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THE ROLE OF INNOVATION CAPABILITIES AND COMPETITIVE ADVANTAGE AS MEDIATING VARIABLES IN THE RELATIONSHIP BETWEEN TECHNOLOGY AND THE SUCCESS OF STARTUP BUSINESSES IN THAILAND

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Abstract

Startup businesses are important for economic development, especially in developing countries. These businesses use technology to drive their successful operations. This research study examined the influence of innovative capabilities and competitive advantage as mediating variables in the relationship between technology and the success of startup businesses in Thailand. The Resource-based View Theory (Barney, 1991) was used as the theoretical basis for the study. The population studied consisted of startup business entrepreneurs in Thailand. A sample of 579 startup businesses was chosen through a probabilistic sampling method through simple random sampling from all types of startup business. Path analysis was used for data analysis, with results of the study showing the influence of innovative capabilities and competitive advantage as mediating variables in the relationship between technology and the success of startup businesses in Thailand. This new knowledge has driven the government to develop strategies and policies to create and grow startup businesses. It has also encouraged startup business entrepreneurs to focus on building competitive advantages and innovation in their businesses and to continuously develop technology for the survival and growth of their businesses.

Keywords: Innovation Capability, Competitive Advantage, Technology, Startup Success

1. INTRODUCTION

Startups are the primary drivers of economic growth and job creation in emerging economies (Yanuarti & Dewi, 2019). According to the Global Digital Report (2020), startup business has Indonesia increased by 64% and continues to grow.

Accordingly, the growth of startups in Thailand and other developing countries such as Vietnam, India, and Brazil has been remarkable (Nikkei Asia, 2023). Thai startups received over $530 million in investments in 2023. This surge in investment can be observed from the Cento Report 2022, which indicated that the investment value in technology (tech investment)

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was only 2% but increased to 6% by the end of 2022. Thailand was able to raise $42 million in funding, highlighting the significant growth of investment in Thai startups. The Nextrans Vietnam Fund, a fintech startup in Vietnam, has successfully raised over $600 million from the United States. In the year 2023, it was discovered that Vietnam has approximately 3,800 startup companies, with 11 startups valued at over $100 million each (Pham et al., 2022). Due to this trend, Vietnam is now a Southeast Asian startup hub trailing only Indonesia and Singapore. Startups in India received $1.4 billion through 50 agreements in August 2019 (IVCA-EY 2019), a seven-fold increase from just $182 million through 32 deals in the previous year. According to Startup India (2019), India is home to over 50,000 businesses, 3,500 of which are expanding at a rate of 30% annually, making it the third-largest startup ecosystem in the world (after the US and the PRC). The success of startups has been the subject of numerous studies, and according to these studies is a great success.

However, startups are also as risk of failure. In Brazil, around 25% of startups cease operations during the first year, and of those that do, 50% close within the fourth year (Arruda et al., 2014). Ten critical success factors (CSFs) for technology-based startups (TBSs) were found in this investigation. By recommending that startups maximize their potential for marketing their competitive advantages, build and strengthen trading networks, and utilize innovations and contemporary technologies in the development of their online businesses, the findings can serve as guidelines for the development of the success of online business entrepreneurs in the digital age (Çağlıyan et al., 2022; Santisteban et al., 2021). Startups need technology to succeed (Pavlenko et al., 2020). Furthermore, academic studies on entrepreneurial accomplishments have demonstrated that the application of technology greatly increases firm owners' success (Jorgensen et al., 2022; Jin & Hoo et al., 2019).

Research on startups and entrepreneurs has shown a correlation between technology and innovation capabilities (e.g., O'Cass & Sok, 2014; Oura et al., 2016; Zhang & Hartley, 2018). Modern technology and innovative product design lead to producing goods that meet customer demands, influencing business success (Saura et al., 2019). Innovation capacities also impact export performance, entrepreneurial success (Dessyana & Riyanti et al., 2017), and the development of new products (Ahn et al., 2022). Furthermore, a startup’s competitiveness is a key factor in determining success. Studies have found that technology, innovation capabilities, and competitive advantages, are all linked to business success (Lahovnik & Matej, 2014). A competitive advantage is critical to a startup's success as it mediates the relationship between technology and innovation (Sait et al., 2018; Weinman, 2012; 2015). Since technology is a major factor in determining a company's success, a competitive advantage also plays a critical role as a mediating variable affecting the success of startups.

Research on startup success in Thailand from 2017 to 2023 explores factors such as entrepreneurs' skills, organizational quality (Tripopsakul et al., 2017; Kaewsawarun et al., 2023; Niyawanont & Napatsaporn, 2023), social capital, entrepreneurial characteristics, and competitive advantages (Warom et al., 2022). The function of a competitive advantage and innovation capacities as mediating elements in the relationship between technology and startup business performance is particularly lacking in Thai research. Thus, this study aims to confirm how innovation capabilities and the competitive advantage work as mediating variables in the relationship between technology and startup success. The findings can guide government policies, aid self-promotion efforts, and contribute to overall economic growth in the country.

2. LITERATURE REVIEW

2.1 Theoretical Background

The Resource-Based View Theory (Barney, 1991) serves as the foundation for this

study, which emphasizes the intangible assets that entrepreneurs might use to gain a competitive edge (Bank, 2020). To obtain a competitive advantage, entrepreneurs must quickly adjust to changing surroundings (Shoosanuk & Ampon, 2021). Business resources are valuable because they are rare and difficult to replicate (Ferreira et al., 2020; Gibson et al., 2021). Businesses use a variety of skills, such as innovation skills, to gain a competitive advantage by developing novel concepts or procedures (Skordoulis et al., 2020; Waqas et al., 2021). Technological and innovative capabilities influence competitive advantages through the development of new products and services.

Investing in creative, high-risk activities produces better returns for startups, as emphasized in the Brealey et al. (2013) study, due to the competitive nature and influential resources that contribute to their success. This leads to enhanced profitability for enterprises, while augmented investment helps to provide enduring viability and triumph of fledgling ventures. A study conducted by Cefis et al. (2019) in the Dutch community revealed a significant association between innovation success and enterprises' subsequent survival. The study conducted by Slepov et al. (2017) analyzed the product variety of German equipment manufacturers after the war and assessed its impact on product innovation. The findings revealed that innovation plays a vital role in ensuring the survival of businesses. Innovation serves as a catalyst for achieving company success.

2.2 Technology, Innovation Capability, and the Success of Startup Businesses

Technology improves operations, leading to lower costs, increased product diversity, and a competitive advantage. It consists of four components (Chamsuk et al., 2017): design technology, control technology, automated production, and information technology. Design technology is used in designing products; control technology uses computer programs (Liu & Gao, 2016); automated production uses engineering concepts (Wan et al., 2015); and information technology uses computer systems for data storage and processing (Huang, 2014).

Research has shown that technology fosters innovation (Huang & Kuo-Feng, 2011; Yam et al., 2011), particularly in the field of information and communication technology (ICT). Startups must employ suitable technology for their production activities and business type to develop a successful business (Lang et al., 2012). Successful entrepreneurs leverage technology used in production to ensure business success (Afolayan et al., 2015; Kleis et al., 2012; Lestari & Ardianti, 2019). Prioritizing the excellence and profitability of goods is essential for a company's success. Investing in production technology yields positive results for small and medium-sized enterprises (Aydiner et al., 2020; Benitez et al., 2018). Strategic use of information technology enhances production efficiency and boosts entrepreneurs' capabilities (Marei, A., et al., 2023). Diverse information technologies facilitate efficient coordination of business operations and effective technology resource management, leading to increased competitive opportunities and improved organizational performance (Lestari & Ardianti, 2019).

The RBV theory explains that technology plays a crucial role in accelerating the creation of startups by providing vital assets that strengthen their competitive advantage. Resources that are valuable, rare, unique, and non-substitutable (VRIN) can be acquired and used by businesses to create a sustained competitive advantage, according to the RBV (Barney, 1991). With minimal physical assets, businesses can use technology as a VRIN resource to facilitate innovation, streamline operations, and enter new markets. Startups may quickly react to changing market conditions and enhance their decision-making processes by utilizing scalable solutions offered by technological tools such as cloud computing, data analytics, and artificial intelligence (Ahn et al., 2022). Moreover, innovation capabilities are crucial to innovation. Startups' dynamic capacities enable them to integrate, build, and reorganize internal

and external competencies to adapt to changing environments (Çağlıyan et al., 2022). Startup growth relies on dynamic skills such as identifying opportunities and adapting to market changes (Teixeira et al., 2021). These characteristics allow startups to develop continuously, keeping them competitive. Startups that recognize market changes and adapt their offers can better satisfy client needs, improving performance and growth. Thus, the present study hypothesizes that:

H1: Technology has the ability to lead to startup success.

H2: Innovation capability has the ability to lead to startup success.

Technology helps companies obtain a competitive edge by optimizing processes, cutting expenses, and facilitating convenient access to global markets. Startups have a competitive advantage when they can offer distinctive products and services or run more efficiently than established companies (Aripradono, 2023) due to the integration of cutting-edge technologies such as cloud computing, artificial intelligence (AI), and data analytics (Porter, 2008). Startups, for instance, can benefit from using AI-driven customer insights to customize their products. Thus, the present study concluded that the strategic use of technology can significantly enhance the competitiveness of startups, enabling them to outperform larger firms and achieve market success. Therefore, this study hypothesizes that:

H3: Technology has the ability to lead to a competitive advantage.

Bakri (2024) stated that technology can induce and accelerate AI techniques that lead to a higher competitive advantage in a fiercely competitive environment. In addition, the integration of digital entrepreneurship practices along with new innovative ideas may attract investors to adopt strategic change that becomes a future strength for successful startups (Matl00b et al., 2023). It was also witnessed by Binowo & Hidayanto (2023) that startups which emphasize innovative methods are better positioned to adjust to shifts in the market and requests from customers. Innovation capability is considered a continuous process of innovation during a digital startup's pioneering stage, while competitive pressures frequently fuel this requirement. Therefore, the present study hypothesizes that:

H4: Technology has the ability to lead to innovation capability.

2.3 The Role of Innovation Capability

Wang & Ahmed (2004) identified five facets of innovation capability: product innovation, market innovation, process innovation, behavioral innovation, and strategic innovation. Product innovation is crucial for a company's competitive edge, resulting in increased productivity, profitability, and sustained growth (Dereli & Dilara, 2015). Market innovation positively influences operational performance, financial returns, and overall business success (Donkor et al., 2018). Process innovation creates new knowledge and processes that challenge product imitation, contributing to a competitive edge (Chang et al., 2012). Behavioral innovation, including leadership, organizational culture, and employee creative thinking, is pivotal in generating new operational innovations (Forsman, 2011; Oura et al., 2016). Strategic innovation enables companies to apply strategies gained in their operations, fostering a competitive edge in production (Goksoy et al., 2013; Lim et al., 2010), doing things that others cannot, performing better, being more cost-effective, and being quicker across various service domains.

From the perspective of the RBV theory, innovation capability is a vital feature that accelerates the formation of a competitive advantage by enabling enterprises to build and deploy distinctive goods, processes, and services. The RBV states that companies can maintain a competitive edge if they have resources that are rare, valuable, unique, and non-substitutable

(VRIN) (Barney, 1991). As a VRIN resource, innovation capability enables businesses to stand out from the competition, adapt to changing client needs, and seize new possibilities before rivals do (Wernerfelt, 1984). Businesses can increase productivity, cut expenses, and create products and services that are hard for competitors to imitate by incorporating innovation into their core operations (Raza et al., 2023). Innovation enhances a company's position and long-term competitiveness by fostering continual development and introducing new market solutions.

Therefore, the present study reinforces the concept that innovation capability has a significant role in successful startup businesses:

H5: Innovation capability has the ability to lead to a competitive advantage.

2.4 The Role of Competitive Advantage

A competitive advantage is crucial for the sustainable growth and sustainability of startups. It involves cost leadership, differentiation, and focus strategies (Jones, 2003). Cost leadership involves offering affordable products and services, while differentiation involves offering products and services at the lowest prices. Focusing on the needs of specific target groups is another strategy. To ensure competitiveness, businesses must create economic value for customers (Barney & Hesterly, 2010). Creating a competitive advantage depends on market demands, the business environment, and internal and external factors (Guo et al., 2017). Entrepreneurs must invest effort, resources, and collaborative networks, in startups to create a competitive advantage in all value chain activities (Pavic et al., 2007). The ability to create a competitive advantage varies depending on the business environment, technology use, and organization collaboration (Çağlıyan et al., 2022; Mikalef et al., 2019). This aligns with the theory of maximizing resource utilization to differentiate products and efficiently defend against substitute products (Barney & Hesterly, 2010).

A competitive advantage is crucial for a business's success, as it leads to increased customer satisfaction and opportunities for operations (Leonidou et al., 2013). Businesses communicate their superiority in products or services, making customers aware of the value they provide. This results in profit from sales, positively impacting financial efficiency (Lopez-Gamero et al., 2011). Efficient cost management, organizational responsiveness, product differentiation, and cost leadership contribute to business success (Udriyah et al., 2019), as well as effective budgeting and high-quality product presentation (Pramono et al., 2021). Therefore, the present study proposes that the competitive advantage has a direct impact on start-up success:

H6: A competitive advantage has the ability to lead to startup success.

2.5 The Success of a Startup Business

The success of a startup business in this article is measured by financial performance and survival. Other studies, such as Venkatraman & Ramanujam (1986) have considered other aspects of startup success, discussing the concept of organizational performance, including both financial and operational aspects. Financial performance focuses on economic achievements, while operational performance includes market share, product quality, and marketing strategies. The focus is on financial outcomes reflecting the business's economic achievements, while the broader concept covers both financial and non-financial aspects. Based on the concept proposed by Kaplan & Norton (1996), the Balanced Scorecard (BSC) is an organizational performance measurement tool that assesses financial, customer, and internal processes, and learning and growth aspects. It evaluates an organization's financial status, success, and operational methods. This research uses Vorhies & Morgan's (2005) approach to

evaluate profitability, incorporating ROI, ROS, and financial goal attainment. This aligns with the perspectives of Venkatraman and Ramanujam (1986) and the balanced scorecard concept from the financial perspective (Kaplan & Norton, 1996).

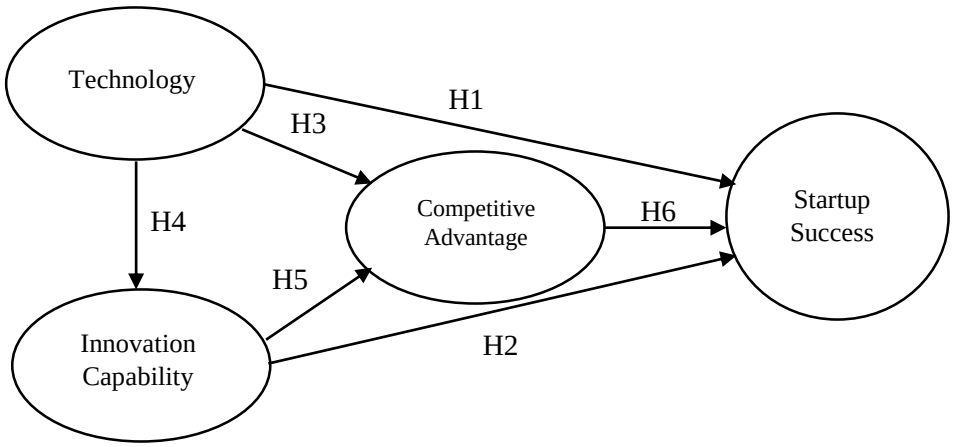
The success of startup businesses in terms of survival involves adaptability and the ability to navigate changes, ensuring a business's resilience in various situations. Sustaining profitability through effective business operations, low employee turnover, and overall successful performance is crucial (Khalique et al., 2018). Researchers have found that survival factors, competition, customer satisfaction, and reputation significantly impact the success of startup businesses (Battistella et al., 2017). This study aims to investigate the correlation between technology and innovation capabilities and their impact on the competitive advantage and success of startup businesses in Thailand, based on the Resource-Based View Theory (Barney, 1991) and the literature. Figure 1 depicts the scenario based on the provided assumptions. Thus, the present study hypothesizes that:

H7: The competitive advantage mediates the relationship between technology and the success of a startup business.

H8: The competitive advantage mediates the relationship between innovation capability and the success of a startup business.

H9: Innovation capability and the competitive advantage mediate the relationship between technology and a startup businesses' success.

Figure 1 Conceptual Framework



H7, H8, H9 are the mediation hypotheses.

3. RESEARCH METHODOLOGY

3.1 Population and Sample

According to the National Innovation Agency, in 2022, the population consists of 1,680 Thai startup entrepreneurs. The data collection process employed a simple random approach to disseminate questionnaires by mail and utilizing a convenience sampling method to collect data through Google Forms, with 204 and 375 respondents, respectively for the two methods. There were consequently a total of 579 respondents.

3.2 Measurement and Questionnaire Design

Proper procedure was followed before selecting the instrument for the current research. First, a literature review was conducted, and different scales were assessed based on their relevance to the context of the study. At an initial level, all items of each scale were assessed to check their relevance. The most relevant scales were chosen for the current study. The study used a five-point Likert scale for measuring technological success, innovation capability, competitive advantage, and startup success in terms of financial performance and survival.

For assessment of the technology, a 12-item measure that includes implementing computer-aided design software, quality inspection software, and tailored software, was selected for the current research. This measure also includes control technology, technological control knowledge, and investment in machinery, automated production systems, computer-integrated manufacturing, halting automated production, utilizing information technology, and providing employee training on modern technologies. The selection process of the scale was based on the relevance of the items. All items from the mentioned evidence were selected, with chosen scales being selected based on the reliability scores of Chamsuk et al. (2017), Wang and Ahmed (2004), Lestart et al. (2020), and Khalique et al. (2018). All these studies yielded high reliability scores, at 0.754, 0.793, 0.587, and 0.626 respectively.

For measuring innovation capabilities, the current research adapted the 19 items from Wang and Ahmed (2004) including a company's ability to develop competitive products and services, introduce novel ones, succeed in launching them, leadership in presenting innovative products, innovative problem-solving, ongoing operational process enhancement, frequent introduction of new products and services, application of new methods and processes, allocating resources for research and development, embracing risks, implementing new strategies to enhance operations, implementing innovative strategies, presenting products or services that surpass competitors, utilizing modern technology, developing tailored products to meet customer needs, utilizing technology and creative thinking in marketing, aligning employee exploration of innovative approaches, employee commitment to exploring innovative approaches, and alignment with emerging trends.

For measuring competitiveness, the current study adapted 12 items from Lestart et al. (2020), focusing on factors such as purchasing raw materials at lower prices, utilizing production technology, budget allocation, directly sourcing raw materials, manufacturing products based on customer demand, using technology in ordering and payment, producing high-quality products, continuous development of product lines and offering after-sales services, planning marketing strategies to target specific customer groups, ensuring product safety for customers, and providing advice and recommendations to customers.

Startup success was measured using 8 items adapted from the frameworks of Kaplan and Norton (1996) and Khalique et al. (2018). These items included consistent revenue increase, ongoing profit improvement, growth in return on assets, expansion from net sales, low employee turnover, strong performance, increased profitability, and adaptability to external changes.

Before data collection, the adapted scale was assessed through pilot testing. During pilot testing, the reliability scores for each variable were assessed. All reliability scores were found to be greater than 0.60, indicating that the adapted scale possessed a sufficient level of reliability, which can be helpful in generalizing the study findings with the notion of reliable findings. For the pilot study, a sample of 30 respondents was chosen based on convenience sampling, and these respondents were not part of the final data collection. Reliability scores from the pilot study are presented in Table 1.

Table 1 Pilot Study (Reliability Scores)

Variable	Items	Alpha
Technology	12	0.755
Innovation Capability	19	0.794
Competitive advantage	12	0.788
Startup Success	08	0.764

3.3 Data Analysis

The study used structural equation modeling (SEM) to assess both the measurement model and the structural model, utilizing confirmatory factor analysis (CFA) to confirm alignment with empirical data. The study also examined the concept validity, factor loadings, composite reliability, and average variance extracted. The goodness-of-fit metrics, such as the relative chi-square, root mean square error of approximation, and comparative fit index, were employed to validate the correctness of the model. In order to examine the hypotheses, the study utilized Structural Equation Modeling (SEM) via Mplus software (Muthén & Muthen, 2017).

4. RESULTS

4.1 Preliminary Data Analysis (respondents' profile)

This paper speculates about the demographic and professional profiles of Thai startup entrepreneurs using a population of 1,680 confirmed by the National Innovation Agency in 2022. Data collection utilized simple random sampling through mail correspondence to acquire 204 participants, while Google Forms was also utilized via convenience sampling to generate a correspondingly larger sample of 375 participants, yielding a total sample size of 579 participants.

The gender analysis shows that most of the entrepreneurs were male, standing at 63.39% of the sample, while 36.61% were female. Occupationally, three-quarters (75.28%) were businessmen, while 16.45% worked as chief executive officers, 12.20% as managers, 4.76% as managing directors, and 1.29% as partners. There were a few differences by marital status, with 56.48% of respondents being single, 42.31% being married and 1.21% being widowed, divorced, or separated. The average age of participants was 35.55 years, with 40.59% falling in the 31 - 40 age group, and 34.72% falling in the 20 -30 age group.

Entrepreneurs in this study developed new ventures with little prior business experience as mean experience was 4.21 years, with 91.36% of respondents operating businesses of less than five years old. In terms of education, most respondents held a bachelor's degree (78.24%), followed by those with master's degrees (19.86%), while the remaining respondents held doctoral qualifications (0.69%) or education levels below bachelor's degree (1.21%). The result of the gathered monthly income data showed that 74.78% of all the respondents earned more than 50,000 baht per month while 23.14% of respondents earned 30,000–50,000 baht.

The sectors of the startup businesses are diverse, with the highest being advertising technology (19.86%), followed by food technology (17.62%), health technology (17.44%), agricultural technology (12.61%), travel technology (6.04%), and the remaining sectors falling below 5 percent. The majority of businesses in the sample were set up in quite recently, with 64.25% being set up between 2018 and 2023 and 35.75% being set up between 2012 and 2017. This broad and profound basic data reveals some crucial aspects of Thai startup ventures and gives the statistical and visual characterization of the Thai venture environment in terms of the

demographic background and educational attainments of the startup founders and business parameters of the Thai startups.

4.1.1 Respondents' Descriptive Analysis

Important results from the interrelationship analysis (Table 2) indicated that all four latent variables had significant linkages, with positive correlations ranging from 0.382 to 0.578. Falling in the 0.01 and 0.001 confidence levels, these associations were all statistically significant. No coefficient was zero, and the coefficients were not collinear, aligning with the recommended threshold of correlation coefficients being below 0.90 for each variable pair (Hair et al., 2010), and confirming the SEM model's applicability to the empirical data.

Table 2 Descriptive Statistics and Correlation Matrix

Variable	Mean	SD	TEC	IC	CA	SS
1.Technology	4.310	0.489	(0.821)			
2. Innovation Capability	4.384	0.520	0.56**2***	(0.799)		
3. Competitive Advantage	4.460	0.485	0.476***	0.5**78***	(0.587)	
4. Startup Success	4.440	0.490	0.339**	0.497***	0.382**	(0.628)

Notes. n =579; * p < 0.05; ** p < 0.01; *** p < 0.001; Numbers on the diagonal (in parentheses) are square roots of the AVE; Numbers below the diagonal are bivariate correlations.

4.2 Reliability and Validity Assessment.

For assessment of the reliability and validity, the current research tested the loading factors for individual item reliability and convergent validity. Detailed findings are presented in Table 3. All factor loadings were found to be greater than 0.50, showing a sufficient level of

Table 3 Factor Loadings, AVE and CR

Description	Factor Loading
Technology : AVE = 0.347 ; CR = **0.677**	
Design Technology **(**DT**)**	0.511***
Control Technology **(**CT**)**	0.638***
Automated Production **(**AP**)**	0.663***
Information Technology **(**IT**)**	0.530***
Innovation Capability **:** AVE = 0.419 ; CR = **0.781**	
Product **(**PD**)**	0.526***
Process **(**PC**)**	0.732***
Strategy **(**ST**)**	0.665***
Marketing **(**MK**)**	0.703***
Behavior **(**BE**)**	0.589***
Competitive Advantage **:** AVE = 0.327 ; CR = **0.592**	
Cost leadership **(**CL**)**	0.618***
Difference **(**DF**)**	0.525***
Focus Customer **(**FC**)**	0.568***
Success Startup : AVE = 0.417 ; CR = 0.579	
Finance **(**FN**)**	0.758***
Survival **(**SV**)**	0.509***

Notes. *** p < 0.001; items are available upon request.

reliability. As each item shows sufficient reliability, this provides better results, which can be generalized easily. Though AVE scores were found to be a little less, CR values were found to be higher than 0.50, and thus satisfy the requirements for internally consistent reliability, with CR values having less bias in estimates, as each item has different loading (Hair, Ringle, & Sarstedt, 2011). For the assessment of validity, the current research examined the HTMT values as presented in Table 4.

Table 4 Discriminant Validity

Factor	TECH	IC	CA	SS
TECH	==			
IC	0.674	==		
CA	0.742	0.891	==	
SS	0.652	0.598	0.691	==

Only a single value of HTMT between CA and IC was found 0.891, but this value was not an issue. Research by Gold, Malhotra, and Segars (2001) and Teo Srivastava and Jiang (2008) recommended the HTMT threshold as an HTMT value of 0.90 or higher, so based on this recommended threshold, this research found all values to be under the stated thresholds. Hence, assessing the HTMT scores for the current study, all values were found to be under the recommended range, and therefore having a sufficient level of discriminant validity. It was thus concluded that there is no issue of multicollinearity.

4.3 The Measurement Model

As shown in Table 5, the results indicate that the proposed four variables are suitable for the data ($\chi^2 = 137.688$, $\chi^2/df = 1.939$, $p < 0.000$; CFI = 0.969; TLI = 0.960, RMSEA = 0.039, SRMR = 0.031). The presented measurement model was deemed appropriate, with Factor Loadings, AVE, and CR values for each variable as follows: Technology (AVE = 0.549, CR = 0.779); Innovation Capability (AVE = 0.521, CR = 0.781); Competitive Advantage (AVE = 0.628, CR = 0.893); and Startup Success (AVE = 0.518, CR = 0.73). The loading values all fell within the range of 0.518-0.893. The correctness was verified through the examination of the extracted mean variance (AVE) and composite reliability (CR). The size of the AVE for each variable was at 0.3, while CR values below 0.6 were all acceptable (Fornell & Larcker, 1981), the CR values for each variable were 0.580-0.781 (Fornell & Larcker, 1981).

Table 5 Measurement Model

χ^2	df	P-Value	χ^2/df	RMSEA	CFI	TLI	SRMR
137.688	71	0.000	1.939	0.039	0.969	0.960	0.031

4.4 The Structural Models

As shown in Table 6, $\chi^2 = 142.811$, DF = 73, and $\chi^2/df = 1.956$, which meets the acceptable criteria of less than 3. SRMR = 0.032, which meets the acceptable criteria (Hair et al., 2019). Meanwhile, value of CFI was 0.967 and within the generally accepted criteria (Hu & Bentler, 1999). TLI = 0.959, and RMSEA = 0.040.

Table 6 Fit Statistics for the Structural Equation Model

Model	χ^2	df	P-Value	χ^2/df	RMSEA	CFI	TLI	SRMR
SEM	142.811	73	0.000	1.956	0.040	0.967	0.959	0.032

Table 7 Values for the Direct and Indirect Effects

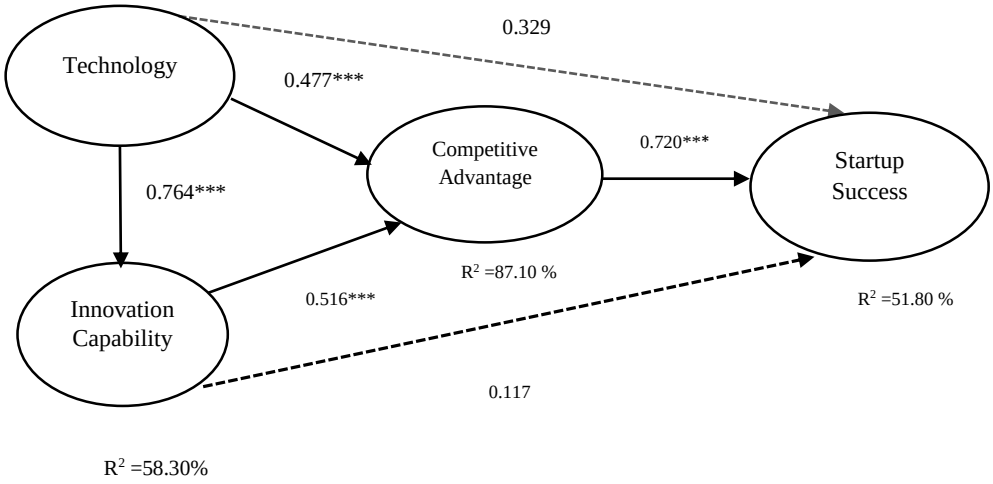
Relationship	β	SE	t	P-value	95% CLS	
1. Technology → Startup Success	0.329***	0.269	1.224	0.221	-0.066	0.789
2. Innovation Capability → Startup Success	0.117	0.363	0.600	0.549	-0.316	0.938
3. Technology → Competitive Advantage	0.477***	0.112	4.277	0.000	0.249	0.690
4. Technology → Innovation Capability	0.764***	0.049	15.537	0.000	0.661	0.856
5. Innovation Capability → Competitive Advantage	0.516***	0.107	4.841	0.000	0.307	0.729
6. Competitive Advantage → Startup Success	0.720***	0.059	12.185	0.000	0.601	0.833
7. Technology → Competitive Advantage → Startup Success	0.344***	0.086	4.000	0.000	0.176	0.515
8. Innovation Capability →Competitive Advantage→ Startup Success	0.372***	0.082	4.452	0.000	0.219	0.541
9. Technology → Innovation Capability → Competitive Advantage → Startup Success	0.284***	0.069	4.139	0.000	0.166	0.434

** Statistically significant at the 0.01 level, *** Statistically significant at the 0.001 level

1) Determining the Direct Effects: The results in Table 7 demonstrate the statistically significant direct effect of technology on innovative capability (β = 0.764***, t = 15.537, P < 0.001). Growing technology leads to a greater capacity for invention, boosting the success of new ventures. Additionally, there is a significant positive correlation between technology and competitive advantage (β = 0.477***, t = 4.277, P < 0.001). Furthermore, there is a statistically significant positive correlation between innovation capability and competitive advantage (β = 0.516***, t = 4.841, P < 0.001). Startup firm success is positively impacted by competitive advantage in a statistically significant way (β = 0.720 ***, t = 12.185, P < 0.001). The results of the study show that neither innovative capability nor technology have a statistically significant correlation with startup success.

2) Explaining Indirect Effects: From the results in Table 7, it can be stated that, in the relationship between technology and startup business success, competitive advantage plays a substantial mediating role (β = 0.344***, t = 4.000, P < 0.001), supporting Hypothesis 7. The success of startup business and innovation capability were also found to be significantly positively correlated through competitive advantage as a mediating variable (β = 0.372***, t = 4.452, P < 0.001), hence validating Hypothesis 8. Additionally, a substantial positive association between technology, competitive advantage, and startup business performance was demonstrated through innovation capability, which serves as a mediating variable (β = 0.284***, t = 4.139, P < 0.001). This suggests that innovation capacity is important and that it uses technology to form a competitive edge, generating an indirect influence, and helping startup businesses to succeed, supporting Hypothesis 9.

Figure 2 The Role of Innovation Capabilities and Competitive Advantage as Mediating Variables in The Relationship Between Technology and The Success of Startup Businesses in Thailand



Note. n = 579; Standardized coefficients * = P < 0.05; *** = p < 0.001

5. DISCUSSION

This research conducted in the context of Thailand reveals a positive relationship between technology, innovation capability, and competitive advantage. Innovation capability and competitive advantage mediate startup success, aligning with the resource-based view theory.

Technology

The study identified four dimensions of technology that affect startup business success: design-conforming technology, control technology, automated production, and information technology. Design-conforming technology creates differentiation, while control technology reduces waste and improves productivity. Automated production systems increase efficiency, address labor shortages, and reduce costs. Information technology enhances operational efficiency, contributing to continuous growth and profitability. These dimensions align with research on product design (Bloch, 2003; Chitturi et al., 2008), control technology (Meredith & Shafer, 2013), automated production (Otto, J. et al., 2014; Berger, 2016), and information technology (Marshall & Wiatt, 2019). Companies should employ these kinds of technologies to generate a competitive advantage.

Innovation Capability

This research explores innovation capabilities in five dimensions: product, process, strategic, marketing, and behavioral. Product innovation is crucial for startups as it enables them to provide novel products that meet consumer demands (Hanaysha, 2022; Al Othman & Sohaib, 2016). Process innovation involves the efficient development and implementation of new techniques or technology in production processes, aiming to increase customer satisfaction and improve product quality (Aftab et al., 2024; Rauter et al., 2019). Strategic innovation involves creating novel revenue sources and business models, with higher levels indicating a higher likelihood of long-term success (Fraser & Heather, 2012). Marketing innovation aids in company expansion by creating effective strategies to communicate benefits to consumers

(Galli, 2019). Behavioral innovation, or developing a creative culture, is essential for a company's survival in the ever-changing business world. High management support is necessary for fostering this culture (Haddad et al., 2019).

Competitive Advantage

In this research, competitiveness was measured in three dimensions: cost leadership, creating differentiation, and focus. Being a cost leader allows businesses to quickly penetrate the market, reduce imitation, and thus gain a competitive advantage (Ruiz & Garcia, 2008). Offering innovative, low-cost products helps retain customers, attract new ones, and contribute to market share growth, increasing sales, profits, and financial efficiency (Leonidou et al., 2013; Sierra-Morán et al., 2024). Differentiation is a strategy that allows companies to introduce unique products or services, fostering customer loyalty and enabling price control. Differentiation innovation involves companies creating new products to differentiate themselves from market competitors, resulting in a competitive advantage and business success (Bradley et al., 2012). Consistent with successful companies, use of advanced technology or innovative design to differentiate the company's products and services, such as in the computer software industry, can attract premium customers. A company must respond to customer needs by presenting superior products, increasing customer loyalty, and preventing imitation (Wilcox et al., 2009). Researchers Subrahmanya (2007) and Prabhu & Jain (2015) examined how businesses in Bangalore and India met the needs of their clients by creating specialized goods for low-income and manufacturing clients, leading to a steady flow of product orders and higher revenues.

The Role of the Mediator: The Mediating Role of Innovation Capabilities and Competitive Advantage

This study highlights the importance of innovation skills in mediating the relationship between competitive advantage and technology. Technology is symbiotic in innovation-fostering processes, giving businesses a competitive edge and increasing profitability. Research by Weihong et al. (2010) and Abdelkader et al. (2013) found that innovation capability mediates organizational culture and the ability to gain a sustainable competitive advantage. Technology has the greatest impact on innovation, and its ability to stimulate creativity determines new venture success (Dubickis & Gaile-Sarkane, 2015).

A competitive edge is necessary for a firm to prosper because it creates opportunities and increases customer satisfaction. Financial and commercial performance has been found to benefit from an increased competitive advantage (Leonidou et al., 2013). Corporate success is also influenced by technological efficiency, innovation, and a long-term competitive advantage (Al-Abed et al., 2014). Furthermore, it has been discovered that a firm's financial success is mediated by its competitive advantage (Lopez et al., 2011). Similarly, a strong medium for enterprise performance in the automobile industry is a durable competitive advantage (Alghamdi & Agag, 2024; Verma & Jayasimha, 2014).

5.1 Theoretical Contributions

This study investigated the correlation between organizational variables and their influence on the success of startups. The Resource-Based View (RBV) paradigm elucidates how firms attain and sustain a competitive advantage by strategically utilizing resources. This study enhances understanding of how companies leverage resources to achieve a competitive advantage in a dynamic business environment. A recent study has validated the importance and role of a competitive advantage in achieving startup success. Technology is crucial in improving the ability to innovate and gain a competitive edge, ultimately leading to a

company's success. This statement affirms the importance of technology in the development of innovative skills and gaining a competitive edge. The competitive advantage is a variable that is transmitted between technologies, whereas innovation capability is also transmitted between technologies in order to gain a competitive advantage. Thai startups depend on three crucial organizational resources to achieve their success. Other emerging countries have the opportunity to evaluate this approach.

5.2 Practical Implications

This study exhibits numerous noteworthy features. (1) Entrepreneurs may utilize the findings from studies on the success of startup businesses, particularly in the area of technology, to propel the creation of innovative products used in production, creating a competitive advantage that can enable the organization to achieve cost leadership. The ability to differentiate products or services and select a target audience is crucial. It contributes to the long-term prosperity of emerging enterprises. (2) It serves as a guideline for policymaking in the government sector, allowing for the formation of strategies to promote and develop startup entrepreneurs in the manufacturing, service, and financial sectors for better operating results. (3) Universities and academics may use the study results to inform their teaching methods. Additionally, universities have the ability to cultivate students into successful entrepreneurs, encouraging students to earn an income while studying and use the results of their studies to build their own successful startup businesses. Furthermore, the success of their business will affect graduates' employment. This study aims to reduce the rate of unemployment among students after graduation. This study aids in enhancing understanding of the context surrounding startup entrepreneurs in Thailand. A startup business's success hinges on its ability to innovate in technology, while the competitive advantage is becoming a mechanism to drive business success.

Understanding this dimension of successful entrepreneurship contributes to startup business development and lays the foundation for formulating organizational resource management strategies for long-term success in startup operations.

6. CONCLUSION

The fresh information gleaned from this study affirms that innovation and technology are essential components of success for new ventures. Technology is the catalyst for creativity. By improving their design, control, automation, and information technology skills, startups can make the most of technology. Product, process, strategy, marketing, and behavioral innovations are all viable avenues for firms to pursue innovation. Competitive advantage factors, such as cost leadership, differentiation strategy, and focus, are critical to the success of startups. Startups can be evaluated based on their survivability and financial capacity. It is hoped that the government will use the findings of this study as an impetus to develop strategies and policies to support startup entrepreneurs' development. Startup entrepreneurs must consistently innovate and establish a competitive advantage within their organizations. They should also concentrate on the ongoing advancement of technology in order to ensure the viability and expansion of their businesses.

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