

# Co-Innovation And Innovation Performance In Small Firms: The Mediating Role Of Absorptive Capacity

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## Abstract

This study analyzes the conceptual model to comprehend the relationship between co-innovation and innovation performance, directly or through the mediation of absorptive capacity in small firms. Take ninety-six small organizations employed in the handicraft, textile, food plus beverage, and numerous industries as study objects; this research tested and authenticated the conceptual design empirically using a partial least square based structural equation model analysis. The results show that co-innovation has a significant positive effect on innovation performance. In addition, absorptive capacity has a positive effect on innovation performance. In addition, this study shows that absorptive capacity plays a mediating role in the relationship between co-innovation and innovation performance. The effects of this study emphasize the importance of creating co-innovation with different partners, such as suppliers, competitors, consumers, and business industries, that can enable access to the broader range regarding resources to enhance innovation performance for small firms ultimately.

## Keywords

Co-innovation, Absorptive capacity, Innovation performance, Small firm

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## Introduction

Small Firms play an essential role in the economic development of a country. A well-managed small business sector is crucial for the stability of the commercial environment, thereby adding significant economic growth to a country. However, apart from the particular contribution of SMEs to economic advancement, research shows that typically the overall performance associated with SMEs is less in developing nations around the world as compared to developed nations, so they really cannot help to make a maximum factor to monetary improvement (Kulathunga, Ye, Sharma, & Weerathunga, 2020). Small firms need to undertake new product development to survive and grow but still minimize costs (Bertello, Ferraris, De Bernardi, & Bertoldi, 2021). However, compared to large companies, small firms have several problems related to their innovation process. Common problems for small firms in developing countries, especially in Indonesia, are lack of capital, low resources, poor infrastructure, business management is required, and new technology use is considered obstacles to small firms' performance (Munawar & Tarmidi, 2020). In addition, there are still limited innovations that already exist in the market, causing the slow development of new products (Zou et al., 2021). As a result, it can lead to the low performance of marketed product innovations (Mendes, Braga, Silva, Rafften, & Braga, 2021).

This study tries to propose several factors that increase innovation performance (IP) in small firms. Based on the results of previous studies, we have discussed factors that can improve innovation performance for small firms, such as innovation capability (Saunila, 2020), absorptive capacity (Lau & Lo, 2019), collaborative network (Najafi-Tavani, Najafi-Tavani, Naudé, Oghazi, & Zeynaloo, 2018), and marketing capability (da Costa, Camargo, Toaldo, & Didonet, 2018). However, minor literature discusses the role of co-innovation and absorptive capacity in improving innovation performance in small firms in an integrated manner. In addition, the mediating role of absorptive capacity in linking co-innovation and innovation performance in small firms is less researched.

Co-innovation (CI) refers to the collaboration between organizations on ideas, development, commercialization of innovative new products, and combining resources to increase innovation (Lehtimäki, Komulainen, Oinonen, & Salo, 2018). Then, Saragih, Simatupang, and Sunitiyoso (2018) states that the value of co-innovation is an effort to create different values in the market from the collaboration of innovations carried out by internal and external parties of the organization. It confirms that companies do not entirely create innovative ideas independently. Still, they need the role of external partners such as competing companies, partner organizations, government, universities, suppliers, and customers to work together to find new ideas and insights in the innovation process (Saragih et al., 2018).

Absorptive capacity (AC) is considered an organization's ability to recognize new information's feasibility, assimilate it, and apply it to industry goals. It is explained by knowledge acquisition, knowledge assimilation, and knowledge application for profit (Cohen & Levinthal, 1990). According to Zhai et al. (2018), knowledge acquisition may be the firm's ability to identify and acquire external knowledge. Firm guidelines and knowledge assimilation may be the firm's ability to investigate and understand outside understanding and integrate new knowledge with existing knowledge; knowledge application may be the firm's ability to commercialize new knowledge to attain profit (Zhai et al., 2018). This study aims to answer the issues of small organizations in increasing innovation performance through co-innovation and absorptive capacity. In addition, this research can fill the gap where the role of absorptive capacity in mediating the partnership between co-innovation and innovation performance continues to be little done in small firms. Therefore, this study's formulation of the condition is: do co-innovation and absorptive capacity positively affect innovation performance in small firms? Then, can absorptive capacity mediate the relationship between co-innovation and innovation performance in small firms?

## Literature Review

### Co-Innovation (CI)

The development of CI has increased in recent years. This phenomenon has attracted researchers to dig deeper into CI and include it in an essential part of business research. CI is how collaboration with partners develops innovative processes and new products (Tsai, 2009). Furthermore, CI improves organizational accessibility to resources, facilitate the exchange of tacit and explicit



knowledge, reduce risk in R&D activities, and share costs with partners (Yan & Dooley, 2014). This study focuses on innovation collaboration between industry and suppliers, industry and customers, industry and competitors, industry and universities, considering such collaborations as a feature of the innovation process (Möller & Halinen, 2017).

CI between industry and supplier partners can increase direct interaction to increase trust between the two parties (Liao, Liao, Tu, & Vonderembse, 2011) and facilitate information exchange between companies (Luzzini, Amann, Caniato, Essig, & Ronchi, 2015). Industry and customer collaboration can identify unmet and unconscious customer needs to offer superior products to customers (Hoyer, Chandy, Dorotic, Krafft, & Singh, 2010). Industry and competitor collaboration aims to reduce the negative impact of competition and increase information sharing between the two parties so that it is expected to produce better innovation capabilities for the industry (Wu, 2014). Industry-university collaboration is an essential factor for successful innovation. Collaboration with universities is helpful as a valuable source of knowledge for the industry, with relatively lower risk when compared to collaborating with other partners, and is beneficial for the firms for long-term R&D development (Brettel & Cleven, 2011).

Innovating on products tends to rely on one's knowledge, skills, and experience in the value creation process (Z. Wang & Wang, 2012). Based on this opinion, sharing knowledge and information with partners is a valuable input for innovation (Chiang & Hung, 2010). Indeed, the firm's ability to utilize knowledge and information from CI with partners can determine the level of innovation. In addition, CI can increase NPD speed as a reaction to volatile market demands (Du Plessis, 2007), such as finding new solutions and NPD speed. (Carbonell & Rodríguez-Escudero, 2009; Fabrizio, 2009).

## Absorptive Capacity (AC)

Prior researchers have studied and elevated the need for absorption—most in the research centered on AC, which focuses on intellectual capability. Based on Cohen and Levinthal (1990), AC refers to acquiring or retaining information by simply an organization and its ability to exploit it. Consequently, an organization's absorption capability does not depend only on typically the organization's direct consumers with all the external environment. Nevertheless, it likewise depends upon knowledge transferability for the corporation (Cohen & Levinthal, 1990).

Arshada, Javed Ahmadb, Waris, Khand, and Arshadc (2020) argue that the AC varies depending on the AC at the average level of internal resources. However, the AC of an organization is not only the sum of its human resource AC. Coordination between internal organizations enables the successful exploitation of external knowledge. AC allows companies to leverage external knowledge, interpret it, combine it with existing knowledge, and utilize it commercially. This capacity facilitates exploration activities that lead to value creation (Arshada et al., 2020). That value creation can reduce costs and minimize risks for the firm (Scuotto, Giudice, & Carayannis, 2017).

Arshada et al. (2020) argue that the AC (AC) varies based on the AC at the average level of internal resources. However, the AC in an organization is not only the total of its human resource AC. Coordination between internal organizations allows successful external knowledge exploitation. AC allows companies to leverage external knowledge, translate it, combine it with existing knowledge, and utilize it commercially. This capacity facilitates exploration activities that lead to value development (Arshada et al., 2020). That value creation can reduce costs and lessen risks for the firm (Scuotto et al., 2017).

That has two categories regarding AC: potential AC, recognized by knowledge buy and assimilation (Cohen & Levinthal, 1990). Then, realized AC is characterized by knowledge modification and exploitation (Jansen, Van Den Bosch, & Volberda, 2005). According to Scuotto et al. (2017), the method allows businesses to produce relational systems with partners. In addition, by integrating implicit and explicit information, the firm's absorptency may be improved. As a result, a firm's achievement is determined by exploiting outside knowledge and how that knowledge is employed to create new items (Scuotto et al., 2017).

## Hypothesis Development

### Co-Innovation (CI) and Innovation Performance (IP)

CI has been seen as an R&D process through which two or more companies come together to bring in a fresh product or perhaps service (Cao & Zhang, 2011). Through the existing literature, it truly is apparent that firms can enhance their IP simply by developing CI together with various partners (Faems, Van Looy, & Debackere, 2005). That is because: first, CI activities may reduce the period and cost required to collect info; second, the business participates in cooperation advancement, which is a new learning process in finding new options and knowledge via interaction with firm partners (C. Wang & Hu, 2020).

Improving interaction between business partners forms a new relational bond since partners get to know the other person well over time. Given that partners have various knowledge domains, these people enhance their innovation efforts by pooling their particular disparate knowledge in addition to combining their knowledge (Yeniyurt, Henke, & Yalcinkaya, 2014). Extensive human relationships enable improved connection, with complementary resources and functions top to better final results from the new product development process (Van Echtelt, Wynstra, Van Weele, & Duysters, 2008). Therefore, if partner participation inside new product growth increases, it is usually expected that advancement performance increases (Yeniyurt et al., 2014).

Firms that collaborate on innovation with partners can increase asset use, gain knowledge transfer, improve innovation procedures, reduce development costs, shorten progress cycles, reduce financial risk, and target and influence clients, improving IP (G. Wang, Dou, Zhu, & Zhou, 2015). In addition, CI can directly contribute to IP (Lehtoranta). Therefore, we can also put forward the hypothesis that CI affects a firm's IP directly. Then, we hypothesized that:

**H<sub>1</sub>:** Co-innovation has a direct effect on innovation performance

### Absorptive Capacity (AC) and Innovation Performance (IP)

AC (AC) is an essential factor in helping companies achieve organizational performance (Fosfuri & Tribó, 2008). Previous research has shown that AC positively impacts overall IP (Huang, Chen, Zhang, & Ye, 2018). Companies that utilize AC can benefit the organization, such as first-mover advantages and fast response to customer needs (Cohen & Levinthal, 1990). That will encourage companies to achieve impressive performance (Huang et al., 2018).

Proactive firms will more quickly recognize opportunities and findings in the market. That is because the company will quickly obtain information from outside parties such as markets, customers, competitors, and others. According to Zhai et al. (2018), with high absorption capability, companies can understand resources quickly and accurately, combine existing information and knowledge resources, and drive the transformation of new knowledge. The effectiveness of this understanding transformation is realized into new products, improving the company's overall IP (Zhai et al., 2018).

Small firms with a higher level of AC can better utilize and transfer new knowledge from external partners and better absorb new knowledge and experiences related to IP (Rangus, Drnovšek, Di Minin, & Spithoven, 2017). So then, Zhai et al. (2018) state that companies with high AC can obtain market information, identify market opportunities, and understand customer needs. That will ultimately drive IP (Zhai et al., 2018). So then, we hypothesized that:

**H<sub>2</sub>:** Absorptive capacity has a direct effect on innovation performance

### Co-Innovation (CI) on Absorptive Capacity (AC)

Small firms that can absorb external knowledge into innovation can decrease internal research expenses and innovation chances. Hong, Zheng, Deng, and Zhou (2019); (Nicotra, Romano, & Del Giudice, 2014) state that knowledge purchase can increase outside knowledge alternatives because assimilation and modification capability affect their knowledge. It clarifies that the capability to acquire, absorb, and transform understanding directly influences performance. Nevertheless, understanding this will not be accessible when there is zero linking factor to IP. Hence, the knowledge gained from CI with partners can be achieved through the particular mediation of AC (Hong et al., 2019).

Inside building CIs, businesses collaborate with vendors, customers, competitors, government authorities, industry associations, and others. It boosts their knowledge sources and promotes information acquisition and transfer between companies (Xiong & Deng, 2008). There is a positive partnership between CI plus AC inside the organization. Chen, Chen, and Luo (2015) found that company absorption influenced by external knowledge acquisition channels directly impacts CI. Through CI with upstream and downstream supply cycle members, organizations could enhance their understanding of acquisition channels and their knowledge purchase capabilities (Hong et al., 2019). That shows that CI influences firms' AC.

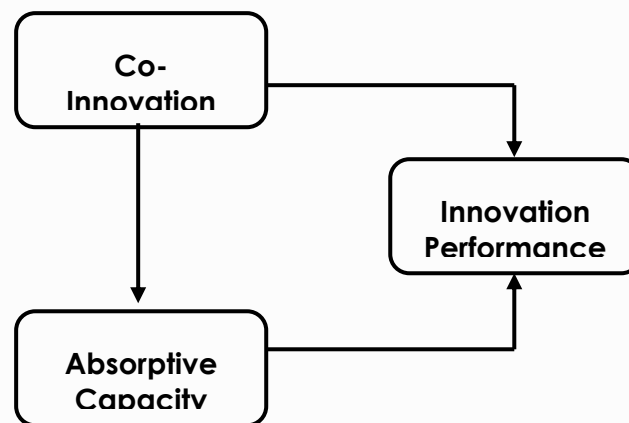
**H3:** Co-innovation has a direct effect on absorptive capacity

Firms that can absorb external knowledge will undoubtedly be challenging if there is no connecting factor to IP. Thus, knowledge gained from CI with partners can be done through the mediation effect of AC (Hong et al., 2019). Firms can absorb outside knowledge to drive overall IP (De Zubielqui, Jones, & Lester, 2016). The study conducted by Hong et al. (2019) has explored the mediating effect of AC between CI on IP. It implies that absorption has been integrated into CI. Firms with more substantial absorption capabilities can better integrate shared understanding, information, and innovation assets, increasing the functionality of their innovations. This explanation can show that AC has a mediating impact between CI and IP.

**H4:** Absorptive capacity mediates the relationship between co-innovation and innovation performance

## Conceptual Framework

Figure 1 presents a conceptual model that describes the three variables. It is explained based on the model that CI and AC affect IP. In addition, AC can mediate the relationship between CI and IP



**Figure 1.** Conceptual Model of Innovation Performance

## Research Method

This study used primary data sources; therefore, respondents were asked to complete the question items posed on the research instrument. The respondents involved in this study are owners or managers of small companies in Bandung, West Java. Based on data from the Industry and Trade Office of West Java Province for the entire population of a small firm in the Bandung area, 10,757 models consist of 5 (five) main commercial categories, such as the textile industry, handicraft industry, shoe & bag industry, food industry, and beverages, as well as various industries. Sample testing in this study identified Ghozali, who said that the number of samples could be determined from how large the parameter was multiplied by 5 to 10 (Şener, Varol, & Şener, 2021). This study uses one independent variable and two dependent variables with 16 parameters, so the sample required is  $16 \times 6 = 90$  samples.

Research instruments are used to obtain information on respondents' biodata and answers to question items on the variables of CI, AC, and IP. First, a five-point Likert scale (1 = strongly disagree, 5 = strongly agree) was used to measure the construction of the analysis. Then, the CI variable consists of four question items; AC consists of six question items, then IP consists of six question items. This research uses structural equation modeling analysis based on partial least squares (SEM-PLS)

with the help of SmartPLS 3.0. Furthermore, we examine validity and reliability testing, as well as structural model testing.

## Data Analysis

### Profile of Respondent

Based on the results of descriptive statistical analysis of the respondent's data, we obtained information about the characteristics of the respondents consisting of gender, number of employees, and business operations. Based on the tabulation results, the data shows that the profiles of respondents are male (70.8%), the number of employees <5 people (46.9%), and business operations with a period of 5-10 years (34%).

**Tabel 1**

Profile of Respondent

Profil	Amount	Percentage
Gender:		
Male	68	70.8
Female	28	29.2
Number of Employees:		
<5 people	45	46.9
5-10 people	23	24.0
11-20 people	19	19.8
21-30 people	4	4.2
>30 people	5	5.2
Business Operation		
< 5 year	9	9.4
5-10 year	34	35.4
11-20 year	27	28.1
21-30 year	22	22.9
> 30 year	4	4.2

### Validity Test

To examine validity test used two stages. The first measure is to evaluate convergent validity. That measure regarding internal consistency. That can be determined by calculating the average variance extracted in the exogenous variables (Hair, Ringle, & Sarstedt, 2011). The AVE test was used to determine the internal consistency of the construct by simply measuring the sum of variance. The assumption is that will the average covariance between indicators needs to be positive. Agarwal, Sun, and Wang (2021) mentioned that the particular AVE should be higher than 0.5. It ensures that the latent varying captures at a minimum of 50% of the measurement variance. Typically the variables tested in this study are CI as an exogenous variable and AC and IP as an endogenous variable, while the typically dependent variable is AC and IP. Table 2 shows that all variables typically exceed the minimum limit (> 0.5) to be carried on inside the following method.

**Table 2**

Test of Validity

Variables	AVE	Description
Co-Innovation (CI)	0.668	Valid
Absorptive Capacity (AC)	0.709	Valid
Innovation Performance (IP)	0.658	Valid

**Source:** Data Processing, 2021

The other stage is to evaluate discriminant quality. Discriminant validity shows the extent to be able to which one build differs from one more construct. Discriminant quality can be assessed by cross-loading analysis. It typically follows the rule that an item must have a higher correlation than



any other variable in the model. Consequently, the particular validity in the features was assessed via cross-loading analysis (Memon & Rahman, 2013). Table 3 exhibits that the CI, AC, and innovation construct have higher discriminant values than the other constructs. Each has a value of 0.818, 0.842, and 0.811. That implies that it offers met the discriminant validity requirements and is continuing in the following process.

**Table 3**  
Discriminant Validity

Constructs	AC	CI	IP
Absorptive Capacity (AC)	0.842		
Co-Innovation (CI)	0.422	0.818	
Innovation Performance (IP)	0.592	0.649	0.811

**Source:** Data Processing, 2021

### Reliability Test

Cronbach alpha is a way of measuring data consistency. As the composite reliability measure to check precisely how well the setup indicators measure the construction. Composite stability is similar in order to Cronbach alpha. The composite reliability report is advanced to Cronbach's internal consistency measurement since it uses item loading obtained in the theoretical model. Cronbach's Alpha weighs about all items consistently without considering the particular loading factor.

Nevertheless, the interpretation of the composite reliability report and Cronbach's Alpha is the same. For reliable info, it is recommended that the particular Cronbach's Alpha should be more than 0.6 to be accepted to confirm internal consistency. Regarding composite reliability, Hair et al. (2011) recommend 0.7 for minimum value. Table 4 shows that all variables typically meet the reliability requirements.

**Table 4**  
Test of Reliability

Variables	Cronbach's Alpha	Composite Reliability	Description
Co-Innovation (CI)	0.838	0.890	Reliable
Absorptive Capacity (AC)	0.917	0.936	Reliable
Innovation Performance (IP)	0.899	0.920	Reliable

**Source:** Data Processing, 2021

### Structural Model Testing

Predicated on the R square value in Table 5 implies that the estimated R-square value with SmartPLS 3.0 shows the AC value of 0.178 and IP of 0.544. It demonstrates that the AC could be explained by CI 17.8%, then the remaining 82.2% could be explained by other variables not included in this research model. Furthermore, the estimated value of IP could be explained by the CI and AC variables of 54.4%, as other variables explain the remaining 45.6% outside the research model.

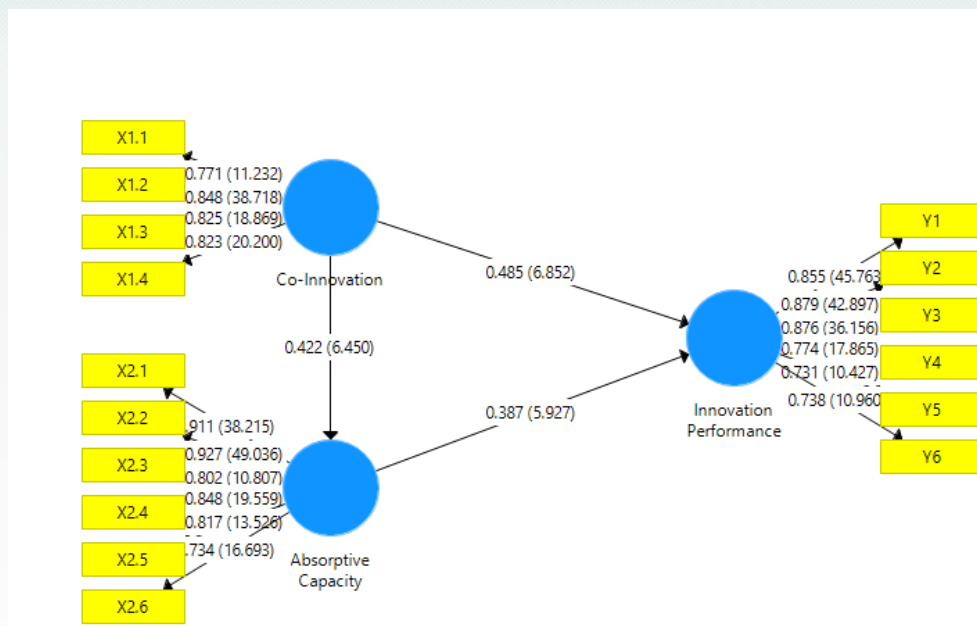
**Table 5**  
R-Square

Variables	R-Square	Adjusted Square	R-
Absorptive Capacity (AC)	0.178	0.170	
Innovation Performance (IP)	0.544	0.534	

**Source:** Data Processing, 2021

The output of the data processing illustrates that the structural equation model through the PLS Algorithm and Bootstrap can explain the structural equation model in the overall test in this study.

By testing through SmartPLS 3.0, the empirical test results for CI variables, AC, and IP are shown in Figure 2.



**Figure 2.** The Summary of The Relationship Between Variables.

## Hypothesis Testing

Based on the data processing results with SmartPLS 3.0, the measurement of hypothesis testing for all variables in the research model is presented in Table 6.

**Table 6**  
Hypothesis Testing Result

Hypothesis	$\beta$	t-Value	Description
Direct Effect:			
H <sub>1</sub> : CI → IP	0.485	6.852	Supported**
H <sub>2</sub> : AC → IP	0.387	5.927	Supported**
H <sub>3</sub> : CI → AC	0.422	6.450	Supported**
Indirect Effect:			
H <sub>4</sub> : CI → AC → IP	0.163	3.627	Supported**

**Notes:** \*\*Sig. < 0.01

### Hypothesis 1

The results through the path analysis show a positive value of 0.485. Thus, it means that when CI is more effective, the IP will increase. Therefore, that can be tested with the results of hypothesis testing  $p < 0.01$  and t-statistics associated with 6.852 to ensure that hypothesis 1 is usually accepted. Thus, this can be concluded that it has a positive and significant result of CI on IP.

### Hypothesis 2

The subsequent results of the examination show that the path analysis associated with the sample estimation is 0.387. Thus, AC affects IP with the t-statistic value of 5.927 and  $p < 0.01$ . Furthermore, typically the value of t-statistic  $5.927 > t_{table} 1.98$  in order that hypothesis 2 is accepted. It ensures that the more AC, the higher IP in a small firm. Therefore, it can be figured that absorptive ability has a significant and positive impact on IP. Nevertheless, the effect associated with AC on IP remains lower (0.387) than the CI effect on IP (0.485).



### Hypothesis 3

Based on data processing results, the construct coefficient's output value is 0.422. Then  $t$ -statistic (6.450) >  $t_{table}$  (1.98) and  $p < 0.01$  and its value is positive so that hypothesis 3 is accepted. Therefore, it can be concluded that there is a significant and positive impact between CI on AC. Furthermore, it indicates that the small firm's AC, the higher the IP obtained for the firm.

### Hypothesis 4

Table 6 shows that the result is positive, and the value is 0.163. Then the  $t$ -statistic  $3.627 > t_{table}$  1.98, so hypothesis 4 is accepted. Thus, it could be explained that AC can mediate the relationship between CI and IP. It shows that AC can indirectly influence the relationship between CI and IP.

## Discussion

The finding of this study indicates that CI contains a significant result on overall IP. These results agree with [Chen et al. \(2015\)](#), who examined the mobile services industry. The findings are that firms that develop operant resources create CI with customers to achieve superior IP. Another for companies undertaking CI by engaging clients is more application-oriented development projects together with a shorter time, less risk, plus lower costs ([Knudsen, 2007](#)). Then, [Yeniyurt et al. \(2014\)](#) explained that firms that co-innovate along with vendors could create new products every once in a while to improve IP. According to [Brettel and Cleven \(2011\)](#), vendors are usually essential partners regarding companies; collaborative activities help companies upgrade their products to be able to available technologies, and new ideas may be developed. Therefore, CI with providers supplies an essential source of understanding and can aid companies in improving their particular IP ([Brettel & Cleven, 2011](#)).

AC positively affects IP. These results are in line with [Şener et al. \(2021\)](#), which describes that absorptive capability plays a statistically significant determinant and positively influences IP. Because typically, the latent construction of AC symbolizes an internal mechanism for the design and assimilation of knowledge that improves IP. After that, [Xie, Zou, and Qi \(2018\)](#) study in high-end companies found that absorption is a critical factor in innovation effectiveness, so there is a significant relationship between AC and IP. Nonetheless, [Liu, Shen, Ding, and Zhao \(2017\)](#) argue that companies cannot quickly realize external knowledge information, but the prospective AC could achieve IP if the organization has realized AC. Therefore, small organizations need to improve their AC.

The particular findings of this study indicate which CI has an essential impact on AC. This getting supports the study of [Hong et al. \(2019\)](#) that the embrace of CI between businesses and partners, like competitors, suppliers, and consumers, has a more substantial effect on the assimilation capacity in the organization. Implementation of CI between companies and partners can potentially get external resources that broaden the channels for seeking information. Therefore, it could reinforce the ability to acquire knowledge, market the flow, transform understanding, and boost its AC ([Hong et al., 2019](#)). Then [Savin and Egbetokun \(2016\)](#) confirm that companies could improve their CI through active interaction with competitors, providers, customers, and industry associations to convert external knowledge directly into their information and apply what they have figured out to improve further.

Furthermore, our findings suggest that AC can mediate the relationship between CI and IP. It means that AC plays a partial mediating role in the relationship between CI and IP. These results agree with [Rangus et al. \(2017\)](#), who conducted a study on companies in Europe that stated that the interaction between CI and IP could be increased through AC. Companies that have a strong AC can make it possible to obtain multiple sources and channels for acquiring knowledge from partners, thereby increasing their accumulation of innovative knowledge. In addition, a strong AC can enable a firm to translate better and absorb knowledge and apply it to research and development from CI, which can improve IP ([Hong et al., 2019](#)); [Liu et al. \(2017\)](#) argue that small firms need to improve their innovation capabilities by relying on increased AC, converting external resources into their IP.

Moreover, our findings recommend that absorptive ability can mediate the relationship between CI to IP. It ensures that absorptive capability plays a part mediating role within the relationship between CI and IP. These effects agree with [Migdadi \(2021\)](#), who conducted a study on

companies inside Europe that expressed that the relationship between CI and IP may increase through AC. Companies with high AC can obtain numerous sources and channels for acquiring understanding from partners, thereby increasing their deposition of exceptional understanding. In addition, a sturdy AC could allow a good to translate better, absorb knowledge, and apply it to research and development through CI, which can enhance IP (Hong et al., 2019); Liu et al. (2017) dispute that small organizations need to increase their innovation abilities by depending on increased AC, thereby converting external assets into IP.

## Conclusion and Implication

The study contributes to the literature on the role of CI in affecting firm IP both directly and through mediating factors such as AC. Our view suggests that to be a successful small business in innovation, they must open their innovation process by CI with the external partners, such as suppliers, customers, and competitors, and keep their AC. At the same time, most previous studies focused on the direct result of AC on IP or the moderating effect of AC on the relationship between CI and IP. This study concentrates on AC in mediating the positive relationship between CI and advancement performance in small firms. In addition, naturally, there is a direct positive relationship between CI and AC on IP. The role of CI has a more substantial contribution to IP when compared to AC.

Implementation for an owner or manager, our results stress the significance of creating and maintaining relationships with different partners, such as vendors, competitors, customers, in addition to business industries, permitting entry to a more extensive array of resources and, finally, impacting IP for a small firm. Our analysis finds evidence that leveraging external information drives overall IP. Additionally, our analysis argues that CI can positively influence IP. However, it is undeniable that companies must have a chance to change and transform newly acquired knowledge with existing knowledge bases and exploit that efficiently. Thus, this can have a new higher effect on IP.

The limitation of this research is the limited area in Bandung and its surroundings on small firms. Suggestions for further studies to examine the broader population with a different scale of business. In addition, this research variable can be developed by adding other factors such as top management support and its impact on sustainable competitive advantage.

## References

- Agarwal, G., Sun, Y., & Wang, H. J. (2021). Copula-based multiple indicator kriging for non-Gaussian random fields. *Spatial Statistics*, 100524. doi:<https://doi.org/10.1016/j.spasta.2021.100524>
- Arshada, M. Z., Javed Ahmadb, M., Waris, M. A. D., Khand, A., & Arshadc, M. H. (2020). THE ROLE OF GOVERNMENT BUSINESS SUPPORT SERVICES AND ABSORPTIVE CAPACITY ON SMES PERFORMANCE. Retrieved from <https://tinyurl.com/z37zj7k>
- Bertello, A., Ferraris, A., De Bernardi, P., & Bertoldi, B. (2021). Challenges to open innovation in traditional SMEs: an analysis of pre-competitive projects in university-industry-government collaboration. *International Entrepreneurship and Management Journal*, 1-16. doi:<https://doi.org/10.1007/s11365-020-00727-1>
- Brettel, M., & Cleven, N. J. (2011). Innovation culture, collaboration with external partners and NPD performance. *Creativity and innovation management*, 20(4), 253-272. doi:<https://doi.org/10.1111/j.1467-8691.2011.00617.x>
- Cao, M., & Zhang, Q. (2011). Supply chain collaboration: Impact on collaborative advantage and firm performance. *Journal of operations management*, 29(3), 163-180. doi:<https://doi.org/10.1016/j.jom.2010.12.008>
- Carbonell, P., & Rodríguez-Escudero, A. I. (2009). Relationships among team's organizational context, innovation speed, and technological uncertainty: An empirical analysis. *Journal of Engineering and Technology Management*, 26(1-2), 28-45. doi:<https://doi.org/10.1016/j.jengtecman.2009.03.005>
- Chen, J., Chen, Y.-C., & Luo, M. M. (2015). Mobile Service Co-innovation and Service Performance: A Cross Industry Study. Retrieved from <https://aisel.aisnet.org/pacis2015/177/>

- Chiang, Y. H., & Hung, K. P. (2010). Exploring open search strategies and perceived innovation performance from the perspective of inter-organizational knowledge flows. *R&D Management*, 40(3), 292-299. doi:<https://doi.org/10.1111/j.1467-9310.2010.00588.x>
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative science quarterly*, 128-152. doi:<https://doi.org/10.2307/2393553>
- da Costa, J. C. N., Camargo, S. M., Toaldo, A. M. M., & Didonet, S. R. (2018). The role of marketing capabilities, absorptive capacity, and innovation performance. *Marketing Intelligence & Planning*, 410-424. doi:<https://doi.org/10.1108/MIP-11-2017-0312>
- De Zubieta, G. C., Jones, J., & Lester, L. (2016). Knowledge inflows from market- and science-based actors, absorptive capacity, innovation and performance—a study of SMEs. *International Journal of Innovation Management*, 20(06), 1650055. doi:<https://doi.org/10.1142/S1363919616500559>
- Du Plessis, M. (2007). The role of knowledge management in innovation. *Journal of knowledge management*. doi:<https://doi.org/10.1142/S1363919616500559>
- Fabrizio, K. R. (2009). Absorptive capacity and the search for innovation. *Research policy*, 38(2), 255-267. doi:<https://doi.org/10.1016/j.respol.2008.10.023>
- Faems, D., Van Looy, B., & Debackere, K. (2005). Interorganizational collaboration and innovation: Toward a portfolio approach. *Journal of product innovation management*, 22(3), 238-250. doi:<https://doi.org/10.1111/j.0737-6782.2005.00120.x>
- Fosfuri, A., & Tribó, J. A. (2008). Exploring the antecedents of potential absorptive capacity and its impact on innovation performance. *Omega*, 36(2), 173-187. doi:<https://doi.org/10.1016/j.omega.2006.06.012>
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing theory and Practice*, 19(2), 139-152. doi:<https://doi.org/10.2753/MTP1069-6679190202>
- Hong, J., Zheng, R., Deng, H., & Zhou, Y. (2019). Green supply chain collaborative innovation, absorptive capacity and innovation performance: Evidence from China. *Journal of Cleaner Production*, 241, 118377. doi:<https://doi.org/10.1016/j.jclepro.2019.118377>
- Hoyer, W. D., Chandy, R., Dorotic, M., Krafft, M., & Singh, S. S. (2010). Consumer cocreation in new product development. *Journal of service research*, 13(3), 283-296. doi:<https://doi.org/10.1177%2F1094670510375604>
- Huang, D., Chen, S., Zhang, G., & Ye, J. (2018). Organizational forgetting, absorptive capacity, and innovation performance: A moderated mediation analysis. *Management Decision*. doi:<https://doi.org/10.1177%2F1094670510375604>
- Jansen, J. J., Van Den Bosch, F. A., & Volberda, H. W. (2005). Managing Potential and Realized Absorptive Capacity: How Do Organizational Antecedents Matter? *The Academy of Management Journal*, 999-1015. doi:<https://doi.org/10.2307/20159726>
- Knudsen, M. P. (2007). The relative importance of interfirm relationships and knowledge transfer for new product development success. *Journal of product innovation management*, 24(2), 117-138. doi:<https://doi.org/10.1111/j.1540-5885.2007.00238.x>
- Kulathunga, K., Ye, J., Sharma, S., & Weerathunga, P. (2020). How does technological and financial literacy influence SME performance: Mediating role of ERM practices. *Information*, 11(6), 297. doi:<https://www.mdpi.com/2078-2489/11/6/297#>
- Lau, A. K., & Lo, W. (2019). Absorptive capacity, technological innovation capability and innovation performance: An empirical study in Hong Kong. *International Journal of Technology Management*, 80(1-2), 107-148. doi:<https://doi.org/10.1504/IJTM.2019.099750>
- Lehtimäki, T., Komulainen, H., Oinonen, M., & Salo, J. (2018). The value of long-term co-innovation relationships: experiential approach. *International Journal of Business Innovation and Research*, 16(1), 1-23. doi:<https://doi.org/10.1504/IJBIR.2018.091078>
- Lehtoranta, O. Innovation, collaboration in innovation and the growth performance of Finnish firms. Retrieved from <https://www.vttresearch.com/sites/default/files/pdf/publications/2010/P729.pdf>.
- Liao, Y., Liao, K., Tu, Q., & Vonderembse, M. (2011). A mechanism for external competence transfer to improve manufacturing system capabilities and market performance. *International Journal of Production Economics*, 132(1), 68-78. doi:<https://doi.org/10.1016/j.ijpe.2011.03.007>
- Liu, X., Shen, M., Ding, W., & Zhao, X. (2017). Tie strength, absorptive capacity and innovation performance in Chinese manufacturing industries. *Nankai Business Review International*, 475-494. doi:<https://doi.org/10.1108/NBRI-01-2017-0002>



- Luzzini, D., Amann, M., Caniato, F., Essig, M., & Ronchi, S. (2015). The path of innovation: purchasing and supplier involvement into new product development. *Industrial Marketing Management*, 47, 109-120. doi:<https://doi.org/10.1016/j.indmarman.2015.02.034>
- Memon, A. H., & Rahman, I. A. (2013). Analysis of cost overrun factors for small scale construction projects in Malaysia using PLS-SEM method. *Modern applied science*, 7(8), 78-88. doi:<http://dx.doi.org/10.5539/mas.v7n8p78>
- Mendes, T., Braga, V., Silva, C., Ratten, V., & Braga, A. (2021). The influence of industrial clusters on SMEs earliness and postentry speed: Exploring the role of innovation activities. *Thunderbird International Business Review*, 63(5), 623-650. doi:<https://doi.org/10.1002/tie.22226>
- Migdadi, M. M. (2021). Impact of knowledge management processes on organizational performance: the mediating role of absorptive capacity. *Business Process Management Journal*. doi:<https://doi.org/10.1108/BPMJ-02-2021-0111>
- Möller, K., & Halinen, A. (2017). Managing business and innovation networks—From strategic nets to business fields and ecosystems. *Industrial Marketing Management*, 67, 5-22. doi:<https://doi.org/10.1016/j.indmarman.2017.09.018>
- Munawar, F., & Tarmidi, D. (2020). Partner Innovation Collaboration and Management Support Toward Innovation Speed and New Product Performance in Small Manufacturing Firms. *Jurnal Aplikasi Bisnis dan Manajemen (JABM)*, 6(2), 437-437. doi:<https://doi.org/10.17358/jabm.6.2.437>
- Najafi-Tavani, S., Najafi-Tavani, Z., Naudé, P., Oghazi, P., & Zeynaloo, E. (2018). How collaborative innovation networks affect new product performance: Product innovation capability, process innovation capability, and absorptive capacity. *Industrial Marketing Management*, 73, 193-205. doi:<https://doi.org/10.1016/j.indmarman.2018.02.009>
- Nicotra, M., Romano, M., & Del Giudice, M. (2014). The evolution dynamic of a cluster knowledge network: The role of firms' absorptive capacity. *Journal of the Knowledge Economy*, 5(1), 70-93. doi:<https://doi.org/10.1007/s13132-012-0140-5>
- Rangus, K., Drnovšek, M., Di Minin, A., & Spithoven, A. (2017). The role of open innovation and absorptive capacity in innovation performance: Empirical evidence from Slovenia. *Journal of East European Management Studies*, 39-62. Retrieved from <https://www.jstor.org/stable/44504151>
- Saragih, H. S., Simatupang, T. M., & Sunityoso, Y. (2018). Co-innovation in the world music business: a conceptual framework. Paper presented at the The 3rd International Conference on Management, Economics and Business. doi:<https://doi.org/10.1504/IJBIR.2018.095542>
- Saunila, M. (2020). Innovation capability in SMEs: A systematic review of the literature. *Journal of Innovation & Knowledge*, 5(4), 260-265. doi:<https://doi.org/10.1016/j.jik.2019.11.002>
- Savin, I., & Egbetokun, A. (2016). Emergence of innovation networks from R&D cooperation with endogenous absorptive capacity. *Journal of Economic Dynamics and Control*, 64, 82-103. doi:<https://doi.org/10.1016/j.jedc.2015.12.005>
- Scuotto, V., Giudice, M. D., & Carayannis, E. G. (2017). The effect of social networking sites and absorptive capacity on SMES' innovation performance. *The Journal of Technology Transfer*, 42(2), 409-424. doi:[10.1007/s10961-016-9517-0](https://doi.org/10.1007/s10961-016-9517-0)
- Şener, Ş., Varol, S., & Şener, E. (2021). Evaluation of sustainable groundwater utilization using index methods (WQI and IWQI), multivariate analysis, and GIS: the case of Akşehir District (Konya/Turkey). *Environmental Science and Pollution Research*, 1-20. doi:<https://doi.org/10.1007/s11356-021-14106-y>
- Tsai, K.-H. (2009). Collaborative networks and product innovation performance: Toward a contingency perspective. *Research policy*, 38(5), 765-778. doi:<https://doi.org/10.1016/j.respol.2008.12.012>
- Van Echtelt, F. E., Wynstra, F., Van Weele, A. J., & Duysters, G. (2008). Managing supplier involvement in new product development: a multiple-case study. *Journal of product innovation management*, 25(2), 180-201. doi:<https://doi.org/10.1111/j.1540-5885.2008.00293.x>
- Wang, C., & Hu, Q. (2020). Knowledge sharing in supply chain networks: Effects of collaborative innovation activities and capability on innovation performance. *Technovation*, 94, 102010. doi:<https://doi.org/10.1016/j.technovation.2017.12.002>
- Wang, G., Dou, W., Zhu, W., & Zhou, N. (2015). The effects of firm capabilities on external collaboration and performance: The moderating role of market turbulence. *Journal of Business Research*, 68(9), 1928-1936. doi:<https://doi.org/10.1016/j.jbusres.2015.01.002>

- Wang, Z., & Wang, N. (2012). Knowledge sharing, innovation and firm performance. *Expert systems with applications*, 39(10), 8899-8908. doi:<https://doi.org/10.1016/j.eswa.2012.02.017>
- Wu, J. (2014). Cooperation with competitors and product innovation: Moderating effects of technological capability and alliances with universities. *Industrial Marketing Management*, 43(2), 199-209. doi:<https://doi.org/10.1016/j.indmarman.2013.11.002>
- Xie, X., Zou, H., & Qi, G. (2018). Knowledge absorptive capacity and innovation performance in high-tech companies: A multi-mediating analysis. *Journal of Business Research*, 88, 289-297. doi:<https://doi.org/10.1016/j.jbusres.2018.01.019>
- Xiong, S., & Deng, H. (2008). Critical success factors for effective knowledge sharing in Chinese joint ventures. 1089-1098. Retrieved from <https://aisel.aisnet.org/acis2008/95/>
- Yan, T., & Dooley, K. (2014). Buyer-supplier collaboration quality in new product development projects. *Journal of Supply Chain Management*, 50(2), 59-83. doi:<https://doi.org/10.1111/jscm.12032>
- Yeniyurt, S., Henke, J. W., & Yalcinkaya, G. (2014). A longitudinal analysis of supplier involvement in buyers' new product development: working relations, inter-dependence, co-innovation, and performance outcomes. *Journal of the Academy of Marketing Science*, 42(3), 291-308. doi:<https://doi.org/10.1007/s11747-013-0360-7>
- Zhai, Y.-M., Sun, W.-Q., Tsai, S.-B., Wang, Z., Zhao, Y., & Chen, Q. (2018). An empirical study on entrepreneurial orientation, absorptive capacity, and SMEs' innovation performance: A sustainable perspective. *Sustainability*, 10(2), 314. doi:<https://doi.org/10.3390/su10020314>
- Zou, Z., Liu, Y., Ahmad, N., Sial, M. S., Badulescu, A., Zia-Ud-Din, M., & Badulescu, D. (2021). What Prompts Small and Medium Enterprises to Implement CSR? A Qualitative Insight from an Emerging Economy. *Sustainability*, 13(2), 952. doi:<https://doi.org/10.3390/su13020952>