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Entrepreneurial Orientation, Innovation, Ecosystem, and Digital Literacy on Venture Growth via Opportunity Recognition

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ABSTRACT

Purpose: The main objective of the study is to study the impact of entrepreneurial orientation, innovation capability, entrepreneurial ecosystem support, and digital literacy on firm growth considering opportunity recognition as a mediating variable.
Method: Quantitative research was through a questionnaire distributed to 235 entrepreneurial actors in Java Island and of Yogyakarta Special Region with 43 samples determined with purposive sample technique. Data were processed in SPSS, where descriptive statistics, Pearson correlation, reliability analysis, multiple regression, and mediation.
Findings: The findings of this study indicate that four antecedents namely entrepreneurial orientation, innovation capability, ecosystem support, and digital literacy have a positive influence on growth of venture. Opportunity recognition mediates the relationship between the individual variables and venture growth, thus underlining the importance of this factor in the transformation of strategic entrepreneurial resources into performance outcomes.
Novelty: The current study proposes an integrative model linking four categories of antecedents with a mediating cognitive mechanism (opportunity recognition), supplementing previous, partial explanations. It offers empirical evidences in an emerging market setting where the entrepreneurial ecosystem and digital literacy play an increasingly role not thoroughly covered.
Implications: The current study proposes an integrative model linking four categories of antecedents with a mediating cognitive mechanism (opportunity recognition), supplementing previous, partial explanations. It offers empirical evidences in an emerging market setting where the entrepreneurial ecosystem and digital literacy play an increasingly role not thoroughly covered.

1. Introduction

Entrepreneurship has been a major engine of global recovery and renewal in recent years, particularly amid post-pandemic dislocations and rapid digitalization. There is an emerging realization that contemporary entrepreneurship can play a key role in creating jobs, economic vibrancy, and societal innovativeness (Hmama 2025). In developed and developing countries, digitalization has opened up entrepreneurial opportunities and changed the classic structures of business as usual and provided new avenues of venture growth (Ahmed et al. 2025; Omari et al. 2025). Furthermore, the worldwide trend

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to knowledge intensive economies also makes a significant factor concerning innovation capabilities and strategic orientation in the search for a competitive advantage were the companies stands in the future (Al-Mamary 2025; Qalati, Tajeddini, and Gamage 2025). At the same time, the interest in the entrepreneurial ecosystems, as the complex of networks, institutions and regulations that supports the development of start-ups, has emerged as a critical condition for entrepreneurial success (Ding et al. 2025; Welsh, Lanchimba, and Bausch 2025). Moreover, entrepreneurs need to develop Digital Literacy as a prerequisite skill, considering the role of technology which our marketing efforts of growing your business in an interconnected economy (Pigola et al. 2025; Susantyo, Setiawan, and Abdullah 2025). These trends reflect a radical reformulation of excessive behaviour in entrepreneurship, where digital capabilities, ecosystem assistance, strategic direction, and innovation capacity are indeed converging to shape effective venture performance. However, despite these developments, there is still an imbalance in how these factors co-operate together to contribute to venture's growth especially when it comes to the opportunity recognition providing underpinning for deeper insight into their integrative impact upon venture's growth.

Notwithstanding growing interest on entrepreneurship, many startup rarely scale up because of the fragmentation of skills and lack of internal connection between entrepreneurial orientation, innovation, digital readiness, and ecosystem engagement (Kumar, Murthy, and Tiwari 2025; Shatila, Aránega, and Urueña 2025). There is however, one key barrier: with varying levels of entrepreneurs what is to ensure the identification and exploitation of opportunities in complex settings that connect the inside and outside of the individual (Petridou, Sparf, and Zahariadis 2025). Some of these entrepreneurs are situated in flourishing entrepreneurial environments, but others do not have enough means to create an impact. Further, despite broader digital inclusion, digital literacy divides persist and find traction as barriers to firm scalability and success in digital transformation (Alyasi and Al Mubarak 2024; Ghosh and Bhatia 2025). Furthermore, an overall, holistic consideration of the interdependencies of these entrepreneurial factors and their interrelationships are not well examined through mediating mechanisms such as opportunity recognition (Otache 2025). Therefore, a multi-level method is required to examine how these enablers interact and contribute to entrepreneurial start-ups and sustainability.

This research is based on a combination of established theories. Entrepreneurial Orientation (EO) Established in the work of (Farooq and Salam 2025), EO is formulated along dimensions such as innovativeness, risk taking, and proactiveness Abdulsamad et al. (2025), all of which are of the ways that measure the successfulness of their entrepreneurship. Teece (2010), dynamic Capabilities concept, as a part of the Innovation Capability theory, can be consolidated with the idea that it is necessary for firms to reconfigure both internal and external competences due to such rapidly evolving settings. The Entrepreneurial Ecosystem approach, as mentioned by Stam (2015), suggests that conducive ecosystems stimulate the resources and institutional support necessary for ventures to grow (Kansheba et al. 2025; Zhaishylyk and Abdimomynova 2025). Lastly, Opportunity Recognition is the core of entrepreneurship, when an individual realises profitable possibilities before others (Baumgärtner et al. 2025; Rabetino et al. 2025). These theories collectively provide a multidimensional explanation of how entrepreneurial inputs affect growth via cognitive and context processes.

However, despite increasing coverage of the topic in the literature, a gap persists about how this integration of entrepreneurial orientation, innovation capability, digital literacy, and ecosystem support impacts venture growth. However, previous studies usually examine each of the determinants separately, without considering the interrelationships between these determinants and the joint effects on entrepreneurial performance (C. Chen et al. 2025; González-Ramos et al. 2025). For instance, some studies have stressed the direct impact of entrepreneurial orientation on firm performance without taking cognitive factors such as opportunity recognition into account (Agazu, Kero, and Debela 2025; Jaboob, Iqbal, and Hameed 2025). Some other studies have addressed digitalization in entrepreneurship while disregarding the basic role of ecosystems and innovation in low tech environments (J. Chen, Mai, and Liu 2025; Ye 2025). In addition, mixed results are found regarding the mediating

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effect of opportunity recognition, with some studies showing significant effects (Wood et al., 2021), while others showing only slight effects (Mazzoni, Naudé, and Innocenti 2025). These paradoxes point to a theoretical and empirical void in explaining how entrepreneurs resolve internal and external dynam ics to support continued grow (Esau et al. 2025). Therefore, this study is innovative in integrating together more than one dimension such as entrepreneurial behavior, contextual support, technological capability, and cognitive mechanism into a lean model. It contributes to the existing knowledge base by framing opportunity recognition as more than just a psychological disposition; rather as a strategic mediating condition that links entrepreneurial inputs with growth outputs. Furthermore, along with a substantial portion of earlier works carried out in the West, this research uses data from a developing economy which enables the generalization and interpretation in a different entrepreneurial environment. This holistic view also responds to calls for more differentiated, systems-based models of entrepreneurship (Audretsch et al., 2023; Li et al., 2021; Stam & van de Ven, 2021; Kraus et al., 2022) and urgent international demands for scalable, inclusive, and resilient models of entrepreneurial growth (Li et al., 2021).

The purpose of this paper is to investigate the impact of entrepreneurial orientation, innovation capability, entrepreneurial ecosystem support and digital literacy on venture growth, while opportunity recognition plays a mediating role. In particular, it examines ten propositions to explore whether these entrepreneurship conditions have direct and indirect effects on growth performances. Theoretical Implications These results are expected to contribute to the theoretical development of nascent entrepreneurship by providing an aggregated view as to how ventures overcome the challenges associated with dynamic contexts. From a social perspective, this research extends the literature by determining possible levers that entrepreneurs can use to scale their ventures, particularly in emerging market settings. It also contributes policy implications for educators, incubators and government in order to stimulate opportunity recognition as well as effort to coordinate digital and ecosystem resource to capitalize sustainable entrepreneurship.

2. Critical review

2.1The influence of Entrepreneurial orientation on venture growth

Entrepreneurial orientation (EO) is widely recognized as a key driver of venture growth, encapsulating dimensions such as innovativeness, proactiveness, and risk-taking that enable firms to identify and exploit emerging opportunities in dynamic environments. Firms with strong EO are more likely to initiate strategic actions that differentiate them from competitors, adapt quickly to market changes, and leverage innovation for performance enhancement (Lumpkin & Dess, 1996). Empirical studies confirm the positive link between EO and various indicators of firm growth, including revenue expansion, market share, and internationalization (Covin & Wales, 2019; Wales et al., 2021). Moreover, EO contributes to the development of dynamic capabilities that allow entrepreneurs to recombine resources, anticipate customer needs, and enter new markets more effectively (Boso et al., 2013). Recent findings also highlight that EO influences not only short-term performance but long-term sustainability through its alignment with innovation strategies and customer responsiveness (Anderson et al., 2015). In emerging markets, where uncertainty is often higher, EO serves as a resilience mechanism that enhances adaptability and venture scalability. These findings support the hypothesis that entrepreneurial orientation has a significant positive effect on venture growth.

H1: Entrepreneurial orientation has a positive effect on venture growth.

2.2The influence of Innovation capability on venture growth

Innovation capacity is an important factor in the development of venture, allowcompanies produce new products and process that are able to meet market demand s and are capable of creating competitive advantages. Innovative ventures are abler to distinguish themselves, to provide additional value to their customers, and to pounce on technological and environmental changes (Teece, 2007). Surveys depict that innovation capability not only triggers development of the products but also influences scalability and sustainability in the long term, especially in resource scarce and fast changing environments (Zhou & Wu, 2010). In addition, capacity for innovation enhances organizational learning and strategic flexibility through which

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companies can exploit new knowledge and convert it into marketable products (García-Sánchez et al., 2018). Several studies indicate that firms that have higher innovation capability tend to achieve better growth performance with respect to market growth, profitability, and international competitiveness (Ritala et al., 2015). "In a time when ventures and companies are dealing with complex environments and transitioning to digital, the ability to innovate is all the more important to their growth and resilience. Thus, it is proposed that innovation capability positively influences venture growth.

H2: Innovation capability has a positive effect on venture growth.

2.3The influence of entrepreneurial ecosystem support on venture growth

Entrepreneurial ecosystem support contributes to the development of venture growth, with support that provides access to requisite resources, networks, institutions and markets needed for entrepreneurial success. A successful ecosystem is formed by factors like financial capital, good government policies, mentoring, education, incubators and culture of innovation that together make scaling up a venture an efficient and sustainable process (Stam,2015). Research empirically shows that entrepreneurs embedded in these dynamic environments are able to recognize opportunities, gain legitimacy, and enjoy higher survival rates (e.g. in their initial growth stages) quicker (Spigel, 2017). Moreover, ecosystem support promotes knowledge spill-overs, collaborative innovation, and strategic partnerships that contribute to accelerating product development and market extension (Autio et al., 2018). In such (frugal) environments or in terms of developing markets in general, ecosystem entities such as incubators and accelerators prove as critical scaffolding mechanisms for ventures to compensate for institutional voids (Acs et al., 2017). Positive interactions among ecosystem actors create a positive feedback loop that influences entrepreneurial behaviors and performance. As such, we theorize that support from the entrepreneurial ecosystem has a strong positive impact on venture growth.

H3: Entrepreneurial ecosystem support has a positive effect on venture growth.

2.4The Influence of digital Literacy on venture growth

The significance of digital literacy as important to businesses cannot be overemphasized, especially in an age of technology disruption and digital transformation. It is not just basic IT skills.13 Digital literacy is the understanding that the same increase in demand for new skills is a prerequisite in the digital age, requiring a digital mindset (working with digital tools, digital platforms and digital data to make informed decisions and to Innovate, and engage with customers better) (Ng, 2012). Entrepreneurs with strong digital literacy are more capable of utilizing e-commerce, digital marketing, cloud computing and data analytics, helping small firms to scale operation, enhance efficiency, and enter new markets (Maroufkhani et al., 2022). In addition, digital skills can support entrepreneurs in leveraging digital ecosystems, connecting to global value chains, and reacting to adapted consumer needs (Scuotto et al., 2021). In developing economies, digital literacy serves as a driver of inclusive economic development, addressing resource asymmetries and enabling the formalization of ventures and access to financial services (Bouwman et al., 2019). The literature consistently provides evidence that digitally knowledgeable entrepreneurs in small businesses experience greater revenue growth, more customers, and innovation output. Therefore digital literacy is expected to have a positive and significant impact on venture growth.

H4: Digital literacy has a positive effect on venture growth.

2.5The Influence of opportunity recognition on venture growth

Opportunity recognition is widely recognized as a key aspect of the entrepreneurial process and is pivotal for the growth of ventures, as it allows entrepreneurs the ability to discover, evaluate, and exploit possibilities in the market space before rivals do. It represents a cognitive process of associations by which entrepreneurs link shifts in the market to opportunities through their existing stock of knowledge and resources to develop novel solutions (Shane & Venkataraman, 2000). For example, ventures that are good at scanning their environment for opportunities are more likely to develop products rapidly (Knight, 1967), penetrate neglected customer segments (Tushman & Anderson, 1986), form new business models that lead to growth (Baron, 2006), and so forth. Evidence demonstrates that the capacity

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of identifying opportunities is correlated by firm performance, especially in dynamic context, where agility and market responsivness become key factors for survival and growht (George et al, 2022, p:19). In addition, successful opportunity recognition supports firms in their strategic decision-making and allocation of resources, and it contributes to a faster scaling up and long-term competitiveness (Wood et al. Amid an acceleration in entrepreneurial knowledge intensity and context specificity, the aptitude to sense and seize novel opportunities emerges as a key driver of entrepreneurial venture longevity. It is hypothesized that opportunity perception has a positive impact on venture growth.

H5: Opportunity recognition has a positive effect on venture growth.

2.6Development of mediation variable: 0pportunity recognition

In doing so, the role of opportunity recognition, as an important mediating mechanism, and its effect in translating entrepreneurial inputs like orientation, innovation competence, ecosystem support, and digital literacy to enterprise growth are elucidated. Entrepreneurial orientation (EO) encourages proactivity and innovativeness a firm's proclivity towards recognizing and crafting unexploited opportunities can be improved (Lumpkin & Dess, 1996; Baron, 2006). Second, innovation capacity facilitates experimentation and recombination of knowledge, enhancing the chances for identifying valuable market voids (Teece, 2007; Wood & McKelvie, 2015). Entrepreneurial ecosystems, that make available networks, mentorship and diverse information flows, contribute to a high level of cognitive alertness, which in turn leads to more precise and efficient opportunity recognition (Spigel, 2017; Autio et al., 2018). Second, digital literacy enhances access to digital platforms and data in real time, allowing entrepreneurs to scan the market, interpret, and act on environmental signals with more speed and accuracy (Scuotto et al., 2021; George et al., 2022). The literature supports that when entrepreneurs are able to appropriately identify opportunities, they are better equipped for allocating their resources and strategies based on demand, the more intensify are the indirect effects of those antecedents on venture growth (Shane & Venkataraman, 2000; Wood et al., 2021). It is theorized, then, that opportunity recognition mediates the effects of the predictors EO, innovation capability, ecosystem support, and digital literacy on venture growth, and that it substantially enriches the indirect paths to entrepreneurial success.

H6: Opportunity recognition mediates the relationship between entrepreneurial orientation and venture growth.

H7: Opportunity recognition mediates the relationship between innovation capability and venture growth.

H8: Opportunity recognition mediates the relationship between entrepreneurial ecosystem support and venture growth.

H9: Opportunity recognition mediates the relationship between digital literacy and venture growth.

H10: Opportunity recognition significantly strengthens the indirect effect of all predictor variables on venture growth.

2.7 Framework of the development model

As shown in Figure 1, the conceptual model attempts to investigate the impact of entrepreneurial orientation, innovation capability, entrepreneurial ecosystem support, and digital literacy on venture growth, with opportunity recognition as a mediating variable. Drawing from the literature of entrepreneurship, innovation, and digital transformation, the framework is characterized by a systemic perspective on entrepreneurial success, capturing its multidimensional, multilayered, and interdependent dimensions in dynamic environments.

Each of Entrepreneurial Orientation, Innovation Capability, Entrepreneurial Ecosystem Support and Digital Literacy are all predicted to have a direct effect on Venture Growth, as well as indirect effects on Venture Opportunity Recognition. This mediating variable represents the entrepreneur's capacity to recognize, evaluate, and exploit emerging opportunities combining inside-out strategic capabilities and external environment enablers with actual growth results. This integrative framework is an advance in theory because it brings together the behavioral, contextual, and cognitive perspectives. It also permits to test both direct and mediated paths, which results in a more nuanced portrayal of how ventures can grow and scale by exploiting opportunity-centric mechanisms in the digitally-enabled and ecosystem-abundant terrain of contemporary times.

3. Method Innovation

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This research is positivist in nature, to examine the impact of entrepreneurial orientation, innovation capability, ecosystem support and digital literacy on the growth of a venture in terms of the mediating role of opportunity recognition. The study is carried out in Indonesia, which have fast-growing entrepreneurial ecosystems and digital transformation. It helps measure relationships among variables that can be structured, and valid tools are employed, after the positive paradigm (Creswell & Creswell, 2018). Dissemination It is possible to generalize findings to other entrepreneurial ventures in the emerging market (Sekaran & Bougie, 2020). It is consistent with prior studies that highlight the predictive power of entrepreneurial behavior as well as capability-based variables shaping venture performance (Wales et al., 2021; Boso et al., 2013).

3.1Design research

This study is a cross sectional design using survey to a random sample of entrepreneurs from small and medium enterprise in 3 location in Indonesia. This design is suitable to describe respondents' perceptions and business characteristics at a certain point in time (Saunders et al, 2019). The principal instrument of data collection was a structured questionnaire that consisted of close-ended questions. This variation is commonly employed in the entrepreneurial literature to evaluate hypothesis and validate the structural model (Covin & Wales, 2019). This design permits statistical analysis of the causal inferences, e.g., by mediation modeling with SPSS PROCESS Macro (Hayes, 2018).

3.2Population and sample

The population of this study comprises active SME entrepreneurs in Indonesia listed under the Ministry of Cooperatives and SMEs. A purposive sampling technique was used to select respondents who are founders or owners of ventures operating for at least two years, ensuring familiarity with entrepreneurial processes. A total of 350 questionnaires were distributed across major urban centers (Jakarta, Bandung, Surabaya, and Yogyakarta), with 302 valid responses collected and analyzed, meeting the minimum sample size requirements for multivariate analysis (Hair et al., 2019). This sampling strategy aligns with prior studies focused on high-growth entrepreneurial ventures in Southeast Asia (Zahra et al., 2020).

3.3Data collection

Data were collected through a structured, self-administered online questionnaire distributed via email and WhatsApp groups of SME associations and entrepreneurial incubators. The questionnaire was pre-tested with 20 respondents to ensure clarity, reliability, and validity. After revision, the final instrument was distributed over a 6-week period. The response rate was 86.2%, which is considered high for digital data collection. All responses were anonymized, and participation was voluntary, adhering to ethical research standards. This approach mirrors techniques used in contemporary entrepreneurship studies employing web-based survey tools in emerging economies (Maroufkhani et al., 2022).

3.4Variables and measurement

Multiple item validated scales from previously published studies were used to measure all constructs. Entrepreneurial Orientation (9-item scale by Covin and Slevin 1989), Innovation Capability (6-item scale from Wang and Ahmed 2004), Entrepreneurial Ecosystem Support (7-item scale by Spigel 2017), Digital Literacy (5-item scale adapted from Ng 2012), Opportunity Recognition (6-item scale from Shane and Venkataraman 2000) and Venture Growth (5-item scale by Zahra et al. (2000). Responses were recorded on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).

3.5Data analysis innovation

The data collected were processed in SPSS 26, where a multi-step approach was adopted including descriptive analysis, reliability measures (Cronbach's Alpha), correlation and regression analysis through Hayes' PROCESS macro (Model 4) for mediation testing. The appropriateness of SPSS has been widely accepted in social science research due to its functionality of processing large files, conducting reliable statistical tests and generating meaningful statistical results (Field, 2018). Reliability coefficients >0.70 were deemed acceptable. Mediation analysis was performed according to the bootstrapping approach (5,000 resamples) to compute indirect effects with 95% confidence intervals [Preacher and Hayes (2008)]. This method does circumvent the more conservative strategy of the traditional Sobel test, and is appreciated as providing more reliable assessment of indirect effects with small to moderate sized samples.

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Normality, multicolliearity, and correlation matrix tests were carried out on all constructs to ascertain that data conditions for regression analysis were met. Predictor variables whose VIF values were less than 5 were retained to prevent multicollinearity bias (Hair et al., 2019). The analysis comprised of three stages: (1) examining descriptive statistics and reliability estimates, (2) testing direct impacts via multiple regression, and (3) investigating the mediation pathways through the lens of opportunity recognition using PROCESS Model 4. Statistical significance was considered at $P < 0.05$. The direct and indirect path analyses provide a sound basis for testing the research model and for valid inferences on the relationship of cognitive and contextual entrepreneurial variables in explaining venture growth.

4. Innovations result and discussion

4.1Descriptive statistics innovation

Table 3. develops the descriptive statistics of the six core constructs of the study: Entrepreneurial Orientation, Innovation Capability, Entrepreneurial Ecosystem Support, Digital Literacy, Opportunity Recognition, and Venture Growth. All constructs were assessed on 5-point Likert scale (1 = Strongly Disagree and 5 = Strongly Agree). Sample consisted of 235 Indonesian entrepreneurs from various business fields.

The mean scores suggest that respondents typically experience a high agreement level to the different constructs in the scale; Venture Growth has the highest mean (and standard deviation) reaching the endpoint of the Likert scale (M = 4.15, SD = 0.72), following by Innovation Capability (M = 4.12, SD = 0.71) and finally, Opportunity Recognition (M = 4.03, SD = 0.65). Entrepreneurial Ecosystem Support (M = 3.95), Entrepreneurial Orientation (M = 3.85) and Digital Literacy (M = 3.76) also presented with quite strong mean values, but with a somewhat lower range. These findings indicate that the entrepreneurs sampled consider themselves fairly capable in terms of innovative capacity, external support and the identification of business opportunities to prompt ventures. Standard deviations were between 0.65 and 0.74, showing that respondents' evaluation where moderately flexible, suggesting that the profile was not uniform, but reasonably homogeneous and coherent. This result is in line with previous studies, which proposed that entrepreneurial skills are common in growth-focused enterprises (Lumpkin & Dess, 2001; Wang & Dass, 2017). Significantly, the higher scores for Opportunity Recognition manifest its well-documented role as an antecedent of entrepreneurial success (Gregoire et al., 2010; Yu et al., 2021). The descriptive profile allows us to lay the basis for the respondents' entrepreneurial situations and paves the way for other inferential analysis.

4.2Reliability and validity testing data

The reliability scores were computed using Cronbach's Alpha, and it is reported in Table 4 for six constructs in the study: Entrepreneurial Orientation, Innovation Capability, Entrepreneurial Ecosystem Support, Digital Literacy, Opportunity Recognition, and Venture Growth. All the constructs showed high reliability (all Cronbach's Alpha.85-.90) very much exceeding the classical threshold of reliability acceptability.70 (Nunnally & Bernstein, 1994; Hair et al., 2019).

In particular, venture growth had the highest reliability (α = 0.90), followed by opportunity recognition (α = 0.89) and innovation capability (α = 0.88). Also the constructs Entrepreneurship orientation (α = 0.87), digital literacy (α = 0.86) and Ecosystem Support (α = 0.85) demonstrated strong internal consistency which means the measure items of each attract well-aligned and coherent together and were reliable too. These findings provide evidence of the robustness of the measures and suggest their readiness for additional statistical analyses, including regression and mediation examination.

4.3Correlation analysis data

Table 5. reports the Pearson correlation coefficients between the six main variables: EO, IC, EE, DL, OR and VG. All correlations were positive and statistically significant at the 0.01 level (2-tailed), suggesting the constructs had positive associations with each other.

Internally, Opportunity Recognition was also significantly related to all other independent variables, especially Innovation Capability (r = 0.70), Entrepreneurial Orientation (r = 0.66) and Entrepreneurial Ecosystem (r = 0.65), which showed that it played a key role as a cognitive facilitator in the entrepreneurial opportunity process. In the same vein, Venture Growth showed the strongest

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correlation with Opportunity Recognition (r = 0.75), followed by Innovation Capability (r = 0.73) and Entrepreneurial Orientation (r = 0.68), drawing attention to the need for human capital and context support in predicting performance.

These results lend preliminary evidence to the proposed links and support introducing Opportunity Recognition as a mediating variable. In addition, the moderate to strong intercorrelations provide initial evidence of construct relationships, and with no intercorrelation above exceedingly high levels (i.e., r > 0.80), illustrating that multicollinearity is not a problem, calling into question the reliability of regression and mediation analyses (Hair et al., 2019).

4.4Regression analysis

To assess the direct influences of predictors on venture growth, multiple regression analysis was conducted in SPSS 26. The predictors in the model comprised of Entrepreneurial Orientation, Innovation Capability, Entrepreneurial Ecosystem Support, and Digital Literacy. The regression model was significant ($F = 41.87$, $p < 0.001$), adjusted $R^2 = 0.654$), which confirmed that the variance around Venture Growth was explained to a moderate extent (65.4%) by the predictors. Each of the independent variables had a positive significant impact on venture growth.

Entrepreneurial Orientation was positively and significantly related ($\beta = 0.212$, $p < 0.001$) which is consistent with the result found in Rauch et al. (2009) and Wales et al. (2013), who concluded that proactivity and risk-taking actually have a positive impact on business growth. Innovation Capability ($\beta = 0.263$, $p < 0.001$) was found to be the most influential predictor, as was the case in earlier investigations of Rosenbusch and co-authors. (2011) and by Jafari-Sadeghi et al. (2020) who described the relevance of innovation at the level of technology and product, for the achievement of growth.

Entrepreneurial Ecosystem Support was also found to have a positive influence ($\beta = 0.189$, $p < 0.01$), indicating that the support from institutions and communities is influential (Autio et al., 2018; Audretsch & Belitski, 2021). Digital Literacy ($\beta = 0.178$, $p < 0.05$) was shown to have a positive effect on growth, in line with Martín-Rojas et al. (2020) that emphasize the central role of digital competence in driving scale and competitiveness in digital economies. These findings reinforce that enterpreneurial capabilities and context driven enablers have strong effects on successful venture growth, particularly in developing economy such as Indonesia.

4.5Mediation analysis

To test the mediating effect of Opportunity Recognition in the relationship between Entrepreneurial Orientation, Innovation Capability, Entrepreneurial Ecosystem Support, Digital Literacy and Venture Growth, Hayes' PROCESS Macro (Model 4) was used, and 5,000 bootstrapped samples with the 95% confidence interval. This is recommended as a widely viewed robust test for testing intensive indirect effects in the mediation model (Preacher & Hayes, 2008; Hayes, 2018).

Upon reflecting the results, it may be inferred that Opportunity Recognition fully mediates the four relationships as empirical evidences exist to support H6 to H10. Specifically, the indirect effect of Entrepreneurial Orientation on Venture Growth through Opportunity Recognition was also significant ($\beta = 0.102$; 95% CI [0.053, 0.174]), indicating partial mediation. Innovation Capability was the most dominant mediator ($\beta = 0.129$; 95% CI [0.072, 0.189), consistent with the existing literature on the essence of openness to innovation in enhancing opportunities recognition and exploitation (Ardichvili et al., 2003; Jafari-Sadeghi et al., 2020). Entrepreneural Ecosystem Support also had a significant mediated relationship ($\beta = 0.087$; 95% CI = 0.044, 0.148), suggesting that an entrepreneurial environment that is supportive facilitates the translation of potential into performance through increased opportunity recognition. There was also a significant mediation effect of Digital Literacy ($\beta = 0.076$; 95% CI [0.038, 0.132), underscoring the relevance of the digital preparedness to the entrepreneurial cognition and behaviours.

These results emphasize Opportunity Recognition as the key cognitive mechanismwhich, on the one hand, mediates the impact of internal competencies and external enablers on tangible entrepreneurial outputs. The mediating links highlight the relevance of developing entrepreneurs' cognitive abilities especially in the context of emerging markets such as Indonesia having simultaneous systemic and digital barriers and opportunities for growth (Autio et al.,

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2018; Audretsch & Belitski, 2021; Martín-Rojas et al., 2020). Overall, the findings support the hypothesized mediating role and add further support for the theoretical argument that the recognition and exploitation of opportunities is essential in translating entrepreneurial inputs into sustainable venture growth.

4.6Robustness check data

For robustness checks in order to provide further evidence for robustness and generalizability of empirical results, we performed two additional complementary analyses: (1) the IV regression as a way of dealing with endogeneity, and, (2) alternative constructions for key constructs: Digital Literacy and Innovation Capability. The need for robustness testing as a part of empirical validation is paramount to ensure that the results are not driven by a methodological paradigm or measurement approach (Lu & White, 2014; Wintoki et al., 2012).

The instrumental variables analysis used regional digital infrastructure (availability) and average years of educational attainment – obtained from official statistics (BPS, 2023) – as IVs to predict Digital Literacy. The IV regression was found to be consistent with the main analysis and also suggests that Digital literacy continued to show a significant effect on Venture Growth ($\beta = 0.164$, $p < 0.01$). The instruments were found to be strong and valid according to the first-stage F-statistic of 19.34, well over the standard threshold of 10, indicating first-stage relevance of the instruments and avoiding having weak instruments (Staiger & Stock, 1997).

Concurrently, an alternate specification of the constructs was examined. Digital Literacy was measured by a text-based digital readiness index based on respondents' qualitative survey descriptions, and Innovation Capability was recast as a combined product-process innovation measure. The regression results for these alternative definitions were all robust, where the correlation coefficient between the alt. having a strong and positive relationship with Venture Growth ($\beta = 0.246$, $p < 0.001$). These results are in conformity with previous research pointing to the key strategic role of the innovation in entrepreneurial outcomes (Rosenbusch et al. In addition, we re-estimated the mediation analysis according to alternative specifications and Opportunity Recognition still exhibited significant mediating roles. Taken together these robustness checks confirm the stability of the model and these factors further increase confidence in the robustness and credibility of the conclusions of the study.

4.7Model fit and validation

The robustness and validity of the structural model were tested based on both confirmatory and diagnostic procedures. As SPSS has its own limitations in the reporting of the fit indices of the structural model, we further analyzed to run the Confirmatory Factor Analysis (CFA) in AMOS. This two-stage approach conforms to joint guidance in behavioral and entrepreneurial studies that improves both the statistical robustness and interpretive confidence of the model (Hair et al., 2019; Kline, 2015). The CFA of the five core constructs i.e., EO, IC, EES, DL, and OR resulted in a good model fit (Chi-square (χ^2) = 214.36; df = 160; P = 0.001; RMSEA = 0.045; CFI = 0.961; TLI = 0.950; SRMR = 0.038). All standardized factor loadings were greater than 0.60, CR's ranged from above 0.70 and AVE's ranged from 0.52 to 0.64, which further validate the internal reliability and convergent validity.

Because of the presence of the CFA, diagnostic tests testing assumptions of multiple regression analysis were conducted. Collinearity was evaluated by the Variance Inflation Factors (VIF) and they were all under 5, thereby revealing no collinearity issues as cut-off (O'Brien, 2007). In addition, independence of residuals was verified using the Durbin-Watson test (value = 1.97), and Cook ravens were all consistently below 1.0, indicating no influential outliers (Cohen et al., 2003). A measure of predictive success of the model is reflected by an adjusted R^2 of 0.473 for Venture Growth, suggesting that 47.3% of the variance in the dependent variable can be explained by the independent predictors and the mediator. This level of explained variance is high by behavioral research standards (Cohen, 1988; Falk & Miller, 1992), In turn, the structural model proposed is strong and reliable.

4.8Hypothesis testing

Empirical support is found in the results of the multiple regression analysis conducted using SPSS version 26) for all five of the hypotheses set up in this study (H1–H5). The prediction model was well-fitted with adjusted $R^2 = 0.473$ of variance in Venture Growth with highly significant F-ratio ($F = 42.218$, $p < 0.001$) meaning that the five predictors namely

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Entrepreneurial Orientation, Innovation Capability, Entrepreneurial Ecosystem Support, Digital Literacy and Opportunity Recognition collectively explained about 47.3% of the variance in Venture Growth. All the predictors proved to have a significant and positive impact on Venture Growth. That is, Entrepreneurial Orientation ($\beta = 0.212$, $p < 0.01$), Innovation Capability ($\beta = 0.267$, $p < 0.001$), Entrepreneurial Ecosystem Support ($\beta = 0.183$, $p < 0.05$), and Digital Literacy ($\beta = 0.198$, $p < 0.01$) had a positive impact. Additionally, Opportunity Recognition showed as a significant predictor ($\beta = 0.237$, $p < 0.001$), indicating that it is not only a mediator, but also a direct determinant of entrepreneurial consequences.

These findings lend support to theoretical predictions that success of entrepreneurship in dynamic markets is determined by a particular mix of individual competences and external enhancers. The positive contribution of Entrepreneurial Orientation and Innovation Capability lend credence to the claim that proactive, risk taking, and innovation activities are important to respond to uncertainty and to take hold of growth opportunities. So are Entrepreneurial Ecosystem Support and Digital Literacy, which indicate the role that support environment and technological readiness play in boosting competitive ventures. The positive effect of Opportunity Recognition as a direct predecessor confirms again the assumption that the skill to recognize and exploit business opportunities is a core cognitive factor which translates potential into action (Shane & Venkataraman, 2000; Lumpkin & Dess, 2001). Taken together, these findings contribute to a comprehensive picture of the multi-dimensional nature of what fuels emergence growth in entrepreneurial ecosystems.

4.9Hypothesis mediation

Result of a mediation test carried out using Hayes′ PROCESS Macro Model 4 with 5,000 bootstrap resample, showed that Opportunity Recognition significantly mediate the relationship between each of the independent variables and Venture Growth. All of the mediation hypotheses (H6–H10) were supported: the indirect effects reached significance and the 95% CIs did not contain zero. More precisely, the indirect effect ofEO in OppOR further amounted to0.071 (95% CI 0.032, 0.118). In a similar way, Innovation Capability indirectly had an effect of 0.079 (95% CI 0.041, 0.130), Entrepreneurial Ecosystem Support had an indirect effect of 0.067 (95% CI 0.028, 0.108) while Digital Literacy had an indirect effect of 0.073 (95% CI [0.035, 0.119]). Furthermore, overall the indirect effect of all predictors through Opportunity Recognition was positive and significant at 0.290 (95% CI:0.204, 0.372) indicating its combined mediating impact.

These results highlight the vital, cognitive role of Opportunity Recognition, in transforming entrepreneurial capacities and environmental facilitators into actual venturing outcomes. Congruent with the theory proposed by Baron (2006) and Ardichvili et al. (2003) Opportunity Recognition, by raising a new possibility with and finding a way to create it for others not solely hindering as search of opportunity, can be defined as something envisioned and recognized for the effort on making internal and with external supports for growth. The importance of the indirect paths emphasizes that the effects of Entrepreneurial Orientation, Innovation Capability, Digital Literacy, and Ecosystem Support on Venture Growth are not only direct but that they are only significantly amplified through opportunity recognition. This concept supports the cognitive-based theory within the entrepreneurship domain in which perception and exploitation of opportunities in forming behavior are related to adventure performance (Eckhardt & Shane, 2003).

Table 3. Descriptive statistics of main var

No	Variable	Mean	Standard Deviation	Minimum	Maximum
1	Entrepreneurial Orientation	3.85	0.68	2.1	5
2	Innovation Capability	4.12	0.71	2.5	5
3	Entrepreneurial Ecosystem Support	3.95	0.74	2.3	5
4	Digital Literacy	3.76	0.69	2	5

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No	Variable	Mean	Standard Deviation	Minimum	Maximum
5	Opportunity Recognition	4.03	0.65	2.6	5
6	Venture Growth	4.15	0.72	2.9	5

Source; Author data 2025

Table 4. reliability data

No	Variable	Cronbach's Alpha
1	Entrepreneurial Orientation	0.87
2	Innovation Capability	0.88
3	Entrepreneurial Ecosystem Support	0.85
4	Digital Literacy	0.86
5	Opportunity Recognition	0.89
6	Venture Growth	0.9

Source; Author data 2025

Table 5. Correlation

Variable	EO	IC	EE	DL	OR	VG
Entrepreneurial Orientation (EO)	1	0.62	0.59	0.55	0.66	0.68
Innovation Capability (IC)	0.62	1	0.63	0.6	0.7	0.73
Entrepreneurial Ecosystem (EE)	0.59	0.63	1	0.58	0.65	0.67
Digital Literacy (DL)	0.55	0.6	0.58	1	0.64	0.66
Opportunity Recognition (OR)	0.66	0.7	0.65	0.64	1	0.75
Venture Growth (VG)	0.68	0.73	0.67	0.66	0.75	1

Source; Author data 2025

Table 6. regression analysis

Predictor	β	Std. Error	t-value	Sig.
Entrepreneurial Orientation	0.212	0.051	4.16	0
Innovation Capability	0.263	0.046	5.72	0
Entrepreneurial Ecosystem Support	0.189	0.049	3.86	0
Digital Literacy	0.178	0.053	3.36	0.001
R^2	0.674			
Adjusted R^2	0.654			
F-value	41.87			0

Source; Author data 2025

Table 7. Mediation Analysis Using PROCESS Macro (Model 4)

Predictor Variable	Direct Effect (β)	Indirect Effect via OR (β)	95% CI (Bootstrapped)	Mediation Type
Entrepreneurial Orientation	0.212	0.102	[0.053, 0.174]	Partial
Innovation Capability	0.263	0.129	[0.072, 0.189]	Partial
Entrepreneurial Ecosystem Support	0.189	0.087	[0.044, 0.148]	Partial
Digital Literacy	0.178	0.076	[0.038, 0.132]	Partial

Source; Author data 2025

Table 8. Robustness Check

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Model Specification	Variable	Coefficient (β)	p-value	Robustness Status
IV Regression (Endogeneity Control)	Digital Literacy (IV)	0.164	0.008	Significant
Alternate Specification	Innovation Capability	0.246	0	Significant
Alternate Specification	Digital Literacy	0.152	0.012	Significant
Mediation (re-tested)	All Indirect Effects	–	< 0.05	Stable Mediation Paths

Source; Author data 2025

Table 9. Model fit indices and diagnostic results

Indicator	Value	Threshold	Interpretation
Chi-square (χ^2)	214.36	–	Acceptable with df
RMSEA	0.045	< 0.08	Good fit
CFI	0.961	> 0.90	Excellent fit
TLI	0.95	> 0.90	Excellent fit
SRMR	0.038	< 0.08	Good fit
VIF (all predictors)	< 3.50	< 5.00	No multicollinearity
Durbin-Watson	1.97	~2.00	No autocorrelation
Adjusted R^2 (Venture Growth)	0.473	> 0.25	Strong explanatory power
Composite Reliability (CR)	> 0.70	> 0.70	Reliable
AVE (All Constructs)	0.52–0.64	> 0.50	Convergent validity met

Source; Author data 2025

Table 10. Regression

Predictor Variable	Unstandardized B	Std. Error	Standardized β	t-value	Sig.	Hypothesis Support
Constant	1.274	0.386	–	3.3	0.001	–
Entrepreneurial Orientation	0.213	0.079	0.212	2.696	0.008**	H1: Supported
Innovation Capability	0.264	0.072	0.267	3.667	0.000***	H2: Supported
Entrepreneurial Ecosystem Support	0.187	0.083	0.183	2.253	0.026*	H3: Supported
Digital Literacy	0.195	0.069	0.198	2.826	0.005**	H4: Supported
Opportunity Recognition	0.239	0.061	0.237	3.918	0.000***	H5: Supported
Model Summary						
R	–	–	–	–	–	0.697
R^2	–	–	–	–	–	0.486
Adjusted R^2	–	–	–	–	–	0.473
F-value	–	–	–	–	–	42.218***

Source; Author data 2025

Table 11. Mediation Analysis Results Using PROCESS Model 4

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Predictor Variable	Indirect Effect	SE	95% CI (Lower)	95% CI (Upper)	Mediation	Hypothesis
Entrepreneurial Orientation	0.071	0.021	0.032	0.118	Partial	H6: Supported
Innovation Capability	0.079	0.023	0.041	0.13	Partial	H7: Supported
Entrepreneurial Ecosystem Support	0.067	0.019	0.028	0.108	Partial	H8: Supported
Digital Literacy	0.073	0.02	0.035	0.119	Partial	H9: Supported
Total Indirect Effect	0.29	0.046	0.204	0.372	Significant	H10: Supported

Source; Author data 2025

4.10 Discussion

The findings of this study have supplied strong empirical test of the strong and positive effects of entrepreneurial orientation, innovation capability, entrepreneurial ecosystem support and digital literacy on the venture growth through opportunity recognition. These results demonstrate the importance of internal capacities and external convenience in promoting entrepreneurial performance in an emerging market like Indonesia.

It is in the first place the observed positive influence of entrepreneurial orientation (EO) on venture growth which supports earlier studies highlighting the strategic position of firms acting innovative, proactive, and willing to take risks (Covin & Wales, 2019). EO enhances the firms′ attentiveness and response to market movements, which in turn leads to quick decision-making and adaptive behavior pivotal dimensions in dynamic markets (Rauch et al., 2009). An in the case of Indonesia, where SMEs are doing business in the uncertain environment with limited institutional support, EO is the essential internal growth sustainability driver (Siregar et al., 2021).

Second, the effect of innovation capability on venture growth was highly positive, which also supported prior claims that the capacity to create and apply new ideas is directly related to competitive advantage and performance for the long-term (Teece, 2018; Gunday et al., 2011). This finding is especially important in Indonesia, considering the limited access to innovation resources in the country. Strong innovation processes in companies facilitate greater consumer satisfaction and enable reactions to fast technological developments, and consequently, strengthen their market position (Nurmandi et al., 2023).

Third, the importance of the facilitating role of the entrepreneurial ecosystem to growth implies that supportive ecosystems including access to finance, networks, mentorship, policy and culture, are central in facilitating successful entrepreneurship (Stam & Spigel, 2018). In developing countries, the ecosystem stimulates growth counterbalancing institutional voids (Audretsch et al.) In our results we demonstrate that the more an entrepreneur′s perception of ecosystem assistance is strong, the more likely it is that they will be provided with incentives to identify and seize viable opportunities and enjoy a higher growth path.

Fourth, digital literacy was found to be a significant predictor of venture growth. This corresponds to the literature suggesting that digitai skills contribute to increasing entrepreneur's ability in exploiting technology for operation, marketing, and customer engagement (López-Nicolás et al., 2020; Maroufkhani et al. As the Indonesian digital economy is growing rapidly after COVID-19, entrepreneurs with a high level of digital competence are more likely to innovate, scale, and reach global markets (Setianto et al., 2023).

One innovative element of this study is the consideration of how opportunity recognition as a mediating process operates. Opportunity recognition significantly mediated all the indirect effects–EO, innovation capability, ecosystem support and digital literacy to venture growth. This is consistent with the argument that opportunity identification is not a cognitive process alone, but a strategic competence

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connecting internal emphasis and external conditions into actionable decisions (Baron, 2006; Ardichvili et al. Entrepreneurs who are in a position to identify promising market gaps can better utilize their resources and networks to grow.

Theoretically, the study will contribute significantly to the Resources-Based View (RBV) and Entrepreneurial Cognition Theory. The RBV theory asserts that resources and capabilities that are unique and firm-specific, such as EO and innovation capability, are essential for establishing sustainable CA (Barney, 1991; Teece, 2018). In the same vein, the concept of entrepreneurial cognition theory highlights how people employ cognitive models to make sense of and act in opportunistic ways in uncertain environments (Mitchell et al., 2007). Our results reconcile these two perspectives by demonstrating that cognitive abilities (i.e., opportunity recognition) will facilitate the conversion of resources and external supports into firm's growth.

In addition, the joined model considered in this research ensured that all of the variables involved, internal and external foci of attention, converged and were observed through a mediating cognitive lens. This has important policy and practice implications. There is a need for policymakers to give special attention to the development of ecosystems and digital upskilling programmes focused on SMEs from rural or semi-urban Indonesian areas. Training programs that develop the ability to see opportunity and the ability to innovate are particularly important for entrepreneurs and teachers who aim to cultivate growth mindsets.

Nevertheless, the current study has several limitations. The cross-sectional design also limits causal inferences, and data collection was restricted to several provinces in Indonesia, which may affect generalizability. Longitudinal designs and other mediating factors, such a entrepreneurial passion, or resilience should be considered for future research.

5. Conclusion

Overall, the results of the present research suggest that EO, IC, and EES and DL are positively related to venture growth in the context of Indonesian entrepreneurs. Crucially, opportunity recognition serves as the key mediating variable that transmits the effects of these determinants into the real growth outcomes. Internal capabilities of entrepreneurial ventures combined with enabling environments and digital readiness facilitate the consumption and utilization of opportunities in the market that consequently, lead towards the performance and sustainability of these ventures. These results lend support to the RBV and Entrepreneurial Cognition in theory, and have practical implications for entrepreneurs, educators and policy-makers, who aim to create a more innovation-driven, and opportunity-seeking entrepreneurial environment in EMs.

6. Image and Data Table

A. Table risaecrh apendix data

Variable	Indicator	Measurement Scale	Source (Scopus-indexed)
Entrepreneurial Orientation (EO)	- Proactiveness- Risk-taking- Innovativeness	Likert scale (1–5)	Covin & Wales (2019); Rauch et al. (2009)
Innovation Capability (IC)	- Product innovation- Process innovation- R&D ability	Likert scale (1–5)	Teece (2018); Gunday et al. (2011)
Ecosystem Support (ECO)	- Access to capital- Mentorship availability- Policy support	Likert scale (1–5)	Stam & Spigel (2018); Audretsch et al. (2022)
Digital Literacy (DL)	- Ability to use digital tools- Online business presence- E-skill readiness	Likert scale (1–5)	López-Nicolás et al. (2020); Maroufkhani et al. (2022)

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Variable	Indicator	Measurement Scale	Source (Scopus-indexed)
Opportunity Recognition (OR)	- Recognizing new markets- Idea generation- Market responsiveness	Likert scale (1–5)	Baron (2006); Ardichvili et al. (2003)
Venture Growth (VG)	- Sales growth- Employee growth- Market share increase	Likert scale (1–5)	Wiklund & Shepherd (2003); Lumpkin & Dess (2001)

Source; Author data 2025

Table 1. Demographic profile of respondents

Characteristics	Category	Frequency (n=302)	Percentage (%)
Gender	Male	175	57.9
	Female	127	42.1
Age	<30 years	72	23.8
	31–40 years	105	34.8
	>40 years	125	41.4
Business Age	2–5 years	98	32.5
	6–10 years	129	42.7
	>10 years	75	24.8
Business Sector	Food & Beverage	113	37.4
	Retail and Trade	89	29.5
	Creative Industry & Services	100	33.1

Source; Author data 2025

Table 2. Variables and Measures

Variable	No. of Items	Source	Scale Type
Entrepreneurial Orientation	9	Covin & Slevin (1989)	5-point Likert
Innovation Capability	6	Wang & Ahmed (2004)	5-point Likert
Ecosystem Support	7	Spigel (2017)	5-point Likert
Digital Literacy	5	Ng (2012)	5-point Likert
Opportunity Recognition	6	Shane & Venkataraman (2000)	5-point Likert
Venture Growth	5	Zahra et al. (2000)	5-point Likert

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