



The influence of entrepreneur orientation and digital competencies to sustainable competitive advantage of artisanal fisheries in Maluku: A case study in Kei Island, Southeast Maluku

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Abstract

Artisanal fisheries face significant challenges in achieving competitiveness and sustainability, particularly in resource-limited regions like Maluku, Indonesia. This study examines the influence of Entrepreneurial Orientation (EO) and Digital Competencies (DC) on Sustainable Competitive Advantage (SCA), guided by the Resource-Based View (RBV) framework. EO encompasses innovation, proactiveness, and risk-taking, while DC effectively uses digital tools to enhance decision-making and operational efficiency. Data were collected from 150 artisanal fishers in Kei, Southeast Maluku, through structured surveys. The findings indicate that EO significantly impacts SCA (path coefficient = .687), highlighting its role as a primary driver of long-term competitiveness. DC also contributes positively to SCA (path coefficient = .101), although its impact is more supportive, amplifying the effects of EO. Additionally, the relationship between EO and DC (path coefficient = .248) underscores their interconnectedness, as entrepreneurial behaviors foster the adoption of digital tools. EO and DC account for 51.6 percent of the variance in SCA, demonstrating their synergistic influence. This study advances RBV by integrating modern capabilities with traditional knowledge in artisanal fisheries, addressing gaps in understanding how internal resources contribute to competitive advantage in resource-constrained contexts. Practically, the findings emphasize the importance of fostering entrepreneurial behaviors and strengthening digital skills through targeted interventions, such as training programs and infrastructure development. Collaborative efforts among policymakers, stakeholders, and technology providers are essential for artisanal fishers to build resilience, enhance sustainability, and achieve long-term competitive success.

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Introduction

Indonesia, the world's largest archipelago with approximately 17,504 islands, has 77.11 percent of its territory covered by water, making the marine sector a crucial pillar of its economy (Kementerian Koordinator Bidang Kemaritiman dan Investasi, 2021). Small-scale fisheries (SSF) contribute 40 percent of global fish catches, with 90 percent of fishermen working in this sector (Smallhorn-West et al., 2022). However, a lack of official records complicates measuring changes in SSF (Warren & Steenbergen, 2021). Seafood, particularly fish, meets up to 54 percent of Indonesia's protein needs (UNDP), and the country supplies 10 percent of the world's fisheries demand (Hartriani, 2017).

Despite their critical role, SSF face significant environmental, economic, and social challenges, exacerbated by overfishing (Hilborn et al., 2020). Fishermen often struggle with limited assets, weak market access, and technological gaps, reinforcing poverty in coastal communities (Cahaya, 2015). Maluku, with its vast marine resources, has high fishery potential yet remains Indonesia's fourth poorest province, with 17.99 percent of its population living in poverty (Hahury et al., 2022).

To optimize fisheries management, the National Fisheries Management Area (WPPNRI) was established, with Maluku spanning three key areas: WPPNRI 714 (Banda Sea), WPPNRI 715 (Seram Sea), and WPPNRI 718 (Arafura Sea), which has Indonesia's highest potential for small pelagic (836,973 tons/year) and demersal fish (876,722 tons/year) (Ministry of Marine Affairs and Fisheries, 2022). The Kei Islands, positioned between WPPNRI 714 and 718, have seen the growth of SSF (Picaulima, 2021). Most fishing in Maluku is conducted by small and medium enterprises (Batubara et al., 2017), yet the sector prioritizes profit over sustainability (Salehe et al., 2024). Of Indonesia's 800,000 fishermen, 372,101 operate boats under 10 GT, making up over 70 percent of the fleet (Barlian et al., 2021).

The Resource-Based View (RBV) explains how firms sustain competitive advantage through unique, hard-to-imitate resources (Barney, 1986; Hamel & Prahalad, 1996; Madhani, 2010). Despite its prominence in strategic management, RBV's application to SSF remains limited (Pereira & Bamel, 2021). Recent critiques argue that sustainable competitive advantage (SCA) requires leveraging strategic resources against competition (Barney, 2002; Barney & Clark, 2007; Kraaijenbrink et al., 2010; Tajeddini et al., 2023).

This study examines how entrepreneurial orientation (EO) and digital competencies (DC) contribute to SCA in Maluku's artisanal fisheries, addressing gaps in RBV application within SSF in developing nations. Prior research has focused on large-scale fisheries or examined EO and DC separately. By exploring their interplay, this study provides insights into how internal capabilities drive sustainability in small-scale fisheries.

Literature Review

Entrepreneurship Orientation

Entrepreneurial orientation (EO) is a key driver of competitive success, particularly in resource-constrained environments. It comprises 5 dimensions: innovation, proactiveness, risk-taking, competitive aggressiveness, and autonomy (Lumpkin & Dess, 1996), enabling businesses to navigate uncertainty and sustain long-term advantages (Tajeddini et al., 2023). In artisanal fisheries, EO fosters product and process innovation, enhancing fishing techniques, supply chain efficiency, and value-added products. Innovations in fish preservation and packaging can expand market reach, boosting competitiveness (Tajeddini et al., 2023). EO also helps fishers leverage traditional knowledge and community networks for resilience (Kanatli, 2024; Nkwei et al., 2023).

However, socio-economic constraints, limited financial capital, weak market access, and inadequate training hinder EO's full potential in Maluku (Kollmann et al., 2021). Addressing these barriers requires microfinance, entrepreneurial training, and stronger market linkages to connect fishers directly to buyers. EO fosters collaboration within fishing communities, enhancing collective capacity through cooperatives and associations that enable resource pooling, knowledge sharing, and stronger market negotiations (Bernoster et al., 2020; Kanatli, 2024).

Recent studies highlight EO's role in digital transformation and sustainability. EO, when integrated with digital competencies, drives innovation, providing fishers access to real-time market data, resource optimization, and alternative revenue streams like eco-tourism (Bachmann et al., 2024). Additionally, EO supports environmental sustainability by aligning business practices with conservation goals. Fishers with strong EO are more likely to adopt sustainable techniques and invest in eco-friendly technologies, ensuring long-

term viability (Dias et al., 2021).

Other studies highlight digital entrepreneurial ecosystems as a means to enhance EO's impact. Liu et al. (2023) emphasize that integrated digital platforms, supportive policies, and accessible resources amplify entrepreneurial initiatives. For artisanal fishers in Maluku, such ecosystems provide real-time market data, logistical support, and digital financial services, reducing reliance on intermediaries and increasing profit margins. Community-driven digital tools also foster knowledge sharing and collective problem-solving.

Digital transformation strengthens EO by streamlining operations and enabling strategic decision-making. Wang et al. (2023) stress the need to align organizational structures with technological investments to improve resource management, supply chains, and market connectivity. Additionally, Li and Donta (2023) highlight the role of green supply chain practices within digital ecosystems, using advanced models like SNN-stacking to optimize resource use and sustainability in artisanal fisheries.

EO effectiveness in artisanal fisheries depends on socio-economic conditions, institutional support, and infrastructure. In Maluku, challenges like limited capital, weak market linkages, and inadequate training hinder its full potential. Targeted interventions microfinance, entrepreneurial training, and market development are crucial. Miles and Morrison (2018) stress that rural entrepreneurial ecosystems thrive when systemic barriers like policy gaps and resource constraints are addressed. Aligning EO with broader policies and fostering collaboration among government, NGOs, and private stakeholders can create a more supportive entrepreneurial environment.

The synergy between EO and digital competencies (DC) enhances innovation and sustainability. Wang et al. (2023) argue that proactive EO enables better use of digital tools, allowing fishers to monitor stocks, utilize predictive analytics, and access direct-to-consumer sales. Makhoulfi et al. (2022) emphasize integrating sustainability into EO strategies, ensuring long-term viability by balancing economic growth with environmental responsibility in a sustainability-conscious global market.

Digital Competencies

Digital competence (DC) refers to the skills, knowledge, and attitudes needed to effectively use digital technologies for information processing, collaboration, and communication (Janssen et al., 2013; He & Li, 2019; Wang et al., 2021). As digitalization reshapes markets,

businesses must leverage DC to innovate and remain competitive (Wang et al., 2024). DC ranges from basic skills like internet navigation to advanced competencies such as data analysis and problem-solving (Oberländer et al., 2020). In artisanal fisheries, applying DC such as using fishing monitoring apps—can enhance resource management and decision-making.

Beyond operational efficiency, digital competence (DC) is crucial for entrepreneurship. ICT expands social networks, unlocking opportunities and funding. Al-Mamary and Alraja (2022) highlight how digital skills shape entrepreneurial ambitions, fostering innovation and adaptability. Digital networks enable real-time, automated data management, reshaping policy, commerce, and social interactions. Torres and Godinho (2021) emphasize that digital entrepreneurial ecosystems drive innovation and competitiveness, particularly in rural areas. Artisanal fishers can leverage such systems for real-time market insights, supply chain optimization, and expanded buyer networks. Khan et al. (2022) further link DC to sustainability, showing how digital tools enhance efficiency when integrated with green supply chain practices. Predictive analytics, such as fisheries stock tracking, contribute to achieving Sustainable Competitive Advantage (SCA).

Digital technologies transform artisanal fisheries by improving efficiency, decision-making, and market access. Tools like fisheries monitoring systems and e-marketplaces reduce reliance on intermediaries and expand business opportunities (Baiyere et al., 2020). However, barriers such as limited infrastructure, affordability, and training gaps hinder adoption. Collaborative efforts among policymakers, NGOs, and private stakeholders are essential. Community-based digital literacy programs can empower fishers, fostering both economic resilience and sustainability.

Sustainable Competitive Advantage

Sustainability underscores the need for responsible environmental, social, and economic actions to meet present needs without compromising future generations (Clark & Dickson, 2003; Kates et al., 2001; Rai et al., 2021). Sustainable Competitive Advantage (SCA) builds on this foundation by enabling organizations to maintain superior market positions through unique, hard-to-replicate assets and capabilities (Li et al., 2022). Rooted in sustainability theory (Meadows et al., 1972), SCA integrates environmental, economic, and social dimensions, ensuring long-term value creation beyond short-term gains (Secchi et al., 2024). Artisanal fisheries

can achieve SCA by leveraging traditional knowledge, adopting sustainable fishing methods, and integrating innovative technologies to enhance efficiency and market positioning.

Digital resources are critical in sustaining competitive advantages. Technologies such as data analytics, blockchain, and IoT improve decision-making, supply chain transparency, and market access. However, Cao et al. (2021) stress the equal importance of physical resources. Digital innovations must be supported by strong infrastructure, including storage and transportation, to maximize impact. In artisanal fisheries, integrating digital tools with physical assets strengthens SCA by improving efficiency and resilience.

Entrepreneurial Orientation (EO) and Digital Competencies (DC) are key drivers of SCA. EO fosters innovation, proactivity, and risk-taking, enabling fishers to adapt to market shifts and identify new opportunities. DC equips them with the skills to utilize digital tools, enhancing operational efficiency and decision-making. The synergy between EO and DC is crucial: EO provides the strategic mindset for innovation, while DC offers the technical skills to implement it. For instance, fishers with a strong EO may recognize opportunities for direct sales via online platforms, while DC allows them to navigate these platforms effectively. This integration empowers artisanal fisheries to differentiate themselves in competitive markets.

Artisanal fisheries face multiple challenges in achieving Sustainable Competitive Advantage (SCA), including competition from larger commercial fisheries, fluctuating market conditions, and limited access to capital and technology. These challenges are further compounded by external pressures such as new market entrants, substitute products, and the bargaining power of suppliers and buyers (Hermawan, 2022). However, these obstacles also create opportunities for artisanal fishers to strengthen their market position by leveraging technological advancements and data-driven strategies.

Digital tools play a crucial role in enhancing transparency, efficiency, and competitiveness. Blockchain technology can verify sustainable fishing practices, increasing market trust and appeal. Real-time analytics optimize resource use and reduce operational costs, contributing to long-term sustainability. Soluk and Kammerlander (2021) emphasize the importance of aligning technological investments with organizational capabilities to enable digital transformation. Artisanal fisheries can integrate traditional fishing methods with modern digital tools to establish a unique competitive advantage. Green supply chain practices further support

SCA, particularly in environmentally sensitive industries (Khan et al., 2024). Digital innovations help artisanal fisheries meet the growing demand for eco-friendly products, enhancing their market position. Belhadi et al. (2022) highlight the role of digital entrepreneurial ecosystems—integrated platforms and supportive policies that provide critical resources and networks to sustain competitive advantages.

Achieving SCA in artisanal fisheries requires a strategic combination of Entrepreneurial Orientation (EO), Digital Competencies (DC), and sustainable practices. Addressing challenges such as resource constraints and market volatility necessitates investments in digital and physical infrastructure, alongside policies that promote innovation and sustainability. As digital transformation reshapes industries, artisanal fisheries that embrace adaptation and innovation will secure lasting competitive advantages.

Resource-Based View (RBV) as the Foundation

The Resource-Based View (RBV), a cornerstone of strategic management theory, serves as the theoretical foundation for this study. Introduced by Barney (1991), RBV asserts that an organization's internal resources and capabilities—if they are valuable, rare, inimitable, and non-substitutable (VRIN)—are fundamental to achieving and sustaining competitive advantage. These resources enable organizations to develop unique value propositions that are difficult for competitors to replicate. In the context of artisanal fisheries, RBV provides a framework for analyzing how internal assets such as traditional knowledge, entrepreneurial orientation (EO), and digital competencies (DC) contribute to long-term success. By effectively leveraging these resources, artisanal fisheries can enhance their resilience, adaptability, and competitiveness in dynamic and resource-constrained environments.

RBV has been widely applied in diverse sectors to explore how internal resources contribute to competitive advantage:

Digital Resources: Cuthbertson and Furseth (2022) demonstrated that dynamic capabilities, supported by physical and digital resources, are essential for innovation in digital service industries.

Entrepreneurial Orientation: Tajeddini et al. (2023) emphasized EO's role as a key internal resource driving innovation and adaptability, particularly in environments with limited external opportunities.

Traditional knowledge and local practices have historically served as unique resources for artisanal

fisheries. However, this study extends the Resource-Based View (RBV) framework by incorporating modern capabilities, namely, Entrepreneurial Orientation (EO) and Digital Competencies (DC) to analyze how these combined resources contribute to Sustainable Competitive Advantage (SCA). This integration underscores the evolving nature of artisanal fisheries as they balance traditional practices with digital transformation.

This study contributes to the ongoing development of RBV by examining the synergistic interaction between EO and DC. While previous research has often treated these competencies independently, this study posits that their combination generates dynamic capabilities, enabling artisanal fisheries to adapt more effectively to market and environmental challenges. Recent studies by Wang et al. (2023) and Liu et al. (2023) advocate for updating RBV to account for digital transformation, enhancing its relevance for contemporary industries.

Unlike studies that primarily focus on large-scale industries or digitally native enterprises (Li & Donta, 2023), this research situates EO and DC within the socio-economic and ecological realities of artisanal fisheries in Maluku. These fisheries, which operate at the intersection of traditional knowledge and emerging technologies, offer a distinctive case for examining the interplay between conventional and modern resources. Additionally, integrating sustainability principles into the RBV framework extends its applicability by addressing pressing challenges such as environmental conservation and social equity.

The theoretical model proposed in this study builds upon RBV, positing that EO and DC are interdependent internal resources that collectively drive SCA:

Entrepreneurial Orientation (EO): EO fosters innovation, proactiveness, and risk-taking, enabling fishers to identify opportunities, develop strategies, and respond to challenges effectively.

Digital Competencies (DC): DC provides the technical skills and tools to implement and sustain these innovative strategies, including digital marketplaces, fisheries monitoring applications, and data analytics.

This model positions EO and DC as complementary resources that amplify each other's impact, creating a competitive edge that aligns with RBV's principles. By applying this framework to artisanal fisheries, the study validates RBV and extends its application to include dynamic, evolving resources.

Methodology

Research Design

This study adopts a quantitative research design, underpinned by the philosophy of positivism, to investigate the influence of Entrepreneurial Orientation (EO) and Digital Competencies (DC) on Sustainable Competitive Advantage (SCA) in artisanal fisheries in Maluku. The research focuses on traditional fishers, primarily in Kei, Southeast Maluku, a region characterized by limited resources and infrastructural challenges.

Hypotheses Development

The hypotheses in this study are developed based on the Resource-Based View (RBV), which suggests that internal resources and capabilities contribute to sustained competitive advantage (Barney, 1991). In particular, entrepreneurial orientation (EO) and digital competencies (DC) are examined for their potential impact on sustainable competitive advantage (SCA) in artisanal fisheries. This section provides a structured discussion leading up to each hypothesis.

Entrepreneurial Orientation and Sustainable Competitive Advantage

Entrepreneurial Orientation (EO) is a key determinant of competitive advantage, particularly in resource-constrained environments. EO consists of three primary dimensions: innovation, proactiveness, and risk-taking (Lumpkin & Dess, 1996). Firms with a strong EO are more likely to innovate, anticipate market changes, and take calculated risks, leading to sustained competitive advantages (Tajeddini et al., 2023).

In the context of artisanal fisheries, EO enables fishers to adopt innovative fishing techniques, explore new markets, and develop value-added products, enhancing their long-term competitiveness. Research suggests that higher levels of EO are associated with improved business performance and resilience in dynamic environments (Kanatli, 2024). Therefore, Hypothesis 1 (H1) proposes that Entrepreneurial Orientation (EO) has a significant positive influence on Sustainable Competitive Advantage (SCA)

Digital Competencies and Sustainable Competitive Advantage

Digital Competencies (DC) refer to the ability to effectively use digital tools and technologies to optimize operations, facilitate decision-making, and improve market access (Oberländer et al., 2020). As markets become increasingly digital, possessing strong digital skills allows businesses to enhance efficiency, engage with broader consumer bases, and streamline supply chain management (Wang et al., 2024).

In artisanal fisheries, digital tools such as GPS tracking, online marketplaces, and data analytics platforms provide fishers with critical insights into resource availability, pricing trends, and consumer demand (Khan et al., 2022). While traditional fishing methods remain integral, integrating digital solutions can enhance productivity and competitiveness. Therefore, Hypothesis 2 (H2) proposes that Digital Competencies (DC) have a positive influence on Sustainable Competitive Advantage (SCA).

Entrepreneurial Orientation and Digital Competencies

Entrepreneurial Orientation fosters a mindset that encourages innovation, experimentation, and openness to new technologies. Studies indicate that firms with high EO are more likely to adopt digital tools, as they actively seek new opportunities and embrace technological advancements (Liu et al., 2023).

For artisanal fishers, an entrepreneurial mindset may drive the adoption of digital solutions to improve operational efficiency and market engagement. Proactive fishers are more inclined to use mobile applications for weather forecasting, digital payment systems, and e-commerce platforms to expand their market reach. Thus, EO is expected to play a crucial role in shaping DC development. Therefore, Hypothesis 3 (H3) proposes that Entrepreneurial Orientation (EO) positively influences the development of Digital Competencies (DC).

Data Collection

Data were collected through a structured questionnaire survey targeting artisanal fishers in Kei, Southeast Maluku. The sampling frame consisted of fishers operating small-scale traditional vessels, representing the primary unit of analysis. One hundred fifty respondents participated in the survey, ensuring adequate representation of the target population. This study examines entrepreneurship orientation, digital competency, and sustainable competitive advantage. The survey questionnaire was used to collect data from the analysis units, which consisted of groups of small-scale fishermen/artisanal fishers in Kei, Southeast Maluku.

Measurement and Scale Development

This study employed a structured questionnaire to measure Entrepreneurial Orientation (EO), Digital Competencies (DC), and Sustainable Competitive Advantage (SCA) using a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The measurement items were adapted from validated sources and tailored to the artisanal fisheries context.

Entrepreneurial Orientation (EO)

Entrepreneurial Orientation was operationalised as a multidimensional construct reflecting the strategic posture of fishers in managing and developing their business activities. Consistent with the framework proposed by Lumpkin and Dess (1996), EO comprises 5 key dimensions: innovation, proactiveness, risk taking, competitive aggressiveness, and autonomy. In this study, EO was measured using five reflective items that capture the extent to which artisanal fishers introduce new techniques, seek emerging market opportunities, take calculated financial risks, compete actively in the marketplace, and make independent business decisions. The detailed measurement items and their sources are presented in [Table 1](#).

Table 1 Measurement items of entrepreneurial orientation (EO)

Code	Item	Source
EO1	I frequently introduce new fishing techniques or business strategies.	Lumpkin and Dess (1996)
EO2	I actively seek new market opportunities for selling my fish.	Lumpkin and Dess (1996)
EO3	I am willing to take financial risks to improve my business.	Lumpkin and Dess (1996)
EO4	I frequently engage in competitive pricing and marketing strategies.	Lumpkin and Dess (1996)
EO5	I make independent business decisions without relying on external guidance.	Lumpkin and Dess (1996)

Digital Competencies (DC)

Digital Competencies were conceptualised as the set of technical abilities and digital literacy skills that enable artisanal fishers to effectively utilise technology in their business operations. Drawing on Oberländer et al. (2020), DC encompasses technical skills, digital literacy, and practical technology usage in daily economic activities. In this study, Digital Competencies were measured using four reflective items that capture the use of mobile applications, digital financial tools, online information access, and digital marketing platforms. The detailed measurement items and their sources are presented in Table 2.

Sustainable Competitive Advantage (SCA)

Sustainable Competitive Advantage was conceptualised as the long term ability of artisanal fisheries to maintain superior market positioning, financial stability, and resource sustainability. Grounded in the resource based view (Barney, 1991; Li et al., 2022), SCA reflects the capacity of business actors to leverage valuable, rare, inimitable, and non substitutable resources in order to achieve sustained performance over time. In this study, Sustainable Competitive Advantage was measured using four reflective items capturing income stability, competitive strength, sustainable operational practices, and long term resource management. The detailed measurement items and their sources are presented in Table 3.

Second-order construct explanation

EO and DC were modeled as second-order constructs, meaning they were formed by multiple dimensions rather than being treated as a single-variable construct. This approach was justified by prior research (Wang et al., 2023), where second-order modeling allows for a more

comprehensive understanding of EO and DC as multi-dimensional factors influencing SCA.

Reliability and validity

The internal consistency of the scales was verified using Cronbach's Alpha and Composite Reliability (CR), both exceeding the recommended 0.7 threshold (Hair et al., 2019). Convergent validity was confirmed with Average Variance Extracted (AVE) > .5, while discriminant validity was assessed using the Fornell-Larcker Criterion and Heterotrait-Monotrait Ratio (HTMT).

Data Analysis

Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM), a robust technique suited for predictive and exploratory research. PLS-SEM was chosen for its flexibility in handling complex models with small sample sizes and non-normal data distributions. The analysis followed a structured approach:

Outer Model Evaluation: Included assessments of reliability (Cronbach's Alpha, Composite Reliability) and validity (Convergent and Discriminant Validity).

Inner Model Evaluation: Examined path coefficients, R-squared values, and effect sizes (f^2) to assess the relationships between constructs.

Hypothesis Testing: Path significance was determined using bootstrapping with 5,000 subsamples, ensuring the robustness of the results.

The evaluation of the Outer and Inner Models in PLS-SEM involves testing validity, reliability, and model fit. The Outer Model is assessed through outer loadings ($\geq .60$ or $.70$) for validity, Cronbach's Alpha and Composite Reliability ($\geq .70$) for reliability, and AVE ($\geq .50$) for

Table 2 Measurement items of digital competencies (DC)

Code	Item	Source
DC1	I use mobile applications to track fish prices.	Oberländer et al. (2020)
DC2	I am proficient in using digital tools for financial transactions.	Oberländer et al. (2020)
DC3	I access weather forecasts and fishing zone data online.	Oberländer et al. (2020)
DC4	I use social media or online platforms to market my fish.	Oberländer et al. (2020)

Table 3 Measurement items of sustainable competitive advantage (SCA)

Code	Item	Source
SCA1	My fishing business has a stable and growing income.	Li et al. (2022)
SCA2	I can compete with larger fisheries in the market.	Li et al. (2022)
SCA3	I adopt sustainable fishing practices to maintain long-term viability.	Li et al. (2022)
SCA4	My fishing techniques ensure continued resource availability.	Li et al. (2022)

convergent validity. Discriminant validity is verified using the Fornell-Larcker Criterion and HTMT ($< .90$). The Inner Model evaluation includes multicollinearity testing ($VIF < 5$), hypothesis testing ($p < .05$), effect sizes (f^2), and path coefficients. Model fit is determined through R^2 , Q^2 , SRMR ($< .08$), GoF Index, PLS Predict, and CVPAT to assess predictive strength.

Result

All indicators have loadings above .6, with most above .7, indicating strong relationships between the indicators and their respective constructs, as illustrated in Figure 1.

Construct reliability and validity are essential in social science research to ensure precise measurements. All constructs Digital Competencies, Entrepreneurial Orientation, and Sustainable Competitive Advantage

have Cronbach’s Alpha values above .7, indicating strong internal consistency. Digital Competencies shows a Composite Reliability (CR) of .980, and rho A values exceed .9, confirming excellent reliability. AVE values above .5 for all constructs demonstrate that over 50 percent of the variance is explained, ensuring convergent validity. These results, as shown in Table 4, validate the reliability and suitability of these constructs for research and measurement.

The path coefficient analysis reveals key relationships between entrepreneurial orientation (EO), digital competencies (DC), and sustainable competitive advantage (SCA) in artisanal fisheries. EO has a strong positive impact on SCA (.687), emphasizing its role in fostering innovation, proactiveness, and risk-taking for competitive advantage. DC’s direct influence on SCA is weaker (.101), suggesting it is most effective when combined with entrepreneurial strategies. The moderate relationship between EO and DC (.248) indicates that an

Table 4 Construct reliability and validity

	Cronbach’s Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Digital Competencies	.978	.982	.980	.765
Entrepreneurship Orientation	.920	.930	.931	.530
Sustainable Competitive Advantages	.936	.946	.944	.584

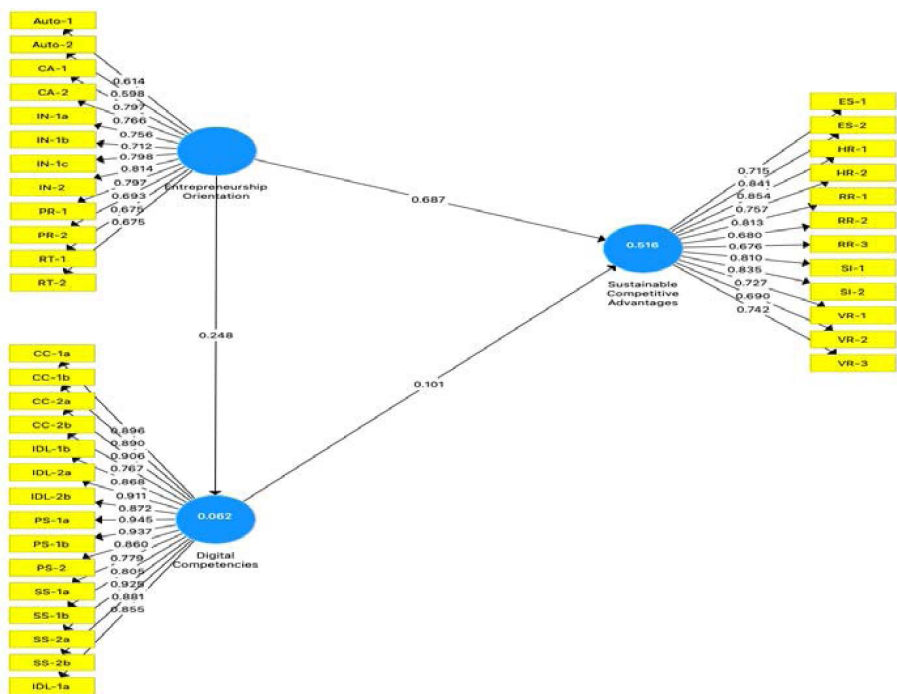


Figure 1 Loading factor

Table 5 Path coefficients

	Digital Competencies	Entrepreneurship Orientation	Sustainable Competitive Advantages
Digital Competencies			.101
Entrepreneurship Orientation	.248		.687
Sustainable Competitive Advantages			

entrepreneurial mindset encourages digital adoption. As shown in Table 5, the findings suggest that strengthening EO is crucial for enhancing SCA, with DC serving as a supportive factor.

The R-squared values presented in Table 6 indicate the explanatory power of the model for the dependent variables. Sustainable Competitive Advantage (SCA) has an R^2 of .516, meaning EO and DC together explain 51.6 percent of its variance, demonstrating moderate to strong influence. In contrast, Digital Competencies (DC) has an R^2 of .062, showing that EO accounts for only 6.2 percent of its variance, suggesting other influential factors outside this model.

Discussion

This study underscores the critical role of entrepreneurial orientation (EO) and digital competencies (DC) in shaping sustainable competitive advantage (SCA) among artisanal fisheries in Maluku. The findings highlight the importance of internal capabilities in overcoming resource constraints. EO has the strongest impact on SCA, with a path coefficient of .687, reinforcing the significance of innovation, proactiveness, and risk-taking in achieving competitiveness. This aligns with prior research (Lumpkin & Dess, 1996; Tajeddini et al., 2023) and the Resource-Based View (RBV) framework, which emphasizes internal resources as key drivers of long-term success (Barney, 1991; Pereira & Bamel, 2021). The model's R-squared value of .516 suggests that EO and DC together explain over 50 percent of the variance in SCA, supporting previous studies (Oberländer et al., 2020; Wang et al., 2024) on the synergy between technological adoption and strategic entrepreneurship.

While digital competencies (DC) positively correlate with sustainable competitive advantage (SCA), their direct impact is relatively minor compared to entrepreneurial orientation (EO), as indicated by a path coefficient of .101. This contrasts with findings in more technologically advanced contexts, where DC plays a greater role in competitive advantage (Oberländer et al., 2020). The moderate relationship between EO and DC, with a path coefficient of .248, suggests that

Table 6 R square

	R Square	R Square Adjusted
Digital Competencies	.062	.062
Sustainable Competitive Advantages	.516	.516

EO supports the adoption and effective use of digital tools. This weaker impact of DC in Maluku can be attributed to socio-economic constraints, including limited technological access, inadequate infrastructure, and low digital literacy. Fishers in Maluku face unique challenges, such as resource limitations, low bargaining power, and reliance on traditional practices. EO helps mitigate these challenges by fostering an innovative mindset, enabling fishers to identify new opportunities and adapt to changing market conditions. Those with strong EO are more likely to leverage digital tools, such as fisheries monitoring applications, to optimize operations and enhance resource management.

The limited development of DC, evidenced by an R-squared value of .062, indicates that EO alone is inadequate for addressing the broader challenges associated with digital adoption. Access to affordable technology, training programs, and infrastructure are essential external factors for improving DC. The findings are consistent with Hu et al. (2023) and Probst (2020), who highlight the significance of systemic interventions for facilitating digital transformation in resource-constrained environments.

The interaction between EO and DC yields valuable insights for enhancing the competitiveness and sustainability of artisanal fisheries. Policymakers and stakeholders must prioritize initiatives promoting entrepreneurial behaviors and improving digital competencies.

- Capacity-building programs in entrepreneurial training emphasizing innovation, risk-taking, and market engagement can enable fishers to leverage emerging opportunities.

- Digital inclusion, through the provision of affordable and accessible digital tools and training for effective utilization, can enhance the impact of EO.

- Collaborative interventions involving partnerships among government agencies, NGOs, and private

stakeholders are crucial for addressing systemic barriers and fostering enabling environments for artisanal fishers.

This study offers insights into sustainable development strategies in resource-limited contexts, specifically within the artisanal fisheries sector. The findings illustrate the essential role of entrepreneurial orientation (EO) and the supportive function of digital competencies (DC) in enhancing resilience, promoting sustainability, and securing long-term competitiveness. These insights are relevant to policymakers, development practitioners, and industry stakeholders focused on fostering sustainable economic growth in analogous contexts.

Future research should examine further factors affecting the development of digital competencies, including infrastructure availability, technology accessibility, and institutional support mechanisms. Examining the influence of external networks and partnerships on digital adoption may yield a deeper insight into how small-scale fishers can efficiently utilize digital tools. Additionally, examining sector-specific challenges in adopting entrepreneurial strategies and digital technologies may provide focused interventions to improve competitive advantages in other resource-constrained industries.

This study highlights the essential role of entrepreneurial orientation (EO) in attaining competitive success and demonstrates the supportive influence of dynamic capabilities (DC). The internal resources collectively enable artisanal fisheries in Maluku to address economic challenges, enhance operational efficiency, and strengthen their market position. Addressing systemic barriers and fostering the integration of entrepreneurial and digital competencies can enable policymakers and practitioners to improve sustainable development outcomes that benefit local economies and global food systems. The findings underscore the necessity of coordinated efforts to improve the capacity of resource-limited sectors, thereby ensuring their long-term viability and success.

Conclusion and Recommendation

Focusing on artisanal fisheries in Maluku, this study emphasizes the importance of Digital Competencies (DC) and Entrepreneurial Orientation (EO) in creating Sustainable Competitive Advantage (SCA) in contexts with low resources. According to the report, traditional industries may adapt to changing market dynamics and secure long-term competitiveness by combining these aspects.

Research shows that EO is a key factor in SCA because of its positive effects on encouraging initiative, creativity, and risk-taking. Because of these qualities, small-scale fishers can face complicated problems and take advantage of new chances. The significance of combining entrepreneurial and digital skills to develop a well-rounded approach is highlighted by the fact that DC has a smaller direct impact than EO, but its supporting role strengthens EO's benefits. The fact that EO and DC work together to explain a large amount of the variation in SCA highlights how important they are.

This study offers practical recommendations for enhancing competitiveness and sustainability in traditional sectors like artisanal fisheries. Policymakers and organizations are encouraged to prioritize capacity-building initiatives to foster entrepreneurial behaviors. Small-scale fishers can better navigate market challenges and seize emerging opportunities by cultivating innovation, proactive decision-making, and adaptability. Additionally, investments in digital tools, infrastructure, and targeted training programs are essential to strengthen fishers' digital skills, enabling them to adopt and effectively utilize technology to improve operational efficiency and market access. A holistic approach that integrates entrepreneurial orientation (EO) and digital competencies (DC) within strategic management frameworks can provide organizations with a comprehensive and sustainable competitive advantage.

Furthermore, collaboration among governments, NGOs, and private stakeholders is critical. These partnerships can provide access to resources, networks, and support systems that empower fishers to overcome systemic barriers and achieve long-term success. Together, these measures can drive sustainable development and resilience in resource-constrained environments.

Various elements, such as social networks, cultural attitudes, and external market conditions, shape the dynamic link between EO and DC. This relationship could be further explored in future research. Such studies could shed light on how these factors combine to promote or impede the growth of digital and entrepreneurial skills. Longitudinal studies that follow their development over time would be very helpful in understanding the long-term impacts of these competencies and the means to maintain a competitive edge further. It is possible to confirm the framework's usefulness by extending it to other traditional areas; doing so may also reveal fresh chances to generalize its principles and improve its application.

The study emphasizes that EO is the main force causing SCA and that DC is an essential supplementary

component. Taken as a whole, these assets provide a solid foundation for flourishing in settings with limited means. Stakeholders may facilitate transformational growth, resilience, and sustainable development by overcoming current obstacles and capitalizing on the interaction between entrepreneurial and digital capabilities; this will help close the gap between conventional wisdom and cutting-edge innovation.

Conflict of Interest

The authors declare that there is no conflict of interest.

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