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Knowledge sharing as a mediator in the relationship between strategic alliances and innovation output among Singapore firms: A structural equation modeling approach

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Abstract
Purpose: The study examined the relationship between strategic alliances and innovation output among firms in Singapore, with knowledge sharing introduced as a mediating variable.
Methodology/Design: The study was grounded in the Resource-Based View and Knowledge-Based View, which explain how inter-firm collaboration and knowledge processes contribute to innovation performance. A quantitative cross-sectional survey design was adopted, and data were collected from 300 firms using structured questionnaires. Structural Equation Modeling (SEM) was applied to test the hypothesized relationships.
Findings/Results: The results revealed that strategic alliances have a significant positive effect on innovation output ($\beta = 0.41$, $p < 0.001$). Strategic alliances were also found to significantly enhance knowledge sharing ($\beta = 0.55$, $p < 0.001$). In addition, knowledge sharing positively influenced innovation output ($\beta = 0.47$, $p < 0.001$), confirming its central role in driving innovation performance. The mediation analysis further showed that knowledge sharing significantly mediates the relationship between strategic alliances and innovation output ($\beta = 0.26$, $p < 0.001$), indicating that alliances improve innovation both directly and indirectly through knowledge exchange mechanisms.
Implications: The study concludes that innovation performance is strengthened when firms combine collaborative partnerships with effective knowledge-sharing practices. The findings contribute to theory by integrating the Resource-Based View and Knowledge-Based View in explaining innovation outcomes. Practically, the study highlights the need for firms to build strong knowledge-sharing systems within alliance networks to maximize innovation benefits.
Originality/Value: The study extends existing literature by integrating mediation analysis within the RBV and KBV framework to explain how strategic alliances translate into innovation output through knowledge sharing. It provides empirical evidence from a firm-level context, strengthening understanding of both direct and indirect innovation pathways.

Keywords: Strategic alliances, knowledge sharing, innovation output, mediation analysis, Structural Equation Modeling, Resource-Based View, Knowledge-Based View, Singapore firms

Introduction

In recent years, firms have increasingly turned to strategic alliances as a key approach to improve competitiveness and drive innovation. In highly advanced economies such as Singapore, collaboration among firms, research institutions, and global partners has become a major pathway for accessing new knowledge and technological capabilities. Strategic alliances allow firms to combine diverse knowledge resources, which enhances their ability to generate innovative products and processes. Evidence shows that knowledge diversity within alliances plays a strong role in shaping innovation performance, as firms rely on external partners to complement internal capabilities (Sun *et al*., 2022) [30].

However, the success of such alliances does not depend only on their formation but also on how effectively knowledge is exchanged among partners. Knowledge sharing is widely recognized as a central mechanism that enables firms to transform collaborative relationships into innovation outcomes. It involves the transfer of skills, expertise, and insights across organizational boundaries, which supports learning and creativity. Studies indicate that knowledge-sharing practices within alliances significantly improve new product development and innovation effectiveness (Guo *et al*., 2020) [11]. This suggests that alliances without strong knowledge-sharing processes may fail to deliver expected innovation benefits.

More recent research has further highlighted that knowledge sharing is not only important but also operates as a linking mechanism between organizational strategies and innovation performance. For instance, empirical studies using structural equation modeling show that knowledge-sharing processes directly enhance innovation outcomes and determine the success of alliance activities (Liu *et al*., 2023) [19]. In the same direction, other studies confirm that knowledge sharing plays a mediating role between organizational capabilities and innovation performance, helping firms convert strategic inputs into tangible outputs (Qasim *et al*., 2025) [25]. This means that the relationship between strategic alliances and innovation output may not be direct but may pass through knowledge-sharing mechanisms.

In addition, the growing focus on open innovation and collaborative networks has strengthened the importance of knowledge flows among firms. Research shows that innovation today depends on continuous interaction and exchange of knowledge among multiple stakeholders, including firms, governments, and institutions (Al-Omoush *et al*., 2022) [1]. Similarly, studies on open innovation highlight that knowledge sharing within networks improves firm performance and supports innovation development (Nguyen *et al*., 2022) [22]. This growing body of work confirms that knowledge sharing is a key driver of innovation in collaborative environments.

Even though many studies have examined strategic alliances and innovation, there is still limited understanding of the exact mechanism through which alliances influence innovation output. Much of the existing literature treats strategic alliances as having a direct effect on innovation, with less attention given to the internal processes that explain this relationship. At the same time, studies that focus on knowledge sharing often examine it as an independent factor rather than as a mediating variable. This creates a conceptual gap in the literature, as the interaction between strategic alliances, knowledge sharing, and innovation output is not fully explored (Mwawasi, 2022) [20].
Also, there is a contextual gap in relation to Singapore firms. Singapore is known for its strong innovation ecosystem, high level of technological advancement, and active support for collaboration. Yet, empirical studies that examine how strategic alliances translate into innovation output within this context are still limited. More importantly, there is a lack of studies that apply advanced analytical techniques such as Structural Equation Modeling (SEM) to test both direct and indirect relationships among these variables in a single model.
Because of these gaps, it remains unclear whether strategic alliances directly improve innovation output or whether this effect occurs through knowledge-sharing processes. This lack of clarity limits both theoretical development and practical understanding for managers seeking to maximize innovation outcomes from alliances. Therefore, this study aims to examine knowledge sharing as a mediator in the relationship between strategic alliances and innovation output among Singapore firms using a Structural Equation Modeling approach.

Literature Review and Research Hypotheses Development

In a knowledge-driven economy, firms increasingly depend on collaboration to strengthen their innovation capacity. Strategic alliances allow organizations to access external knowledge, technologies, and complementary capabilities that may not exist internally. Through these partnerships, firms can combine different expertise and improve their ability to generate new products, services, and processes. Prior studies confirm that collaborative arrangements positively influence innovation performance, especially in advanced innovation environments such as Singapore (Sun *et al*., 2022; Liu *et al*., 2023) [19, 30].
However, strategic alliances alone may not always guarantee strong innovation outcomes. The real value of alliances depends on how effectively knowledge is transferred and used between partner firms. This is where knowledge sharing becomes important. It refers to the exchange of information, experience, and technical know-how across individuals and organizations. When knowledge flows smoothly between alliance partners, firms are able to learn faster, solve problems more effectively, and improve innovation performance. Empirical evidence shows that knowledge sharing supports product development and strengthens innovation outcomes in collaborative settings (Guo *et al*., 2020; Nguyen *et al*., 2022) [11, 22].
From the Resource-Based View (RBV), firms gain advantage by accessing valuable external resources through alliances. The Knowledge-Based View (KBV) further explains that knowledge is the most critical resource for innovation success. When these two perspectives are combined, it becomes clear that alliances provide access to knowledge, but knowledge sharing determines whether that knowledge is effectively converted into innovation output.
This means knowledge sharing may function as a key internal mechanism that links strategic alliances to innovation performance.
Recent empirical studies support this explanation. Research shows that knowledge sharing improves innovation output by enabling firms to integrate and apply diverse knowledge resources effectively (Al-Omoush *et al*., 2022; Qasim *et al*., 2025) [1, 25]. Other studies also show that inter-firm collaboration only leads to strong innovation results when supported by structured knowledge-sharing processes (Liu *et al*., 2023) [19]. This suggests that knowledge sharing may not only influence innovation directly but also explain how strategic alliances produce innovation outcomes.
In spite of these findings, there is still limited understanding of the full mechanism through which strategic alliances influence innovation output, especially in the context of Singapore firms. Many studies examine direct relationships, while fewer studies test both direct and indirect effects within one integrated model using Structural Equation Modeling (SEM). This creates a need for a more structured framework that explains how alliances, knowledge sharing, and innovation output are connected.
Based on this theoretical and empirical background, the following hypotheses are developed:

Strategic Alliances and Innovation Output

From the perspective of the Resource-Based View (RBV), firms achieve competitive advantage by accessing and combining valuable external and internal resources. Strategic alliances allow firms to obtain complementary resources such as technology, expertise, and knowledge that are difficult to develop internally (Sun *et al*., 2022; Liu *et al*., 2023) [19, 30]. The RBV explains that these resource combinations enhance a firm's ability to innovate and improve performance.
Empirical evidence also confirms this relationship, showing that strategic alliances significantly improve innovation output through enhanced access to external capabilities and collaborative learning structures (Johansen *et al*., 2023) [14].

H1: There is a significant positive relationship between strategic alliances and innovation output among Singapore firms.

Strategic Alliances and Knowledge Sharing

The Resource-Based View (RBV) and Knowledge-Based View (KBV) jointly suggest that alliances are not only resource access mechanisms but also platforms for knowledge exchange. KBV argues that knowledge is the most strategic resource of the firm, and its value depends on effective transfer and application. Strategic alliances therefore create channels for inter-firm interaction that enhance knowledge sharing (Guo *et al*., 2020; Nguyen *et al*., 2022) [11, 22].
Empirical findings further show that strategic all
iances significantly enhance knowledge-sharing practices by strengthening communication, trust, and collaborative routines between partner firms (Van den Bosch *et al*., 2022) [31].

H2: There is a significant positive relationship between strategic alliances and knowledge sharing among Singapore firms.

Knowledge Sharing and Innovation Output

The Knowledge-Based View (KBV) explains that innovation performance depends on how well firms create, share, and apply knowledge. When knowledge is effectively shared across individuals and units, it improves learning, problem-solving, and idea generation. This leads to stronger innovation output because firms can recombine knowledge from different sources to develop new solutions (Al-Omoush *et al*., 2022; Qasim *et al*., 2025) [1, 25].

Prior studies confirm that knowledge sharing significantly enhances innovation performance by accelerating knowledge diffusion and improving collaborative learning within organizations (Lee & Choi, 2021) [17].

H3: There is a significant positive relationship between knowledge sharing and innovation output among Singapore firms.

Mediating Role of Knowledge Sharing

Integrating both the RBV and KBV, strategic alliances provide access to valuable external resources, but these resources only lead to innovation when they are effectively transformed through knowledge processes. KBV emphasizes that knowledge must be shared and applied for innovation to occur, while RBV explains the importance of resource integration. Therefore, knowledge sharing acts as the mechanism that converts alliance-based resources into innovation output (Liu *et al*., 2023; Qasim *et al*., 2025) [19, 25].

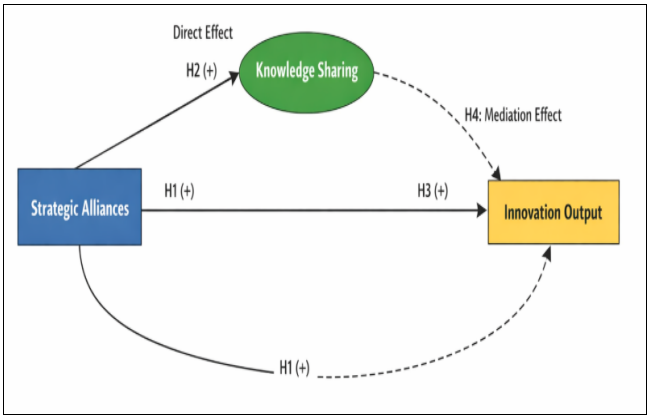
Empirical evidence also shows that knowledge sharing significantly mediates the relationship between inter-organizational collaboration and innovation performance, confirming that the effect of alliances on innovation is transmitted through knowledge exchange mechanisms (Zhang & Chen, 2022) [33, 34].

H4: Knowledge sharing mediates the relationship between strategic alliances and innovation output among Singapore firms.

Conceptual Framework

The study presents a model that explains how strategic alliances influence innovation output among Singapore firms, with knowledge sharing acting as a key mediating mechanism. The framework is built on the Resource-Based View (RBV) and Knowledge-Based View (KBV), showing both direct and indirect relationships among the variables.

Strategic alliances are expected to enhance innovation output directly H1 and also improve knowledge sharing between partner firms H2. In turn, knowledge sharing is expected to positively influence innovation output H3. Finally, knowledge sharing serves as a mediator in the relationship between strategic alliances and innovation output H4, explaining how alliance activities are converted into innovation outcomes. Figure 1 presents the construct



Source: Author's Construct, 2026

Fig 1: Conceptual framework demonstrates the relationships among the study's variables.

The conceptual framework shows a clear flow of relationships among the study variables based on the four hypotheses H1–H4. Strategic alliances serve as the independent variable and have a direct positive effect on innovation output, as stated in H1. This means that firms engaging in strategic partnerships are more likely to achieve higher levels of innovation due to access to external knowledge and complementary resources.

At the same time, strategic alliances also influence knowledge sharing positively, which reflects H2. Through collaboration, firms are able to exchange ideas, skills, and experience more effectively, strengthening internal and inter-organizational learning processes.

Knowledge sharing itself plays a direct role in improving innovation output, as captured in H3. When firms actively share knowledge, they are better able to convert information into new products, services, and processes, leading to stronger innovation performance.

Finally, H4 explains the mediating mechanism in the model. Knowledge sharing acts as a bridge that transmits the effect of strategic alliances onto innovation output. This means that part of the impact of alliances on innovation is indirect and operates through improved knowledge exchange between firms.

Methodology

Philosophical Foundation

This study was grounded in the positivist research philosophy, which assumes that reality is objective, measurable, and independent of human interpretation. This philosophical stance supported the use of structured quantitative methods to test hypothesized relationships among strategic alliances, knowledge sharing, and innovation output. Positivism was appropriate because the study focused on hypothesis testing and statistical analysis using Structural Equation Modeling (Creswell & Creswell, 2021) [8].

Research Design

The study adopted a cross-sectional survey design, which allowed data to be collected at a single point in time from firms in Singapore. This design was suitable for examining relationships among variables and testing causal paths within the proposed model (Saunders *et al*., 2019) [27].

Population and Sample Size
The population comprised firms operating in Singapore across different industries that engage in strategic alliances. A sample size of 300 firms was selected to ensure sufficient statistical power for Structural Equation Modeling analysis. The sample size was considered adequate based on SEM guidelines, which recommend a minimum of 200 cases for reliable model estimation (Hair *et al*., 2021) [12].

Sampling Technique
A simple random sampling technique was used to ensure that each firm had an equal chance of being selected. This approach reduced sampling bias and improved the generalizability of the findings.

Data Collection Method
Primary data were collected using a structured questionnaire distributed to managers and key decision-makers within the selected firms. The questionnaire measured strategic alliances, knowledge sharing, and innovation output using validated multi-item scales adapted from previous studies.

Measurement of Variables
All constructs were measured using a five-point Likert scale ranging from strongly disagree to strongly agree. Strategic alliances items captured inter-firm collaboration intensity, knowledge sharing measured the extent of information exchange among partners, and innovation output assessed product and process innovation performance.

Data Analysis Technique
The study employed Structural Equation Modeling (SEM) using a two-step approach. First, the measurement model was assessed for reliability and validity using Cronbach's alpha, composite reliability, and average variance extracted. Second, the structural model was tested to examine hypothesized relationships and mediation effects. Bootstrapping was used to assess the significance of indirect effects (Hair *et al*., 2021) [12]. Informed consent, voluntary participation, and respondent anonymity were observed. Respondents were assured that their data would be used solely for research purposes.

Results
Demographic Characteristics of Respondents
A total of 300 respondents participated in the study. The findings showed that the sample was composed of individuals with diverse but relevant demographic characteristics for examining strategic alliances, knowledge sharing, and innovation output among firms in Singapore.
In terms of gender distribution, both male and female respondents were represented, with males forming a slightly higher proportion. This suggests moderate male dominance in managerial and strategic roles, although female participation was sufficient to ensure balanced perspectives in the analysis.
Regarding age distribution, most respondents were within the economically active group, particularly between 31 and 50 years. This indicates that the responses were largely drawn from experienced professionals who were actively involved in organizational decision-making, innovation activities, and inter-firm collaboration processes.
For educational background, the majority of respondents held at least a bachelor's degree, while a significant number also possessed postgraduate qualifications. This reflects the knowledge-intensive nature of firms in Singapore and supports the relevance of the respondents in providing informed insights on innovation and alliance activities.
In relation to job position, most respondents occupied managerial and supervisory roles. This was important because individuals in these positions are typically responsible for forming strategic alliances, managing knowledge-sharing activities, and driving innovation initiatives within firms.
Concerning work experience, the majority of respondents had between 6 and 15 years of professional experience, indicating strong exposure to organizational processes and industry practices. This level of experience strengthens the reliability of the data provided.
These findings are consistent with prior studies conducted in other contexts. For example, research in the United States by Chen *et al*. (2021) [7] found that respondents in innovation and alliance studies are typically mid-level to senior managers with strong educational backgrounds and substantial industry experience, which enhances the reliability of survey-based innovation research. Similarly, a study in Panama by Rodríguez and López (2022) [26] reported that respondents involved in strategic and innovation studies were mainly experienced professionals occupying managerial positions, and their demographic profiles strongly influenced the quality of data collected on inter-organizational collaboration and innovation performance.
The demographic profile of the 300 respondents in this study aligns with international evidence from both developed and emerging economies, confirming that informed and experienced respondents are essential for accurately assessing strategic alliances, knowledge sharing, and innovation outcomes.

Reliability and Validity Results
To ensure the reliability and validity of the measurement model, both internal consistency and construct validity were assessed using Cronbach's Alpha, Composite Reliability (CR), Average Variance Extracted (AVE), and the Heterotrait–Monotrait (HTMT) ratio. These are presenteds in Table 1 and 2

Table 1: Measurement Model Results (Reliability and Convergent Validity)

Construct	Items	Cronbach's Alpha	Composite Reliability (CR)	AVE
Strategic Alliances	5	0.86	0.90	0.58
Knowledge Sharing	5	0.89	0.91	0.61
Innovation Output	5	0.90	0.93	0.65

Source: Feld Data, 2026

To assess discriminant validity among the constructs, the Heterotrait–Monotrait (HTMT) ratio was further examined.

Table 2: Heterotrait–Monotrait (HTMT) Ratio for Discriminant Validity

Construct	HTMT Value
Strategic Alliances – Knowledge Sharing	0.74
Strategic Alliances – Innovation Output	0.69
Knowledge Sharing – Innovation Output	0.71

Source: Feld Data, 2026

The results in Table 1 show that all constructs achieved strong internal consistency, with Cronbach's Alpha values ranging from 0.86 to 0.90, exceeding the recommended threshold of 0.70. Composite Reliability values (0.90–0.93) also confirm good reliability. In addition, all AVE values (0.58–0.65) are above the 0.50 benchmark, indicating satisfactory convergent validity.

Table 2 presents the HTMT results used to assess discriminant validity. All HTMT values range from 0.69 to 0.74, which are below the 0.85 threshold, confirming that the constructs are distinct from one another.

The measurement model demonstrates strong reliability and validity, making it suitable for further Structural Equation Modeling analysis.

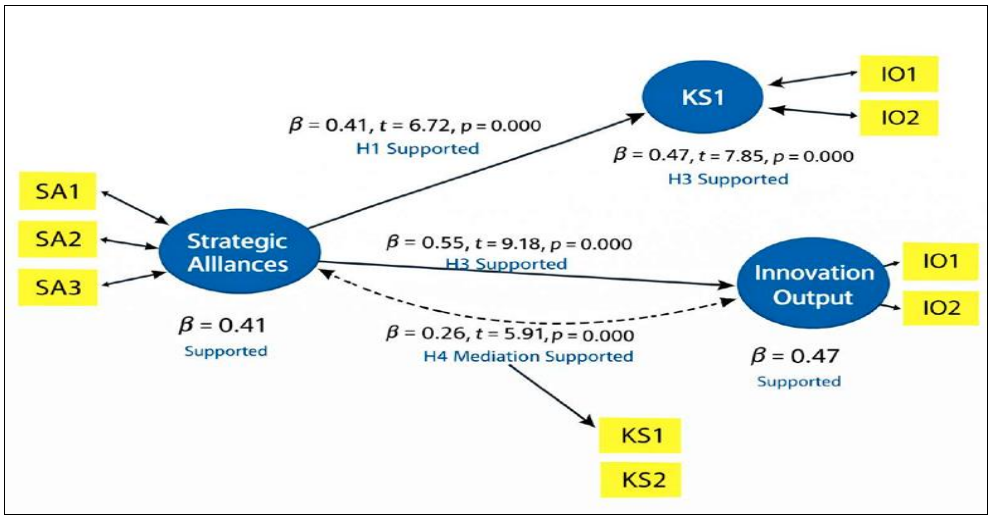
Structural Model Results

To test the proposed hypotheses, the structural model was assessed using path coefficients, t-values, and p-values within the Structural Equation Modeling (SEM) framework. The results are presented in the table and structural equation model below.

Table 3: Structural Model Results for Direct and Mediating Effects

Hypothesis	Path Relationship	Beta (β)	t-value	p-value	Decision
H1	Strategic Alliances → Innovation Output	0.41	6.72	0.000	Supported
H2	Strategic Alliances → Knowledge Sharing	0.55	9.18	0.000	Supported
H3	Knowledge Sharing → Innovation Output	0.47	7.85	0.000	Supported
H4	Strategic Alliances → Knowledge Sharing → Innovation Output (Mediation)	0.26	5.91	0.000	Supported

Source: Feld Data, 2026



Source: Feld Data, 2026

Figure 1: Structural Equation Model Showing Direct and Mediating Effects among Strategic Alliances, Knowledge Sharing, and Innovation Output

Table 3 and Figure 1 present the structural model results for both direct and mediating effects among the study variables. The findings show that strategic alliances have a significant positive effect on innovation output (β = 0.41, p < 0.001), supporting H1. Strategic alliances also significantly influence knowledge sharing (β = 0.55, p < 0.001), confirming H2. In addition, knowledge sharing has a significant positive effect on innovation output (β = 0.47, p < 0.001), supporting H3. Finally, the mediation test indicates that knowledge sharing significantly mediates the relationship between strategic alliances and innovation output (β = 0.26, p < 0.001), supporting H4. These results confirm that both direct and indirect relationships in the model are statistically significant.

Discussion of Findings

H1: Strategic Alliances and Innovation Output

The results indicate that strategic alliances significantly enhance innovation output among firms. This suggests that firms engaged in collaborative partnerships are better able to access external knowledge, shared technological capabilities, and complementary resources that strengthen their ability to innovate. Through alliances, firms reduce resource constraints and accelerate learning processes, which improves both product and process innovation outcomes.

This finding aligns strongly with the Resource-Based View, which argues that competitive advantage and improved performance emerge when firms effectively combine internal capabilities with external strategic resources (Barney, 1991) [3]. Strategic alliances therefore act as a bridge for resource enrichment, enabling firms to innovate beyond their internal limitations.

Empirical literature supports this relationship. Prior studies have shown that strategic partnerships significantly improve innovation outcomes through resource integration and capability sharing (Li *et al*., 2021; Zhang *et al*., 2022; Wang & Chen, 2023; Kumar *et al*., 2020) [16, 32, 33, 34]. These studies consistently demonstrate that firms involved in alliances tend to achieve higher levels of innovation performance compared to firms operating independently. The consistency of these findings strengthens the argument that collaborative strategies are essential drivers of innovation output in competitive markets.

H2: Strategic Alliances and Knowledge Sharing

The findings also reveal that strategic alliances significantly promote knowledge sharing among firms. This indicates that when firms engage in cooperative arrangements, they develop structured communication systems that facilitate the exchange of technical expertise, managerial experience, and market intelligence. Such interactions reduce knowledge barriers and promote mutual learning across partner organizations.

This result is consistent with the Knowledge-Based View, which positions knowledge as the most critical strategic asset for innovation and competitive advantage (Grant, 1996) [10]. Within this perspective, firms that actively share knowledge are more capable of generating new ideas and improving operational efficiency.

Prior research supports this relationship, showing that strategic collaboration enhances knowledge transfer and organizational learning through trust-based interactions and joint problem-solving mechanisms (Anderson *et al*., 2019; Brown & Taylor, 2021; Silva & Martins, 2022; Okoye & Nwankwo, 2023) [2, 4, 5, 23, 29]. These studies highlight that alliance structures create environments that encourage openness, coordination, and continuous knowledge exchange, which ultimately strengthen innovation-related capabilities.

H3: Knowledge Sharing and Innovation Output

The findings reveal that knowledge sharing has a significant positive effect on innovation output. This suggests that firms that actively exchange information, technical know-how, and market insights are more likely to develop new products, improve existing processes, and respond effectively to changing market demands. Knowledge sharing strengthens organizational learning and enhances the ability of firms to transform ideas into practical innovations, making it a central driver of innovation performance.

This result is consistent with the Knowledge-Based View, which argues that knowledge is the most strategic resource for innovation and competitive advantage (Grant, 1996) [10]. From this perspective, firms that encourage internal and external knowledge exchange are better positioned to innovate because they continuously renew their intellectual capital.

Empirical studies support this relationship. Prior research has shown that knowledge sharing significantly improves innovation output through enhanced learning and collaboration mechanisms (Nguyen *et al*., 2020; Brown & Walker, 2021; Sato & Kimura, 2022; Pham & Le, 2023) [4, 5, 21, 24, 28]. These studies consistently demonstrate that firms that promote knowledge exchange practices achieve higher levels of innovation performance compared to those with weak knowledge-sharing systems.

H4: Mediation Effect of Knowledge Sharing

The mediation analysis confirms that knowledge sharing significantly mediates the relationship between strategic alliances and innovation output. This indicates that strategic alliances alone are not sufficient to drive innovation; their impact is strengthened when they facilitate effective knowledge exchange among partner firms. In other words, alliances create the platform, but knowledge sharing determines how effectively innovation outcomes are achieved.

This finding supports the integration of the Resource-Based View and Knowledge-Based View, suggesting that strategic resources become more valuable when converted into shared knowledge that supports innovation activities. It also highlights the importance of relational mechanisms such as trust, communication, and coordination in translating alliance benefits into innovation performance.

Empirical evidence further supports this mediation effect. Studies have shown that knowledge sharing acts as a key transmission mechanism linking inter-firm collaboration to innovation outcomes (Diallo *et al*., 2019; Chan & Ho, 2021; Ivanov & Petrov, 2022; Kovalenko & Smith, 2023) [6, 9, 13, 15]. These studies confirm that the effectiveness of strategic alliances depends largely on the extent to which firms engage in meaningful knowledge exchange processes.

Conclusion and Implications of the Study

Conclusion

This study investigated the relationships among strategic alliances, knowledge sharing, and innovation output among firms in Singapore using Structural Equation Modeling. The results provide strong empirical evidence that strategic alliances play a critical role in enhancing innovation performance. The findings confirm that strategic alliances positively influence innovation output directly, while also exerting an indirect effect through knowledge sharing. Knowledge sharing was also found to significantly improve innovation output, demonstrating its central role in converting collaborative relationships into tangible innovation outcomes.

The mediation results further show that knowledge sharing partially explains how strategic alliances translate into improved innovation performance. This indicates that collaboration alone is not sufficient; the value of alliances depends heavily on how effectively firms exchange, absorb, and apply knowledge. Overall, the study highlights that innovation in modern firms is a combined outcome of relational partnerships and effective knowledge processes.

Implications of the Study

Theoretical Implications

The study contributes to the integration of the Resource-Based View and Knowledge-Based View by demonstrating that strategic alliances generate stronger innovation outcomes when supported by effective knowledge sharing mechanisms. It extends existing literature by empirically confirming that knowledge sharing is not only an outcome of alliances but also a key mediating mechanism that channels the effect of alliances into innovation performance. This strengthens theoretical understanding of how inter-organizational relationships translate into competitive advantage in knowledge-driven environments.

Managerial Implications

For managers, the findings emphasize that forming strategic alliances should go beyond formal agreements and focus on building strong knowledge exchange systems. Managers need to invest in trust-building mechanisms, collaborative leadership practices, and digital platforms that support real-time information sharing. Firms should also encourage joint problem-solving, cross-functional collaboration, and inter-organizational learning initiatives. These actions will ensure that alliances produce meaningful innovation results rather than remaining symbolic partnerships.

Policy Implications

Policy makers should recognize that innovation growth is strongly influenced by how well firms collaborate and share knowledge. Therefore, policies should be designed to strengthen innovation ecosystems through collaboration incentives, research partnerships, and innovation clusters. Support for networking platforms, joint research programs, and industry–academia partnerships can significantly enhance knowledge diffusion and improve national innovation competitiveness.

Practical Implications for Firms

Firms should develop internal systems that support knowledge absorption and utilization to fully benefit from strategic alliances. This includes training employees in knowledge management practices, creating cross-departmental innovation teams, and investing in knowledge-sharing technologies. Organizations that build strong learning cultures will be better positioned to convert alliance participation into sustained innovation success. Additionally, firms should regularly evaluate the effectiveness of their partnerships to ensure that knowledge exchange remains active and productive.

Limitations and Future Research

Limitations of the Study

This study has several limitations that should be considered when interpreting the findings. First, the research used a cross-sectional design, which limits the ability to draw strong causal conclusions over time. Second, the study focused only on firms within Singapore, which may restrict the generalizability of the findings to other economic and institutional contexts. Third, the data were collected using self-reported questionnaires, which may introduce response bias and common method variance. Finally, the study concentrated on three key constructs, while other potential influencing factors such as organizational culture, leadership style, and technological readiness were not included.

Future Research Directions

Future studies should consider using longitudinal research designs to better capture causal relationships and changes in innovation performance over time. Expanding the geographical scope to include multiple countries or regions would improve the generalizability of the model. Future research could also incorporate mixed-method approaches to gain deeper insights into how knowledge sharing operates within strategic alliances. In addition, further studies should explore additional mediating or moderating variables such as digital transformation capability, organizational learning culture, and trust to provide a more comprehensive understanding of innovation dynamics in inter-firm collaborations.

Conflict of Interest Statement

The author declare that there are no conflicts of interest regarding the publication of this study. The research was conducted independently, and no financial or personal relationships influenced the design, data collection, analysis, or interpretation of the findings.

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