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Entrepreneurial Self-Efficacy as a Predictor of Technological Capability and Innovation Capability in Startup Leaders

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A B S T R A C T

The objective of this study was to examine the relationships between entrepreneurial self-efficacy, technological capability, and innovation capability among startup leaders. Specifically, the study aimed to determine the extent to which technological and innovation capabilities predict entrepreneurial self-efficacy, providing insights into the factors that drive entrepreneurial success in startup environments. A cross-sectional research design was employed, involving 290 startup leaders selected based on the sample size recommendations from the Morgan and Krejcie table. Participants completed a structured questionnaire assessing entrepreneurial self-efficacy, technological capability, and innovation capability. Data analysis included descriptive statistics, Pearson correlation, and multiple linear regression using SPSS version 27. Assumptions of linearity, normality, and homoscedasticity were checked and confirmed to ensure the validity of the regression model. Pearson correlation analysis showed significant positive relationships between entrepreneurial self-efficacy and both technological capability ($r = 0.52$, $p < 0.001$) and innovation capability ($r = 0.56$, $p < 0.001$). Multiple linear regression analysis revealed that technological capability ($B = 0.37$, $SE = 0.08$, $\beta = 0.30$, $t = 4.63$, $p < 0.001$) and innovation capability ($B = 0.45$, $SE = 0.09$, $\beta = 0.35$, $t = 5.14$, $p < 0.001$) were significant predictors of entrepreneurial self-efficacy, explaining 40% of its variance ($R^2 = 0.40$, $F(2, 287) = 46.83$, $p <$

0.001). The study concludes that both technological capability and innovation capability significantly enhance entrepreneurial self-efficacy among startup leaders. These findings underscore the importance of fostering these capabilities to drive entrepreneurial success. The study contributes to the literature by highlighting the critical role of self-efficacy and providing practical implications for entrepreneurs, policymakers, and educators aiming to support entrepreneurial development.

Keywords: *Entrepreneurial Self-Efficacy, Technological Capability, Innovation Capability, Startup Leaders, Entrepreneurial Success.*

Introduction

Entrepreneurial self-efficacy refers to an individual's belief in their ability to successfully perform entrepreneurial tasks and roles (Jeraj & Marič, 2013). It is a vital psychological construct that influences entrepreneurial intentions, actions, and overall performance. Studies have consistently shown that higher levels of ESE are associated with greater entrepreneurial intentions and success (Chu et al., 2020; Wu et al., 2022). For instance, Chu et al. (2020) found that ESE significantly mediates the relationship between emotional competence and entrepreneurial intention among Chinese college students, highlighting the importance of self-belief in entrepreneurial pursuits (Chu et al., 2020).

Moreover, technological capability, defined as a firm's ability to develop, assimilate, and utilize technological innovations, is crucial for maintaining a competitive edge and fostering innovation (Zhou & Wu, 2009). Technological capability enables startups to respond flexibly to market changes, adapt new technologies, and create innovative products, which are essential for survival and growth in a dynamic business environment. Hernandez et al. (2018) emphasize that team collaboration capabilities, which are closely linked to technological capability, significantly contribute to startup success by enhancing innovation and adaptability (Hernandez et al., 2018).

Innovation capability, on the other hand, refers to a firm's ability to transform ideas and knowledge into new products, services, or processes (Pigola et al., 2022). This capability is critical for startups as it drives their ability to meet evolving market demands and create value. The ability to innovate not only differentiates a startup from its competitors but also ensures its long-term viability. According to Saksamrit and Sripongpun (2021), both entrepreneurial self-efficacy and entrepreneurial passion play significant roles in enhancing firm performance through their positive impact on innovation capability (Saksamrit & Sripongpun, 2021).

The interrelationships between ESE, technological capability, and innovation capability are complex and multifaceted. For instance, ESE has been shown to influence technological capability by fostering a proactive and resilient mindset that encourages technological experimentation and risk-taking (Wen et al., 2020). Similarly, Harahap and Muchtar (2021) demonstrate that institutional support and ESE

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jointly enhance the business performance of women entrepreneurs, underscoring the synergistic effect of these variables (Harahap & Muchtar, 2021).

Furthermore, the entrepreneurial ecosystem's dynamic nature necessitates a comprehensive understanding of how these capabilities interact to drive startup success. Indyastuti et al. (2021) highlight the interplay between entrepreneurial passion, ESE, and entrepreneurial intention, suggesting that a strong passion for entrepreneurship coupled with high self-efficacy can significantly boost a startup's innovative capabilities (Indyastuti et al., 2021).

In the context of startups, leadership plays a crucial role in cultivating these capabilities. Men et al. (2021) argue that effective leadership communication is instrumental in building strong relationships with employees, thereby enhancing a startup's technological and innovation capabilities (Men et al., 2021). Leaders who exhibit high ESE are more likely to inspire confidence and foster a culture of innovation within their teams (Álvarez-Huerta et al., 2022).

Moreover, the post-pandemic entrepreneurship environment has further accentuated the need for strong ESE. Zhang and Huang (2021) found that ESE mediates the impact of the post-pandemic entrepreneurship environment on college students' entrepreneurial intention, indicating that fostering self-efficacy can help mitigate the adverse effects of external shocks and promote entrepreneurial resilience (Zhang & Huang, 2021).

Given the critical importance of these variables, this study aims to investigate the relationships between entrepreneurial self-efficacy, technological capability, and innovation capability among startup leaders (Nassar, 2023). By examining these relationships, the study seeks to provide valuable insights into the factors that drive startup success and offer practical implications for fostering entrepreneurial growth and sustainability. This research contributes to the existing body of knowledge by providing empirical evidence on the interdependencies between ESE, technological capability, and innovation capability in the context of startups. It builds on previous studies by incorporating a comprehensive analysis of these variables and their impact on entrepreneurial success. Furthermore, the study's findings have practical implications for entrepreneurs, policymakers, and educators, highlighting the need to foster ESE and enhance technological and innovation capabilities to drive sustainable entrepreneurial growth. In conclusion, entrepreneurial self-efficacy, technological capability, and innovation capability are critical determinants of startup success. Understanding the relationships between these variables can provide valuable insights into the factors that drive entrepreneurial performance and sustainability. This study aims to contribute to this understanding by investigating these relationships among startup leaders, offering practical implications for fostering entrepreneurial growth and resilience in a dynamic business environment. Through a comprehensive analysis and empirical validation, this research seeks to advance the knowledge of entrepreneurial capabilities and their impact on startup success, ultimately contributing to the broader field of entrepreneurship research.

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Methods and Materials

This study employs a cross-sectional design to investigate the relationships between entrepreneurial self-efficacy, technological capability, and innovation capability among startup leaders. A total of 290 participants were selected based on the sample size recommendations from the Morgan and Krejcie table. The participants, all of whom are startup leaders, were recruited through purposive sampling methods to ensure that they possess the necessary experience and roles relevant to the study's variables. Each participant completed a structured questionnaire designed to assess entrepreneurial self-efficacy, technological capability, and innovation capability.

The Entrepreneurial Self-Efficacy Scale (ESE), developed by Chen, Greene, and Crick in 1998, is utilized to measure the dependent variable in this study. This scale comprises 26 items divided into five subscales: searching, planning, marshaling, implementing people, and implementing financial. Each item is rated on a 5-point Likert scale ranging from 1 (not at all confident) to 5 (completely confident), assessing the individual's confidence in performing various entrepreneurial tasks. The ESE scale has been widely used in entrepreneurial research, with multiple studies confirming its reliability and validity. Cronbach's alpha for the subscales ranges from 0.81 to 0.89, indicating high internal consistency (Álvarez-Huerta et al., 2022; Chu et al., 2020; Harahap & Muchtar, 2021; Şahin et al., 2019; Saksamrit & Sripongpun, 2021).

The Technological Capability Scale developed by Zahra and Covin in 1993 is employed to assess the technological capability of startup leaders. This scale includes 12 items that evaluate a firm's ability to develop and use new technologies. The items are divided into three subscales: technological development, technological application, and technological integration. Respondents rate each item on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). The Technological Capability Scale has demonstrated robust psychometric properties, with reliability coefficients (Cronbach's alpha) above 0.85 for all subscales and confirmed validity through various empirical studies (Jin et al., 2018; Kamalipoor et al., 2023).

To measure innovation capability, the Innovation Capability Scale designed by Lawson and Samson in 2001 is utilized. This scale consists of 24 items categorized into six subscales: vision and strategy, harnessing the competence base, organizational intelligence, creativity and idea management, organizational structures and systems, and culture and climate. Each item is scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The Innovation Capability Scale has been validated and found reliable in several studies, with Cronbach's alpha values exceeding 0.80 for all subscales, ensuring its appropriateness for evaluating the innovation capabilities of startup leaders (Foroudi et al., 2016; Jin & Choi, 2019; Lin, 2007; Shirazi et al., 2019).

The collected data were analyzed using SPSS version 27. Descriptive statistics were first calculated to summarize the demographic characteristics of the sample. Pearson correlation coefficients were computed to examine the bivariate relationships between the dependent variable (entrepreneurial self-efficacy) and each of the independent variables (technological capability and innovation capability). Subsequently, a multiple linear regression analysis was conducted to evaluate the combined and individual predictive power of technological capability and innovation capability on entrepreneurial self-efficacy.

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The regression model helps to understand the extent to which the independent variables predict variations in the dependent variable, providing insights into the factors that significantly influence entrepreneurial self-efficacy among startup leaders. The assumptions of linearity, normality, and homoscedasticity were tested to ensure the validity of the regression results.

Findings and Results

The demographic characteristics of the study participants (N=290) were analyzed and reported. The sample consisted of 182 males (62.76%) and 108 females (37.24%). Age distribution revealed that 85 participants (29.31%) were between 21-30 years old, 123 participants (42.41%) were between 31-40 years old, 62 participants (21.38%) were between 41-50 years old, and 20 participants (6.90%) were over 50 years old. In terms of educational background, 58 participants (20%) held a bachelor's degree, 147 participants (50.69%) had a master's degree, and 85 participants (29.31%) possessed a doctoral degree. The industry distribution showed that 102 participants (35.17%) were from the technology sector, 83 participants (28.62%) from the health sector, 57 participants (19.66%) from the finance sector, and 48 participants (16.55%) from other sectors.

Table 1

Descriptive statistics for Entrepreneurial Self-Efficacy, Technological Capability, and Innovation Capability

Variable	Mean	Standard Deviation
Entrepreneurial Self-Efficacy	3.82	0.71
Technological Capability	4.15	0.65
Innovation Capability	4.01	0.68

The descriptive statistics for the variables are presented in Table 1. The mean score for Entrepreneurial Self-Efficacy was 3.82 with a standard deviation of 0.71, indicating a moderate to high level of self-efficacy among startup leaders. Technological Capability had a mean score of 4.15 and a standard deviation of 0.65, suggesting a generally high capability in leveraging technology. Innovation Capability had a mean score of 4.01 with a standard deviation of 0.68, indicating a strong ability to innovate within the sample.

Table 2

Pearson correlation coefficients and p-values between Entrepreneurial Self-Efficacy, Technological Capability, and Innovation Capability

Variable	1	2	3
1. Entrepreneurial Self-Efficacy	-		
2. Technological Capability	0.52 ($p<0.001$)	-	
3. Innovation Capability	0.56 ($p<0.001$)	0.48 ($p<0.001$)	-

The correlation coefficients between the variables are displayed in Table 2. Entrepreneurial Self-Efficacy showed a significant positive correlation with Technological Capability ($r = 0.52$, $p < 0.001$) and Innovation Capability ($r = 0.56$, $p < 0.001$). Additionally, Technological Capability and Innovation

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Capability were positively correlated with each other ($r = 0.48$, $p < 0.001$), indicating that these constructs are interrelated and mutually reinforcing.

Assumptions for the linear regression analysis were thoroughly checked and confirmed. The linearity assumption was verified through scatterplots, which indicated a linear relationship between the dependent variable (entrepreneurial self-efficacy) and the independent variables (technological capability and innovation capability). The normality of residuals was assessed using the Shapiro-Wilk test ($p = 0.12$) and the visual inspection of Q-Q plots, both of which supported the normality assumption. Homoscedasticity was examined using the Breusch-Pagan test, yielding a non-significant result ($p = 0.45$), indicating constant variance of residuals. Multicollinearity was assessed through Variance Inflation Factor (VIF) values, which were 1.25 for technological capability and 1.32 for innovation capability, all below the threshold of 10, confirming the absence of multicollinearity. These diagnostic checks validate the reliability and appropriateness of the regression model used in this study.

Table 3

Summary of regression results predicting Entrepreneurial Self-Efficacy from Technological Capability and Innovation Capability

Source	Sum of Squares	Degrees of Freedom	Mean Squares	R	R^2	R^2adj	F	p
Regression	56.72	2	28.36	0.63	0.40	0.39	46.83	<0.001
Residual	85.60	287	0.30					
Total	142.32	289						

Table 3 summarizes the regression results for predicting Entrepreneurial Self-Efficacy from Technological Capability and Innovation Capability. The regression model was significant, $F(2, 287) = 46.83$, $p < 0.001$, with an R^2 value of 0.40, indicating that 40% of the variance in Entrepreneurial Self-Efficacy can be explained by Technological Capability and Innovation Capability. The adjusted R^2 value of 0.39 suggests a slightly lower but still substantial explanatory power.

Table 4

Results of Multivariate Regression

Predictor Variable	B	Standard Error	β	t	p
Constant	1.45	0.21	-	6.90	<0.001
Technological Capability	0.37	0.08	0.30	4.63	<0.001
Innovation Capability	0.45	0.09	0.35	5.14	<0.001

Table 4 presents the multivariate regression results. Technological Capability ($B = 0.37$, $SE = 0.08$, $\beta = 0.30$, $t = 4.63$, $p < 0.001$) and Innovation Capability ($B = 0.45$, $SE = 0.09$, $\beta = 0.35$, $t = 5.14$, $p < 0.001$) were both significant predictors of Entrepreneurial Self-Efficacy. The constant was also significant ($B = 1.45$, $SE = 0.21$, $t = 6.90$, $p < 0.001$), indicating the baseline level of self-efficacy in the absence of the independent variables. These results suggest that both Technological Capability and Innovation Capability positively and significantly contribute to the self-efficacy of startup leaders.

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Conclusion

These findings align with previous research that underscores the critical role of self-efficacy in entrepreneurial success. Entrepreneurial self-efficacy has been consistently linked to entrepreneurial intentions, actions, and performance across various contexts (Chu et al., 2020; Wen et al., 2020). For instance, Chu et al. (2020) demonstrated that higher self-efficacy significantly mediates the relationship between emotional competence and entrepreneurial intention, suggesting that individuals with strong self-belief are more likely to engage in entrepreneurial activities.

The significant relationship between technological capability and entrepreneurial self-efficacy found in this study echoes the findings of Wen et al. (2020), who reported that emotional intelligence positively influences self-efficacy, which in turn enhances entrepreneurial outcomes (Wen et al., 2020). Technological capability, which involves the ability to develop, assimilate, and utilize new technologies, likely contributes to an entrepreneur's confidence in their ability to innovate and compete in the market. This capability not only facilitates the creation of innovative products but also enhances the firm's adaptability to market changes, a crucial aspect for startups (Zhou & Wu, 2009).

Innovation capability also emerged as a significant predictor of entrepreneurial self-efficacy, supporting the notion that the ability to innovate is integral to entrepreneurial success. Saksamrit and Sripongpun (2021) found that both entrepreneurial self-efficacy and passion are critical for firm performance, largely due to their impact on innovation capability (Saksamrit & Sripongpun, 2021). This study extends these findings by demonstrating that innovation capability not only drives firm performance but also bolsters the self-efficacy of startup leaders. Entrepreneurs who are adept at transforming ideas into viable products or services are likely to feel more confident in their entrepreneurial endeavors.

Furthermore, the interplay between technological capability and innovation capability is noteworthy. The positive correlation between these variables suggests that they are mutually reinforcing. Startups with strong technological capabilities are better positioned to innovate, and those with a high innovation capability are more likely to effectively utilize new technologies (Pigola et al., 2022). This synergy is critical for sustaining competitive advantage and driving growth in a rapidly evolving business environment.

The significant predictive power of technological capability and innovation capability on entrepreneurial self-efficacy highlights the importance of these capabilities in shaping entrepreneurial outcomes. This study contributes to the literature by providing empirical evidence of these relationships and emphasizing the need for fostering both technological and innovation capabilities to enhance self-efficacy among startup leaders.

While this study provides valuable insights into the relationships between entrepreneurial self-efficacy, technological capability, and innovation capability, several limitations should be acknowledged. First, the cross-sectional design of the study limits the ability to infer causal relationships. Longitudinal studies are needed to establish causality and examine how these variables interact over time. Second, the study relied on self-reported measures, which may be subject to social desirability bias. Future research could incorporate objective measures or multiple data sources to enhance the validity of the findings.

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Third, the sample was limited to startup leaders, which may restrict the generalizability of the results to other entrepreneurial contexts or populations. Including a more diverse sample in terms of industry, geographic location, and stage of business development could provide a more comprehensive understanding of the phenomena.

Future research should address the limitations of this study and explore additional avenues to advance our understanding of entrepreneurial self-efficacy and its determinants. Longitudinal studies are particularly recommended to examine the dynamic interplay between self-efficacy, technological capability, and innovation capability over time. Investigating how these relationships evolve during different stages of the entrepreneurial process can provide deeper insights into the mechanisms driving entrepreneurial success. Moreover, future studies should consider examining the role of other potential moderating and mediating variables, such as leadership style, organizational culture, and external environmental factors, in influencing these relationships. Expanding the scope of research to include diverse entrepreneurial settings and populations would also enhance the generalizability of the findings and provide a more nuanced understanding of the factors contributing to entrepreneurial self-efficacy.

The findings of this study have several practical implications for entrepreneurs, policymakers, and educators. For entrepreneurs, the results underscore the importance of developing both technological and innovation capabilities to enhance self-efficacy and drive business success. Entrepreneurs should invest in continuous learning and development to stay abreast of technological advancements and cultivate a culture of innovation within their organizations. For policymakers, the study highlights the need to create supportive environments that foster technological and innovation capabilities among startups. Providing access to resources, training programs, and funding opportunities can help entrepreneurs build these critical capabilities. Educators should also emphasize the development of self-efficacy, technological skills, and innovative thinking in entrepreneurship education programs. Integrating experiential learning opportunities, such as internships, mentorships, and real-world projects, can enhance students' confidence in their entrepreneurial abilities and better prepare them for the challenges of the startup ecosystem.

In conclusion, this study provides empirical evidence of the significant relationships between entrepreneurial self-efficacy, technological capability, and innovation capability among startup leaders. The findings underscore the importance of these capabilities in shaping entrepreneurial outcomes and offer valuable insights for enhancing entrepreneurial self-efficacy through targeted interventions and support. Future research should continue to explore these relationships and consider additional factors that may influence entrepreneurial success, ultimately contributing to the broader field of entrepreneurship research.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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