



The Effect of Absorptive Capacity and Innovation Strategy on Indonesian SMEs' Performance with Open Innovation as the Mediator

Nur Rohman Arifin¹, Arif Hartono^{2*}

¹Master of Management Study Program, Faculty of Business and Economics, Universitas Islam Indonesia, Yogyakarta, Indonesia,

²Department of Management, Faculty of Business and Economics, Universitas Islam Indonesia, Yogyakarta, Indonesia.

*Email: arif.hartono@uii.ac.id

Received: 30 November 2024

Accepted: 27 March 2025

DOI: <https://doi.org/10.32479/irmm.18431>

ABSTRACT

This study aims to examine the effect of absorptive capacity (ACAP) and innovation strategy (IS) on SME performance with open innovation (OI) as a mediator. The study was conducted among 200 SMEs in Yogyakarta Province, Indonesia. Data were collected through a quantitative approach, both online and offline surveys. Data is analyzed using partial least squares - structural equation modeling (PLS-SEM). The results show that absorptive capacity positively affects open innovation, improving SME performance. The findings also indicate that innovation strategy directly affects open innovation, but the direct effect on SME performance is insignificant. In contrast, open innovation is a significant mediator in the relationship between absorptive capacity and SME performance and between innovation strategy and SME performance. This research provides a practical contribution to SMEs' optimization of their innovation strategy by focusing on improving absorptive capacity and implementing open innovation to improve performance. The theoretical implications of this research enrich the literature on absorptive capacity, open innovation, and innovation strategy in the context of SMEs in developing countries.

Keywords: Absorptive Capacity, Innovation Strategy, Open Innovation, Performance, Structural Equation Modeling, Indonesia

JEL Classifications: O36, L25, L21, L10

1. INTRODUCTION

Globalization and technological advancements have created increasingly fierce business competition, marked by the entry of many new businesses into the global and domestic markets. These changes affect large companies and Small and medium enterprises (SMEs) contributing to the Indonesian economy. SMEs contribute over 60% of gross domestic product (GDP), absorbing around 97% of the national workforce (Ministry of Cooperatives and SMEs, 2020). Despite their strategic role, SMEs face challenges such as limited resources, access to technology, and low innovation capabilities (Fairlie, 2020; World Trade Organization, 2020). To overcome these challenges, innovation is a key element in

improving SME competitiveness. Innovation enables SMEs to create more competitive products, improve operational efficiency, and respond quickly to market changes (Laforet, 2011). In this context, innovation strategy plays an important role as a guide for SMEs to manage resources and create added value. Previous research shows that complex innovation strategies significantly improve SME performance compared to simple innovation strategies (Stankevičė, 2016; Susanto and Wasito, 2017).

Furthermore, research by Carrasco-Carvajal et al. (2023) shows that innovation strategy positively and significantly affects open innovation practices. Companies that make innovation part of their goals tend to be more active in open innovation, both

internally and externally. This is reflected in increased internal cooperation, employee skill development, and a greater focus on customer satisfaction and product quality. Thus, a strong innovation strategy can encourage SMEs to use open innovation to improve performance.

In addition to innovation strategy, absorptive capacity (ACAP) also plays an important role in supporting innovation. ACAP refers to a firm's ability to acquire, assimilate and exploit external knowledge to create added value (Cohen and Levinthal, 1990). Research shows that ACAP positively impacts SME innovation and performance, enabling firms to respond more quickly to market changes and find innovative solutions (Bedoya-Villa et al., 2023; Grandinetti, 2016). By increasing ACAP, SMEs can maximize their open innovation potential and overcome their limited resources (Spithoven et al., 2011).

As a strategic approach introduced by Chesbrough (2003), open innovation helps companies access external knowledge and share internal knowledge to accelerate innovation. A study by Valdez-Juárez and Castillo-Vergara (2021) found that open innovation positively affects SME performance. However, research by Yulianto and Supriono (2023) shows that the effectiveness of open innovation is highly dependent on the company's knowledge management and innovation capabilities. This research confirms that open innovation does not always provide significant results in every context, especially in developing countries, where internal factors such as managerial skills and innovation capacity are still challenging.

This study aims to fill the gap in the literature by analyzing how absorptive capacity and innovation strategy affect SME performance through the mediation of open innovation. A focus on 200 SMEs in Yogyakarta was chosen as the sample as the region is known as one of the Centers of the creative economy in Indonesia with the dominance of the SME sector. This research is expected to provide theoretical contributions in enriching the innovation literature and practical insights for SMEs in developing effective innovation strategies to improve competitiveness.

2. LITERATURE REVIEW

2.1. Knowledge Based View (KBV)

The knowledge-based view (KBV) theory emphasizes that knowledge is a key strategic resource in creating sustainable competitive advantage (Grant, 1996). KBV evolved from the Resource-Based View (RBV) perspective, which views a firm's internal resources as the main source of competitiveness (Barney, 1991). In KBV, explicit and implicit knowledge plays a crucial role in enhancing innovation and firm performance (Nonaka and Takeuchi, 1995).

Grant (1996) emphasizes that firms act as knowledge integrators, combining different information forms, skills, and experience to create innovative solutions. Organizational structure, continuous learning, and collaboration become important elements in managing knowledge. In this context, information technology also plays a key role in accelerating knowledge transfer,

especially for organizations that focus on open innovation (Alavi and Leidner, 2001). As such, KBV supports the concept that an organization's ability to manage, disseminate, and leverage knowledge contributes directly to improving the competitiveness and performance of firms, including SMEs.

2.2. Absorptive Capacity (ACAP)

Absorptive capacity (ACAP) is the organization's ability to recognize the value of external information, assimilate it, and apply it for commercial purposes (Cohen and Levinthal, 1990). According to Spithoven et al. (2011), ACAP consists of four dimensions:

- Acquisition: The ability to acquire external knowledge
- Assimilation: The process of understanding and interpreting knowledge
- Transformation: Combining external knowledge with internal knowledge
- Exploitation: Applying knowledge to create innovation and added value.

ACAP plays an important role in increasing companies' innovation capacity by effectively utilizing external knowledge (Bedoya-Villa et al., 2023). The study by Carrasco-Carvajal et al. (2023) shows that ACAP positively affects open innovation, especially in facilitating external collaboration and the integration of technological knowledge.

2.3. Innovation Strategy (IS)

Innovation strategy is a company's systematic approach to developing new products, services, or processes to maintain competitiveness (Tidd and Bessant, 2013). This strategy involves utilizing internal and external resources to achieve innovation goals (Schilling, 2017).

Research by Carrasco-Carvajal et al. (2023) emphasizes that a good innovation strategy encourages the implementation of open innovation, where companies actively access external ideas to accelerate innovation development.

2.4. Open Innovation (OI)

According to Chesbrough (2003), open innovation involves utilizing external knowledge and sharing internal knowledge to accelerate innovation. Open innovation is divided into two main mechanisms:

- Inbound open innovation: Accessing ideas or technologies from external parties
- Outbound open innovation: Spreading an idea or technology to external parties.

Research shows that open innovation helps SMEs overcome internal resource limitations and accelerate innovation (Valdez-Juárez and Castillo-Vergara, 2021; Carrasco-Carvajal et al., 2023).

2.5. SME Performance

SME performance is a measure of the extent to which an SME successfully achieves its business objectives, which include both financial and non-financial aspects. This performance is usually assessed through indicators such as revenue growth, increased

profitability, productivity, operational efficiency, and the ability to innovate and respond to market changes (Wiklund and Shepherd, 2005). Good performance reflects the ability of SMEs to optimize their resources, increase competitiveness, and adapt quickly to challenges and opportunities in the market. In the context of SMEs, performance can also be influenced by several external and internal factors, such as management skills, access to capital, business environment, and the innovation strategy implemented (Soininen et al., 2012).

In the context of innovation, SME performance is strongly influenced by the company's ability to create and implement new ideas relevant to market needs. Drucker (1985) states that effective innovation drives increased efficiency, reduced production costs, and the creation of more competitive products, all of which contribute to improved business performance.

3. THEORETICAL FRAMEWORK

3.1. Absorptive Capacity and Open Innovation

Absorptive capacity (ACAP) is crucial in enhancing a firm's ability to identify, assimilate, and utilize external knowledge for innovation (Cohen and Levinthal, 1990). ACAP comprises four main components: knowledge acquisition, assimilation, transformation, and exploitation (Spithoven et al., 2011). These capabilities enable organizations, particularly SMEs, to respond more quickly to market changes and create significant innovations.

In the context of open innovation, ACAP helps companies acquire and integrate external knowledge in the internal innovation process. Carrasco-Carvajal et al. (2023) emphasize that firms with strong ACAP are more likely to adopt open innovation practices, including cross-sector collaboration and integration of external feedback. This has a positive impact on improving innovation and operational efficiency.

H₁: Absorptive Capacity has a positive effect on open innovation.

3.2. Innovation Strategy and Open Innovation

Innovation strategy is a systematic approach companies use to develop new products, processes, or services to improve competitiveness (Tidd and Bessant, 2013). This strategy encourages companies to seek solutions from internal and external sources proactively.

Research by Carrasco-Carvajal et al. (2023) shows that a well-designed strategy contributes significantly to open innovation. Through external collaboration and technology utilization, companies can accelerate innovation development, reduce risks, and increase market competitiveness.

H₂: Innovation strategy has a positive effect on open innovation.

3.3. Absorptive Capacity and SME Performance

ACAP plays a role in improving SMEs' performance by enabling firms to utilize external knowledge to improve innovation, productivity, and operational efficiency (Grandinetti, 2016; Bedoya-Villa et al., 2023). With strong ACAP capabilities, SMEs

can overcome internal resource limitations and create more innovative solutions.

Previous research shows that ACAP directly influences firm performance through increased adaptability and innovation (Flatten et al., 2011). By utilizing ACAP, SMEs can compete more effectively in a competitive market.

H₃: Absorptive Capacity has a positive effect on SME performance.

3.4. Innovation Strategy and SME Performance

Innovation strategies support SMEs in facing market challenges by driving new product development, production process improvement, and business efficiency (Tidd and Bessant, 2013). With effective implementation of innovation strategies, SMEs can improve competitiveness through creative solutions and quick responses to changes in the business environment.

Research by Taufik and Faeni (2019) shows that innovation strategies significantly improve company performance by strengthening competitive advantage. This strategy allows SMEs to adapt quickly and exploit existing market opportunities.

H₄: Innovation strategy has a positive effect on SME performance.

3.5. Open Innovation's Role as a Mediator

Open innovation is a mediator that strengthens the relationship between ACAP, innovation strategy, and SME performance. Open innovation allows firms to integrate external knowledge with internal innovation processes to improve business outcomes (Chesbrough, 2003).

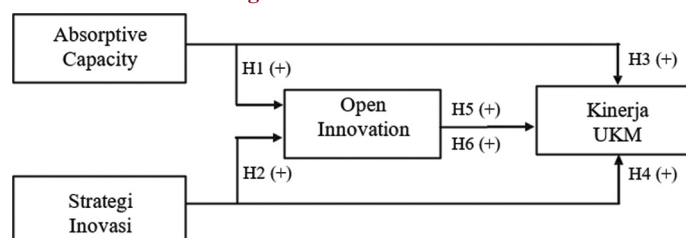
The study by Carrasco-Carvajal et al. (2023) shows that open innovation helps translate absorptive capacity into higher innovation performance. Similarly, innovation strategies combined with open innovation encourage the creation of faster and more efficient solutions.

H₅: Open innovation mediates the relationship between Absorptive Capacity and SME performance

H₆: Open innovation mediates the relationship between innovation strategy and SME performance.

Through these hypotheses, we aim to fill the gap in previous literature by analyzing how absorptive capacity and innovation strategy affect SME performance through the mediation of open innovation (Figure 1).

Figure 1: Research model



4. METHODOLOGY

4.1. Sample and Data Collection

This research focuses on SMEs operating in Yogyakarta. The sampling technique used purposive sampling with criteria:

- The SME has been in operation for at least 2 years
- Have more than 5 employees
- Active in product or process innovation activities.

Based on the structural equation modeling (SEM) method, the sample size is calculated by considering the number of indicators (35 indicators) and the general rule (Hair et al., 2019), which is at least 5-10 times the number of indicators. Thus, the sample size in this study ranged from 175 to 350 respondents. After the validation process for the number of respondents we used in this study, 200 respondents were valid.

The data collection technique in this study used a quantitative approach by distributing questionnaires online through platforms such as Google Forms and contacting SMEs through social media and relationships with owners or senior employees. The convenience sampling method was applied as a sampling technique, where questionnaires were distributed to respondents who met the criteria randomly through social media such as WhatsApp, Facebook, and Instagram. The selection of this method aims to simplify the process of collecting data from SMEs in Yogyakarta that are involved in innovation.

All variables were measured using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

4.2. Data Analysis

This study's data analysis used the partial least square—structural equation modeling (PLS-SEM) method, which was processed with the help of SmartPLS software. The PLS-SEM approach was chosen because it can handle complex research models with many latent variables and indicators and is more flexible to moderate sample sizes. Data analysis was carried out in two main stages: measurement model evaluation (outer model) and structural model evaluation (inner model).

The first stage is evaluating the measurement model to ensure the validity and reliability of the research instrument. Convergent validity tests are carried out by assessing factor loading and average variance extracted (AVE). Indicators are declared valid if the factor loading value ≥ 0.5 and AVE ≥ 0.5 (Hair et al., 2021). Discriminant validity is tested using the Fornell-Larcker criterion, where a latent variable's AVE square root value must be greater than its correlation with other latent variables (Fornell and Larcker, 1981). In addition, reliability is tested by looking at the Cronbach's Alpha and composite reliability (CR) values, where the instrument is considered reliable if the Cronbach's Alpha value ≥ 0.6 and CR ≥ 0.7 (Nunnally and Bernstein, 1994; Hair et al., 2017).

The second stage is structural model evaluation, which tests the relationship between latent variables and hypothesis testing. This evaluation begins by testing the coefficient of determination (R^2) to assess the contribution of independent variables in explaining

the variance of the dependent variable. The R^2 value is categorized as weak if 0.19-0.33, moderate if 0.33-0.67, and strong if more than 0.67 (Chin, 1998). Furthermore, the path coefficient test was conducted to assess the direction and strength of the relationship between latent variables. This test is carried out using the bootstrapping method to estimate the t-statistic and P-value, with the criteria that the hypothesis is accepted if the t-statistic > 1.96 ($P < 0.05$) at the 5% significance level (Hair et al., 2021).

In addition, to measure the practical impact between latent variables, the effect size (f^2) test was used. The f^2 value is classified into small (≥ 0.02), medium (≥ 0.15), and large (≥ 0.35) according to the criteria given by Cohen (1988). This study also examines the role of open innovation as a mediating variable between absorptive capacity and innovation strategy in SMEs' performance. Mediation testing uses a bootstrapping approach to analyze direct and indirect effects. The mediation path is considered significant if the direct and indirect effect meets the same significance criteria (t-statistic > 1.96 and $P < 0.05$).

At this stage of analysis, the research is expected to produce valid and reliable findings that answer the hypothesis and make an empirical contribution to the literature related to absorptive capacity, innovation strategy, open innovation, and SME performance.

5. RESULTS

5.1. Respondent Profile

We have categorized the respondents' profiles based on gender, age, latest education, and job position in Table 1. The profiles of the respondents that we have grouped are mostly male. This finding shows that the majority of respondents in this study are male. The number of male respondents was 116, representing 58% of the total respondents. Meanwhile, the number of female respondents was 84 people, with a percentage of 42% of the total respondents. This finding indicates that most of the research participants were male, which aligns with the sample characteristics determined for this study. Also, these results suggest that the preponderance of male respondents may reflect decision-making tendencies in the SME environment, while female respondents potentially exhibit role dynamics that support innovation and collaboration in business.

Furthermore, we have also categorized the respondents' profiles based on age. We found from the primary data processed in this study that 58 respondents aged 26-30 years, or 29% of all respondents. Furthermore, 58 respondents (26%) were 31-35 years old, 49 respondents were 36-40 years old (25%), 27 respondents were 21-25 years old (7%), 14 respondents were > 40 years old (7%), and 1 respondent was < 20 years old (1%). The following analysis results show that the respondents in this research, as the parties involved in the SME process, are mostly 31-35 years old. These results show that most respondents are at the productive age (26-40 years), which is the ideal age to be actively involved in the management and development of SMEs. Respondents in this age group have great potential to implement innovation strategies and improve ACAP, which is the main focus in this study.

Table 1: Profile of respondents

Criteria	Category	Total	Percentage
Gender	Men	116	58
	Women	84	42
Age	<20 years	1	1
	21-25 years	27	7
	26-30 years	58	29
	31-35 years old	51	26
	36-40 years	49	25
	>40 years	14	7
Last education	High school equivalent	30	15
	Diploma equivalent	33	17
	S1 equivalent	120	60
	Master's degree	16	8
	S3 equivalent	1	1
Position	Manager	19	10
	Owner	78	39
	Owner - Manager	51	26
	Senior Staff	52	26
	Total	200	100

Table 2: SME profile

Criteria	Category	Total	Percentage
Number of employees	1-5 people (minimum)	87	44
	6-19 people (small)	100	50
	20-99 people (medium)	13	7
Industry type	Business and trade	13	7
	Clothing	37	19
	Services	16	8
	Beauty and health	12	6
	Crafting	40	20
	Food and beverage	58	29
	Automotive	11	6
	Tourism	7	4
	Education	2	1
	Agriculture	1	1
	Technology and electronics	3	2
	IDR 2,000,000-IDR 10,000,000	17	9
SME Revenue	IDR 10,000,001-IDR 50,000,000	73	37
	IDR 50,000,001-IDR 100,000,000	92	46
	IDR 100,000,001-IDR 500,000,000	18	9
	Total	200	100

SME: Small and medium enterprises

We also categorize respondents based on the last level of education they have achieved. Most of the respondents have the latest education at the Bachelor level (S1), with 120 people (60%) of the total respondents. This shows that the majority of respondents in this study have a fairly high level of education, which is expected to support their understanding of concepts related to innovation strategy, absorptive capacity (ACAP), and open innovation. Furthermore, respondents with a Diploma level of education were recorded as 33 people (17%), followed by high school education as many as 30 people (15%), Master's education (S2) as many as 16 people (8%), and Doctoral (S3) as many as 1 person (1%). This finding shows that SMEs in Yogyakarta are mostly managed or operated by individuals with relevant educational backgrounds, particularly those with a bachelor's degree. The high proportion of S1-educated individuals reflects their readiness to implement knowledge-based innovation strategies and external collaboration to improve their business performance.

In addition, the respondents' positions within the SMEs were also analyzed to illustrate their roles and responsibilities within the organization. Most of the respondents were SME owners, with 78 people (39%), followed by the Owner - Manager category with 51 people (26%), and Senior Staff with 52 people (26%). There were fewer Managers in the sample, with 19 people (10%). The findings on these positions indicate that the study involved respondents who play a direct role in SMEs' strategic and operational decision-making. The dominant role of owners and owner-managers reflects their significant influence in determining the direction of innovation strategy, ACAP implementation, and open innovation adoption. Meanwhile, the involvement of senior staff provides an important additional perspective on innovation implementation at the operational level (Table 2).

5.2. SME Profile

Table 2 provides the profile of the respondents. The majority of SMEs that are respondents in this study fall into the small category, which has 6-19 employees with 100 SMEs (50%). Furthermore, 87 SMEs (44%) fall into the minimal category, which has 1-5 employees. Only 13 SMEs (7%) are in the medium category, with 20-99 employees. These findings reflect that most SMEs in Yogyakarta still operate on a small scale, with limited human resources. This highlights the importance of innovation strategies that can help optimize available resources, especially for SMEs with fewer employees.

From an industry-type perspective, the majority of SMEs responding to this study are engaged in the food and beverage sector, with a total of 58 SMEs (29%), followed by the handicraft sector with 40 SMEs (20%), and the clothing sector with 37 SMEs (19%). Other industry types include business and trade (13 SMEs, 7%), services (16 SMEs, 8%), and beauty and health (12 SMEs, 6%). Some other sectors such as automotive (11 SMEs, 6%), tourism (7 SMEs, 4%), education (2 SMEs, 1%), agriculture (1 SME, 1%), and technology and electronics (3 SMEs, 2%) have a smaller representation. These findings suggest that the main drivers of local economic growth are the food and beverage, handicrafts, and apparel sectors in Yogyakarta. Innovation efforts in these sectors are expected to have a significant impact on improving SME competitiveness and performance.

Furthermore, in terms of revenue, most SMEs have annual revenue in the range of Rp 10,000,001-Rp 50,000,000, with a total of 73 SMEs (37%), followed by SMEs with annual revenue of Rp 50,000,001-Rp 100,000,000 with 92 SMEs (46%). Meanwhile, 17 SMEs (9%) have IDR 2,000,000-IDR 10,000,000, and 18 SMEs (9%) are in the annual revenue range of IDR 100,000,001-IDR 500,000,000. This finding shows that most SMEs are still in the lower-middle income category. This indicates that SMEs in Yogyakarta need more effective innovation and absorptive capacity implementation (ACAP) strategies to increase their revenue through resource management and relevant innovation implementation.

5.3. Measurement Model

This section outlines the methodology applied to test the proposed structural model using the partial least squares structural equation

modeling (PLS-SEM) approach through Smart PLS 4.0 software. Bootstrapping techniques were used in this process to evaluate the hypotheses and ensure the validity and reliability of the research results.

5.3.1. Reliability and validity assessment

The model's reliability was confirmed by calculating Cronbach's Alpha (CA), Composite Reliability (CR), and rho_C, where all values obtained exceeded the threshold of 0.70. This indicates good internal consistency (Fornell and Larcker, 1981; Hair et al., 2019).

Convergent validity was assessed based on factor loadings and average variance extracted (AVE), with all values obtained exceeding the 0.50 threshold. This finding indicates adequate convergent validity (Hair et al., 2019; Kaiser, 1974).

Table 3 presents the results of the descriptive analysis of the four main variables: Absorptive Capacity, Innovation Strategy, Open Innovation, and SME Performance. Absorptive Capacity has the highest mean on item AC1 (mean = 0.823, SD = 0.031) and the lowest on AC7 (mean = 0.649, SD = 0.050), with relatively small standard deviations, reflecting the consistency of responses. Innovation Strategy showed mean scores varying between 0.596 and 0.854, with item IS2 having the highest score (mean = 0.854, SD = 0.082). The highest standard deviation on this variable (0.109) indicates significant differences in opinion among respondents.

Open Innovation has a mean score that ranges from 0.681 to 0.783, with a relatively low standard deviation, signalling homogeneity of responses. Meanwhile, SME Performance showed the highest score on FP1 (mean = 0.803, SD = 0.049) and the lowest on FP4 (mean = 0.689, SD = 0.058), with a moderate standard deviation, reflecting fairly uniform responses. Overall, the Absorptive Capacity and SME Performance variables recorded the highest means, indicating more positive perceptions from respondents towards these two variables.

Table 4 presents the validity and reliability test results for the measurement model used in this study. The statistics shown include item loading, average variance extracted (AVE), composite reliability (CR), and Cronbach's Alpha (CA) for each variable. In general, most items have a loading value above the 0.70 threshold, indicating a strong relationship between the item and its construct. However, there are some items with loading values below 0.70, such as IS1 (0.610) on the Innovation Strategy variable and IOI3 (0.620) on the Open Innovation variable, which indicates a weaker relationship.

The reliability test results show that all variables in this study have Cronbach's Alpha and composite reliability (CR) values >0.60, which means that these variables can be considered reliable (Hair et al., 2021). The absorptive capacity (ACAP) variable recorded a Cronbach's Alpha value of 0.727 and a CR of 0.829, indicating an excellent reliability level. Although the Innovation Strategy (IS) variable has a slightly lower Cronbach's Alpha (0.551), the CR value of 0.762 indicates that the reliability of this construct still meets the criteria. The

Table 3: Measurement items and descriptive

Variables	Items	Mean	Standard deviation
Absorptive capacity	AC1	0.823	0.031
	AC2	0.794	0.035
	AC4	0.681	0.052
	AC7	0.649	0.050
Innovation strategy	IS1	0.596	0.109
	IS2	0.854	0.028
	IS7	0.672	0.092
Open innovation	IOI2	0.732	0.047
	IOI3	0.614	0.082
	IOI4	0.783	0.035
	OOI1	0.681	0.054
SME performance	FP1	0.803	0.049
	FP3	0.738	0.063
	FP4	0.689	0.058

Table 4: The validity convergent and reliability

Variables	Items	Test results			
		Item loading	AVE	CR	CA
Absorptive capacity	AC1	0.824	0.550	0.829	0.727
	AC2	0.794			
	AC4	0.684			
	AC7	0.649			
Innovation strategy	IS1	0.610	0.522	0.762	0.551
	IS2	0.851			
	IS7	0.684			
Open innovation	IOI2	0.735	0.501	0.800	0.666
	IOI3	0.620			
	IOI4	0.783			
	OOI1	0.683			
SME performance	FP1	0.806	0.560	0.792	0.607
	FP3	0.741			
	FP4	0.695			

Table 5: Discriminant validity (Fornell-Larcker criterion)

Construct	AC	IS	OI	SMEP
AC	0.742			
IS	0.715	0.722		
OI	0.500	0.406	0.748	
SMEP	0.610	0.627	0.529	0.708

Open Innovation (OI) variable also showed good results, with a Cronbach's Alpha of 0.666 and a CR of 0.800, indicating excellent reliability. Meanwhile, the SME Performance variable recorded a Cronbach's Alpha of 0.607 and a CR of 0.792, indicating a fairly good level of reliability.

In terms of convergent validity, the AVE values of all variables are above the minimum threshold of 0.50, indicating that the constructs can explain most of the variance of their indicators. For example, the ACAP variable has an AVE of 0.550, while the SME Performance variable records an AVE of 0.560. However, the AVE for the Innovation Strategy (0.522) and Open Innovation (0.501) variables is not as high.

Overall, the validity and reliability test results show that the constructs in this measurement model are valid and reliable. CR as a reliability indicator provides stronger results on some variables compared to Cronbach's Alpha, especially for IS and OI variables.

This finding ensures that the measurement model is reliable for further analyses, such as structural equation modelling, to provide meaningful and accurate results.

Discriminant validity was tested by comparing the square root of the AVE value with the correlation coefficient between variables. The results show that the square root value of the AVE is significantly greater than the correlation coefficient between variables, which meets the criteria of Fornell and Larcker (1981) (Table 5).

5.3.2. Structural model evaluation

This research uses structural model testing by conducting a collinearity test, path coefficient test, coefficient of determination test, and F-square. The collinearity test is based on the variance inflation factor (VIF) value (Hair et al., 2021). The coefficient of determination test uses R-square, which shows how much the independent variable can explain the dependent variable. This test is carried out by looking at the results of the f^2 test to evaluate the contribution of each exogenous construct to the endogenous construct in the research model. The path coefficient test results show the direction of the relationship between variables as indicated by the β value and the results of hypothesis testing. The direction of the relationship between variables is categorized as positive or negative based on the hypothesized direction and compared to the path coefficient value, which is between -1 or $+1$. Hypothesis testing is done by considering the T-statistic and P-values. The research hypothesis is accepted if the T-statistic value is >1.96 (T-statistic > 1.96), and is considered significant if the $P < 0.05$.

Table 6 presents the results of the structural model. It turned out that absorptive capacity (AC) has a positive influence on open innovation (OI) ($B = 0.330$, t-statistic = 3.767, $P < 0.05$), which confirms H_1 . This suggests that SMEs with high absorptive capacity are more likely to adopt open innovation practices. Innovation Strategy (IS) also shows a positive influence on open innovation (OI) ($B = 0.391$, t-statistic = 3.750, $P < 0.05$), which supports H_2 . This indicates that a good innovation strategy can encourage SMEs to be more active in engaging external knowledge through open innovation.

However, the relationship between innovation strategy (IS) and SME performance (SMEP) was not found to be significant ($B = -0.046$, t-statistic = 0.303, $P > 0.05$), which means H_4 was not confirmed. Nonetheless, the mediation analysis results show that open innovation (OI) mediates the relationship between absorptive capacity (AC) and SME performance (SMEP) with coefficient $B = 0.123$ and t-statistic = 2.222, which confirms H_3 . Likewise, open innovation (OI) mediates the relationship between

innovation strategy (IS) and SME performance (SMEP) with coefficient $B = 0.145$ and t-statistic = 3.326, confirming H_6 .

6. DISCUSSION AND CONCLUSION

The results of this study reveal that absorptive capacity (AC) and innovation strategy (IS) play an important role in improving SME performance through open innovation (OI) as a mediator. This finding is consistent with the theory stating that the ability to absorb and utilize external knowledge related to ACAP can accelerate the innovation process within the firm (Cohen and Levinthal, 1990). In addition, a clear and structured innovation strategy also encourages SMEs to be more open to external cooperation and improve their innovation process.

However, the finding that does not support hypothesis H_4 , which states that innovation strategy directly has a positive effect on SME performance, suggests that innovation strategy alone is not enough to improve SME performance in the absence of other supporting factors, such as open innovation and absorptive capacity. It also indicates that while innovation strategy is important, its effectiveness is highly dependent on SMEs' ability to integrate external knowledge and utilize it in product and service development. As a practical implication, this study emphasizes the importance of SMEs to improve their absorptive capacity in order to access and utilize external knowledge more effectively. In addition, the innovation strategy implemented should be supported by open innovation practices, which enable collaboration with external parties and the utilization of new ideas to improve performance and competitiveness.

6.1. Theoretical Implications

This study makes a significant contribution to the innovation and absorptive capacity (ACAP) theory literature by showing that open innovation plays an important role as a mediator in the relationship between ACAP and SME performance. The findings confirm that although absorptive capacity and innovation strategy directly influence SME performance, they can only achieve optimal results if supported by good implementation of open innovation.

Another theoretical contribution is that this study enriches the Knowledge-Based View (KBV) theoretical framework, where external knowledge absorbed through absorptive capacity can be leveraged to drive more effective innovation, which impacts SME performance. As such, existing theories on open innovation and absorptive capacity need to consider the importance of integration between these elements, which can improve understanding of how firms, particularly SMEs, manage external knowledge for competitive advantage.

Table 6: Structural model results

Hypothesis	Paths	B	t-statistic	f^2	Results
H_1	AC→OI	0.330	3.767	0.096	Supported
H_2	IS→OI	0.391	3.750	0.135	Supported
H_3	AC→SMEP	0.307	2.389	0.063	Supported
H_4	IS→SMEP	-0.046	0.303	0.001	Not supported
H_5	AC→OI→SMEP	0.123	2.222	-	Supported
H_6	IS→OI→SMEP	0.145	3.326	-	Supported

In addition, this study examines the relationship between innovation strategy, absorptive capacity, and SME performance in a more concrete context, namely SMEs in Indonesia, which is rarely the focus of international literature. The findings, therefore, add depth to existing theory, particularly in the context of developing countries and the SME sector.

6.2. Practical Applications

Practically, the results of this study guide SME managers in Indonesia, especially in Yogyakarta, to utilize absorptive capacity as an important element in improving their competitiveness. By improving the ability to absorb and integrate external knowledge into their operations, SMEs can be more responsive to market changes and capitalize on existing innovation opportunities.

In addition, this study's results also highlight the importance of designing a structured innovation strategy supported by open innovation to create more competitive products and improve operational efficiency. SMEs that can forge external partnerships, such as with suppliers, customers, or competitors, can accelerate the innovation process and improve their market competitiveness.

For policymakers and decision-makers, this research also emphasizes the need for policies that support cooperation between SMEs and related industries, such as providing access to technology and improving human resource capacity in terms of innovation. Open innovation should be facilitated through policies that encourage cross-sector collaboration, information access, and innovative competencies development.

6.3. Limitations of the Study and Recommendations for Future Studies

While this study provides important insights into the relationship between absorptive capacity, innovation strategy, and SME performance, some limitations exist. First, this study used a purposive sampling method with a sample limited to SMEs in Yogyakarta. This limits the ability to generalize the findings to SMEs in other regions or countries with different characteristics. Therefore, future research should expand the sample to other regions in Indonesia or developing countries to test whether the findings can be applied more broadly.

Another limitation is that this study did not consider broader external factors, such as government policies, market conditions, or changes in the global economy, which may affect strategic decision-making by SMEs. Future research could develop a more comprehensive model by incorporating these external factors to see how they affect the application of absorptive capacity and open innovation in the context of SMEs.

Further research could also explore the long-term relationship between innovation strategies and SME performance, using longitudinal research designs that can identify how changes in absorptive capacity and open innovation adoption affect SME performance over time. In addition, research involving qualitative methods such as in-depth interviews with SME managers could provide deeper insights into the challenges

faced by SMEs in implementing absorptive capacity and open innovation.

REFERENCES

- Alavi, M., Leidner, D.E. (2001), Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly*, 25(1), 107-136.
- Barney, J. (1991), Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120.
- Bedoya-Villa, M., Pérez-Sánchez, E., Baier-Fuentes, H., Zapata-Molina, C., Román-Castaño, E. (2023), The effects of dynamic absorptive capacity on innovation strategy: Evidence from SMEs in a technological context. *Mathematics*, 11(10), 2366.
- Carrasco-Carvajal, O., García-Pérez-de-Lema, D., Castillo-Vergara, M. (2023), Impact of innovation strategy, absorptive capacity, and open innovation on SME performance: A Chilean case study. *Journal of Open Innovation Technology Market and Complexity*, 9(2), 100065.
- Chesbrough, H. (2003), *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Massachusetts: Harvard Business Press.
- Chin, W.W. (1998), The partial least squares approach to structural equation modeling. In: *Modern Methods for Business Research*. England: Psychology Press.
- Cohen, J. (1988), *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.
- Cohen, W.M., Levinthal, D.A. (1990), Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1), 128-152.
- Drucker, P.F. (1985), *Innovation and Entrepreneurship: Practice and Principles*. United States: Harper and Row.
- Fairlie, R. (2020), The impact of COVID-19 on small business owners: Evidence from the first three months after widespread social distancing restrictions. *Journal of Economics and Management Strategy*, 29(4), 727-740.
- Flatten, T.C., Engelen, A., Zahra, S.A., Brettel, M. (2011), A measure of absorptive capacity: Scale development and validation. *European Management Journal*, 29(2), 98-116.
- Fornell, C., Larcker, D.F. (1981), Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research*, 18, 382-388.
- Grandinetti, R. (2016), Absorptive capacity and knowledge management in small and medium enterprises. *Knowledge Management Research and Practice*, 14(2), 159-168.
- Grant, R.M. (1996), Toward a knowledge-based theory of the firm. *Strategic Management Journal*, 17(S2), 109-122.
- Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. (2019), *Multivariate Data Analysis*. Cengage.
- Hair, J.F., Hult, G.T.M., Ringle, C.M., Sarstedt, M., Danks, N.P., Ray, S. (2021), *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R*. Germany: Springer International Publishing.
- Hair, J.F., Ringle, C.M., Sarstedt, M. (2017), Partial least squares structural equation modeling. In: *Handbook of Market Research*. Germany: Springer International Publishing. p1-40.
- Laforet, S. (2011), A framework of organisational innovation and outcomes in SMEs. *International Journal of Entrepreneurial Behaviour and Research*, 17(4), 380-408.
- Ministry of Cooperatives and Small and Medium Enterprises of the Republic of Indonesia, (2020), *Annual Report of the Ministry of Cooperatives and SMEs*.
- Nonaka, I., Takeuchi, H (1995), *The Knowledge Creating Company: How Japanese Companies Create the Dynamics of Innovation*. New York: Oxford University Press.

- Nunnally, J.C., Bernstein, I.H. (1994), The assessment of reliability. *Psychometric Theory*, 3, 248-292.
- Schilling, M.A. (2017), *Strategic Management of Technological Innovation*. 5th ed. United States: McGraw-Hill Education.
- Soininen, J., Puumalainen, K., Sjögrén, H., Syrjä, P. (2012), The impact of global economic crisis on SMEs: Does entrepreneurial orientation matter? *Management Research Review*, 35(10), 927-944.
- Spithoven, A., Clarysse, B., Knockaert, M. (2011), Building absorptive capacity to organise inbound open innovation in low tech industries. *Technovation*, 31, 10-21.
- Stankevičė, I. (2016), *Innovation Strategies: The Patterns Across Countries, Industries and Firm Competitiveness*. Lithuania: Kaunas University of Technology.
- Susanto, A.B., Wasito, W. (2017), Improve the performance of SMES through innovation strategies in developing countries. *International Journal of Scientific and Technology Research*, 6(10), 282-285.
- Taufik, M.M., Faeni, D.P. (2019), Effect of innovation strategies on SME performance mediated competitive advantages. *Restaurant Business*, 118(2), 94-97.
- Tidd, J., Bessant, J. (2013), *Managing Innovation Integrating Technological, Market and Organizational Change*. United States: John Wiley.
- Valdez-Juárez, L.E., Castillo-Vergara, M. (2021), Technological capabilities, open innovation, and eco-innovation: Dynamic capabilities to increase corporate performance of SMEs. *Journal of Open Innovation Technology Market and Complexity*, 7(1), 8.
- Wiklund, J., Shepherd, D.A. (2005), Entrepreneurial orientation and small business performance: A configurational approach. *Journal of Business Venturing*, 20(1), 71-91.
- World Trade Organization. (2020), *World Trade Report 2020: Government Policies to Promote Innovation in the Digital Age*. Switzerland: World Trade Organization.
- Yulianto, E., Supriono. (2023), Effect of open innovation on firm performance through type of innovation: Evidence from SMES in Malang city, east java, Indonesia. *Cogent Business and Management*, 10(3), 2262671.