking entrepreneurial and market orientation to the SME's performance growth: The moderating role of entrepreneurial experience and networks," *International Entrepreneurship and Management Journal*, vol. 15, no. 3, pp. 697-720, 2019. https://doi.org/10.1007/s11365-018-0533-4

[24] A. S. Ibidunni, O. M. Ogundana, and A. Okonkwo, "Entrepreneurial competencies and the performance of informal Smes: The contingent role of business environment," *Journal of African Business*, vol. 22, no. 4, pp. 468-490, 2021. https://doi.org/10.1080/15228916.2021.1874784

[25] R. Kusa, J. Duda, and M. Suder, "Explaining SME performance with fsQCA: The role of entrepreneurial orientation, entrepreneur motivation, and opportunity perception," *Journal of Innovation & Knowledge*, vol. 6, no. 4, pp. 234-245, 2021. https://doi.org/10.1016/j.jik.2021.06.001

[26] S. S. Hassan, K. Meisner, K. Krause, L. Bzhalava, and P. Moog, "Is digitalization a source of innovation? Exploring the role of digital diffusion in SME innovation performance," *Small Business Economics*, vol. 62, no. 4, pp. 1469-1491, 2024. https://doi.org/10.1007/s11187-023-00826-7

[27] S. A. Rahman, N. S. Taghizadeh, S. A. A. Tipu, and S. M. Far, "Leveraging dynamic capabilities for digital transformation: Exploring the moderating role of cost in environmental performance of SMEs," *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 11, no. 2, p. 100523, 2025. https://doi.org/10.1016/j.joitmc.2025.100523

[28] B. D. Liengaard, "Measurement invariance testing in partial least squares structural equation modeling," *Journal of Business Research*, vol. 177, p. 114581, 2024. https://doi.org/10.1016/j.jbusres.2024.114581

[29] J.-H. Cheah, S. Amaro, and J. L. Roldán, "Multigroup analysis of more than two groups in PLS-SEM: A review, illustration, and recommendations," *Journal of Business Research*, vol. 156, p. 113539, 2023. https://doi.org/10.1016/j.jbusres.2022.113539

[30] M. Yusuf, B. Surya, F. Menne, M. Ruslan, S. Suriani, and I. Iskandar, "Business agility and competitive advantage of SMEs in Makassar City, Indonesia," *Sustainability*, vol. 15, no. 1, p. 627, 2022. https://doi.org/10.3390/su15010627

[31] J. Zhang, S. Zhang, X. Tan, and H. Zhao, "The impact of digitalization on organizational agility: Evidence from the enterprise survey for innovation and entrepreneurship in China," *Humanities and Social Sciences Communications*, vol. 12, no. 1, pp. 1-15, 2025. https://doi.org/10.1057/s41599-025-05256-2

[32] A. Kücher, S. Mayr, C. Mitter, C. Duller, and B. Feldbauer-Durstmüller, "Firm age dynamics and causes of corporate bankruptcy: Age dependent explanations for business failure," *Review of Managerial Science*, vol. 14, no. 3, pp. 633-661, 2020. https://doi.org/10.1007/s11846-018-0303-2

[33] B. Wernerfelt, "A resource-based view of the firm," *Strategic Management Journal*, vol. 5, no. 2, pp. 171-180, 1984. https://doi.org/10.1002/smj.4250050207

[34] J. Barney, "Firm resources and sustained competitive advantage," *Journal of Management*, vol. 17, no. 1, pp. 99-120, 1991. https://doi.org/10.1177/014920639101700108

[35] Y. Temouri, K. Shen, V. Pereira, and X. Xie, "How do emerging market SMEs utilize resources in the face of environmental uncertainty?," *BRQ Business Research Quarterly*, vol. 25, no. 3, pp. 212-223, 2022. https://doi.org/10.1177/2340944420929706

[36] D. J. Teece, G. Pisano, and A. Shuen, "Dynamic capabilities and strategic management," *Strategic Management Journal*, vol. 18, no. 7, pp. 509-533, 1997. https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z

[37] R. Rupeika-Apoga and K. Petrovska, "Barriers to sustainable digital transformation in micro-, small-, and medium-sized enterprises," *Sustainability*, vol. 14, no. 20, p. 13558, 2022. https://doi.org/10.3390/su142013558
[38] H. Jiang, J. Yang, and J. Gai, "How digital platform capability affects the innovation performance of SMEs—Evidence from China," *Technology in Society*, vol. 72, p. 102187, 2023. https://doi.org/10.1016/j.techsoc.2022.102187
[39] K. Wenke, F. B. Zapkau, and C. Schwens, "Too small to do it all? A meta-analysis on the relative relationships of exploration, exploitation, and ambidexterity with SME performance," *Journal of Business Research*, vol. 132, pp. 653-665, 2021. https://doi.org/10.1016/j.jbusres.2020.10.018
[40] N. Salfore, M. Ensermu, and Z. Kinde, "Business model innovation and firm performance: Evidence from manufacturing SMEs," *Heliyon*, vol. 9, no. 6, p. e16384, 2023. https://doi.org/10.1016/j.heliyon.2023.e16384
[41] A. A. Eniola *et al.*, "High-performance work system on sustainable organizations performance in SMEs," *Business: Theory and Practice*, vol. 24, no. 2, pp. 447–458, 2023. https://doi.org/10.3846/btp.2023.17342
[42] S. Oduro, "Eco-innovation and SMEs' sustainable performance: A meta-analysis," *European Journal of Innovation Management*, vol. 27, no. 9, pp. 248-279, 2024. https://doi.org/10.1108/EJIM-11-2023-0961
[43] A. Pilav–Velic, H. Jahic, and L. Krndzija, "Firm resilience as a moderating force for SMEs' innovation performance: Evidence from an emerging economy perspective," *Regional Science Policy & Practice*, vol. 16, no. 8, p. 100033, 2024. https://doi.org/10.1016/j.rspp.2024.100033
[44] M. Mitrega, S. Forkmann, G. Zaefarian, and S. C. Henneberg, "Networking capability in supplier relationships and its impact on product innovation and firm performance," *International Journal of Operations & Production Management*, vol. 37, no. 5, pp. 577-606, 2017. https://doi.org/10.1108/IJOPM-11-2014-0517
[45] M. Mitręga, "SME networking capabilities in export markets and contingencies related to power asymmetry and brand assets," *Industrial Marketing Management*, vol. 110, pp. 129-146, 2023. https://doi.org/10.1016/j.indmarman.2023.03.001
[46] R. Zacca, "Leveraging network capability for small enterprise success: The critical roles of organizational capability and alertness," *Journal of Small Business Management*, pp. 1-24, 2025. https://doi.org/10.1080/00472778.2025.2478448
[47] A. S. Acosta, Á. H. Crespo, and J. C. Agudo, "Effect of market orientation, network capability and entrepreneurial orientation on international performance of small and medium enterprises (SMEs)," *International Business Review*, vol. 27, no. 6, pp. 1128-1140, 2018. https://doi.org/10.1016/j.ibusrev.2018.04.004
[48] A. Majid, M. Yasir, M. Yasir, and Z. Yousaf, "Network capability and strategic performance in SMEs: The role of strategic flexibility and organizational ambidexterity," *Eurasian Business Review*, vol. 11, pp. 587-610, 2021. https://doi.org/10.1007/s40821-020-00165-7
[49] N. Farida and Nuryakin, "Network capability, relational capability and Indonesian manufacturing SME performance: An empirical analysis of the mediating role of product innovation," *Engineering Management in Production and Services*, vol. 13, no. 1, pp. 41–52, 2021. https://doi.org/10.2478/emj-2021-0003
[50] S. Riaz, W. Yanqing, M. I. Ishaq, A. Raza, and R. A. Siddiqui, "Role of social networks and entrepreneurial success: Understanding the dynamics of knowledge acquisition and green entrepreneurial orientation," *Journal of Cleaner Production*, vol. 468, p. 143065, 2024. https://doi.org/10.1016/j.jclepro.2024.143065
[51] P. Ritala, A. Baiyere, M. Hughes, and S. Kraus, "Digital strategy implementation: The role of individual entrepreneurial orientation and relational capital," *Technological Forecasting and Social Change*, vol. 171, p. 120961, 2021. https://doi.org/10.1016/j.techfore.2021.120961
[52] P. Ebrahimi and S. M. Mirbargkar, "Green entrepreneurship and green innovation for SME development in market turbulence," *Eurasian Business Review*, vol. 7, no. 2, pp. 203-228, 2017. https://doi.org/10.1007/s40821-017-0073-9
[53] M.-A. Ibarra-Cisneros and F. Hernandez-Perlines, "Entrepreneurial orientation, absorptive capacity and business performance in SMEs," *Measuring Business Excellence*, vol. 24, no. 4, pp. 417-429, 2020. https://doi.org/10.1108/MBE-09-2019-0091
[54] R. Kusa, M. Suder, and J. Duda, "Role of entrepreneurial orientation, information management, and knowledge management in improving firm performance," *International Journal of Information Management*, vol. 78, p. 102802, 2024. https://doi.org/10.1016/j.ijinfomgt.2024.102802
[55] M. Kohtamäki, J. Heimonen, D. Sjödin, and V. Heikkilä, "Strategic agility in innovation: Unpacking the interaction between entrepreneurial orientation and absorptive capacity by using practice theory," *Journal of Business Research*, vol. 118, pp. 12-25, 2020. https://doi.org/10.1016/j.jbusres.2020.06.029
[56] J. L. Ferreras-Méndez, J. Olmos-Peñuela, A. Salas-Vallina, and J. Alegre, "Entrepreneurial orientation and new product development performance in SMEs: The mediating role of business model innovation," *Technovation*, vol. 108, p. 102325, 2021. https://doi.org/10.1016/j.technovation.2021.102325
[57] V. Prasannath, R. P. Adhikari, S. Gronum, and M. P. Miles, "Impact of government support policies on entrepreneurial orientation and SME performance," *International Entrepreneurship and Management Journal*, vol. 20, pp. 1533-1595, 2024. https://doi.org/10.1007/s11365-024-00993-3
[58] B. M. Pulka, A. Ramli, and A. Mohamad, "Entrepreneurial competencies, entrepreneurial orientation, entrepreneurial network, government business support and SMEs performance. The moderating role of the external environment,"

Journal of Small Business and Enterprise Development, vol. 28, no. 4, pp. 586-618, 2021. https://doi.org/10.1108/JSBED-12-2018-0390

[59] V. Butkouskaya, J. Llonch-Andreu, and M.-d.-C. Alarcón-del-Amo, "Entrepreneurial orientation (EO), integrated marketing communications (IMC), and performance in small and medium-sized enterprises (SMEs): Gender gap and inter-country context," *Sustainability*, vol. 12, no. 17, p. 7159, 2020. https://doi.org/10.3390/su12177159

[60] S. Tehseen, F. U. Ahmed, Z. H. Qureshi, M. J. Uddin, and R. T, "Entrepreneurial competencies and SMEs' growth: The mediating role of network competence," *Asia-Pacific Journal of Business Administration*, vol. 11, no. 1, pp. 2-29, 2019. https://doi.org/10.1108/APJBA-05-2018-0084

[61] I. S. Mokbel Al Koliby, H. H. Abdullah, and N. Mohd Suki, "Linking entrepreneurial competencies, innovation and sustainable performance of manufacturing SMEs," *Asia-Pacific Journal of Business Administration*, vol. 16, no. 1, pp. 21-40, 2024. https://doi.org/10.1108/APJBA-09-2021-0480

[62] R. B. Soomro, S. G. Memon, and M. Soomro, "Impact of entrepreneurial knowledge, skills, and competencies on MSME performance: an evidence from a developing country," *Asia Pacific Journal of Innovation and Entrepreneurship*, vol. 19, no. 1, pp. 42-72, 2025. https://doi.org/10.1108/APJIE-04-2023-0071

[63] L. Li, F. Su, W. Zhang, and J. Y. Mao, "Digital transformation by SME entrepreneurs: A capability perspective," *Information Systems Journal*, vol. 28, no. 6, pp. 1129-1157, 2018. https://doi.org/10.1111/isj.12153

[64] T. T. Sousa-Zomer, A. Neely, and V. Martinez, "Digital transforming capability and performance: a microfoundational perspective," *International Journal of Operations & Production Management*, vol. 40, no. 7/8, pp. 1095-1128, 2020. https://doi.org/10.1108/IJOPM-06-2019-0444

[65] M. Saeedikiya, S. Salunke, and M. Kowalkiewicz, "Toward a dynamic capability perspective of digital transformation in SMEs: A study of the mobility sector," *Journal of Cleaner Production*, vol. 439, p. 140718, 2024. https://doi.org/10.1016/j.jclepro.2024.140718

[66] R. Eller, P. Alford, A. Kallmünzer, and M. Peters, "Antecedents, consequences, and challenges of small and medium-sized enterprise digitalization," *Journal of Business Research*, vol. 112, pp. 119-127, 2020. https://doi.org/10.1016/j.jbusres.2020.03.004

[67] M. Matarazzo, L. Penco, G. Profumo, and R. Quaglia, "Digital transformation and customer value creation in Made in Italy SMEs: A dynamic capabilities perspective," *Journal of Business Research*, vol. 123, pp. 642-656, 2021. https://doi.org/10.1016/j.jbusres.2020.10.033

[68] S. Malodia, M. Mishra, M. Fait, A. Papa, and L. Dezi, "To digit or to head? Designing digital transformation journey of SMEs among digital self-efficacy and professional leadership," *Journal of Business Research*, vol. 157, p. 113547, 2023. https://doi.org/10.1016/j.jbusres.2022.113547

[69] A. Rajala and T. Hautala-Kankaanpää, "Exploring the effects of SMEs' platform-based digital connectivity on firm performance–the moderating role of environmental turbulence," *Journal of Business & Industrial Marketing*, vol. 38, no. 13, pp. 15-30, 2023. https://doi.org/10.1108/JBIM-01-2022-0024

[70] Y. Han and L. Xie, "Platform network ties and enterprise innovation performance: The role of network bricolage and platform empowerment," *Journal of Innovation & Knowledge*, vol. 8, no. 4, p. 100416, 2023. https://doi.org/10.1016/j.jik.2023.100416

[71] S. H. Bhatti, A. Ahmed, A. Ferraris, W. M. Hirwani Wan Hussain, and S. F. Wamba, "Big data analytics capabilities and MSME innovation and performance: A double mediation model of digital platform and network capabilities," *Annals of Operations Research*, vol. 350, no. 2, pp. 729-752, 2025. https://doi.org/10.1007/s10479-022-05002-w

[72] Y. Li, L. Cui, L. Wu, P. B. Lowry, A. Kumar, and K. H. Tan, "Digitalization and network capability as enablers of business model innovation and sustainability performance: The moderating effect of environmental dynamism," *Journal of Information Technology*, vol. 39, no. 4, pp. 687-715, 2024. https://doi.org/10.1177/02683962231219513

[73] M. Samsami, P. San-Martín, E. Palazuelos, and T. Schøtt, "Roles of digitalization in the effect of entrepreneurial orientation on innovation in startups: Mediator, moderator, capability?," *Information Systems and e-Business Management*, vol. 23, pp. 785-807, 2025. https://doi.org/10.1007/s10257-025-00709-2

[74] F. Campos-Núñez and J. Serrano-Malebrán, "Enhancing firm performance: How entrepreneurial orientation and information technology capability interact," *Applied Sciences*, vol. 14, no. 16, p. 7243, 2024. https://doi.org/10.3390/app14167243

[75] A. Martins, "Dynamic capabilities and SME performance in the COVID-19 era: The moderating effect of digitalization," *Asia-Pacific Journal of Business Administration*, vol. 15, no. 2, pp. 188-202, 2023. https://doi.org/10.1108/APJBA-08-2021-0370

[76] M. Suder, R. Kusa, J. Duda, and J. Karpacz, "Exploring impact of entrepreneurial orientation on firm performance–moderators' variability under changing market conditions," *Review of Managerial Science*, vol. 19, no. 3, pp. 797-842, 2025. https://doi.org/10.1007/s11846-024-00775-9

[77] A. S. Aydiner, E. Tatoglu, E. Bayraktar, S. Zaim, and D. Delen, "Business analytics and firm performance: The mediating role of business process performance," *Journal of Business Research*, vol. 96, pp. 228-237, 2019. https://doi.org/10.1016/j.jbusres.2018.11.028

[78] P. Susanto, M. E. Hoque, N. U. Shah, A. H. Candra, N. M. H. N. Hashim, and N. L. Abdullah, "Entrepreneurial orientation and performance of SMEs: The roles of marketing capabilities and social media usage," *Journal of*

Entrepreneurship in Emerging Economies, vol. 15, no. 2, pp. 379-403, 2023. https://doi.org/10.1108/JEEE-03-2021-0090

[79] I. N. Van, "Impact of entrepreneurial competencies and coopetition strategy on sustainable performance: A moderated mediation model," *Asian Academy of Management Journal*, vol. 30, no. 1, pp. 121-148, 2025. https://doi.org/10.21315/aamj2025.30.1.5

[80] J. Yu, J. Wang, and T. Moon, "Influence of digital transformation capability on operational performance," *Sustainability*, vol. 14, no. 13, p. 7909, 2022. https://doi.org/10.3390/su14137909

[81] D. Prihandono, A. P. Wijaya, B. Wiratama, W. Prananta, and S. Widia, "Digital transformation to enhance Indonesian SME performance: Exploring the impact of market competition and digital strategy," *Problems and Perspectives in Management*, vol. 22, no. 2, pp. 103-113, 2024. https://doi.org/10.21511/ppm.22(2).2024.09

[82] A. Kallmuenzer, A. Mikhaylov, M. Chelaru, and W. Czakon, "Adoption and performance outcome of digitalization in small and medium-sized enterprises," *Review of Managerial Science*, vol. 19, pp. 2011-2038, 2025. https://doi.org/10.1007/s11846-024-00744-2

[83] J. Fu, N. Zhang, and F. Li, "Research on the impact of managerial capabilities on the digital transformation of enterprises," *Journal of Business Economics and Management*, vol. 24, no. 4, pp. 614-632, 2023.

[84] L. Djou, U. Udin, F. Lukiastuti, and E. W. Filatrovi, "The contingency approach of digitalization and entrepreneurial orientation on smes performance in metal and machinery industry," *International Journal of Criminology and Sociology*, vol. 9, no. 1, pp. 2235-2249, 2020.

[85] V. Kumar, S. Kumar, S. Chatterjee, and M. Mariani, "Optimizing the digital transformation capability for enhancing economic sustainability of entrepreneurial venture: the moderating role of entrepreneurial orientation," *IEEE Transactions on Engineering Management*, vol. 71, pp. 8517-8530, 2024. https://doi.org/10.1109/TEM.2024.3387540

[86] M. R. Rita and P. K. Y. Nastiti, "The influence of financial bootstrapping and digital transformation on financial performance: Evidence from MSMEs in the culinary sector in Indonesia," *Cogent Business & Management*, vol. 11, no. 1, p. 2363415, 2024. https://doi.org/10.1080/23311975.2024.2363415

[87] Y. A. K. Noegroho, G. M. Tinungki, P. G. Hartono, and J. S. Matitaputty, "Personality, cognitive style and auditors' professional skepticism," *Review of Behavioral Finance*, vol. 17, no. 5, pp. 938-959, 2025. https://doi.org/10.1108/RBF-04-2025-0131

[88] M. C. Ansar, T. W. Tsusaka, and S. Syamsu, "Social sustainability of micro, small, and medium enterprises: the case of Makassar city, Indonesia," *Frontiers in Sustainability*, vol. 6, p. 1545072, 2025. https://doi.org/10.3389/frsus.2025.1545072

[89] R. Casidy and M. Nyadzayo, "Drivers and outcomes of relationship quality with professional service firms: An SME owner-manager perspective," *Industrial Marketing Management*, vol. 78, pp. 27-42, 2019. https://doi.org/10.1016/j.indmarman.2017.09.011

[90] D. Agyapong and A. B. Attram, "Effect of owner-manager's financial literacy on the performance of SMEs in the Cape Coast Metropolis in Ghana," *Journal of Global Entrepreneurship Research*, vol. 9, no. 1, p. 67, 2019. https://doi.org/10.1186/s40497-019-0191-1

[91] C. Kraft, J. P. Lindeque, and M. K. Peter, "The digital transformation of Swiss small and medium-sized enterprises: Insights from digital tool adoption," *Journal of Strategy and Management*, vol. 15, no. 3, pp. 468-494, 2022. https://doi.org/10.1108/JSMA-02-2021-0063

[92] J. F. Hair, W. C. Black, B. J. Babin, and R. E. Anderson, *Multivariate data analysis*. Hampshire London: Cengage Learning EMEA, 2019.

[93] J. F. Hair, G. T. M. Hult, C. M. Ringle, and M. Sarstedt, *A primer on partial least squares structural equation modeling (PLS-SEM)*, 3rd ed. Los Angeles: SAGE Publication, 2022.

[94] C. M. Chao and T. K. Yu, "How emotions and green altruism explain consumer purchase intention toward circular economy products: A multi-group analysis on willingness to be environmentally friendly," *Business Strategy and the Environment*, vol. 33, no. 4, pp. 2803-2816, 2024. https://doi.org/10.1002/bse.3632

[95] P. G. Hartono, R. Robiyanto, G. M. Tinungki, B. Frensidy, M. Y. Raya, and A. Hidarto, "Revisiting dividend policy and stock market reaction of indonesian manufacturing enterprises amidst the covid-19 crisis: A series of robustness checks," *Scientific Papers of the University of Pardubice. Series D, Faculty of Economics & Administration*, vol. 32, no. 1, p. 1773, 2024.

[96] G. M. Tinungki, P. G. Hartono, B. Frensidy, N. Sunusi, R. Robiyanto, and A. Dorkas Rambu Atahau, "Revisiting dividend policy in Indonesian green investment firms and associated market reaction: an in-depth analysis over crises period," *Cogent Business & Management*, vol. 12, no. 1, p. 2467229, 2025. https://doi.org/10.1080/23311975.2025.2467229

[97] E. M. Gimenez-Fernandez, F. D. Sandulli, and M. Bogers, "Unpacking liabilities of newness and smallness in innovative start-ups: Investigating the differences in innovation performance between new and older small firms," *Research Policy*, vol. 49, no. 10, p. 104049, 2020. https://doi.org/10.1016/j.respol.2020.104049

[98] M. Cristofaro, I. Hristov, R. Cimini, and D. Lovallo, "From start to stardom: The impact of resource allocation strategies on new venture survival and growth," *Long Range Planning*, vol. 58, no. 2, p. 102513, 2025. https://doi.org/10.1016/j.lrp.2025.102513

[99] G. M. Tinungki *et al.*, "Exploring the team-assisted individualization cooperative learning to enhance mathematical problem solving, communication and self-proficiency in teaching non-parametric statistics," *Cogent Education*, vol. 11, no. 1, p. 2381333, 2024. https://doi.org/10.1080/2331186X.2024.2381333

[100] G. M. Tinungki, B. Nurwahyu, A. B. Hartono, and P. G. Hartono, "Team-assisted individualization type of the cooperative learning model for improving mathematical problem solving, communication, and self-proficiency: Evidence from operations research teaching," *Education Sciences*, vol. 12, no. 11, p. 825, 2022. https://doi.org/10.3390/educsci12110825

[101] B. Tanujaya, R. C. I. Prahmana, and J. Mumu, "Likert scale in social sciences research: Problems and difficulties," *FWU Journal of Social Sciences*, vol. 16, no. 4, pp. 89-101, 2022.

[102] F. Schuberth, "Confirmatory composite analysis using partial least squares: Setting the record straight," *Review of Managerial Science*, vol. 15, pp. 1311-1345, 2021. https://doi.org/10.1007/s11846-020-00405-0

[103] C. M. Ringle, M. Sarstedt, N. Sinkovics, and R. R. Sinkovics, "A perspective on using partial least squares structural equation modelling in data articles," *Data in Brief*, vol. 48, p. 109074, 2023. https://doi.org/10.1016/j.dib.2023.109074

[104] S. Sood and A. Sharma, "A moderated-mediation model of fear of illness and subjective psychological well-being during COVID-19 pandemic," *Journal of Applied Structural Equation Modeling*, vol. 5, pp. 1–2, 2020. https://doi.org/10.47263/JASEM.5(2)03.

[105] J. Henseler, C. M. Ringle, and M. Sarstedt, "A new criterion for assessing discriminant validity in variance-based structural equation modeling," *Journal of the Academy of Marketing Science*, vol. 43, no. 1, pp. 115-135, 2015. https://doi.org/10.1007/s11747-014-0403-8

[106] J. F. Hair, J. J. Risher, M. Sarstedt, and C. M. Ringle, "When to use and how to report the results of PLS-SEM," *European business review*, vol. 31, no. 1, pp. 2-24, 2019. https://doi.org/10.1108/EBR-11-2018-0203

[107] A. Čirjevskis, "The role of dynamic capabilities as drivers of business model innovation in mergers and acquisitions of technology-advanced firms," *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 5, no. 1, p. 12, 2019. https://doi.org/10.3390/joitmc5010012

[108] W. Li and X. Wang, "Investigating how digital technology network embeddedness affects small and medium-sized enterprise growth: A dynamic capabilities perspective," *Technological Forecasting and Social Change*, vol. 223, p. 124442, 2026. https://doi.org/10.1016/j.techfore.2025.124442

[109] X. Chen, X.-e. Zhang, Z. Cai, and J. Chen, "The non-linear impact of digitalization on the performance of SMEs: A hypothesis test based on the digitalization paradox," *Systems*, vol. 12, no. 4, p. 139, 2024. https://doi.org/10.3390/systems12040139

[110] M. Skare, M. d. l. M. de Obesso, and S. Ribeiro-Navarrete, "Digital transformation and European small and medium enterprises (SMEs): A comparative study using digital economy and society index data," *International Journal of Information Management*, vol. 68, p. 102594, 2023. https://doi.org/10.1016/j.ijinfomgt.2022.102594

[111] F. Aiello, P. Cardamone, L. Mannarino, and V. Pupo, "Networks, ownership and productivity does firm age play a moderating role?," *Journal of Economic Studies*, vol. 51, no. 9, pp. 212-231, 2024. https://doi.org/10.1108/JES-10-2023-0547

[112] J. Soluk, C. Decker-Lange, and A. Hack, "Small steps for the big hit: A dynamic capabilities perspective on business networks and non-disruptive digital technologies in SMEs," *Technological Forecasting and Social Change*, vol. 191, p. 122490, 2023. https://doi.org/10.1016/j.techfore.2023.122490

[113] M. G. Andrade-Rojas, T. J. Saldanha, A. Kathuria, J. Khuntia, and W. Boh, "How information technology overcomes deficiencies for innovation in small and medium-sized enterprises: Closed innovation vs. open innovation," *Information Systems Research*, vol. 35, no. 4, pp. 1981-2012, 2024. https://doi.org/10.1287/isre.2021.0096

[114] R. K. Brahmana and M. Kontesa, "Does digital orientation enhance firm performance?," *Vision*, p. 09722629241257300, 2024. https://doi.org/10.1177/09722629241257300

[115] R. Kusa, M. Suder, J. Duda, W. Czakon, and D. Juárez-Varón, "Does knowledge management mediate the relationship between entrepreneurial orientation and firm performance?," *Journal of Knowledge Management*, vol. 28, no. 11, pp. 33-61, 2024. https://doi.org/10.1108/JKM-07-2023-0608

Appendix A

Appendix A.1.

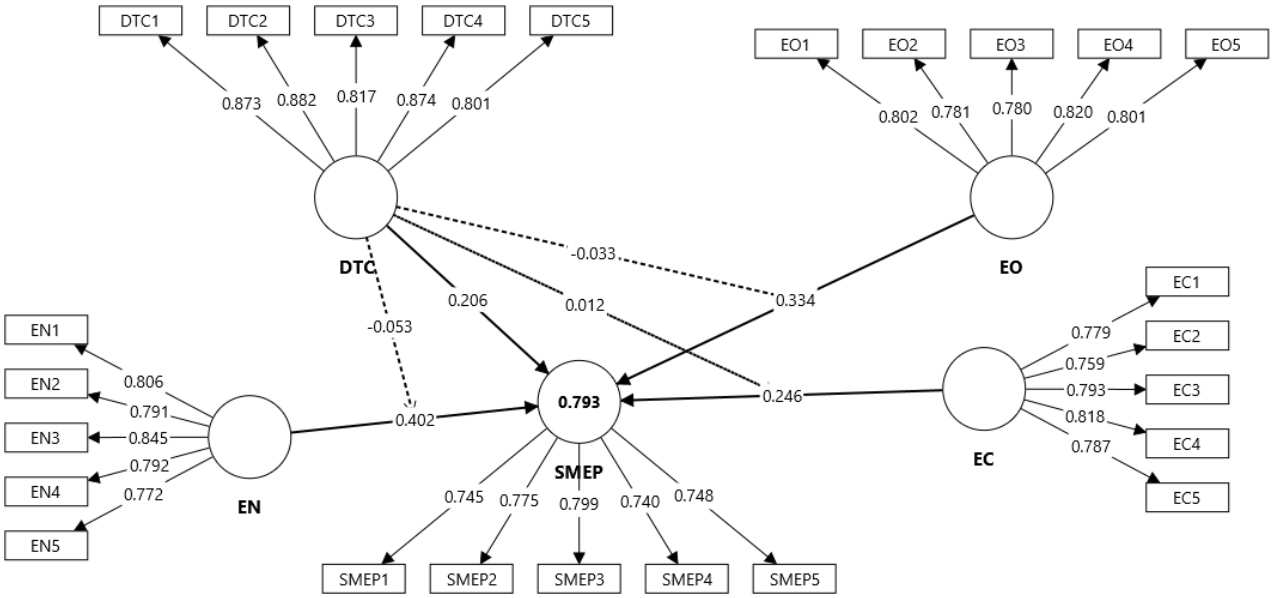

Figure A1.
PLS-SEM path model results for the overall sample.

Appendix A.2.

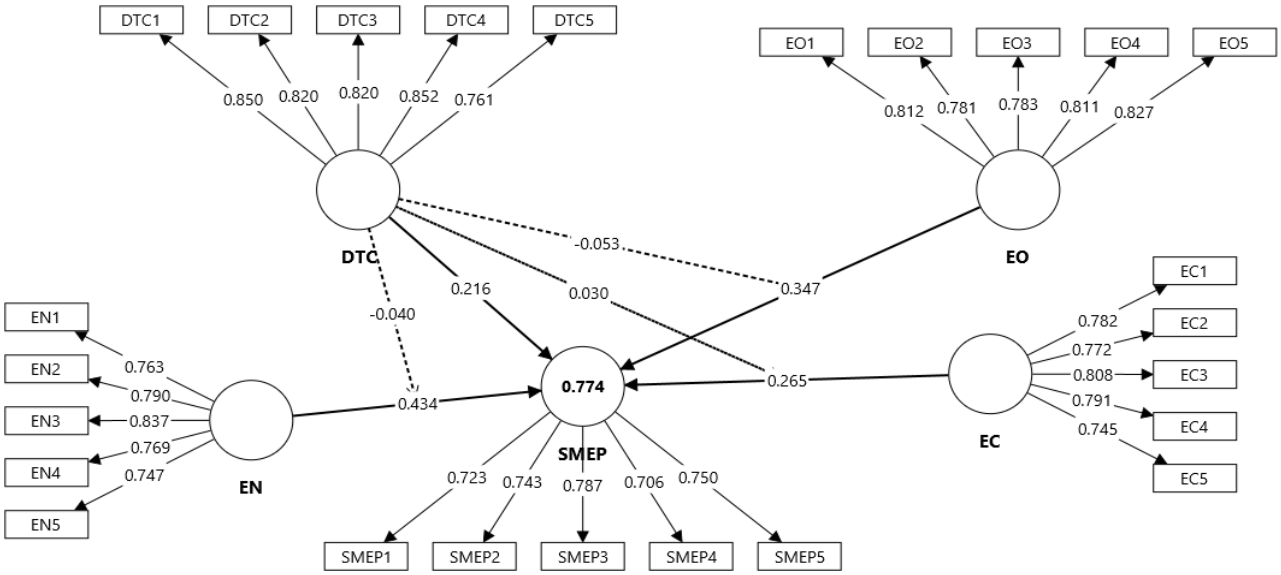

Figure A2.
PLS-SEM path model results for the 0 – 3 years subgroup.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200

Appendix A.3.

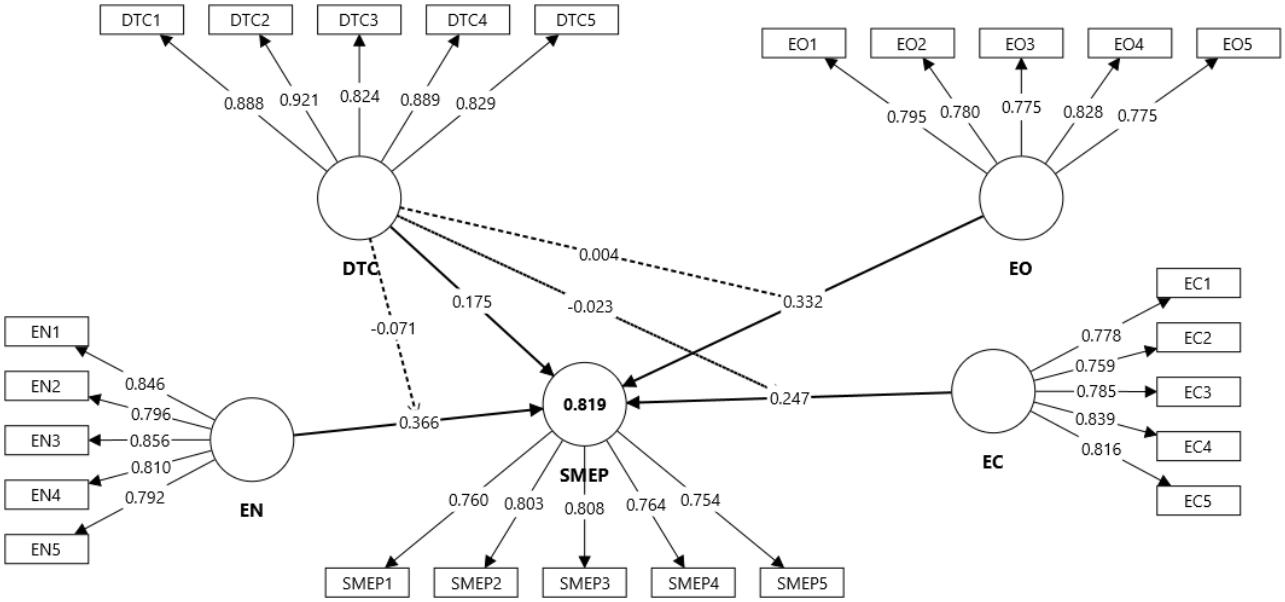

Figure A3.
PLS-SEM path model results for the >3 years subgroup.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 686-712, 2026
DOI: 10.55214/2576-8484.v10i2.12200