The Influence Mechanism of Co-opetition Strategy on Competitive Advantage

Jianfeng Zou[1], Ampol Navavongsathian[2*]

Natha Thornjareonkul[3], and Busaya Vongchavalitkul[4]

Faculty of Accounting and Management Science, Southeast Bangkok University Thailand

**Corresponding author.* E-mail: zoujianfeng@gzgs.edu.cn

Received August 31, 2024; **Revised** September 20, 2024; **Accepted** October 15, 2024

Abstract

In the era of globalization and digitalization, collaboration and innovation are crucial elements for enterprises to cope with global market competition and enhance their competitive advantage. Taking the competitive advantage of the advanced manufacturing industry in the Pearl River Delta region of China as the research object, a theoretical model of co-opetition strategy, open innovation, trust, and competitive advantage was constructed. This study explores how co-opetition strategy affects the sustainable competitive advantage of the manufacturing industry and the mediating role of open innovation. It is quantitative research. A questionnaire was designed to measure these variables, and both convenience sampling and random sampling were applied, targeting 225 advanced manufacturing enterprises in the Pearl River Delta region. Data were collected and analyzed using SPSS 24.0 and AMOS 24.0 to verify the relationships between the variables. The results show that the co-opetition strategy has a significant positive impact on the competitive advantage of enterprises. Both inbound open innovation and outbound open innovation play a partial mediating role, while trust positively moderates the effect of co-opetition strategy on open innovation. The findings provide a reference path for the implementation of co-opetition strategies and open innovation in the global advanced manufacturing industry, enhancing sustainable competitive advantage.

Keywords: co-opetition strategy; open innovation; trust; competitive advantage

Introduction

In this rapidly changing digital economy era, product life cycles are continuously shortening, and customer demands are becoming increasingly diverse and personalized, purely competitive strategies or purely cooperative strategies are no longer sufficient for enterprises' survival and development needs (Yang, 2023). The co-opetition strategy, a new strategic model, is being increasingly adopted by many enterprises in their management practices (Bengtsson et al., 2010). Innovation has become a key factor driving continuous development in enterprises and plays a crucial role in gaining competitive advantages (Peng et al., 2023). The approach of relying solely on internal resources for closed innovation is shifting towards cooperation and open innovation (Zhao et al., 2016).

Through cooperation, enterprises can share R&D costs and reduce R&D risks, thereby creating competitive advantages in the market with a stronger stance (Hafezi et al., 2023). At the same time, whether it is inbound open innovation or outbound open innovation, the issue of trust in the co-opetition strategy is involved (Obradović et al., 2021). Trust among members allows partners to obtain key technologies or solutions to critical problems at a very low cost (Barrane et al., 2021). Therefore, the issue of trust is an important topic in implementing a co-opetition strategy.

However, from the review of existing research, we found the following: First, current studies lack investigation into the mechanism by which coopetition strategies drive open innovation, and the pathway through which coopetition strategies influence open innovation remains unclear. Second, few scholars have deeply explored the formation mechanism of competitive advantage from both the perspectives of organizational strategy and organizational innovation. Third, while the establishment of coopetition relationships between organizations requires a foundation of trust, there is limited research that examines trust as a psychological boundary condition for organizations participating in coopetition and open innovation, and in exploring the formation of competitive advantage.

This study places co-opetition strategy, open innovation, trust, and competitive advantage into a single framework to discuss. It primarily addresses how co-opetition strategy influences open innovation, thereby affecting enterprises' ability to achieve sustainable competitive advantages, and also explores the moderating role of trust.

Research Objective

This paper starts from the actual practice of Co-opetition strategy and open innovation, based on existing research, and further studies the Co-opetition strategy, open innovation, and corporate competitive advantage in connection with China's reality. The focus of the research is to answer the following questions:

1. To explain the mechanism of how the Co-opetition strategy affects open innovation and competitive advantage.

2. To explore the moderating role of trust between Co-opetition strategy and open innovation.

Literature review and hypotheses development

Co-opetition Strategy and Competitive Advantage

The rapid development of the digital economy has intensified industry competition, making it essential for enterprises to build strong competitive advantages and establish high entry barriers (Cenamor et al., 2019). The co-opetition strategy is a superior strategy for enterprises in the current competitive landscape, helping them stimulate, amplify, and strengthen their network effects to expand the market size, create network visions to identify user value, and coordinate complex networks to create user value (Tang et al., 2020). Therefore, as a crucial capability for enterprises' survival in the digital age, co-opetition strategy provides opportunities for the development of new services and technologies and for improving data processing capabilities at low costs, which is vital for competitive advantage (Xiao et al., 2020). Since enterprises facing incomplete factor markets must accumulate key resources internally rather than purchasing them in the factor market (Cenamor et al., 2019), they need to design an integrated system that leverages integrated functions, consolidates critical shared knowledge, centralizes, codifies, and utilizes internal information resource flows (Dominguez Gonzalez, 2023). Simultaneously, using a digital modular architecture enables companies to manage an ever-changing network of partners, enhancing relational skills and partner knowledge. These key assets, which are highly irreplaceable and inimitable, constitute firm-specific resource advantages (Miric et al., 2019). Therefore, the following assumptions are proposed:

H1: Co-petition strategy has a positive impact on the competitive advantage of enterprises.

Co-petition Strategy and Open Innovation

A co-opetition strategy can provide knowledge sources and knowledge acquisition channels for inbound open innovation (Mostafiz et al., 2022). New technologies have high complexity and cross-domain characteristics (Gao et al., 2021). The wider the co-petition strategy, the more knowledge acquisition channels enterprises can establish (Gao et al., 2021), which can help improve the diversity of knowledge connectivity, facilitate enterprises to timely learn and grasp the opportunities and knowledge of relevant technological progress or change (Gernsheimer et al., 2024). A co-opetition strategy can provide reliable sources for enterprises to acquire heterogeneous knowledge and have a positive impact on the implementation of inbound open innovation. At the same time, companies can adopt outbound open innovation strategies, such as intellectual property transfer or technology transfer, to strengthen cooperation and knowledge sharing among companies (Rahman, 2021). In management practices, many companies have embraced coopetition strategies, enhancing the impact of outbound open innovation on firm performance (Singh et al., 2021). Qutbound open innovation can become a strategic mechanism where the central company collaborates with other firms in the ecosystem, fostering collaboration and complementary innovations, thereby jointly creating new products and markets (Costa et al., 2021). Leveraging input from competing and partnering companies to improve internal innovation processes or to seek external commercialization opportunities for internally developed products has been widely practiced by many companies (Costa et al., 2021). Therefore, the following assumptions are proposed:

H2: Co-opetition strategy has a positive impact on inbound open innovation.

H3: Co-opetition strategy has a positive impact on outbound open innovation.

Open Innovation and Competitive Advantage

Open innovation promotes sustainable competitive advantages by influencing enterprises' ambidextrous learning capabilities (Zhang et al., 2023). Implementing open innovation has a significant positive impact on organizational dynamic capabilities, thereby affecting competitive advantage (van Lieshout et al., 2021). From the perspective of dynamic capabilities, Lee and Yoo (2019) argued that implementing open innovation can enhance an enterprise's knowledge perception, acquisition, and transformation capabilities, thus influencing the attainment of sustainable competitive advantages. Open innovation can enhance organizational learning capabilities, contributing to the achievement of sustainable competitive advantages for enterprises (Pundziene et al., 2022). Enterprise risk management and organizational strategy also play important mediating

roles between open innovation and competitive advantage, significantly influencing the formation of competitive advantages (Rua et al., 2022). Existing research also indicates that open innovation does not necessarily have a positive impact on gaining competitive advantages for enterprises (Hosseini & Shams, 2014; Reed et al., 2012). Therefore, the following assumptions are proposed:

H4: Inbound open innovation has a positive impact on competitive advantage.

H5: Outbound open innovation has a positive impact on competitive advantage.

The Mediating Role of Open Innovation

In the existing research, there are not many studies directly proving that open innovation plays a mediating role between co-opetition strategy and competitive advantage, but there is much indirect evidence. The study by (Osarenkhoe, 2010) indicates that implementing a co-opetition strategy can help enterprises achieve knowledge sharing, enhance innovation capabilities, and thus strengthen competitive advantage. (Della Corte, 2018), a systematic review of the literature on co-opetition strategy, open innovation, and competitive advantage, found that most scholars believe that a balanced combination of competition and cooperation (especially a highly balanced combination) can generate innovation, thereby contributing to competitive advantage. co-opetition strategy has been proven to be more conducive to innovation than pure cooperation or competition strategies (Quintana-Garcia & Benavides-Velasco, 2004) Coopetition promotes knowledge acquisition and exchange among partners, facilitates joint technology development, and provides companies with opportunities to share the risks and costs associated with innovation (Bouncken et al., 2020). Based on the above literature analysis, Therefore, the following assumptions are proposed:

H6: Inbound open innovation plays a mediating role between co-opetition strategy and competitive advantages of enterprises.

H7: Outbound open innovation plays a mediating role between co-opetition strategy and enterprise competitive advantages.

The Moderating Role of Trust

The role of trust in co-opetition is very important because when different companies join together to make progress and improve business performance, open innovation has an important positive impact on corporate performance (Venesz et al., 2022). Trust can promote co-opetition partners to work comfortably to increase open innovation and improve business performance (Mathafena & Msimango-Galawe, 2023). Open innovation is related to the level of trust and

openness between co-opetition partners (Chesbrough, 2020). Companies have the opportunity to establish fruitful relationships with co-opetition partners to help them enter new markets, develop new products, or diversify their business models and establish new revenue sources for the company (Camilleri & Bresciani, 2022). Therefore, a co-opetition strategy can have a significant impact on corporate performance through open innovation (Avotra et al., 2022). Trust can not only promote inbound open innovation and generate organizational synergy but also have a positive impact on outbound open innovation and enhance the interaction effect of partners (Brockman et al., 2018). Therefore, the following assumptions are proposed:

H8: Trust plays a moderating role between co-opetition strategy and inbound open innovation.

H9: Trust plays a moderating role between co-opetition strategy and outbound open innovation.

Conceptual Framework

This research is a quantitative research study. The researcher sets the research concept based on the concepts or theories of co-opetition strategy, open innovation, social capital together with Competitive Advantage, as shown in Figure 1.

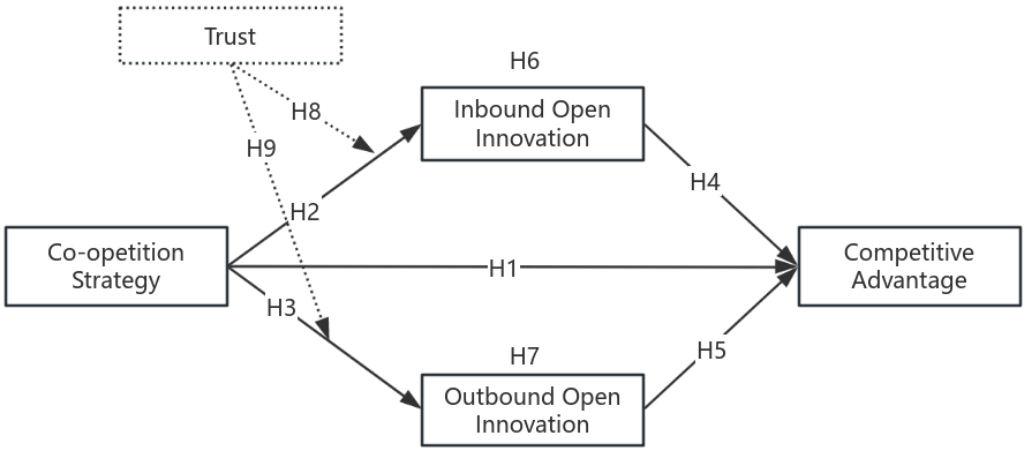

Figure 1 Conceptual Framework

Research Method

Quantitative research methods were used as a survey approach. Questionnaires were distributed and used as a research tool to collect primary data. Researchers selected 200 small and medium-sized manufacturing enterprises from Sanshui District, Foshan City, using a random sampling method, and distributed 479 questionnaires to mid-to-senior managers of these enterprises. Structural equation modeling was employed to analyze the data. The questionnaire passed validity and reliability tests. Three experts in the field of innovation management research were invited to do the Index of Item-Objective Congruence (IOC) test. The scores of the items were all between 0.67 and 1, Above the recommended threshold of 0.5 (Lenz, 2010), indicating that the questionnaire had good content validity. Cronbach's alpha coefficient was used to measure the reliability or internal consistency of the scale used in this study. A pilot test of the questionnaire was conducted, and a total of 133 questionnaires were collected from 15 manufacturing enterprises through their human resources departments. With 21 invalid questionnaires excluded, the final number of valid questionnaires was 112, resulting in a questionnaire validity rate of 84.21%. Cronbach's alpha for the five Variables were all greater than 0.7 (Nunnally, 1994), indicating that the questionnaire used in this study has high reliability.

Sample Selection and Data Acquisition

The data collection for this study was conducted from May to July 2024. According to the recommendations of Bentler and Chou (1987), the sample size should be at least 5-10 times the number of observed variables. With 28 observed variables in this study, the target sample size was 280. The questionnaires were distributed in two ways: First, we conducted an offline survey of 25 manufacturing enterprises within 20 kilometers and collected 75 valid questionnaires. Second, 200 manufacturing enterprises were randomly selected from the list of manufacturing enterprises in Foshan City, via phone and online communication tools were used to contact the human resources departments, and 425 questionnaires were distributed to mid-to-senior management personnel. A total of 479 questionnaires were collected using these two methods, of which 362 were returned. After excluding 75 invalid questionnaires due to regular responses or missing key items, 287 valid questionnaires were obtained, yielding an effective response rate of 59.91%, Higher than 50% (Babbie, 2020). To avoid differences between the data collected on-site and online, an independent samples t-test was conducted to analyze the two groups of data, and the results showed that

the t-value was not significant. Ultimately, we obtained 287 valid questionnaires. The basic demographic data is presented in Table 1.

Table 1 Survey Sample Characteristics

Name	Category	Frequency	Percentage （%）
Age of Enterprise	3year and under	69	24.04
	4-7years	76	26.48
	8-10years	27	9.41
	11years and over	115	40.07
The size of the enterprise	100 and under	34	11.84
	101-300	129	44.95
	301-500	103	35.89
	501 and over	21	7.32
Family Enterprise or Not	Yes	110	38.33
	No	177	61.67
Nature of property rights	Public	66	23.00
	Non-Public	221	77.00

Results

The following sections present the results of the descriptive statistics and correlation analysis, SEM analysis, the measurement structural model, mediation analysis, and moderation analysis, along with the testing of hypotheses.

Reliability and Validity Tests

Cronbach's α and CR values were used to test the reliability, and confirmatory factor analysis and AVE values were used to test the structural validity of the scale. The results are shown in Table 2. All the research variables Cronbach's α and CR values are greater than 0.7, According to the suggestions of Cronbach (1951) and Hair (2010), indicating that the scales for these variables have good reliability and stability. All item factor loadings greater than 0.5 and AVE values greater than 0.5. According to the suggestions of scholars such as Fornell and Larcker (1981) and Hair (2010), it can be considered that the questionnaire has good discriminant validity and convergent validity.

Table 2 Results of the Reliability and Validity Test

Variable Names	Items	Factor loadings	Cronbach's α	CR	AVE
Co-opetition Strategy	CO1	0.891	0.892	0.893	0.633
	CO2	0.760			
	CO3	0.800			
	CO4	0.765			
	CO5	0.753			
Outbound Open Innovation	OB1	0.883	0.901	0.902	0.651
	OB2	0.782			
	OB3	0.762			
	OB4	0.796			
	OB5	0.806			
Inbound Open Innovation	IB1	0.879	0.888	0.889	0.621
	IB2	0.807			
	IB3	0.755			
	IB4	0.736			
	IB5	0.754			
Trust	TR1	0.837	0.941	0.941	0.696
	TR2	0.823			
	TR3	0.821			
	TR4	0.780			
	TR5	0.831			
	TR6	0.860			
	TR7	0.837			
Competitive Advantage	CA1	0.837	0.887	0.888	0.573
	CA2	0.738			
	CA3	0.718			
	CA4	0.735			
	CA5	0.754			
	CA6	0.754			

Descriptive Statistics and Correlation Analysis

Before conducting regression analysis, this study performed descriptive statistics and correlation analysis on all variables, as shown in Table 3. The mean and standard deviation of each variable are within reasonable ranges, and most correlation coefficients between variables are less than 0.7, Below the recommended threshold (Bagozzi et al., 1991). Additionally, the square root of the Average Variance Extracted (AVE) for key variables exceeds their correlations with other variables, indicating good discriminant validity among the main variables in this study. The above descriptive statistics analysis provides a foundation for subsequent hypothesis testing.

Table 3 Descriptive Statistics and Correlation Analysis results

Variable	1	2	3	4	5
1. Co-option Strategy	0.795				
2. Outbound Open Innovation	.537**	0.807			
3. Inbound Open Innovation	.524**	.476**	0.788		
4. Trust	.256**	.318**	.175**	0.804	
5. Competitive Advantage	.611**	.581**	.681**	.213**	0.757
Mean	3.882	3.822	3.859	3.291	3.931
SD	0.888	0.947	0.880	1.099	0.806

Note: *p<0.05, **p<0.001(2-tailed)

Evaluation of the Structural Model

To validate the relationships among co-opetition strategy, open innovation, and competitive advantage in this study, AMOS 24.0 was used to test the main effect hypotheses. The results are shown in Figure 6.1 and Table 4. Figure 2 represents the structural equation model of this study. The model fit parameters were obtained using the maximum likelihood method, yielding CMIN = 362.104, df = 184, CMIN / DF = 1.968, NFI = 0.910, IFI = 0.945, CFI = 0.953, GFI = 0.904, RMSEA = 0.058. As it is less than 2.0, means the structural equation model is harmonized with empirical data (Schumacker & Lomax, 2004). Therefore, the structural equation model demonstrates a good fit with the sample data obtained from the questionnaire.

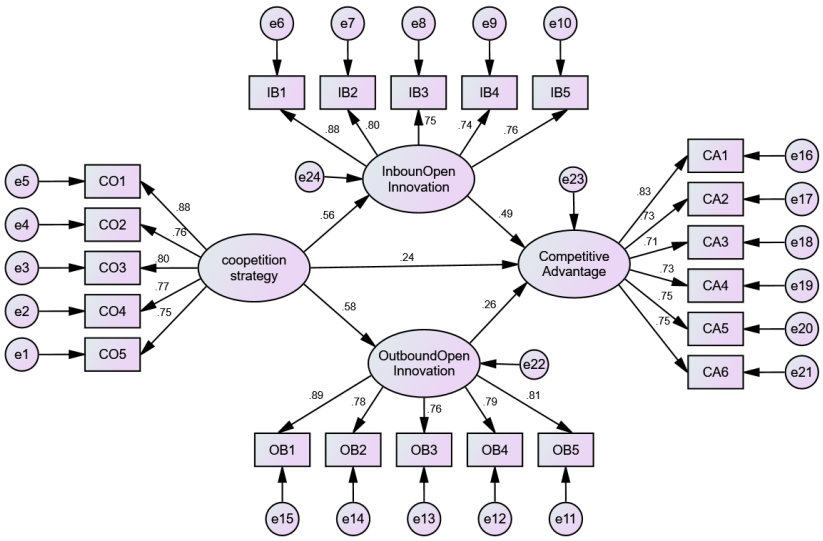

Figure 2 The structural equation model of co-opetition strategy, open innovation, and competitive advantage which can be shown in the form of the following equation

χ^2 = 362.104, df. =184, χ^2 /df. = 1.968, p-value = .000, NFI=0.910, IFI = .945, CFI = .953, GFI=0.904, RMSEA = .058, Significant level at .000

In the AMOS text output, the t-value is the Critical Ratio (C.R.), which equals the parameter estimate divided by its standard error. And t-value greater than 1.96 indicates statistical significance (Segars, 1997). In the structural equation model, the standardized path coefficient of the co-opetition strategy to inbound open innovation is 0.558 and it reaches a significant level (P<0.01), indicating that the co-opetition strategy has a significant positive impact on inbound open innovation, thus supporting hypothesis H2. The standardized path coefficient of the co-opetition strategy to outbound open innovation is 0.577 and it reaches a significant level (P<0.01), indicating that the co-opetition strategy has a significant positive impact on outbound open innovation, thus supporting hypothesis H3. The standardized path coefficient of inbound open innovation to competitive advantage is 0.487 and it reaches a significant level (P<0.01), indicating that inbound open innovation has a significant positive impact on competitive advantage, thus supporting hypothesis H4. The standardized path coefficient of outbound open innovation to competitive advantage is 0.263 and it reaches a significant level (P<0.01), indicating that outbound open innovation has a significant positive impact on competitive advantage, thus supporting hypothesis H5. The standardized path coefficient of the co-opetition strategy to competitive advantage is 0.292 and it reaches a significant level (P<0.01), indicating that the co-opetition strategy has a significant positive impact on competitive advantage, thus supporting hypothesis H1. The path coefficients and significance levels between the variables are shown in Table 4.4.

Table 4 Path coefficient test results

			Estimate	S.E.	C.R.	P
Inbound Open Innovation	<---	Coopetition Strategy	0.558	0.087	8.567	***
Outbound Open Innovation	<---	Coopetition Strategy	0.577	0.079	8.551	***
Competitive Advantage	<---	Inbound Open Innovation	0.487	0.054	8.087	***
Competitive Advantage	<---	Outbound Open Innovation	0.263	0.059	4.52	***
Competitive Advantage	<---	Coopetition Strategy	0.244	0.082	3.579	***

Note: *p<0.05, **p<0.01, ***p<0.001

Mediating Effect Testing

To further test the mediating effects of outbound open innovation and inbound open innovation proposed in hypotheses H6 and H7, we used the Bootstrap method for verification. In the Bootstrapping analysis, we selected model 4 with 5000 iterations. The results of the mediation effect analysis are shown in Table 5 The results indicate that the indirect effect of outbound open innovation on competitive advantage through co-opetition strategy is 0.117, with a 95% bias-corrected bootstrap confidence interval of [0.067, 0.172], which does not include 0. Therefore, the mediating role of outbound open innovation proposed in hypothesis H7 is supported. Additionally, repeating the above steps, the results show that the indirect effect of co-opetition strategy on competitive advantage through inbound open innovation is 0.208, with a 95% bias-corrected bootstrap confidence interval of [0.155, 0.273], which does not include 0, thus supporting hypothesis H6. Since the direct effect of co-opetition strategy on competitive advantage is supported, so inbound and outbound open innovation play a partial dual mediating role between co-opetition strategy and competitive advantage.

To further clarify the magnitude of the mediating effects, this study adopted the following analysis procedures: First, we analyzed the dual mediating effects of outbound open innovation and inbound open innovation. First, we analyzed the overall mediating effect of the co-opetition strategy on competitive advantage through outbound open innovation and inbound open innovation. The total mediating effect (Ind1+Ind2) is 0.325, with a 95% confidence interval of [0.256, 0.407], which does not include 0. This indicates that the co-opetition strategy influences competitive advantage through open innovation. Second, we analyzed the relative importance of different mediating paths in the process of transforming a co-opetition strategy into a competitive advantage. The mediating effect of outbound open innovation accounts for 21.01% of the total effect, while the mediating effect of inbound open innovation accounts for 37.34% of the total effect. The confidence interval (CI) for Ind1-Ind2 is -0.091, with a 95% confidence interval of [-0.178, -0.010], which does not include 0. This indicates that among the two mediating paths, the mediating role of inbound open innovation is the strongest.

Table 5 The mediating effect testing results

Mediating path	Effect	Boot SE	Boot LLCI	Boot ULCI	Effect proportion
Total effect	0.557	0.043	0.473	0.642	100%
Direct effect	0.232	0.045	0.144	0.320	41.65%
Total Indirect effect	0.325	0.039	0.256	0.407	58.35%
Ind1: OB	0.117	0.027	0.068	0.172	21.01%
Ind2: IB	0.208	0.030	0.155	0.273	37.34%
(CI): Ind1–Ind2	–0.091	0.043	–0.178	–0.010	

Moderating Effects Testing

This study utilized Hayes' Bootstrapping analysis procedure to validate the positive moderating effect of trust on the relationship between co–opetition strategy and outbound open innovation. Model 1 was selected with 5000 iterations, and the analysis results are presented in Table 6.

Table 6 The moderating effect testing results

Variable	Outbound Open Innovation		Inbound Open Innovation	
	Coefficient	95%CI	Coefficient	95%CI
Co–opetition Strategy	0.559 ***	[0.451,0.667]	0.564 ***	[0.462,0.666]
Trust	0.181 ***	[0.096,0.267]	0.046	[–0.035,0.126]
Co–opetition Strategy*Trust	0.144 **	[0.053,0.234]	0.192***	[0.053,0.278]
Indicator	R^2=0.597 F=22.115		R^2=0.578 F=19.953	

Note: *p<0.05, **p<0.01, ***p<0.001

The results indicate that the interaction between co–opetition strategy and trust is significant in its effect on outbound open innovation (β=0.144, CI [0.053, 0.234]), suggesting that Hypothesis H9 is supported. The interaction between co–opetition strategy and trust significantly affects inbound open innovation (β=0.192, p<0.01, CI [0.053, 0.278]), supporting Hypothesis H8.

Discussion

Results from research objective 1 found that co-opetition strategy positively influences the competitive advantage of manufacturing enterprises. This was because, with the globalization of the economy, global supply chains have become increasingly interconnected, and the boundaries between cooperation and competition have become increasingly blurred, forcing many companies to establish cooperative relationships with other stakeholders, and even competitors, to maintain a competitive advantage. The results of this study align with those of previous research, such as Hameed and Naveed (2019); Lee and Roh (2023); and Hamid, Sajid et al. (2023), indicating that implementing a co-opetition strategy helps small and medium-sized enterprises integrate internal and external resources for open innovation, thereby forming a competitive advantage.

Results from research objective 1 also found that outbound and inbound open innovation play dual mediating roles between coopetition strategy and competitive advantage. This was because open innovation has become a key factor in the sustainable development of modern enterprises. Since the 1990s, open innovation has replaced closed innovation and become the core element for enterprises to pursue sustainable competitive advantages. The results of this study align with those of previous research, such as Abubakar (2024); Wang and Chen (2022), indicating that the implementation of a co-opetition strategy by small and medium-sized enterprises facilitates innovation development and the formation of a competitive advantage.

Results from research objective 2 found that trust positively moderates the relationship between co-opetition strategy and open innovation. This was because, when enterprises maintain a high level of trust with their competition partners, those with high coopetition strategies are more likely to achieve competitive advantage through inbound open innovation. Then, when enterprises maintain high-trust cooperation with their competition partners, they are more likely to achieve competitive advantage through outbound open innovation. The results of this study align with those of previous research, such as Hameed and Naveed (2019); and Chai et al. (2020), indicating that trust plays an important role in competition and innovation among enterprises.

New Knowledge

First, this study clarifies the conceptual connotation of corporate co-opetition strategy and enriches and expands the theoretical research on co-opetition strategy and competitive advantage. This article deconstructs the impact mechanism of corporate co-opetition strategy on competitive

advantage. Enterprises can not only adopt a co-opetition strategy to aggregate multiple resources with co-opetition partners but also use the spillover effect of the co-opetition relationship to create resource integration and orchestration modules to extract the unique value of resources.

Second, this study explores the impact of the co-opetition strategy of manufacturing enterprises on their competitive advantage. Based on the inherent theoretical logic of different types of open innovation, it opens the "black box" between the co-opetition strategy and the competitive advantage of enterprises. On the one hand, it makes up for the defect of previous research that over-focused on internal innovation and expands the innovation theory in the symbiotic era. On the other hand, it opens the "black box" from co-opetition strategy to corporate competitive advantage, which helps to inspire research related to co-opetition strategy to actively explore the important role of open innovation in the process of creating corporate competitive advantage.

Third, this study combines the relationship network background with Chinese characteristics to reveal the moderating effect of inter-firm trust on co-opetition strategy and open innovation. Under the relationship network with Chinese characteristics, more and more corporate organizations pay attention to cultivating trust relationships and using trust to deal with business issues. Trust, as a network governance mechanism, helps promote the exchange and conversion of resources between competitive partners, affects the efficiency and effectiveness of corporate resource management, and plays a key role in the process of creating corporate competitive advantages.

In summary, the new findings of this paper can be represented in Figure 3.

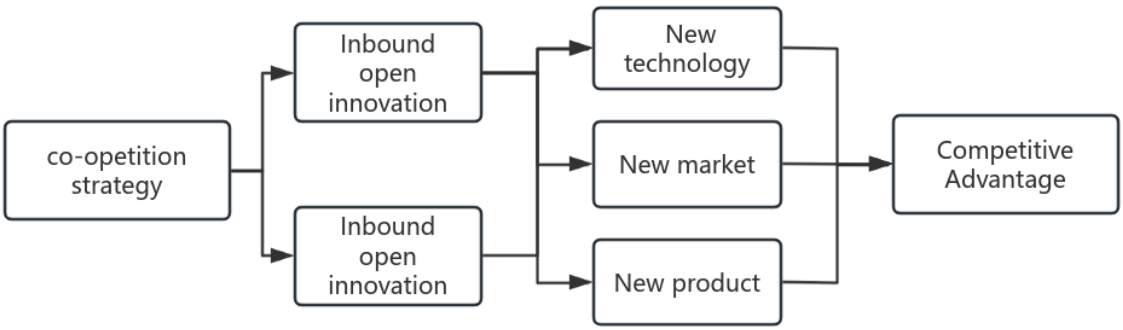

Figure 3 New findings of the study

Conclusion

This paper aims to reveal the internal mechanism of manufacturing enterprises achieving competitive advantage through co-opetition strategy and explore the mediating role of open innovation and the moderating role of trust.

The findings show that enterprises can promote sustainable competitive advantage by implementing coopetition strategies and both competing and cooperating with competitors and stakeholders.

The findings highlight the importance of co-opetition and open innovation in the sustainable competitive advantage of enterprises.

The findings also indicated that trust between enterprises plays an important moderating role between coopetition strategy and open innovation.

These results not only confirm the mediating role of open innovation between coopetition and competitive advantage but also highlight the key role of trust in the implementation of co-opetition and open innovation by enterprises. A noteworthy contribution of this study is the detailed exploration of how coopetition affects the open innovation of enterprises and thus affects the acquisition of competitive advantage. These insights have practical significance for manufacturing managers and provide a specific path to improve sustainable competitive advantage by improving co-opetition and open innovation among enterprises.

Suggestion

From the research results. The researcher has recommendations as follows:

1. Actively implementing a co-opetition strategy and emphasizing its practical application are crucial.

Results from research objective 1 found that co-opetition strategy positively influences competitive advantage. So, Enterprises should adopt a coopetition mindset, develop coopetition thinking, and enhance their coopetition capabilities. They need to define their coopetition targets based on their strategic goals and actively build coopetition relationships with members of the value network, such as suppliers, customers, and competitors. All parties should create a symbiotic interface for exchanging products, technologies, information, and data, aggregating various resources. Additionally, enterprises should effectively leverage coopetition relationships to acquire or create knowledge through resource searching, machine learning, and other methods, thereby

generating enterprise value and achieving competitive advantage. Furthermore, enterprise managers need to establish a symbiotic mindset of co-creating value within the organization. They should provide training to employees to enhance their cooperation awareness and skills, and actively coordinate the interests of network members to meet their survival and development needs.

2. Developing a new value-creation logic to achieve sustainable competitive advantage is essential.

Results from research objective 1 also found that open innovation plays dual mediating roles between coopetition strategy and competitive advantage. Therefore, enterprises should prioritize, encourage, and implement open innovation, forming a new value creation logic through both outbound and inbound open innovation to generate sustainable competitive advantage. Under inbound open innovation, managers should create more opportunities and conditions for extensive collaboration with external entities such as customers, suppliers, distributors, research institutions, intellectual property agencies, and government departments to enhance the breadth of openness. Under outbound open innovation, enterprises should focus on improving the quality of patent technologies and innovative outcomes, attracting numerous commercial partners to engage in diverse outbound innovation activities, such as patent transfers, patent licensing, external R&D of innovation outcomes, and technical consulting services, thus enhancing the breadth of openness.

3. Fully leveraging inter-firm trust is crucial for strengthening open innovation.

Results from research objective 2 found that trust positively moderates the relationship between co-opetition strategy and open innovation. Therefore, enterprises should recognize the significant role that trust plays in the effectiveness of a co-opetition strategy and choose to engage in open innovation activities with partners with whom they maintain high-quality trust. This approach enhances the mediating effect of open innovation. In outbound open innovation, to quickly leverage the cooperation network for value transformation, enterprises might transfer organizational knowledge outcomes to partners under unfavorable conditions, which can result in substantial post-facto risks. In inbound open innovation, to rapidly update organizational resources to meet development needs, enterprises might form partnerships with resource-rich but low-quality resource providers, potentially harming their operations. To avoid inefficient or ineffective outbound and inbound open innovation, enterprises should select partners with whom they have high levels of trust for their innovation activities.

References

Abubakar, A. (2024). Competition and cooperation: a coopetition strategy for sustainable performance through serial mediation of knowledge sharing and open innovation. *Global Knowledge, Memory, and Communication*. https://doi.org/10.1108/GKMC-10-2023-0398

Avotra, A. A. R. N., Chengang, Y., Said, K. S. M., Chu, C., & Xiang, L. (2022). The notion of coopetition-based open-innovation in business practices: a model to accelerate firm performance. *Frontiers in Psychology, 13*, 931623.

Babbie, E. R. (2020). *The practice of social research.* Cengage Au.

Bagozzi, R. P., Yi, Y., & Phillips, L. W. (1991). Assessing construct validity in organizational research. *Administrative Science Quarterly*, 421-458.

Barrane, F. Z., Ndubisi, N. O., Kamble, S., Karuranga, G. E., & Poulin, D. (2021). Building trust in multi-stakeholder collaborations for new product development in the digital transformation era. *Benchmarking: An International Journal, 28*(1), 205-228.

Bengtsson, M., Eriksson, J., & Wincent, J. (2010). Co-opetition dynamics-an outline for further inquiry. *Competitiveness Review: An International Business Journal, 20*(2), 194-214.

Bentler, P. M., & Chou, C.-P. (1987). Practical issues in structural modeling. *Sociological Methods & Research, 16*(1), 78-117.

Bouncken, R. B., Fredrich, V., Kraus, S., & Ritala, P. (2020). Innovation alliances: balancing value creation dynamics, competitive intensity, and market overlap. *Journal of Business Research, 112*, 240-247.

Brockman, P., Khurana, I. K., & Zhong, R. I. (2018). Societal trust and open innovation. *Research Policy, 47*(10), 2048-2065.

Camilleri, M. A., & Bresciani, S. (2022). Crowdfunding small businesses and startups: a systematic review, an appraisal of theoretical insights and future research directions. *European Journal of Innovation Management*. DOI:10.1108/EJIM-02-2022-0060

Cenamor, J., Parida, V., & Wincent, J. (2019). How entrepreneurial SMEs compete through digital platforms: the roles of digital platform capability, network capability and ambidexterity. *Journal of Business Research, 100*, 196-206.

Chai, L., Li, J., Tangpong, C., & Clauss, T. (2020). The interplays of coopetition, conflicts, trust, and efficiency process innovation in vertical B2B relationships. *Industrial Marketing Management, 85*, 269-280.

Chesbrough, H. (2020). To recover faster from COVID–19, open up: managerial implications from an open innovation perspective. *Industrial Marketing Management, 88*, 410–413.

Costa, J., Neves, A. R., & Reis, J. (2021). Two sides of the same coin. University–industry collaboration and open innovation as enhancers of firm performance. *Sustainability, 13*(7), 3866.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*(3), 297–334.

Della Corte, V. (2018). Innovation through coopetition: future directions and new challenges. *Journal of Open Innovation: Technology, Market, and Complexity, 4*(4), 47.

Dominguez Gonzalez, R. V. (2023). How do formalization, centralization, and integration impact dynamic knowledge–based capability?. *Total Quality Management & Business Excellence, 34*(3–4), 421–439.

Fornell, C., & Larcker, D. F. (1981). *Structural equation models with unobservable variables and measurement error: algebra and statistics*. Sage.

Gao, J., He, H., Teng, D., Wan, X., & Zhao, S. (2021). Cross–border knowledge search and integration mechanism–a case study of Haier open partnership ecosystem (HOPE). *Chinese Management Studies, 15*(2), 428–455.

Gernsheimer, O., Gast, J., & Kanbach, D. K. (2024). Always on par? how small– and medium–sized enterprises manage coopetition strategies to innovate with large firms. *International Small Business Journal*, *42*(7), 863–900. https://doi.org/10.1177/02662426241237182

Hafezi, M., Zhao, X., & Zolfagharinia, H. (2023). Together we stand? co–opetition for the development of green products. *European Journal of Operational Research, 306*(3), 1417–1438.

Hair, J.F., Black, W.C., Babin, B.J., & Anderson, R.E. (2010). *Multivariate data analysis* (7th ed.). Pearson.

Hameed, W. U., & Naveed, F. (2019). Coopetition–based open–innovation and innovation performance: role of trust and dependency evidence from Malaysian high–tech SMEs. *Pakistan Journal of Commerce and Social Sciences (PJCSS), 13*(1), 209–230.

Hamid, I., Sajid, A. N., & Batool, Z. (2023). Influence of competition on firm financial performance: mediating role of open innovation performance. *Journal of Finance and Accounting Research, 5*(1). DOI:10.32350/jfar.51.05

Hosseini, S. A., & Shams, F. (2014). The impact of positive organizational behavior and open innovation on improving the competitive advantage. *Management Studies in Development and Evolution, 23*(75), 137–159.

Lee, K., & Yoo, J. (2019). How does open innovation lead to competitive advantage? a dynamic capability view perspective. *PloSone, 14*(11), e0223405.

Lee, M.–J., & Roh, T. (2023). Digitalization capability and sustainable performance in emerging markets: mediating roles of in/out–bound open innovation and coopetition strategy. *Management Decision*. https://doi.org/10.1108/MD–10–2022–1398

Lenz, E. R. (2010). *Measurement in nursing and health research.* Springer.

Mathafena, R. B., & Msimango–Galawe, J. (2023). Entrepreneurial orientation, market orientation and opportunity exploitation in driving business performance: the moderating effect of inter–functional coordination. *Journal of Entrepreneurship in Emerging Economies, 15*(3), 538–565.

Miric, M., Boudreau, K. J., & Jeppesen, L. B. (2019). Protecting their digital assets: the use of formal & informal appropriability strategies by app developers. *Research Policy, 48*(8), 103738.

Mostafiz, M. I., Ahmed, F. U., & Hughes, P. (2022). Open innovation pathway to firm performance: the role of dynamic marketing capability in Malaysian entrepreneurial firms. *International Journal of Entrepreneurial Behavior & Research*. DOI:10.1108/IJEBR–02–2022–0206

Nunnally, J. (1994). *Psychometric theory.* McGraw–Hill.

Obradović, T., Vlačić, B., & Dabić, M. (2021). Open innovation in the manufacturing industry: a review and research agenda. *Technovation, 102*, 102221.

Osarenkhoe, A. (2010). A coopetition strategy–a study of inter–firm dynamics between competition and cooperation. *Business Strategy Series, 11*(6), 343–362.

Peng, S., Jiang, X., & Li, Y. (2023). The impact of the digital economy on Chinese enterprise innovation based on intermediation models with financing constraints. *Heliyon, 9*(3).

Pundziene, A., Nikou, S., & Bouwman, H. (2022). The nexus between dynamic capabilities and competitive firm performance: the mediating role of open innovation. *European Journal of Innovation Management, 25*(6), 152–177.

Quintana-Garcia, C., & Benavides-Velasco, C. A. (2004). Cooperation, competition, and innovative capability: a panel data of European dedicated biotechnology firms. *Technovation, 24*(12), 927-938.

Rahman, H. (2021). Dimensions of researches for open innovation in SMEs. In *Human-Computer Interaction and Technology Integration in Modern Society* (pp. 76-105): IGI Global.

Reed, R., Storrud‐Barnes, S., & Jessup, L. (2012). How open innovation affects the drivers of competitive advantage: trading the benefits of IP creation and ownership for free invention. *Management Decision, 50*(1), 58-73.

Rua, O. L., Musiello-Neto, F., & Arias-Oliva, M. (2022). Linking open innovation and competitive advantage: the roles of corporate risk management and organizational strategy. *Baltic Journal of Management, 18*(1), 104-121.

Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling*. Psychology Press.

Segars, A. H. (1997). Assessing the unidimensionality of measurement: a paradigm and illustration within the context of information systems research. *Omega, 25*(1), 107-121.

Singh, S. K., Gupta, S., Busso, D., & Kamboj, S. (2021). Top management knowledge value, knowledge sharing practices, open innovation, and organizational performance. *Journal of Business Research, 128*, 788-798.

Tang, T. Y., Fang, E. E., & Qualls, W. J. (2020). More is not necessarily better: an absorptive capacity perspective on network effects in open source software development communities. *MIS Quarterly, 44*(4).

van Lieshout, J. W., Van Der Velden, J. M., Blomme, R. J., & Peters, P. (2021). The interrelatedness of organizational ambidexterity, dynamic capabilities, and open innovation: a conceptual model towards a competitive advantage. *European Journal of Management Studies, 26*(2/3), 39-62.

Venesz, B., D**ő**ry, T., & Raišien**ė**, A. G. (2022). Characteristics of lead users in different stages of the new product development process: a systematic review in the context of open innovation. *Journal of Open Innovation: Technology, Market, and Complexity, 8*(1), 24.

Wang, M.-C., & Chen, J.-S. (2022). Driving coopetition strategy to service innovation: the moderating role of coopetition recognition. *Review of Managerial Science, 16*(5), 1471-1501.

Xiao, X., Tian, Q., & Mao, H. (2020). How the interaction of big data analytics capabilities and digital platform capabilities affects service innovation: a dynamic–capabilities view. *IEEE Access, 8*, 18778–18796.

Yang, Q., Geng, R., Feng, T., & Li, T. (2023). Impacts of supply chain integration on product–and service–oriented mass customization capability: the role of customer need. *International Journal of Physical Distribution & Logistics Management, 53*(3), 354–377.

Zhang, X., Chu, Z., Ren, L., & Xing, J. (2023). Open innovation and sustainable competitive advantage: the role of organizational learning. *Technological Forecasting and Social Change, 186*, 122114.

Zhao, S., Sun, Y., & Xu, X. (2016). Research on open innovation performance: a review. *Information Technology and Management, 17*, 279–287.