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Optimizing MSME Business Networks Through Innovation and Digital Platforms for Competitive Advantage

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ARTICLE INFO	ABSTRACT
	Introduction: The relationship between business networks, open innovation, shared value creation, and competitive advantage is an important topic, especially with the role of digital platforms in supporting these processes. This research provides insight into these dynamics. **Objectives**: To explore how business networks, open innovation, shared value creation, and competitive advantage influence each other, and to evaluate the moderating role of digital platforms in this relationship. **Methods**: The study used a quantitative approach with data analysis to test the relationship between the variables. A cross-sectional approach was applied to collect data. **Results**: Business networks significantly enhance open innovation, which in turn enhances competitive advantage and value co-creation. Value co-creation directly affects competitive advantage. The direct effect of business networks on value co-creation and competitive advantage is insignificant, so the effect is mediated by open innovation. Digital platforms have a positive effect on open innovation, but their moderating role on other relationships is limited. **Conclusions**: Businesses must build strong networks to drive open innovation and value co-creation to enhance competitive advantage. Digital technology must be leveraged to support collaboration and innovation processes. This study has limitations, such as limited sample size and a cross-sectional approach that does not capture time dynamics. Future research is recommended to use larger samples, a longitudinal approach, and explore other moderating variables. **Keywords:** Business Networks, Open Innovation, Value Sharing, Competitive Advantage, Digital platforms

INTRODUCTION

Due to their substantial GDP contributions and ability to employ millions of people, MSMEs in Indonesia are vital to the country's economy (Arifin, Ningsih, & Putri, 2021; Rohayati, Soetjipto, Haryono, Wahyono, Prakoso, & Rafsanjani, 2023; Ratnawati, Soetjipto, Murwani, & Wahyono, 2018). However, to remain competitive in the ever-evolving digital era, MSMEs need to adopt innovative strategies and utilize digital technology (Putri & Kusuma, 2024; Yaskun, Sudarmiatin, Hermawan, & Rahayu, 2023; Soetjipto, Handayati, Hanurawan, Meldona, Rochayatun, & Bidin, 2023).

MSMEs need to adopt innovative strategies and utilize digital technology to face increasingly complex and dynamic market challenges. By implementing innovative approaches, MSMEs can create added value for their products and services, differentiate themselves from competitors, and better meet customer needs. Innovation also enables MSMEs to improve operational efficiency, reduce costs, and optimize business processes (Loo, Ramachandran, & Raja Yusof, 2023). In this digital era, digital technology plays an important role in supporting MSME transformation. Digital technologies as well as e-commerce, social media, and data analytics enable MSMEs to expand market reach, improve customer interactions, and understand market trends in real time (Sirodjudin & Sudarmiatin, 2023; Rahman, Sudarmiatin, & Hermawan, 2023). Additionally, MSMEs may boost productivity,

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expedite decision-making, and automate repetitive operations with the use of digital technology (Bhuiyan, Faraji, Rashid, Bhuyan, Hossain, & Ghose, 2024).

One important aspect that can improve MSME performance is the business network. MSMEs establish business networks with a range of stakeholders, such as suppliers, customers, rivals, and strategic partners. These networks are essential for facilitating access to resources including cash, technology, and information. Through strong business networks, MSMEs can obtain better market information, identify new business opportunities, and improve their operational efficiency (Aulia, Junaidi, & Hendrayani, 2024). In addition, business networks also allow MSMEs to access knowledge and skills that they may not have internally, thereby accelerating the process of innovation and product development. Thus, MSMEs can adapt more quickly to market changes and maintain their competitiveness. Not only that, business networks also help MSMEs build reputation and trust in the eyes of customers and business partners, It can enhance client loyalty and the viability of the firm (Hilmersson & Hilmersson, 2021).

The benefits and drawbacks of earlier studies demonstrate that opinions on how corporate networks affect open innovation and competitive advantage vary. Business networks may boost open innovation and shared value creation, which eventually boosts competitive advantage, according to several studies. Gay (2014), Lee et al. (2010), and Papa et al. (2021) stated that business networks enable MSMEs to access external resources, share knowledge, and collaborate with business partners, which in turn drives innovation and competitive advantage. On the other hand, studies by Chierici et al. (2020) and Temmerman et al. (2021) show that in certain contexts, business networks do not have a significant impact on open innovation or competitive advantage, especially if they are not supported by effective Digital platforms.

One of the primary ideas in strategic management that highlights the significance of an organization's internal resources in attaining competitive advantage is the Resource-Based View (RBV) hypothesis. According to RBV, competitive advantage is achieved through effective management of unique, rare, difficult to imitate, and irreplaceable resources. In the context of MSMEs, resources such as knowledge, skills, and business networks can be determining factors for success (Lubis, 2022).

In the context of MSMEs, dynamic capabilities can include the capacity to innovate, establish business networks, and leverage digital technology. Dynamic Capability Theory, which is closely related to RBV, emphasizes an organization's capacity to adapt, build, and reconfigure both internal and external skills to react to environmental changes. This theory emphasizes the significance of dynamic capabilities in generating new value and preserving competitive advantage (Manzoor, Baig, Hashim, Sami, Rehman, & Sajjad, 2022).

Network theory highlights how crucial relationships are to generating value and gaining a competitive edge. In the context of MSMEs, business networks can include relationships with suppliers, customers, strategic partners, and financial institutions. Business networks can provide access to external resources, information, and collaboration opportunities that can enhance innovation and competitive advantage (Battour, Barahma, & Al-Awlaqi, 2021; Setya & Djatmika, 2017).

The process of invention spreading within a social system is explained by the Diffusion of invention Theory. According to this theory, the adoption of innovation is influenced by the characteristics of the innovation itself, communication channels, time, and the social system in which the innovation occurs. In the context of MSMEs, the diffusion of innovation can be influenced by business networks and the use of Digital platforms (Oyelana, Kamanzi, & Richter, 2021).

Business Networks are one of the main concepts in this study. Formal and informal connections between MSMEs and other stakeholders, including suppliers, consumers, financial institutions, and strategic partners, are referred to as business networks. Business networks can give users access to outside data, resources, and teamwork possibilities that can boost creativity and competitiveness (Corazza, Cisi, & Falavigna, 2022).

Open Innovation is a concept that emphasizes the importance of collaboration with external parties in the innovation process. Open innovation involves sharing knowledge, ideas, and resources with business partners, customers, suppliers, and even competitors. In the context of MSMEs, open innovation can increase innovation

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capacity by leveraging business networks and digital platforms (Carrasco-Carvajal, Castillo-Vergara, & Garcia-Perez-de-Lema, 2023).

The idea of "value co-creation" highlights how businesses and consumers may work together to create value. This idea involves active interaction between companies and customers in developing products, services, and solutions. In the context of MSMEs, value co-creation can increase competitive advantage by utilizing business networks and Digital platforms (Saha, Goyal, & Jebarajakirthy, 2022).

The primary goal of company strategy is to get a competitive advantage. When a business has a consistent edge over its rivals in terms of price, product uniqueness, or customer response, it is said to have a competitive advantage. In the context of MSMEs, competitive advantage can be obtained through open innovation, value co-creation, and the use of Digital platforms (Farida & Setiawan, 2022; Yaskun, Sudarmiatin, Hermawan, & Rahayu, 2023).

Digital platforms are technologies that enable interaction and collaboration between various stakeholders in a business network. Digital platforms can include e-commerce applications, social media, customer relationship management (CRM) systems, and online collaboration tools (Sulisnaningrum, Mutmainah, Bawono, S., & Drean, 2023; Sasongko, Bawono, & Prabowo, 2021). In the context of MSMEs, digital platforms can increase access to markets, external resources, and collaboration opportunities that can enhance open innovation, shared value creation, and competitive advantage (Reim, Andersson, & Eckerwall, 2023). We develop the following hypotheses:

H1. Open innovation benefits from business networks.

H2. Value co-creation benefits from business networks.

H3. Competitive advantage is positively impacted by business networks.

H4. Value co-creation benefits from open innovation.

H5. Open innovation has a positive effect on competitive advantage.

H6. Value co-creation has a positive effect on competitive advantage.

H7. Open innovation mediates the effect of business networks on competitive advantage

H8. Value co-creation mediates the influence of business network on competitive advantage.

H9. Digital platform strengthens the influence of business network on value co-creation.

H10. The impact of corporate networks on open innovation is reinforced by digital platforms.

H11. The impact of open innovation on competitive advantage is reinforced by digital platforms.

H12. The impact of value co-creation on competitive advantage is reinforced by digital platforms.

H13. The impact of business networks on competitive advantage is reinforced by digital platforms

H14. Value co-creation and open innovation work together to mitigate the impact of corporate networks on competitive advantage.

OBJECTIVES

To explore how business networks, open innovation, shared value creation, and competitive advantage influence each other, and to evaluate the moderating role of digital platforms in this relationship.

METHODS

This study uses a quantitative approach to explore the role of Digital platforms in moderating the influence of MSME business networks on competitive advantage through open innovation and shared value creation as mediating variables. The quantitative approach was chosen because it allows for in-depth statistical analysis and objective hypothesis testing. This study's research design is an explanatory quantitative survey design. This design was chosen because it is appropriate for testing the link among variables and identifying the influence of independent variables on dependent variables through mediating and moderating variables. This study collected data using a questionnaire distributed to RedDoorz partner MSMEs in East Java Province. There were 882 MSMEs

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in the East Java Province that were RedDoorz partners, making up the study's population. Purposive sampling was used to choose 268 MSMEs as a sample from this group. Because it enables researchers to choose samples according to specific attributes that are pertinent to this investigation, purposeful sampling was chosen. In this instance, MSMEs with broad business networks and active usage of digital platforms are taken into consideration. The sample size calculator from the Calculator.net program was used to determine the number of samples of 268 MSMEs with a 95% confidence level and a 5% margin of error. Questionnaires and document analysis were the methods of data gathering employed in this investigation. Primary data were collected through questionnaires distributed to RedDoorz partner MSMEs in East Java Province. The questionnaire was compiled based on research variables, namely Business Network, Open Innovation, Value Co Creation, competitive advantage, and use of Digital platforms. To make data collecting easier, the survey was disseminated via Google Form. Secondary data was gathered from pertinent publications and papers that bolster the interpretation and analysis of the study findings. A questionnaire comprising closed-ended questions on a 5-point Likert scale—from strongly disagree (1) to strongly agree (5)—was the research tool utilized in this study. Business networks, open innovation, shared value creation, competitive advantage, and the usage of digital platforms are the study factors that this questionnaire was created to examine. To guarantee that the study tool utilized was legitimate and dependable, the questionnaire was examined for validity and reliability prior to usage. The data analysis techniques used in this study are Partial Least Squares (PLS) and Multi-Group Analysis (MGA). PLS was chosen because it allows the analysis of structural models with small samples and does not require the assumption of normal distribution. PLS analysis is carried out to test the link among variables, both directly and indirectly through mediating variables. MGA is used to identify significant differences between groups in this study. In the data analysis steps carried out in this study, the first step is to identify relevant groups. The relevant groups in this study are MSMEs that actively use Digital platforms and MSMEs that are not actively using Digital platforms. After the relevant groups are identified, PLS (Partial Least Squares) analysis is carried out for each group separately. The association between the variables in the research model is tested using PLS analysis. Furthermore, the bootstrapping technique is applied to estimate model parameters and test the significance of the relationship between variables. Bootstrapping is a resampling method that allows researchers to obtain more accurate parameter estimates and measure the significance of relationships in the model. A comparison analysis across groups (MGA) was carried out to find notable variations in the impact of business networks on open innovation, shared value creation, and competitive advantage following the completion of the PLS analysis for each group. The final step in data analysis is the interpretation of results and reporting. The results of the PLS and MGA analyses are interpreted to provide a deeper understanding of the influence of business networks and Digital platforms on open innovation, shared value creation, and competitive advantage of MSMEs. The results of this analysis are then presented in the form of tables and graphs to facilitate understanding and delivery of research findings. It is anticipated that by following these data analysis procedures, the study would offer thorough insights into how MSMEs may use digital platforms and business networks to strengthen their competitive edge.

RESULTS

This study focuses on MSMEs that are RedDoorz partners in East Java Province. The study population includes all 882 MSMEs that are RedDoorz partners in the area. From this population, purposive sampling was used to choose a sample of 268 MSMEs. This approach was adopted to make sure that the sample that was picked had certain attributes that were pertinent to the study's goals, specifically MSMEs with a large business network and active usage of digital platforms. Using the sample size calculator from the Calculator.net program, the sample size of 268 MSMEs was determined with a 95% confidence level and a 5% margin of error. Table 1 presents the Population and Sample Table of RedDoorz MSME Partners in East Java Province

Table 1. Population and Sample of RedDoorz Partner MSMEs in East Java Province

No	City Name	Number of Partners	Number of Samples
1	Banyuwangi	19	6
2	Batu	53	16
3	Bojonegoro	46	14
4	Bondowoso	10	3

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5	Gresik	1	1
6	Jember	8	2
7	Jombang	7	2
8	Kediri	25	8
9	Lamongan	86	26
10	Lumajang	2	1
11	Malang	82	25
12	Madiun	26	8
13	Mojokerto	108	33
14	Nganjuk	26	8
15	Ngawi	40	12
16	Pacitan	5	2
17	Pasuruan	59	18
18	Ponorogo	1	1
19	Probolinggo	19	6
20	Sampang	1	1
21	Sidoarjo	136	41
22	Situbondo	5	2
23	Sumenep	2	1
24	Surabaya	109	33
25	Tuban	5	2
26	Tulungagung	1	1
Total		882	268

The population under investigation consisted of all 882 MSMEs in East Java Province that are RedDoorz partners. Purposive sampling was used to choose 268 MSMEs as a sample from this group. This approach was chosen because it enables researchers to choose samples according to certain attributes that are pertinent to this investigation. MSMEs with broad business networks and active use of digital platforms were taken into account while choosing the sample. The population and sample distribution of RedDoorz MSME partners in different East Javan cities is displayed in Table 1. Sidoarjo has the largest number of partners (136) with a sample of 41 MSMEs, followed by Surabaya and Mojokerto which each have 109 and 108 partners with a sample of 33 MSMEs. Cities such as Gresik, Ponorogo, Sampang, and Tulungagung each have only one partner and were also selected as samples. The selection of samples from each city was carried out proportionally according to the number of partners in each city, so that the selected samples represent the population as a whole. This data illustrates the diverse distribution of RedDoorz partners in East Java and ensures that the study includes MSMEs that have a significant impact and are integrated into modern business practices. Thus, this study provides an in-depth analysis of MSMEs that are active on Digital platforms and have extensive business networks, which is very important to understand their performance and impact. Table 2 presents the Validity and Reliability Tests

Table 2. Validity and Reliability Test

	Cronbach's Alpha	rho_A	Composite Reliability (CR)	Average Variance Extracted (AVE)
Business network	0,566	0,693	0,729	0,384
Paltform Digital Moderating Value Co Creation Competitice Advantage	1,000	1,000	1,000	1,000
Digital platforms Moderating Business Network to Competitive Advantage	1,000	1,000	1,000	1,000
Digital platforms Moderating Open	1,000	1,000	1,000	1,000

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Innovation to Competitive Advantage				
Digital platforms Moderating Business Network to Value Co-Creation	1,000	1,000	1,000	1,000
Digital platforms Moderating Open Innovation to Co Creation	1,000	1,000	1,000	1,000
Digital platforms	-0,046	-0,056	0,472	0,327
competitive advantage.	0,338	0,547	0,547	0,202
open innovation	0,585	0,633	0,732	0,324
value co-creation	0,651	0,706	0,766	0,359

Table 2 displays the findings of the validity and reliability tests, along with the values for each construct's Cronbach's Alpha, rho_A, CR, and AVE. The analysis's findings show that the Cronbach's Alpha values for a number of constructs, such as "Business network" (0.566), "Digital platforms" (-0.046), "Competitive advantage" (0.338), "Open innovation" (0.585), and "Value co-creation" (0.651) still need to be improved because these values indicate low internal reliability. The moderation construct "Digital platforms Moderating" has a value of 1.000, which indicates very high reliability or possible problems in the calculation. The Composite Reliability value shows the internal consistency of the construct. "Business network" (0.729) and "Open innovation" (0.732) showed good internal consistency, while "Digital platforms" (0.472), "Competitive advantage" (0.547), and "Value co-creation" (0.766) still need to be improved. The AVE values for constructs such as "Business network" (0.384), "Digital platforms" (0.327), "Competitive advantage" (0.202), "Open innovation" (0.324), and "Value co-creation" (0.359) showed low convergent validity, which means these constructs do not absorb enough variance from their indicators.

Table 3. R-squared (R²) Values

	R Square	R Square Adjusted
competitive advantage.	0,752	0,743
open innovation	0,365	0,362
value co-creation	0,539	0,527

The R-squared (R-sq) value indicates the explanatory power of the model to the variability of the dependent variable, which in this context includes competitive advantage, open innovation, and value co-creation. Based on the analysis results, competitive advantage has an R² value of 0.752 and an Adjusted R² of 0.743. This means that 75.2% of the variability in competitive advantage can be explained by the independent variables in the model, indicating that this model is very strong in explaining competitive advantage. The independent factors account for 36.5% of the variability in open innovation, according to the R-sq value of 0.365 and the Adjusted R-sq of 0.362. This suggests that the model's capacity to explain open innovation is mediocre. In contrast, value co-creation's R-sq value of 0.539 and Adjusted R-sq of 0.527 show that the independent variables account for 53.9% of its variability, indicating that this model is quite good at explaining shared value creation. Overall, this model shows a very strong ability to explain competitive advantage, moderate ability to explain open innovation, and quite good ability to explain value co-creation. The Adjusted R² values that are almost the same as the R² values indicate that this model is stable and is not too influenced by the number of independent variables used. Thus, these results provide confidence that the research model used can provide an adequate explanation of the relationship among the variables studied.

Table 4. Path Coefficients

	competitive advantage.	open innovation	value co-creation
Business network	-0,051	0,604	-0,126
Paltform Digital Moderating Value Co Creation Competitice	0,011		

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Advantage			
Digital platforms Moderating Business Network to Competitive Advantage	0,054		
Digital platforms Moderating Open Innovation to Competitive Advantage	-0,033		
Digital platforms Moderating Business Network to Value Co-Creation			-0,036
Digital platforms Moderating Open Innovation to Co Creation			-0,022
Digital platforms	-0,015		0,081
competitive advantage.			
open innovation	0,377		0,780
value co-creation	0,589		

This study presents various path coefficients that indicate the strength and direction of the relationship between the constructs in the model. Based on Table 4, we can interpret each relationship between the constructs. Initially, the correlation between "Open innovation" and "Business network" is positive (0.604), suggesting a strong and meaningful association. This indicates that more open innovation is associated with a robust corporate network. Conversely, the correlation between "Value co-creation" and "Competitive advantage" and "Business network" is negative, with path coefficients of -0.126 and -0.051, respectively. This suggests that in this situation, value co-creation and competitive advantage are not much impacted by business networks. The route coefficient of 0.011 between "Competitive Advantage" and "Digital platforms Moderating Value Co-creation" is quite minimal, indicating that the moderating effect of Digital platforms on this relationship is almost non-existent. The path coefficient of "Digital platforms Moderating Business Network to Competitive Advantage" of 0.054 also shows a weak and insignificant influence. Likewise, the relationship between "Digital platforms Moderating Open Innovation to Competitive Advantage" with a coefficient of -0.033 shows that Digital platforms moderation does not provide a significant positive influence.

For "Digital platforms Moderating Business Network to Value Co-creation" and "Digital platforms Moderating Open Innovation to Co-creation," the path coefficients of -0.036 and -0.022 respectively indicate that Digital platforms do not have a significant influence in moderating these relationships. The direct relationship between "Digital platforms" and "Value Co-creation" also has a small path coefficient of 0.081, indicating a minimal influence.

A very strong and positive correlation between "Open innovation" and "Value Co-creation" is indicated by the path coefficient of 0.780, which indicates that there is a positive correlation between the two. Although not as strong as the preceding association, the correlation among "Open innovation" and "Competitive Advantage" is still substantial and favorable, with a value of 0.377. Conversely, the correlation among "Competitive Advantage" and "Value Co-creation" is 0.589, indicating that value co-creation is a significant factor in boosting competitive advantage. According to the table's interpretation, "Open innovation" significantly influences "Value Co-creation" and "Competitive Advantage," however "Business network" only significantly influences "Open Innovation" and not the other factors. Moderation by "Digital platforms" does not seem to have a significant effect in this context. Table 5 presents the T-values and P-values

Table 5. T-values and P-values

Relationship Between Constructs	T-values	P-values
Business Network -> Competitive Advantage	0.282	0.778
Business Network -> Open Innovation	9.707	0.000
Business Network -> Value Co-creation	0.896	0.370
Digital platforms Moderating Value Co-creation -> Competitive Advantage	0.168	0.867

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Digital platforms Moderating Business Network -> Competitive Advantage	0.559	0.576
Digital platforms Moderating Open Innovation -> Competitive Advantage	0.458	0.647
Digital platforms Moderating Business Network -> Value Co-creation	0.718	0.473
Digital platforms Moderating Open Innovation -> Co-creation	0.419	0.675
Digital platforms -> Competitive Advantage	0.288	0.774
Digital platforms -> Open Innovation	3.093	0.002
Digital platforms -> Value Co-creation	0.895	0.371
Open Innovation -> Competitive Advantage	13.361	0.000
Value Co-creation -> Competitive Advantage	7.736	0.000

Based on Table 5, we can interpret the significance of the relationship between constructs. The relationship between "Business Network" and "Competitive Advantage" has a T value of 0.282 and a P value of 0.778. This high P value indicates that this relationship is not significant, so we can conclude that business networks do not have a significant influence on competitive advantage in this model. On the contrary, the relationship between "Business Network" and "Open Innovation" has a very high T value of 9.707 and a very low P value of 0.000. This demonstrates a highly substantial association, leading us to infer that open innovation is strongly positively impacted by corporate networks. The T value of 0.896 and the P value of 0.370 for the association between "Value Co-creation" and "Business Network" show that it is not significant. This indicates that value co-creation is not much impacted by business networks. The moderation relationships of "Digital platforms" on "Value Co-creation -> Competitive Advantage", "Business Network -> Competitive Advantage", "Open Innovation -> Competitive Advantage", "Business Network -> Value Co-creation", and "Open Innovation -> Co-creation" all have low T-values and high P-values, indicating that the moderation of Digital platforms is not significant in these relationships. Table 6 presents the Effect Size (f²)

Table 6. Effect Size (f²)

	competitive advantage.	open innovation	value co-creation
Business network	0,006	0,575	0,021
Paltform Digital Moderating Value Co Creation Competitice Advantage	0,000		
Digital platforms Moderating Business Network to Competitive Advantage	0,008		
Digital platforms Moderating Open Innovation to Competitive Advantage	0,002		
Digital platforms Moderating Business Network to Value Co-Creation			0,002
Digital platforms Moderating Open Innovation to Co Creation			0,001
Digital platforms	0,001		0,014
competitive advantage.			
open innovation	0,186		0,757
value co-creation	0,641		

Table 6 shows the Effect Size (f²) values for each relationship in the model, which illustrates how much influence a construct has on the dependent variable. A larger effect size value indicates a more significant influence. In this table, we see that "Business network" has a very small influence on "competitive advantage" (0.006) and "value co-creation" (0.021), but has a very strong influence on "open innovation" (0.575). This shows that business networks

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have an important role in enhancing open innovation, but their influence on competitive advantage and shared value creation is very minimal. The moderating effect of "Digital platforms" on the link among "Value Co-creation" and "Competitive Advantage" is zero (0.000), indicating that Digital platforms do not have a significant influence as a moderator in this relationship. Likewise, the moderating effect of Digital platforms on "Business Network" on "Competitive Advantage" (0.008), "Open Innovation" on "Competitive Advantage" (0.002), "Business Network" on "Value Co-creation" (0.002), and "Open Innovation" on "Co-creation" (0.001) are all very small and insignificant. Directly, "Digital platforms" have a very small effect on "competitive advantage" (0.001) and "value co-creation" (0.014), suggesting that digital platforms don't directly affect these factors in a meaningful way. The moderate impact size of "Open Innovation" on "Competitive Advantage" (0.186) indicates that open innovation significantly affects competitive advantage. Meanwhile, the effect of "Open Innovation" on "Value Co-creation" is very large (0.757), indicating that open innovation is an important factor in creating shared value. Finally, the influence of "Value Co-creation" on "Competitive Advantage" is also very large (0.641), which confirms the importance of value co-creation in increasing competitive advantage. Table 7 presents the Predictive Relevance (Q²)

Table 7. Predictive Relevance (Q²)

Variabel Dependen	Q²
Competitive Advantage	0,516
Open Innovation	0,253
Value Co-creation	0,369

Table 7 displays the Predictive Relevance (Q²) values for the dependent variables in the model. Predictive Relevance (Q²) measures the ability of a model to predict variability in the dependent variable. The model has sufficient predictive significance for that dependent variable if the Q2 value is higher than 0. Competitive advantage has a great predictive ability, as seen by its Q2 score of 0.516. This indicates that the independent factors included in the model are crucial in determining competitive advantage since the model can considerably anticipate variability in competitive advantage. The Q² value for Open Innovation is 0.253, indicating moderate predictive ability. Although not as strong as competitive advantage, the model still has fairly good predictive relevance for open innovation, proving that the model's independent variables are adequate to account for open innovation's unpredictability. Value Co-creation has a Q2 value of 0.369, which suggests a rather high degree of predictive power. The independent variables in the model are crucial in understanding shared value creation, as seen by the model's strong ability to forecast fluctuation in shared value production.

Table 8. Goodness of Fit (GoF) Index

	Saturated Model	Estimated Model
SRMR	0,112	0,112
d_ULS	5,049	5,118
d_G	4,171	4,188
Chi-Square	2676,159	2680,921
NFI	0,191	0,190

In Table 8, the GoF Index is displayed. A moderate model fit is indicated by an SRMR value of 0.112; a good fit is defined as one with an SRMR value less than 0.08. The estimated model matches the observed data rather well, as seen by the minor difference among the d_ULS and d_G values for the saturated and estimated models (5.049 and 5.118 for d_ULS, and 4.171 and 4.188 for d_G, respectively). Furthermore, there is only a tiny difference in the Chi-Square values between the estimated (2680.921) and saturated (2676.159) models, suggesting that the estimated model is reasonably compatible with the observed data. However, since the ideal NFI value is around 1, the

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saturated model's NFI value of 0.191 and the estimated model's NFI value of 0.190 show a very poor match. This indicates that this model still needs improvement to better match the observed data. Overall, the results of this analysis indicate that the model has a moderate fit based on the SRMR and Chi-Square values, but the low NFI value indicates that the model still needs improvement to achieve a better fit with the observed data. These results provide useful insight into the reliability of the research model and indicate areas that require further attention to improve model fit. Table 9 presents the Moderation Test

Table 9. Moderation Test

Relationship Between Constructs	Path Coefficient	T-values	P-values	Status
Business Network -> Competitive Advantage	-0,051	0.282	0.778	Not Supported
Digital platforms Moderating Business Network -> Competitive Advantage	0,054	0.559	0.576	Not Supported
Business Network -> Open Innovation	0,604	9.707	0.000	Supported
Digital platforms Moderating Business Network -> Open Innovation	-0,013	0.419	0.675	Not Supported
Business Network -> Value Co-creation	-0,126	0.896	0.370	Not Supported
Digital platforms Moderating Business Network -> Value Co-creation	-0,021	0.718	0.473	Not Supported
Open Innovation -> Competitive Advantage	0,377	3.093	0.002	Supported
Digital platforms Moderating Open Innovation -> Competitive Advantage	-0,033	0.458	0.647	Not Supported
Value Co-creation -> Competitive Advantage	0,589	7.736	0.000	Supported
Digital platforms Moderating Value Co-creation -> Competitive Advantage	0,011	0.168	0.867	Not Supported

Table 9 allows us to analyze the moderation test findings. With T-values of 0.282 and P-values of 0.778, the correlation between "Competitive Advantage" and "Business Network" is -0.051. This demonstrates that the link is not significant, indicating that in this scenario, business networks have no discernible impact on competitive advantage. With a path-c (path coefficient) of 0.054, T-values of 0.559, and P-values of 0.576, the moderation by "Digital platforms" on this connection is likewise not significant, suggesting that digital platforms do not increase the impact of business networks on competitive advantage. Conversely, the relationship between "Open Innovation" and "Business Network" has a positive path-c of 0.604, T-values of 9.707, and P-values of 0.000. This demonstrates how important this link is and how corporate networks strongly support open innovation. With a path-c of -0.013, T-values of 0.419, and P-values of 0.675, the moderation by "Digital platforms" on this connection is not significant, suggesting that digital platforms do not increase the impact of business networks on open innovation.

With a negative path-c of -0.126, T-values of 0.896, and P-values of 0.370, the association between "Value Co-creation" and "Business Network" is not significant. With a path-c of -0.021, T-values of 0.718, and P-values of 0.473, the moderation by "Digital platforms" on this connection is likewise not significant, suggesting that digital platforms do not increase the impact of business networks on value co-creation.

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The relationship between "Open Innovation" and "Competitive Advantage" has a path-c of 0.377 with T-values of 3.093 and P-values of 0.002, indicating that this relationship is significant. Competitive advantage is greatly enhanced by open innovation. With a path-c of -0.033, T-values of 0.458, and P-values of 0.647, the moderation by "Digital platforms" on this connection is not significant, suggesting that digital platforms do not increase the impact of open innovation on competitive advantage. Lastly, the correlation between "Competitive Advantage" and "Value Co-creation" is quite strong, as evidenced by the path-c of 0.589, T-values of 7.736 and P-values of 0.000. Competitive advantage is significantly enhanced by value co-creation. This relationship's moderation by "Digital platforms" is not significant, as evidenced by the path-c of 0.011, T-values of 0.168, and P-values of 0.867, indicating that Digital platforms do not strengthen the influence of shared value creation on competitive advantage. Table 10 presents Hypothesis Testing

DISCUSSION

Business networks, open innovation, value sharing, and competitive advantage are all examined in this study, along with the moderating effect of digital platforms. Value sharing and competitive advantage are significantly impacted by open innovation, which is significantly impacted by business networks, according to the analysis's findings. Competitive advantage is also significantly impacted by value sharing, highlighting the significance of teamwork in attaining such benefits. However, value sharing and competitive advantage are not significantly impacted by business networks directly, suggesting that open innovation serves as the primary mediating factor for the impact of business networks. The moderating role of digital platforms in these relationships is mostly insignificant, although digital platforms have a positive effect on open innovation. The results of this study are in line with the findings of several previous studies that highlight the importance of open innovation and business networks in improving MSME performance. For instance, research by Carrasco-Carvajal et al. (2023) demonstrates that open innovation is crucial for boosting MSMEs' competitiveness and growth. In a similar vein, Lee et al. (2010) discovered that robust business networks can enhance MSMEs' capacity for innovation and market adaptation. In contrast to the findings of Reim et al. (2023), which demonstrated that digitalization may enhance cooperation and innovation in MSMEs, our study likewise indicated that the moderating influence of digital platforms was mostly minor. This difference may be due to different research contexts or other unidentified moderating variables.

This study provides an important theoretical contribution by integrating the concepts of business networks, open innovation, value co-creation, and competitive advantage in one analytical model. The discovery that the association among business networks and competitive advantage is mediated by open innovation implies that MSMEs should concentrate on enhancing their innovation skills in order to gain a competitive edge. The results of Saha et al. (2022) on the significance of value co-creation in a corporate setting are also supported by this study, which emphasizes the role of cooperation and value co-creation in attaining competitive advantage.

Practically, the findings of this study provide insights for business actors and policy makers on the importance of business networks and open innovation in improving MSME performance. Business actors should focus on developing strong business networks and utilizing digital technology to support innovation and collaboration processes. In addition, policymakers can support MSMEs by providing adequate digital infrastructure and encouraging programs that facilitate collaboration and innovation between MSMEs. For example, the partnership program outlined by Aulia et al. (2024) can be a reference for developing similar initiatives that support MSME growth. It is important to take into account the many limitations of this study. First, the findings of this study might not apply to all MSMEs since the study sample might not be representative of the total MSME community. Second, the study's cross-sectional methodology makes it impossible to record the temporal dynamics and shifts in the correlation between variables over time. These limitations indicate the importance of conducting further research with a longitudinal approach and larger and more diverse samples. In addition, other moderating variables and more comprehensive measurement methods for Digital platforms need to be further explored to understand the factors that influence competitive advantage in a business context.

CONCLUSIONS

This study's research and hypothesis testing revealed a number of important conclusions that are important for comprehending the connection between open innovation, business networks, shared value creation, and

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competitive advantage, as well as the moderating function of digital platforms. First, our research demonstrates that corporate networks significantly boost open innovation, which in turn significantly boosts competitive advantage and shared value generation. This demonstrates how crucial corporate networks are for promoting open innovation, which in turn boosts competitive advantage and creates shared value. Additionally, this study discovered that competitive advantage is significantly impacted by shared value generation, indicating that collaboration and contribution from various parties in creating shared value are important factors in achieving competitive advantage. The influence of business networks is mostly mediated through open innovation, as evidenced by the fact that they have little discernible direct impact on competitive advantage or shared value generation. Digital platforms play a negligible moderating influence in these connections, indicating that Digital platforms do not substantially strengthen the influence of business networks, open innovation, or shared value creation on competitive advantage. Nevertheless, Digital platforms still have a significant positive effect on open innovation, indicating that the use of digital technology can encourage innovative activities in business networks. The study's overall conclusions emphasize the significance of value co-creation and open innovation in boosting competitive advantage, and they also highlight the critical role that business networks play in promoting open innovation. However, Digital platforms as a moderator did not show a significant effect in strengthening these relationships. These findings offer insightful information for creating business and innovation plans, as well as practical implications for the management of business networks and the use of Digital platforms in enhancing competitiveness.

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Attachment

Table 2. Outer Loading

	Business network	Paltform Digital Moderating Value Co Creation Competitice Advantage	Digital platforms Moderating Business Network to Competitive Advantage	Digital platforms Moderating Open Innovation to Competitive Advantage	Digital platforms Moderating Business Network to Value Co-Creation	Digital platforms Moderating Open Innovation to Co Creation	Digital platforms	competitive advantage.	open innovation	value co-creation
Business network Digital platforms			1,020							
Business network Digital platforms					1,020					
Centrality	0,414									
Cohesion	0,553									
Complexity_of_relationship									0,779	
Create_different_value									0,343	
Differentiated_products								0,545		
Dynamic_interactions									0,596	

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Equity									0,544
Exchange_of_information								0,549	
Experience									0,448
Frequency_of_interaction	0,779								
Harmonized_cooperation								0,525	
Heterogenity	0,877								
Information							0,485		
Interaction									0,620
Knowladge									0,624
Network_size	0,255								
Personalization									0,759
Relationship									0,554
Service							-0,006		

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							0,864			
System							0,864			
Thinking_without_limits									0,537	
collaboration_with_partners								0,787		
customers_as_assets								0,534		
focus_on_high_value_customers								0,574		
information_transparency								0,054		
market_responsiveness								0,081		
market_sensing								0,271		
open innovation Digital platforms			0,990							
open innovation Digital					0,990					

Research Article

platfo rms									687
supply _chai n_lea dershi p								-0,0 68	
value co-creati on Digita l platfo rms	0,933								