

NAVIGATING THE INNOVATION LANDSCAPE: THE CRUCIAL ROLE OF TECHNOLOGY AND ENTREPRENEURIAL ORIENTATION

Fahrul Riza*, **Novia Agatha Luhur**
Universitas Bunda Mulia, Indonesia

ABSTRACT

This study examines the impact of technology orientation on entrepreneurial orientation and its consequent effect on the innovation performance of Indonesian startups. In this study, 156 local startups were examined using the structural equation model (SEM). The results demonstrate a significant and positive relationship between innovation performance and both entrepreneurial and technology orientation. Notably, the technology orientation has a positive effect on the entrepreneurial orientation, which partially mediates the indirect relationship between the technology orientation and innovation performance. This study's integrated framework concept to enhance the innovation performance of startups in emerging economies is unprecedented. The findings also urge businesses to adopt proactive, inventive, and risk-taking practices to keep up with the rapid pace of technological advancements. Certain limitations of this study must be acknowledged, including the subjective evaluation of constructs by senior management and the deliberate selection of the sample. To advance this topic further, it is suggested that future research include objective data gathered through assessments by various stakeholders and investigate case studies of designated businesses.

JEL: L25, I26, O32.

Keywords: technology orientation, entrepreneurial orientation, innovation performance, startups, SEM.

1. INTRODUCTION

The substantial growth of the global technology sector has resulted in the emergence of digital startup companies. As a result, the startup ecosystem has witnessed rapid expansion in recent years (Stam & van de Ven, 2021). However, empirical evidence highlights the vulnerability of numerous startups, leading to challenges in their survival (Choi, Sung, & Park, 2020; Danarhamanto, Primiana, Azis, & Kaltum, 2020). A survey conducted in 2018 by the Ministry of Tourism and Creative Economy unveiled a survival startup rate of merely 5%. Only 25% of the survivors managed to achieve profitability, accounting for a mere 1.25% of startups that succeeded in both the survival and profitability (Nurchahyo, Akbar, & Gabriel, 2018).

Previous researches highlighted that many startups fail due to a combination of factors, including a lack of market demand (Gruber-Muecke & Hofer, 2015), poor financial management (Omoregie, Olofin, & Ikpesu, 2019), ineffective leadership (Nguyen, Huynh, Lam, Le, & Nguyen, 2021), operational inefficiencies (Rompho, 2018), and external challenges. While many researches have pointed to capital constraints as the major cause of failure, it is crucial to recognize that failures can also be caused by an excessive emphasis on the market demand or technological aspects. This results to the ongoing debate in the discipline of business and innovation management over market-oriented innovation vs technology-oriented innovation. The market-oriented innovation entails the process of developing products or services that are tailored particularly to the needs and preferences of the target market. Conversely, the technology-oriented innovation

*Email : riza.fahrul@gmail.com

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places a strong emphasis on the development of cutting-edge technologies and solutions, frequently driven by the technological advancements. These two approaches have different underlying focal points, whereas the market-oriented innovation emphasizes on consumer demand and market trends, while the technology-oriented innovation prioritizes the advancement and breakthroughs in technology (Jeong, Kim, Son, & Nam, 2020). This study emphasizes the role of technology orientation and entrepreneurial orientation in improving the innovation performance.

The outcome of innovation is inherently speculative, carrying the potential for both successes and setbacks within the companies (Ponta, Puliga, & Manzini, 2021). Consequently, integrating the entrepreneurial orientation throughout every aspect of innovation activity has become mandatory (Si, Zahra, Wu, & Jeng, 2020). This entails building a proactive and risk-taking mentality within an organization, promoting the active pursuit of opportunities, and fostering a readiness to pivot in response to shifting circumstances. This orientation is critical in navigating the intricacies and obstacles posed by the innovation, allowing the companies to adeptly discover, nurture, and leverage novel opportunities (Urban & Maphumulo, 2021).

Within the academic realm, the pivotal role of entrepreneurial orientation in navigating ambiguous landscapes and fostering innovation is widely acknowledged. Nevertheless, there remains a substantial gap in understanding, notably in the sphere of startups (Choi *et al.*, 2020; Han & Zhang, 2021; Li, Ahmed, Qalati, Khan, & Naz, 2020). Most of the previous studies focus on the startups in developed countries with higher levels of technological literacy. Although these studies offer valuable insights into how the entrepreneurial orientation stimulates the innovation in technologically advanced settings, it is essential to recognize that the entrepreneurial orientation's relevance is not limited to developed countries. Its importance extends beyond the developed markets to emerging and developing startup ecosystems (Danarrahmanto *et al.*, 2020; Nurcahyo *et al.*, 2018). This presents a unique opportunity for further researches, as exploring the entrepreneurial orientation's implications in various contexts could provide insights relevant to policymakers and practitioners supporting the startups across diverse environments.

Furthermore, many studies have explored how being entrepreneurial might lead to improved innovation outcomes. These findings consistently show that having an entrepreneurial mindset has a positive influence on the success of innovative action. However, it is worth noting that having an entrepreneurial mindset might have a weaker influence when combined with a strong market-focused approach (Kajalo & Lindblom, 2015). Despite prior studies on the effect of technology orientation on improving the innovation performance, the serial effect between the technology and entrepreneurial orientations has yet to be evaluated (Kwiatkowska & Gębczyńska, 2019). Thus, a specific dynamic of how the entrepreneurial orientation interacts with technology orientation has to be explored. In addition, Kiyabo & Isaga (2020) also emphasized the need to investigate mediating variables in the entrepreneurial orientation-performance relationship, as previous researches primarily noted these mechanisms. Therefore, the research problem of this study is as follows: "What are the influences of integrating the entrepreneurial orientation and technology orientation on the innovation performance?"

This study aims to investigate the influence of technology orientation and entrepreneurial orientation on the innovation performance of Indonesian startups. In line with previous researches conducted by Morgan, Anokhin, Kretinin, & Frishammar (2015), this study seeks to explore the serial relationship of technology orientation to entrepreneurial orientation and assess how this combined orientation affects the innovation performance. Additionally, the study aims to compare

the results of the combined orientation with those of only entrepreneurial orientation on the performance of new product development. This study also contributes to the existing knowledge by shedding light on the complex relationship between strategic orientations and innovation outcomes, thereby enhancing the understanding of how the businesses might exploit these orientations strategically to improve their innovation performance.

2. THEORETICAL FRAMEWORK AND EMPIRICAL STUDIES

Technology orientation stands as a key component of strategic orientation, alongside marketing orientation and entrepreneurial orientation (Halac, 2015; Aloulou, 2019). Scholars disagree on where the technology orientation should be placed; some believed it should be in the context of functional operations, such as research and development (R&D) (Arunachalam, Ramaswami, Patel, & Chai, 2022), while others believe it should be at the organizational level. The degree of commitment to R&D, acquisition of recent technologies, and adoption of the latest findings characterizes the technology orientation at the organizational level. On the other hand, others see the technology orientation as a culture-based firm-level phenomenon (Cohn, 2013), with top management playing a crucial role in directing the firm's strategic direction towards enhancing its technological capabilities and fostering a commitment to learning and necessary adjustments to maintain competitive positioning. This organizational culture is defined as a general mindset within the organization that aims to foster the creation or adoption of new ideas, products, services, or processes (Moon, 2017).

Despite the ongoing debate over its nature, researchers generally agree on the critical role of technology in driving innovation and determining the creation of products and services that effectively address people's needs (Choi *et al.*, 2020). The technology orientation encompasses a combination of skills and capabilities that may significantly cut production time and costs, while also facilitating timely decision-making through accesses to up-to-date information (Halac, 2015). A company with a strong technology orientation is committed to continuously monitoring promising or accepted technologies, imitating or adopting them into its processes and production functions to maintain competitiveness beyond the creation of new technologies. The strength of technology orientation is strongly related to its capacity to absorb and integrate technological advancements effectively (Mubarak & Petraite, 2020).

IT in innovation processes improves different small and medium-sized firms (SMEs), according to a study. This study examined how solid technical focus illuminates this disparity. The research initially revealed no association between IT use in innovation processes and innovation performance in 246 Danish small and medium firms. This association became significant when technology orientation was considered the mediating component (Haug, Aadsbøll Wickstrøm, Stentoft, & Philipsen, 2020). Urban & Maphumulo (2021) collected primary data from 347 South African bankers in cross-sectional research. The study found that technological opportunism improves innovation performance. These correlations are moderated by entrepreneurial orientation, which includes innovativeness, risk-taking, and proactiveness. Moon (2017) examined how a CEO's technical background and cross-functional cooperation affect a firm's technological innovation performance. This impact was direct and indirect, mediated by technological innovation orientation. Moon examined 87 Korean IT SMEs. The results showed that technological innovation orientation fully and favorably moderated the association between a firm's

technological innovation performance and a CEO's technically oriented functional background and cross-functional coordination.

According to Halac (2015), the technology orientation has four main dimensions, including the top management capability (TMC), technological capability (TC), commitment to learning (CL) and commitment to change (CC). The TMC refers to the proficiency of a firm's senior leadership in making crucial decisions, including whether to internally develop technology or procure it externally, the extent of investment in R&D, the decision to compete or collaborate with industry peers, and prediction of future prospects. Moreover, the TMC entails considering future forecasts, ensuring that the firm's operations remain aligned with the cutting-edge technologies and determining the amount and direction of R&D investments.

Further, the TC can be defined as a set of functional capabilities whose ultimate purpose is to develop difficult-to-copy organizational resources and capabilities (Halac, 2015). A firm with a high TC will evaluate its performance through various industrial activities. The TC effectiveness depends on how effective those resource combinations of capabilities have been deployed and bundled (Choi *et al.*, 2020). In conclusion, technological-related resources are the centre of competitive advantage, particularly in the digital industry. If the company can combine and recombine its specific TC, the competitor will have difficult time imitating the resources and capabilities and developing market monopolistic power (Kwiatkowska & Gębczyńska, 2019).

Furthermore, the CL refers to the process through which new knowledge is developed, distributed and accepted in an organizational learning system. Meanwhile, the CC can be defined as making an appropriate adjustment to integrate the new method and belief as a result of learning, as well as eliminating the old ones (unlearning). The companies unlearn processes by eliminating their old routines and operations to create more space for the new processes or beliefs. Organizational method changes introduce something novel or replace a well-established belief or process in an organization's memory (Leal-Rodríguez, Eldridge, Roldán, Leal-Millán, & Ortega-Gutiérrez, 2015; Urban & Maphumulo, 2021).

The entrepreneurial orientation refers to an individual's or organization's mindset and behavior focused on identifying and pursuing opportunities for innovation and value creation (Covin & Slevin, 1989; Gupta & Gupta, 2015). This orientation consists of dimensions, such as risk-taking, pro-active behavior, and innovation. The innovation relates to a firm's willingness to implement novel ideas or creative strategies to gain a competitive advantage. Meanwhile, the risk-taking denotes a firm's willingness to commit significant resources even when profits are questionable. Further, the pro-active behavior characterizes a firm's proactive stance in initiating actions to gain a competitive advantage over rivals (Hechavarria & Ingram, 2014; Kang, Li, Cheng, & Kraus, 2021).

The academic landscape has witnessed a long-running debate about various dimensions of entrepreneurial orientation (Huang, Huang, & Soetanto, 2022), with autonomy and competitive aggressiveness proposed as additional dimensions. Nonetheless, the first three dimensions have gained more general acceptance and are recognized as the prevailing perspective (Gupta & Gupta, 2015).

In academic discussions, there is a general agreement that entrepreneurial orientation has the ability to greatly influence organizational performance. Researchers have extensively studied the ways in which entrepreneurial orientation affects performance and have examined its role as

both a mediating and moderating variable (Aloulou, 2019; Song & Jing, 2017; Urban & Maphumulo, 2021). A study that examined the relationship between technology orientation, entrepreneurial orientation, and innovation performance. The study involved 347 participants from the South African banking sector. The findings revealed that entrepreneurial orientation had a positive moderating effect on the relationship between technology orientation and innovation performance (Urban & Maphumulo, 2021).

In a similar vein, a study conducted by (Aloulou, 2019) examined a total of 292 medium-large firms from various industrial sectors in the Kingdom of Saudi Arabia. The study found that entrepreneurial orientation played a role in the relationships between market orientation, technology orientation, and new product development performance. In addition, the research conducted by Song & Jing, (2017) focused on 199 new ventures in China. The researchers discovered that entrepreneurial orientation played a positive role in influencing the relationship between technology orientation and entrepreneurial performance.

The innovation performance refers to a company's capacity to conceive and actualize novel concepts, products, or processes that hold the potential to generate value for the company and its stakeholders (Ponta *et al.*, 2021). This expansive realm of innovation can be categorized into several types including incremental innovation and radical innovation - each bearing unique implications. The incremental innovation is related to refining existing products, processes, or business models through minor enhancements. On the other hand, the radical innovation drives the creation of entirely new solutions, capable of either disrupting existing markets or generating new ones (Schilling, 2017). The evaluation of innovation performance is multifaceted, often encompassing factors such as the number of patents secured by a company, the proportion of revenue derived from new products, and the success rate of ongoing product development activities (Dziallas & Blind, 2019).

It is important to note that while a company might exhibit a commendable track record of innovation, it could still struggle with operational inefficiencies that subsequently impact its overall firm performance. Similarly, a company could achieve strong financial results but may not emphasize innovation as a strategic focus, leading to suboptimal innovation performance (Choi *et al.*, 2020). The firm performance, meanwhile, encompasses a broader spectrum of a company's financial and operational accomplishments, including revenue, profitability, market share, and shareholder value (Burrus, Edward-Graham, & Jones, 2018; Zehir, Gurol, Karaboga, & Kole, 2016). This multi-dimensional perspective offers a more holistic understanding of a company's competitive position and capacity to generate sustainable value.

Businesses that prioritize a technology-oriented approach can significantly boost their performance and simultaneously foster their entrepreneurial orientation (Dziallas & Blind, 2019). This can be achieved by maintaining and updating their technology capabilities on a regular basis. Furthermore, these businesses can leverage their capabilities by adeptly selecting and reselecting the most fitting technology opportunities from a pool of available alternatives, ultimately refining their work processes and task performance (Lin & Kunnathur, 2019). This dynamic interplay of routine and non-routine activities not only invigorates entrepreneurial progress, but also empowers the firm to seize both technological knowledge and entrepreneurial opportunities (Colomo-Palacios, Fernandes, Soto-Acosta, & Larrucea, 2018; Lee & Park, 2020; Rubin & Callaghan, 2019).

The iterative process of enhancing the technology capabilities contributes to the strengthening of the entrepreneurial orientation within the firms, propelling them forward. Grounded in this premise, the formulated hypothesis is as follows:

H1: The technology orientation has an impact on the entrepreneurial orientation of startups.

Investing in the expansion of technological capabilities holds the potential to yield long-term cost efficiency gains (Lin & Kunnathur, 2019). The companies aspiring to outpace their competitors in terms of product innovation must exhibit a robust technology orientation (Aloulou, 2019). The innovation can range from incremental enhancements of existing products to the creation of entirely novel offerings (Ferrerias-Méndez, Olmos-Peñuela, Salas-Vallina, & Alegre, 2021). A consistent culture of innovation can increase the likelihood of successful innovative outcomes, providing the companies with a sustainable competitive advantage in the market and their prospects for survival.

Furthermore, the companies that have a stronger technology orientation tend to be consistently engaged in innovation initiatives (Aloulou, 2019). Notably, the technology orientation yields a positive influence on technology-driven innovations. The companies with a tendency for technology adoption, characterized by the proactive incorporation of novel and unconventional technologies or methodologies to boost the innovation performance, might gain an advantage to the companies in terms of research output. This advantage stems from the productivity-enhancing potential inherent in these innovative technologies (Rubin & Callaghan, 2019).

H2: The technology orientation has an impact on the innovation performance of startups.

In the dynamic landscape of the business world, the startups face constant management and adaptive reconfiguration of their resources and capabilities. This importance stems from the need to develop novel competitive offerings, explore fresh business avenues, and remain agile in response to market shifts. However, the inherent limitations of resources and capabilities within these emerging entrepreneurial ventures can exert considerable pressure on their survival prospects (Li *et al.*, 2020). This combination of factors underscores the importance of the startups to successfully navigate their operational challenges. In this context, the entrepreneurial orientation emerges as a pivotal factor that can significantly influence the firm performance (Ferrerias-Méndez *et al.*, 2021). By seamlessly integrating attributes, such as the innovation, proactivity, and risk-taking, the entrepreneurial orientation drives the introduction of new products and services to the market (Kwiotkowska & Gębczyńska, 2019). This combination of qualities does not only stimulate the innovation process, but also fuels the pursuit of potential opportunities and the expansion of the production opportunity set.

H3: The entrepreneurial orientation has an impact on the innovation performance of startups.

Rauch, Wiklund, Lumpkin, & Frese (2009) conducted a meta-analysis study and found a moderately large correlation between the entrepreneurial orientation (EO) and business performance. Lumpkin & Dess (1996) proposed an alternative model to investigate the EO-performance relationship, offering insights into the EO constructs' nature and suggesting mediating effects and contingency frameworks. Nguyen *et al.* (2021) explored the entrepreneurial orientation as a mediator for the relationship between entrepreneurial leadership and firm performance. The entrepreneurial orientation, which involves the ability to generate new ideas and take advantage of opportunities, is particularly important in such environments (Nguyen, An, Ngo,

& Hau, 2020). To succeed in today's business world, it is essential for the startups to be managed by individuals who possess both entrepreneurial and technological capabilities (Halac, 2015).

H4: The entrepreneurial orientation mediates the influence of technology orientation on the innovation performance.

While the capital constraints are frequently identified as a primary factor, it is important to acknowledge that failures can also stem from an excessive focus on the market demands or technological aspects. This leads to the ongoing debate regarding the market-oriented innovation versus the technology-oriented innovation within the realms of business and innovation management. The market-oriented innovation involves creating products and services that cater specifically to the preferences and needs of the target market. On the other hand, the technology-oriented innovation places great emphasis on developing advanced technologies and solutions, often driven by technological progress. These two approaches differ in their focal points: the market-oriented innovation focuses on the consumer demand and market trends, while the technology-oriented innovation prioritizes the advancement and breakthroughs in the technology (Jeong, Kim, Son, & Nam, 2020). This study highlights the importance of technology and entrepreneurial orientation in enhancing innovation performance.

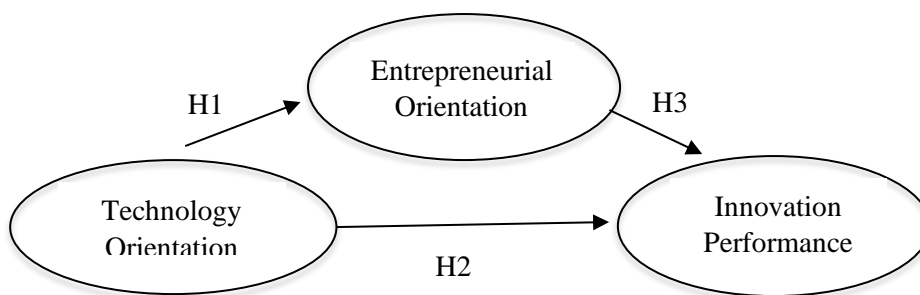


Figure 1. Conceptual Framework

3. RESEARCH METHODS

This study aims to investigate the influence of technological orientation on entrepreneurial orientation and innovation performance. This study was done in a quantitative manner. The hypotheses were examined using a covariance based Structural Equation Modeling (SEM) using AMOS version 23. The data was examined for its descriptive analysis using SPSS version 26.

Based on the data published on www.startupranking.com in February 2022, the number of local startups in Indonesia reached 2,333 units. The data of this study was collected using a purposive sampling method that met several specific criteria. These criteria included a minimum operational duration of 3 years, domestic ownership, and a position among the top 1,000 in Indonesia. A total of 550 questionnaires were distributed to targeted samples obtained from LinkedIn and company websites. The data was collected from February to August 2022, following the distribution of an introduction e-mail inviting participants in the survey. There was a total of 210 responses collected, with 156 responses fully completed and meeting the criteria, for a response rate of 38.2%. This sample size was within the statistical analysis range of 100 to 150 subjects (Riley, Snell, Ensor, Burke, Harrell, Moons, & Collins, 2019).

Most of the startups participating in the study had workforces of 35 to 50 employees. The majority of them also reported monthly earnings ranging from IDR 300 million (US\$20,000) to IDR 2.5 billion (US\$166,000) (see Table 1).

Table 1. Sample Profile

Startup Type	N	%
Marketplace	56	35.9
E-commerce	23	14.7
Fintech	10	6.4
Application	41	26.3
Games	26	16.7
	156	100
Number of Employee		
10 - 20 employees	23	14.7
21 - 35 employees	54	34.6
35 - 50 employees	69	44.2
More than 50 employees	10	6.4
	156	100
Estimated Gross Revenue/Month		
> IDR 2.5 billion (US\$ 166,000)	23	14.7
IDR 300 million (US\$ 20,000) < N < IDR 2.5 billion (US\$ 166,000)	86	55.1
< IDR 300 million (US\$ 20,000)	47	30.1
N	156	100

Source: Field research (2022)

The questionnaire was divided into four sections: screening, company profile, main instruments, and closing remarks. The screening section focused on evaluating the company's age and experience in the innovation development. In the company profile section, information on the startup's industry, number of employees, and estimated gross revenue were collected. The main instruments section sought answers about the startups' innovation processes and strategies. Finally, the closing remarks section provided the participants an opportunity to share additional comments or feedback. The questionnaire consisted of 17 closed-ended statements, as detailed in Appendix 1. The participants used a five-point Likert scale to describe their degree of agreement with each item (1=strongly disagree; 2=disagree; 3=neutral; 4=agree; 5=strongly agree).

Three key constructs were measured in the primary instruments, consisting of technology orientation, entrepreneurial orientation, and innovation performance. The technology orientation assessed a firm's commitment to implementing new technology-related processes across the organization. This construct utilized six items adapted from Masa'deh, Al-Henzab, Tarhini, & Obeidat (2018). The entrepreneurial orientation captured the integration of innovation, proactivity, and risk-taking within a firm. For this construct, there were seven measurement items adapted from Aloulou (2019), and Masa'deh *et al.* (2018). Meanwhile, the innovation performance aimed to measure a firm's innovation process. The more advanced the innovation process, the higher the number of product indicators (Dziallas & Blind, 2019). Given that small- and medium-sized firms might have a lack of readily available accounting data and subjective measures (Aloulou, 2019), this study adopted four process instrument dimensions representing efficiency, time, diversification, and quality (Dziallas & Blind, 2019). They were measured based on the top management's satisfaction and perception of their innovation accomplishments.

This study evaluated the reliability and validity of each construct through confirmatory factor analysis (CFA), providing insights for interpreting the comprehensive model in the

subsequent section. The validity of the instrument was assessed based on the factor loading value. The factor loading and composite reliability value are presented in Appendix 1. The results show that all factor loading value, except EO1, are higher than 0.7, exceeding the threshold of 0.6 (Hair, Black, Babin, & Anderson, 2019). These values demonstrate that all instruments exhibit a satisfactory level of validity. The following Table 2 indicates no multicollinearity among the constructs and all correlation values exhibit a moderate positive correlation. The positive direction signifies that variations in the independent variables align with changes in the dependent variable.

Table 2. Discriminant Validity and Correlation

	Mean	SD	T	EO	IP
T	3.33	0.896	0.768	-	-
EO	3.36	0.833	0.686	0.747	-
IP	3.5	0.757	0.644	0.644	0.830

Source: Field research (2022)

The reliability test was measured through composite reliability (CR) and discriminant validity tests. The results show that the CR values are higher than 0.7. In addition, the results of discriminant validity test show an equal level of satisfaction. The above Table 2 presents that the square roots of the average variance extracted (AVE) for all constructs are higher than the correlations between them, indicating that the level of discriminant validity is above the satisfactory level. Further, the goodness of fit analysis shows that the model has a good fit. The following Table 3 summarizes the measures of P-value, CMIN/DF, RMSEA, GFI, AGFI, TLI, and NFI. Each of these measures was evaluated based on the threshold values recommended by (Hair *et al.*, 2019), confirming the robustness and appropriateness of the model.

Table 3. Model Fit and Parameter Indices

Measures	Threshold Value	TO	EO	IP	SM
P -value	≥ 0.05	0.052	0.046	0.132	0.06
CMIN/DF	< 2.0	1.89	1.71	2.0	1.22
RMSEA	< 0.08	0.075	0.068	0.08	0.037
GFI	> 0.90	0.97	0.96	0.99	0.91
AGFI	> 0.90	0.92	0.92	0.94	0.88
TLI	> 0.90	0.97	0.97	0.98	0.98
NFI	> 0.90	0.97	0.97	0.99	0.92

Note:

TO : Technology Orientation

EO : Entrepreneurial Orientation

IP : Innovation Performance

SM : Structural Model (Full Model)

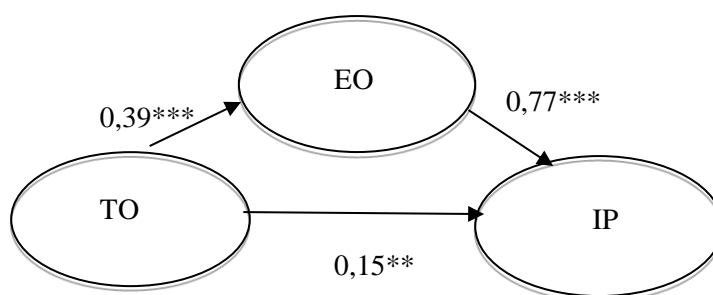
The technology orientation and innovation performance show a good relationship across all metrics. While the p-value of the entrepreneurial orientation indicates a comparatively less optimal fit, the other metrics indicate a favorable fit. Consequently, the comprehensive CFA assessment for the entrepreneurial orientation is considered to have yielded a satisfactory outcome. As outlined by Hair *et al.* (2019), three to four fit indices usually offer substantial evidence of model fit.

4. DATA ANALYSIS AND DISCUSSIONS

The results of this study show that the structural model demonstrates a strong alignment with the data, as evidenced by multiple fit indices surpassing the recommended threshold values (see Table 3 and Appendix 2). The Absolute Fit Index (AFI) assessed whether the model

effectively explained the data variance. The Chi-square statistic, along with the model's degrees of freedom and a probability (p-value) of 0.6, indicates a favorable fit. The Goodness of Fit Index (GFI) of 0.991 and the Root Mean Square Error of Approximation (RMSEA) of 0.037 further support this conclusion. Additionally, the Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), and Incremental Fit Index (IFI) all exceed their respective threshold values, with CFI > 0.90, TLI > 0.90, and NFI > 0.90. These results collectively suggest that the structural model appropriately corresponds to the data.

Further, the following Figure 2 presents the results of the SEM analysis, illustrating the relationships among the technology orientation (TO), entrepreneurial orientation (EO), and innovation performance (IP). Each path in the diagram portrays a corresponding hypothesis, accompanied by standardized regression weight estimates and associated significance levels (*p < 0.1; **p < 0.05; ***p < 0.01).



Note: β is in Unstandardized value

Figure 2. SEM Path Coefficient

Based on the results of the SEM path coefficient analysis, the technology orientation significantly and positively influences both entrepreneurial orientation ($\beta_1 = 0.39$, $p < 0.01$) and innovation performance ($\beta_3 = 0.77$, $p < 0.01$), thereby confirming H1 and H3. Furthermore, the entrepreneurial orientation also exhibits a significant positive impact on the innovation performance ($\beta_2 = 0.15$, $p < 0.05$), validating H2 (Appendix 3).

In the context of evaluating indirect effects, a requisite condition involved the presence of relationships with at least one intervening construct. The p-value of the paths signifies substantively significant relationships between the technology orientation and entrepreneurial orientation, as well as between the entrepreneurial orientation and innovation performance. In this study, the utilization of bootstrapping techniques was adopted, affording more statistical power for assessing the mediating effects in contrast to the conventional mediation analysis approaches. The bootstrapping methodology concurrently computed the direct, indirect, and total effects, alongside significance levels represented as confidence intervals (CI) (Zhao, Linch, & Chen, 2010).

The researchers utilized the bootstrapping mediation test to investigate the presence of a mediation effect. The calculated parameter values indicated that the relationship between the predictor variable (TO) and the mediator variable (EO), and subsequently between the mediator variable (EO) and the outcome variable (IP), was assessed to be 0.30. The confidence interval for this estimate was bounded by 0.21 on the lower end and 0.43 on the top end. The p-value associated with the mediation effect was determined to be statistically significant at a level of 0.001, providing evidence to support the presence of the mediation effect.

The p-value indicates that the entrepreneurial orientation has a positive and significant mediating effect on the relationship between technology orientation and innovation performance ($***p < 0.001$). The indirect effect coefficient is $\beta_{IF} = 0.30$. The entrepreneurial orientation partially mediates the relationship between technology orientation and innovation performance, because the technology orientation also has a significant direct effect on the innovation performance ($\beta = 0.15$). Therefore, H4 is supported empirically. Thus, the total effect of technology orientation on innovation performance is $0.45 (\beta + \beta_{IF})$, indicating the magnitude of the role of entrepreneurial orientation in increasing the innovation performance. Ignoring the entrepreneurial orientation might decrease this effect by 0.30.

Technology-driven startups exhibited high levels of innovation, yet they often operated within volatile and precarious environments, posing a challenge to their survival. Numerous factors contributed to their struggle for growth, ranging from errors made by young entrepreneurs in their initial stages, discrepancies between managerial strategies and execution that could result in failure, to financial considerations (Omorieg *et al.*, 2019).

Our research results not only confirm the positive effects of technology orientation, but also cast light on its symbiotic relationship with entrepreneurial orientation. This is consistent with prior research by Masa'deh *et al.* (2018), Poudel, Carter, & Lonial (2019), and Urban (2010), all of which contribute to the expanding body of knowledge in this field. Technology orientation denotes a company's commitment to incorporating innovative technology-driven processes throughout its operations (Rezazadeh, Karami, & Karami, 2016). In this context, technology orientation at the organizational level consists of four dimensions: top management capability, technological capability, commitment to learning, and commitment to change. These factors collectively support and foster the inherent risk-taking, creativity, and initiative of fledgling companies.

Innovation is a multifaceted process that is influenced by the interaction between market-driven influences and technological advances. In this complex environment, technology orientation corresponds to the dynamics of technological push, which emanate from upstream industries and propagate downstream. Although this strategy has the potential for significant advancements, it carries a greater inherent risk of failure compared to the market-pull-focused strategy. However, this dynamic push-pull interaction contributes synergistically to the overall landscape of innovation performance. On the other hand, market pull originates from downstream connections within the same stratum, with end-user demand driving growth in the sectors upstream (Rezazadeh *et al.*, 2016). This interaction highlights the intricate connection between technological and entrepreneurial orientation.

Scholars argue that this complex interaction between technological orientation and entrepreneurial orientation can stimulate entrepreneurial behavior by facilitating a proactive response to market signals. In addition, it improves a company's adaptability, allowing it to effectively navigate an ever-changing business environment. This dynamic relationship demonstrates the importance of these orientations in fostering an all-encompassing and responsive entrepreneurial ecosystem.

In addition, this study also confirms a positive impact of entrepreneurial orientation on firm performance. In the rapidly evolving landscape of the dynamic digital sector, the entrepreneurial orientation increased the chances of achieving successful innovation propelled by

technological progress. This finding is in line with the investigation by (Hendrix, 2019), which explored the influence of entrepreneurial orientation in navigating swift technological advancements and unanticipated shifts in the environment. While a solitary technological orientation construct impacted the innovation performance, the entrepreneurial orientation magnified this influence. The entrepreneurs would assume a pivotal function in the technological innovation, with their innovation behavior being guided by the potential for profits.

Furthermore, the findings of this study agree with a substantial body of previous research that has repeatedly highlighted the positive correlation between technology and innovation performance (Adams, Bodas Freitas, & Fontana, 2019; Aloulou, 2019; Kim, Lee, Park, & Oh, 2011; Ripsas, Schaper, & Tröger, 2018). This correlation has been consistently highlighted as a driving force behind technological advancement. According to Choi *et al.* (2020), technology has consistently been one of the most influential factors in economic expansion across the course of human history, continuing into the modern digital era. Its relevance extends even further, working as an enabler of entrepreneurial potential (Tripathi, Seppänen, Boominathan, Oivo, & Liukkunen, 2019) and inspiring unprecedented transformations in consumer behavior (Jesemann, 2020). These are only two examples of the ways in which it has an impact.

Our research is in line with this larger pattern; nevertheless, it is essential to point out that our findings contrast with those of Saqib, Zarine, & Udin (2018), who did not uncover any evidence of a significant impact that technology has on the innovation performance of businesses. The diverse findings emphasize the delicate interaction of contextual elements and specific situations that can alter the relationship between technology and innovation in different places. These contradictory findings highlight the complexity of this relationship and the necessity of conducting additional nuanced research to gain an understanding of the myriad ways in which technology influences the results of innovation.

On the other hand, this study confirms that the technology innovation has a moderate impact on the innovation performance. This finding is in line with Arshad, Rasli, Arshad, & Zain (2014), Hortinha, Lages, & Lages (2011), Masa'deh *et al.* (2018). The technology had a significant impact on the innovation performance when there was a well-focused capacity-building plan and a pursuit of more competitive markets (Saqib *et al.*, 2018). It needed several strategies to move forward, including enhancing capabilities for the R&D, fostering collaboration among startups, reviewing government legislation and support for the startups, implementing a well-focused capacity-building plan, and striving for more competitive markets. Given that the entrepreneurial orientation involved the ability to balance risks and opportunities within the technology-driven capabilities and other crucial aspects, it became crucial for the startups to effectively enhance their entrepreneurial capability. This approach helped reducing the risk of misalignment between their offerings and market demand.

Our research demonstrates that entrepreneurial orientation plays a crucial role in mediating the links between technology and innovation. This discovery aligns closely with extant research that emphasizes the capacity of entrepreneurial entities to effectively mediate vital factors such as organizational culture, business intelligence, and leadership to improve overall performance (Caseiro & Coelho, 2018).

Considering these findings, business owners and managers are advised to strategically enhance their organizations' implementation of entrepreneurial orientation strategies. This strategic

approach entails a variety of actions, including the introduction of innovative product lines, the incorporation of emerging technologies, the exploration of new markets, the facilitation of increased employee participation in idea generation and design, and the embrace of competitive ventures guided by a calculated risk-taking strategy.

This study has implications that extend beyond theoretical substantiation, as it emphasizes the importance of fostering entrepreneurial orientation within businesses (Piispanen, Paloniemi, & Simonen, 2017). This strategy demonstrates to be effective in a variety of operational contexts, including both challenging and favorable circumstances (Kwiatkowska & Gębczyńska, 2019). Consequently, this study not only contributes to the academic discourse, but also functions as a guiding light for new businesses seeking to flourish and excel in their respective environments.

5. CONCLUSION, SUGGESTION, AND LIMITATION

According to the findings of the study, both the technology orientation and entrepreneurial orientation have a beneficial impact on the innovation performance. The technology orientation refers to a company's commitment to develop and implement new technological procedures. In contrast, the entrepreneurial orientation refers to a company's tendency to be proactive, innovative, and risk-taking. According to the findings, the companies committed to both technology orientation and entrepreneurial orientation were more likely to succeed in their innovation endeavours.

Furthermore, this study discovers that the entrepreneurial orientation serves as a partial mediator between the technology orientation and innovation performance. Furthermore, in addition to its direct influence, an entrepreneurial attitude worked as a bridge that enhanced the effect of technology on innovative performance. As a result of entrepreneurial orientation, the organizations were able to use the technological orientation more successfully for innovation success.

The conclusions of this study are critical for managers. The managers are suggested to prioritize both technological orientation and entrepreneurial orientation to boost the innovation performance. They should also build a culture that favors the risk-taking and stimulates entrepreneurial behavior. This can assist them in managing difficult settings and capitalizing on fruitful possibilities.

Future researches are suggested to examine other strategic orientations, such as learning orientation (Wade & Kidd, 2019), as exogenous components. Firms with a strong learning orientation are more likely to be innovative because they are continually on the lookout for new information and ideas. This can aid in the development of new products and services, the enhancement of existing offerings, and the discovery of new ways to compete in the market.

Furthermore, incorporating organizational capabilities such as networking and absorptive capacity may also strengthen the relationship between these strategic orientations and innovation performance (Aloulou, 2019; Crick & Crick, 2020), which can provide the firms with access to new knowledge, resources, and markets. This can assist them in innovating by providing them with the information and capabilities required to create new products and services.

Given that the samples were collected using a non-random purposive sampling method and that no one in the population had an equal chance of being chosen for the sample, this study

has faced several limitations. Future researches are suggested to use the random sampling method where the time and resources permit. Additionally, this study is based on arbitrary and subjective metrics. By utilizing more thorough methodologies, including firm-level case studies, future researches are expected to validate the findings of this investigation.

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Appendix

Appendix 1. Loading Factors and Composite Reliability

Construct	Measurement Items	Loading	CR
Technological Orientation	The R&D activities are the main routine activities in our company (T1).	0.777	0.896
	We learn and absorb new knowledge in order to advance in technology (T2).	0.761	
	We develop technology to anticipate the users' needs (T3).	0.734	
	Our knowledge of technology is more advanced than our competitors' (T4).	0.729	
	We develop ambitious technologies in the eyes of our competitors (T5).	0.839	
	We use the latest technology to deliver products and services (T6).	0.765	
Entrepreneurial Orientation	Our organizational culture fosters innovations for every one (EO1).	0.621	0.897
	Our top management encourages everyone to participate to innovations (EO2).	0.821	
	We perform a proactive behavior rather than the reactive behavior to markets/ competitors (EO3).	0.782	
	Our activities become a benchmark to the competitors, because we predict and anticipate changes (EO4).	0.782	
	We are willing to take action in order to demonstrate the result (EO5).	0.740	
	We have assigned a risk to each action we do (EO6).	0.736	
	Uncertainties must be confronted with bravery in order to accept measured risks (EO7).	0.732	
Innovation Performance	We are more agile than our competitors in developing prototypes (IP1).	0.846	0.898
	Our project portfolio is continuously expanding (IP2).	0.771	
	Our project's return of investments exceeds our expectations (IP3).	0.832	
	We receive a lot of positive feedbacks from the users about our prototypes (IP4).	0.871	

Appendix 2. Goodness of fit Evaluation

Evaluation Index	Value	level	Evaluation
Absolute Fit Index			
χ^2/df (Probability)	136.953 (0.05)	Prob. > 0.05 for good fit	Good
RMSEA	0.038	≤ 0.05 for good fit and ≤ 0.08 for adequate fit	Good
GFI	0.911	> 0.9 for good fit	Good
Relative Fit Index			
TLI	0.981	> 0.9 for good fit	Good
NFI	0.922	> 0.9 for good fit	

Appendix 3. Full Model

