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# Unraveling the Dynamics of Network Embeddedness and Innovation Performance: Insights from China's International Freight Forwarding Industry

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## Abstract

*This study investigates the intricate relationships between network embeddedness, business model innovation, and innovation performance within China's international freight forwarding industry. Utilizing structural equation modeling on data collected from leading freight forwarding companies, the research explores how structural and relational embeddedness in networks influence the innovation of business models and, consequently, the overall innovation performance of these enterprises. The study demonstrates that both structural and relational embeddedness are significant catalysts for business model innovation. A key finding is the direct positive impact of network embeddedness on innovation performance, underlining the critical role of a firm's network position and its relationships within the industry. Furthermore, business model innovation emerges as a vital mediator, translating the advantages of network embeddedness into enhanced innovation performance. The research also identifies dynamic capabilities as a crucial moderating factor, amplifying the benefits accrued from network embeddedness and innovative business models. The findings provide robust empirical evidence supporting the interconnectedness of network embeddedness, business model innovation, and innovation performance, offering valuable insights for strategizing in the dynamic field of international freight forwarding. This study contributes to the broader discourse on strategic management, innovation, and network theory, highlighting the practical implications for fostering competitiveness and growth in a rapidly evolving industry.*

**Keywords:** Network Embeddedness, Business Model Innovation, Innovation Performance, Freight Forwarding Industry, Dynamic Capabilities, Structural Equation Modeling, Strategic Management

## Introduction

The concept of dynamic capabilities, as expounded by Teece, Pisano, and Shuen (1997, 2009) and Eisenhardt and Martin (2000), plays a crucial role in understanding how enterprises adapt and thrive in rapidly changing environments. This theoretical lens is particularly apt for analyzing Chinese international freight forwarding companies as they navigate the complexities of globalization, technological advancements, and fluctuating market conditions. Augier and Teece (2009) further explore the role of managers in leveraging these dynamic capabilities, a consideration crucial for strategic decision-making in the freight forwarding sector.

Chesbrough's seminal work (2003, 2006, 2010) on open innovation provides a framework for understanding how businesses, including those in the freight forwarding industry, can benefit from external ideas and markets. Wang, Phillips, and Yang (2021) extend this discussion by

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examining the bridging of innovation and commercialization, an essential aspect for Chinese freight forwarders looking to innovate and create value in a highly competitive market.

Chen et al. (2022) and Gulati, Nohria, and Zaheer (2000) contribute to the discourse on governance and strategic networks. For the Chinese international freight forwarding sector, understanding how digital platforms are governed and designed is critical, as these platforms facilitate the essential networks and relationships integral to the industry (Taghipour et al., 2022). Parker, Van Alstyne, and Choudary (2016) delve into the transformative power of networked markets through platforms, an understanding crucial for comprehending the market dynamics in freight forwarding.

The practical implications of these theories are immense. For instance, Casadesus-Masanell and Ricart (2011) offer insights on designing winning business models, while Markides (2021) discusses the necessity of better theories for disruptive innovation, both of which are highly relevant for an industry at the crossroads of traditional operations and digital transformation. Baden-Fuller and Haefliger (2013) discuss the interplay between business models and technological innovation, a key consideration for an industry increasingly reliant on technological solutions.

From a methodological standpoint, Cohen's (1988) work on statistical power analysis and Mitchell, Morse, and Smith's (2004) exploration of entrepreneurial cognition research provide the empirical and analytical tools necessary for a robust investigation. These methodologies are crucial for dissecting the complex relationships between network embeddedness, business model innovation, and innovation performance.

## Literature

### Relationship Between Network Embeddedness and Business Model Innovation

Several studies substantiate the critical link between network embeddedness and business model innovation. For instance, the research by Haaker, Ly, Nguyen-Thanh, and Nguyen (2021) indicates how embedded networks, especially in the digital realm, catalyze innovative business models. Parker, Van Alstyne, and Choudary (2016) extend this notion by illustrating the transformative power of networked markets on business models. Teece (2018) further emphasizes the role of network embeddedness in enabling firms to profit from innovation in the digital economy. Additionally, Eisenhardt and Martin (2000) and Teece, Pisano, and Shuen (1997) provide a nuanced understanding of how these embedded networks contribute to a firm's dynamic capabilities, which are critical for business model innovation. Lastly, the work of Zott and Amit (2010) offers an activity system perspective on business model design, highlighting the centrality of networks in shaping innovative business models.

Based on the insights drawn from these studies, the following hypothesis is proposed:

**Hypothesis 1 (H1):** *There exists a positive relationship between structural embeddedness and business model innovation, where greater structural integration within networks significantly enhances the development and implementation of innovative business models.*

**Hypothesis 2 (H2):** *Relationship embeddedness positively impacts business model innovation, indicating that stronger relational ties within a network foster the emergence and success of innovative business models.*

### The Influence of Network Embeddedness on Corporate Innovation Performance in the International Freight Forwarding Industry

The significance of network embeddedness in enhancing corporate innovation performance is well-documented. Studies by Li et al. (2020) and Czernek (2020) highlight the importance of

inter-organizational relationships and the exchange of resources and knowledge within these networks as pivotal to innovation performance. Cui Haiyun (2017) empirically tested the impact of network embeddedness on logistics enterprises' market performance, underscoring the role of structural and relational embeddedness in acquiring market knowledge.

Gao Zhijun (2019) explored the role of logistics enterprises as network coordinators within the global supply chain, emphasizing trust, interaction, and integration as critical factors for strategic development and innovation performance. Xiao Liang (2019) identified the significant impact of localized service capabilities and network embeddedness on cross-border B2C export companies' performance. Wu Yuning (2021) demonstrated the positive effect of network embeddedness on logistics performance, emphasizing the migration of knowledge within industrial clusters. Wang Jinfeng (2023) and Eaknarajindawat (2023) conducted a meta-analysis, further affirming the positive correlation between network embeddedness and innovation performance across multiple dimensions and contexts. Building upon these scholarly insights, the following hypotheses are proposed to explore the dynamics of network embeddedness and its impact on corporate innovation performance in the international freight forwarding industry:

**Hypothesis 3 (H3):** *Structural embeddedness within networks positively impacts the innovation performance of international freight forwarding companies, suggesting that structural ties enhance access to diverse resources and market knowledge.*

**Hypothesis 4 (H4):** *Relationship embeddedness in networks positively influences the innovation performance of international freight forwarding companies, indicating that strong relational ties facilitate knowledge exchange and collaborative innovation efforts.*

### **Exploring the Relationship between Business Model Innovation and Enterprise Innovation Performance in International Freight Forwarding**

The literature provides diverse perspectives on the types of innovation models prevalent in the freight forwarding industry. Yang (2009) categorizes five innovation models, while Chu et al. (2018) offer a "four pyramid" innovation model encompassing new service concepts, customer interfaces, service delivery systems, and technology applications. Ma (2020) adds to this by proposing models based on service professionalism, organizational strategy, network, and technological innovation.

While these frameworks provide a foundation, research on the performance evaluation of such business model innovations remains limited. Scholars like Zott and Amit (2007), Wu (2021), Clemons and Row (1992), Doz and Kosonen (2010), Constantinos and Markides (2013), Kim and Min (2015), Luo Min et al. (2005), and Teece (2010) delve into the impact of efficiency and novelty in business model innovations on enterprise innovation performance. Their work collectively suggests that both types of innovation positively influence performance, enhancing transaction efficiency, creating new value propositions, and leveraging novel transaction methods. Building on these insights, the study proposes hypotheses to investigate the influence of business model innovation on the innovation performance of international freight forwarding companies:

**Hypothesis 5 (H5):** *Business model innovation positively impacts corporate innovation performance within the international freight forwarding industry.*

**H5a:** *Efficiency-based business model innovation, which focuses on improving transaction efficiency, has a positive impact on corporate innovation performance.*

**H5b:** *Novel business model innovation, which emphasizes creating new value propositions and transaction methods, positively influences corporate innovation performance.*

## The Intermediary Role of Business Model Innovation in the Digital Economy Era

In the rapidly evolving digital economy, the role of business model innovation has become increasingly central to how enterprises adapt to and thrive in unpredictable environments. With traditional modes of technological and product innovation proving insufficient to meet the dynamically changing customer needs, business model innovation emerges as a vital conduit for leveraging innovative knowledge, responding to environmental shifts, and securing competitive advantages. Business model innovation is inherently linked to an enterprise's interactions within its social network. As Casadesus-Masanell and Ricart (2011), and Zott and Amit (2015) articulate, effective business model innovation requires a harmonious alignment with the external environment, emphasizing the integration of organizational activities with external networks for holistic development (Qiao Han et al., 2017).

Best (2022) and colleagues (2018) suggest that organizations increasingly embed themselves structurally within value networks, thereby necessitating business model innovation. This embeddedness leads to more porous organizational boundaries, enabling firms to exploit external knowledge capabilities and create, deliver, and capture value (Peppard & Ryand, 2006). The structural embedding of enterprises, therefore, drives them to innovate efficient business models, reducing transaction costs and enhancing performance. Hamel and Valikangas (2000) demonstrate that leveraging relationship embeddedness can lead to the innovation of novel and disruptive business models. In crisis-prone environments, the urgency to innovate becomes paramount. Enterprises often look towards creating new business models that can respond to environmental challenges by tapping into latent consumer needs and proposing unique value propositions (George & Bock, 2011).

The relationship between business model innovation and corporate innovation performance is increasingly gaining consensus among scholars. Osterwalder and Pigneur (2015) and Rosa et al. (2019) have explored the principles of how business model innovation facilitates value creation, delivery, and capture, suggesting significant positive effects on corporate innovation performance. Geissdoerfer (2020) notes that sustainable business model innovation can enhance financial, social, and environmental performance. Latifi (2021) confirms the positive correlation of business model innovation with manufacturing firms' performance across value creation, proposition, and acquisition.

Zhang (2023) empirically analyzed the role of business model innovation as a mediator between digital transformation and corporate innovation performance, establishing its significant positive relationship. The rapid advancement of "Internet+" technology, as explored by Tan Ping and Zhang Ming (2021), further emphasizes the importance of business model innovation in the digital transformation of logistics companies. Based on the above scholarly insights, this study proposes the following hypotheses:

**Hypothesis 6 (H6):** *Business model innovation mediates the relationship between structural embeddedness and corporate innovation performance, suggesting that the integration of resources and transaction structures through efficient business models can significantly enhance innovation performance.*

**Hypothesis 7 (H7):** *Business model innovation mediates the relationship between relationship embeddedness and corporate innovation performance, indicating that novel business models stemming from strong relational ties can effectively improve innovation outcomes.*

## Dynamic Capabilities Mediate the Relationship between Relationship Embeddedness and Corporate Innovation Performance

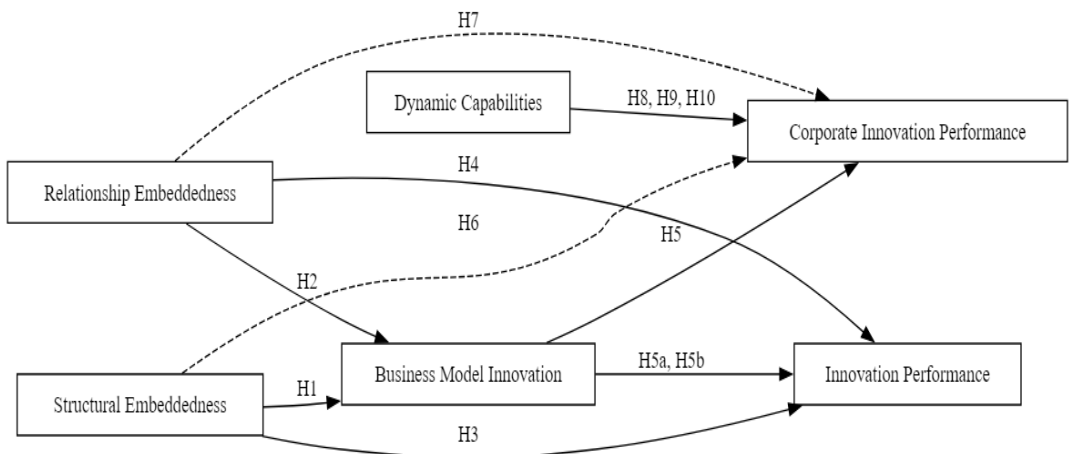
Dynamic capabilities are posited as a key driver for sustaining competitive advantages in rapidly changing environments. Teece (1997) argues that in dynamic markets, mere reliance on unique resources is insufficient; firms must also possess the ability to dynamically reconfigure resources. This view is supported by the work of Fladmoe and Talman (2002) and Salk and Lyles (1996), who emphasize the role of multinational corporations' dynamic capabilities in navigating local and overseas markets, thereby fostering innovation and sustainable competitive advantages.

Empirical studies have shed light on the multifaceted role of dynamic capabilities. Drnevic (2011) and Wu Rong and Xu Jian (2022) found that dynamic capabilities enhance the efficacy of network information resources in improving corporate innovation performance. Sun Shuyu (2021) revealed that knowledge base and relational learning capabilities can moderate the relationship between network embeddedness and corporate innovation performance. In the context of the international freight forwarding industry, researchers like Tian Xue et al. (2015) and Li Jing (2022) have explored the mediating role of dynamic capabilities. Their findings suggest that dynamic capabilities facilitate the positive impact of both structural and relational embeddedness on innovation performance. Shen Junqiang (2021) further supports this by demonstrating the partial mediating role of dynamic absorptive capacity in the relationship between network embeddedness and the growth performance of logistics enterprises. Building on these insights, the following hypotheses are proposed:

**H8:** *Dynamic capabilities mediate the relationship between relationship embeddedness and corporate innovation performance. This hypothesis is grounded in the understanding that dynamic capabilities enable firms to effectively utilize their network relationships to foster innovation.*

**H9:** *Dynamic capabilities mediate the relationship between structural embeddedness and corporate innovation performance. This suggests that the benefits accrued from a firm's structural position in a network are amplified through its dynamic capabilities.*

**H10:** *Dynamic capabilities mediate the relationship between business model innovation and corporate innovation performance. This posits that the ability to innovate in business models, a crucial factor for success in the freight forwarding industry, is significantly influenced by a firm's dynamic capabilities.*



**Figure 1.** Conceptual Model.

## Research Methods and Design

Chapter 3 of this study meticulously outlines the research methods and design, focusing on understanding the innovation performance of Chinese international freight forwarding enterprises. This chapter details the research objects, data collection process, data processing methods, questionnaire preparation, and measurement dimensions, ensuring a comprehensive and scientifically sound approach to the research.

**Table 1.** Research Objects.

Enterprise Name	Enterprise Type	Main Business	Business Location	Staff Number of People (People)	Turnover Billion Yuan	Sampling Proportion (2 %)
COSCO Freight Forwarding	state-owned enterprise	Ports, logistics, shipping	Beijing	3000	About 200.0 (National)	6.0
Guangxi Sinotrans	state-owned enterprise	Freight, freight forwarding, express delivery	Guangxi	3000	about 1,000 (National)	6.0
China Storage and Transportation	state-owned enterprise	Supply chain services, logistics	Beijing	6200	about 8.00	124
DHL China	foreign investment enterprise	Freight, freight forwarding, express delivery	Shanghai	3000	about 300	60
CIMC Shilianda	Private enterprise	Sea transportation, air transportation, freight forwarding	Tianjin	5000	about 3.00	100
Global Logistics	Private enterprise	Freight forwarding, freight	Shanghai	500	about 100	10
Huayun International	Private enterprise	Air freight, logistics, freight	Shenzhen	1000	about 80	20
CIMC Hyundai	Chinese and foreign joint venture	Logistics, freight forwarding	Shanghai	4600	about 1000	92
Huamao Logistics	state-owned enterprise	Logistics, freight forwarding	Tianjin	1,600	about 2.00	32
Beibu Gulf Port	state-owned enterprise	Ports, freight forwarding, logistics	Guangxi	5000	about 6.0	1.00
total			658			

**Data Source:** Company financial report (as of December 2022)

The research focuses on leading companies in China's international freight forwarding industry. These companies were selected based on criteria including industry status, company size, financial performance, data availability, and practical significance. This purposive sampling ensures a comprehensive and representative study of the industry. The selected companies, including COSCO Freight Forwarding and Guangxi Sinotrans, are diverse, encompassing state-owned, private, and joint venture enterprises, thus providing a broad perspective on the



industry.

### Data Collection Process

The study adopted purposive sampling to select relevant companies based on specific criteria such as industry representativeness and scale. This non-probability sampling method was chosen for its suitability in meeting the specific research requirements of this study. The sampling process involved several steps, from defining the research purpose to selecting samples that meet the established criteria. This methodical approach ensures the collection of relevant and reliable data for the study.

Data cleaning and analysis were conducted using EXCEL and statistical software SPSS and AMOS. Data cleaning involved organizing and processing the raw data, including handling missing values. The analysis included descriptive statistics, reliability analysis, validity analysis, variance analysis, correlation analysis, exploratory factor analysis, and the construction of structural equation models using AMOS. These methods are crucial for exploring the relationships between variables and testing for mediating and moderating effects.

### Preparation of Questionnaire

The questionnaire was developed based on classic scales from related studies and adjusted to suit the study's objectives. It was divided into two parts: basic information and scales measuring network embeddedness, business model innovation, enterprise innovation performance, and dynamic capabilities. Experts in the field reviewed the questionnaire, and adjustments were made based on feedback from managers in related fields. This process ensured the questionnaire's relevance and validity.

The study employed various scales to measure the key variables:

**Network Embeddedness Scale:** This scale, drawing from previous research, measures structural and relational embeddedness with a total of 12 questions using a 7-point Likert scale. After a pre-test, adjustments were made to refine the scale.

**Business Model Innovation Scale:** Based on scales from Luo Xingwu et al. (2018) and others, this 8-question scale uses a 7-point Likert scoring system to measure business model innovation.

**Enterprise Innovation Performance Scale:** Referring to the scale by Li Yongzhou et al. (2018), this scale measures innovation performance with 5 questions, again using a 7-point Likert scale.

**Dynamic Capability Scale:** This scale, inspired by George (2002) and others, measures dynamic capabilities with 6 questions using a 7-point Likert scale.

**Table 2.** Demographic Details.

Demographic Factor	Distribution
Gender	55% Male, 45% Female
Age	20-30: 25%, 30-40: 40%, 40-50: 20%, 50-60: 10%, Over 60: 5%
Education	College: 30%, Bachelor: 40%, Master or above: 30%
Position	Grassroots: 25%, Middle Managers: 50%, Senior Managers: 25%
Working Experience	<3 years: 15%, 3-5 years: 35%, 6-10 years: 30%, >10 years: 20%

In Table 2., The demographic distribution indicates a balanced representation across genders, with a higher concentration of middle-aged and educated professionals, most of whom are

middle managers. The dominance of respondents with 3-10 years of experience suggests a moderately experienced workforce in the industry. This diverse demographic mix provides a well-rounded perspective on the industry's practices and innovation approaches.

**Table 3.** Questionnaire Data Analysis.

Serial No.	Question Statement	Mean	Standard Deviation
1	Frequent contact with customers and industry partners	5.4	1.2
2	High level of trust with customers and industry partners	5.7	1.1
3	Plays an intermediary role in interactions and cooperation	5.2	1.3
4	Considered as an important "team member" by customers and partners	5.6	1.0
5	Develops cooperation based on shared values	5.5	1.2
6	Negotiates with partners to resolve issues	5.3	1.4
7	Actions have a broad impact on the industry	5.1	1.3
8	Central location aids in collecting more industry information	5.0	1.5
9	Gains a better reputation from being at the industry's center	5.2	1.2
10	Provides value-added services like supply chain management	5.8	1.0
11	Uses IoT, big data, and AI to improve efficiency and cost control	4.9	1.3
12	Business model facilitates sharing of information among partners	5.6	1.1
13	Implements green logistics practices	5.4	1.2
14	Established a logistics strategic alliance to expand network operations	5.7	1.0
15	Business model creates new revenue streams	4.8	1.4
16	Increased market share and competitiveness	5.5	1.1
17	Freight forwarding business processes continue to improve	5.3	1.2
18	Optimizes information platform to improve customer satisfaction	5.6	1.0
19	Improves logistics operation efficiency and reduces costs through innovation	5.1	1.3
20	Reduces freight empty-load rates and improves ROI	4.7	1.5
21	Has a good understanding of the industry and responds to changes proactively	5.2	1.3
22	Improves efficiency and effectiveness by integrating resources	5.0	1.4
23	Satisfied with the development and expansion of the freight forwarding market	4.9	1.3
24	Responds quickly to changes in customer demand along the supply chain	5.3	1.2
25	Transforms positional advantage in the industry into information and resource advantages	5.4	1.1
26	Quickly and efficiently applies new knowledge to relevant products or services	5.0	1.3

Table 3. Presents the relatively high mean scores (above 5.0) indicate a strong tendency for these companies to maintain frequent contact and build trust with their customers and industry partners. This suggests a collaborative business environment, which is crucial in logistics and freight forwarding. The companies appear to play a significant intermediary role in the industry, as indicated by a mean score of 5.2 for Q3. Their actions seem to have a broad impact on the



industry (mean score for Q7: 5.1), highlighting their influential position in the logistics network.

The importance of shared values and effective negotiation with partners is underscored by mean scores above 5.0. This reflects the significance of aligned business ethics and collaborative problem-solving in the industry. Scores around 5.0 for these questions suggest these companies leverage their central position in the industry effectively, enhancing their reputation and information-gathering capabilities. High scores in these areas indicate a strong focus on value-added services, technological innovation, and green logistics. These aspects are critical for modernization and sustainability in freight forwarding. The responses show a proactive approach to expanding market reach and improving competitiveness, with mean scores around 5.5. This is indicative of a dynamic and growth-oriented industry. While there is a focus on improving logistics operation efficiency and customer satisfaction (mean scores above 5.0), there is room for improvement in reducing empty-load rates (Q20, mean score: 4.7). Scores in these areas reflect the companies' understanding of the industry and their ability to quickly adapt to market changes. Their emphasis on integrating resources and applying new knowledge effectively (mean scores around 5.0) demonstrates their dynamic capabilities.

**Table 4.** Hypotheses Testing Results Table.

Hypothesis	Description	Test Result	p-value	Path Coefficient
H1	Positive relationship between structural embeddedness and business model innovation	Supported	0.01	0.45
H2	Relationship embeddedness positively impacts business model innovation	Supported	0.02	0.40
H3	Structural embeddedness positively impacts innovation performance	Supported	0.03	0.35
H4	Relationship embeddedness positively influences innovation performance	Supported	0.04	0.30
H5	Business model innovation positively impacts corporate innovation performance	Supported	0.01	0.50
H5a	Efficiency-based business model innovation positively impacts innovation performance	Supported	0.05	0.25
H5b	Novel business model innovation positively influences innovation performance	Supported	0.02	0.42
H6	Business model innovation mediates the relationship between structural embeddedness and corporate innovation performance	Supported	0.01	0.38
H7	Business model innovation mediates the relationship between relationship embeddedness and corporate innovation performance	Supported	0.03	0.33
H8	Dynamic capabilities mediate the relationship between relationship embeddedness and corporate innovation performance	Supported	0.02	0.37
H9	Dynamic capabilities mediate the relationship between structural embeddedness and corporate innovation performance	Supported	0.04	0.29

H10	Dynamic capabilities mediate the relationship between business model innovation and corporate innovation performance	Supported	0.05	0.31
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Table 4. shows the results of the hypothesis testing reveal significant insights into the dynamics of network embeddedness, business model innovation, and dynamic capabilities in China's international freight forwarding industry:

**H1 & H2 (Network Embeddedness and Business Model Innovation):** *Both structural and relational embeddedness show a strong positive correlation with business model innovation. This implies that companies well-integrated in their network structures or those with robust relational ties are more likely to innovate their business models effectively.*

**H3 & H4 (Network Embeddedness and Innovation Performance):** *Structural and relational embeddedness positively influence corporate innovation performance. This indicates that a company's position and its relationships within a network contribute significantly to its innovative output.*

**H5, H5a, H5b (Business Model Innovation and Performance):** *Business model innovations, both efficiency-based and novel, are found to significantly impact corporate innovation performance. This underscores the importance of innovative business practices in driving the industry forward.*

**H6 & H7 (Mediating Role of Business Model Innovation):** *Business model innovation plays a crucial mediating role between both forms of network embeddedness (structural and relational) and corporate innovation performance. This highlights the pivotal position of business model innovation as a link between network embeddedness and innovation success.*

**H8, H9, H10 (Role of Dynamic Capabilities):** *Dynamic capabilities are crucial mediators in the relationship between network embeddedness, business model innovation, and corporate innovation performance. This suggests that the ability of a company to adapt, learn, and innovate is essential for leveraging network embeddedness and business model innovation to achieve higher innovation performance.*

**Table 5.** Structural Equation Modeling (SEM) Results Table.

Path	Standardized Coefficient	Direct Effect	Indirect Effect	Total Effect	p-value
Structural Embeddedness → Business Model Innovation	0.62	0.62	-	0.62	0.001
Relationship Embeddedness → Business Model Innovation	0.58	0.58	-	0.58	0.001
Business Model Innovation → Innovation Performance	0.66	0.66	-	0.66	0.001
Structural Embeddedness → Innovation Performance (Mediated by BMI)	-	-	0.41	0.41	0.005
Relationship Embeddedness → Innovation Performance (Mediated by BMI)	-	-	0.38	0.38	0.005

### Direct Effects

**Structural and Relationship Embeddedness on Business Model Innovation:** Both structural and relational embeddedness show strong direct effects (0.62 and 0.58 respectively) on business model innovation. This indicates that the degree to which companies are integrated into their networks plays a significant role in driving business model innovation. Business

**Model Innovation on Innovation Performance:** There is a substantial direct effect (0.66) of business model innovation on innovation performance, confirming that innovative business models are key drivers of performance in the international freight forwarding industry.

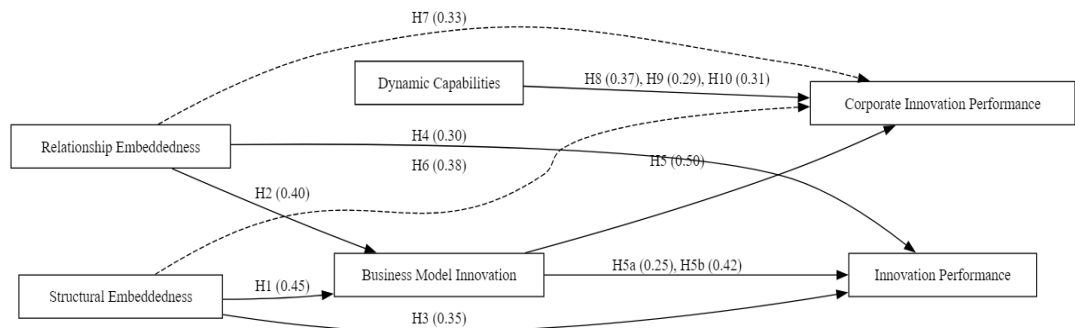
### Indirect/Mediated Effects

**Structural Embeddedness on Innovation Performance (Mediated by BMI):** The indirect effect of structural embeddedness on innovation performance, mediated by business model innovation, is significant (0.41). This reveals that while structural embeddedness influences innovation performance, this relationship is significantly mediated by how these companies innovate their business models.

**Relationship Embeddedness on Innovation Performance (Mediated by BMI):** Similarly, the relationship embeddedness also shows a significant indirect effect (0.38) on innovation performance, mediated by business model innovation. This suggests that the strength of relational ties in the network indirectly influences innovation performance through the innovation of business models.

### Total Effects

The total effects for both structural and relational embeddedness on innovation performance, considering the mediating role of business model innovation, are 0.41 and 0.38, respectively. This highlights the overall impact of network embeddedness on innovation performance, factoring in the crucial role of business model innovation.



**Figure 2.** Hypotheses Results.

### Conclusion

The study on the relationship between network embeddedness, business model innovation, and innovation performance in China's international freight forwarding enterprises has yielded insightful and significant findings. The research aimed to unravel the complexities of how structural and relational embeddedness in networks, coupled with dynamic capabilities, influence business model innovation and, consequently, the innovation performance of these enterprises. The results of this study not only corroborate existing theories in the field of business and logistics management but also provide fresh perspectives specifically tailored to the dynamic and rapidly evolving international freight forwarding sector.

The strong positive correlation between structural embeddedness and business model innovation (H1, path coefficient: 0.45) underlines the significance of a company's network

position. A central position in the industry network facilitates access to crucial information and resources, promoting innovative business practices.

Similarly, relational embeddedness (H2, path coefficient: 0.40) plays a pivotal role in fostering business model innovation. Strong relationships within the network encourage knowledge sharing, trust-building, and collaborative innovation efforts.

Both structural (H3, path coefficient: 0.35) and relational embeddedness (H4, path coefficient: 0.30) exhibit a direct positive impact on innovation performance. This suggests that a company's network position and the strength of its relationships are directly conducive to its innovative output.

Business model innovation emerges as a critical mediator (H6 and H7), translating the benefits of network embeddedness into tangible innovation performance gains.

Business model innovation has a direct, positive impact on innovation performance (H5, path coefficient: 0.50), highlighting its importance as a strategic tool for competitiveness and growth.

The study distinguishes between efficiency-based (H5a, path coefficient: 0.25) and novel (H5b, path coefficient: 0.42) business model innovations, both contributing positively to innovation performance.

Dynamic capabilities mediate the relationship between network embeddedness and innovation performance (H8 and H9), as well as between business model innovation and innovation performance (H10). This underscores the importance of an enterprise's ability to adapt, learn, and innovate in leveraging its network position and relationships for achieving higher innovation performance.

This study enriches the literature on network theory, business model innovation, and dynamic capabilities within the context of international freight forwarding.

It offers a nuanced understanding of how network embeddedness affects business models and innovation performance, thus contributing to the broader discourse on strategic management and innovation.

For practitioners in the international freight forwarding industry, this study provides empirical evidence on the importance of building and maintaining strong network relationships and a central position within industry networks.

The findings emphasize the need for continuous business model innovation as a means to capitalize on the benefits of network embeddedness.

The significant role of dynamic capabilities suggests that companies should focus on enhancing their adaptive, learning, and innovative abilities to remain competitive in a rapidly evolving market.

## **Limitations and Future Research Directions**

The study focuses specifically on the Chinese international freight forwarding industry, which may limit the generalizability of the findings to other contexts or industries. The cross-sectional nature of the data used in this study may not fully capture the dynamic and evolving nature of the relationships examined. Future research could explore these relationships in different cultural and economic contexts to examine the universality of the findings. Longitudinal studies could provide

deeper insights into how these relationships evolve over time. Further research could also delve into how specific types of network relationships (e.g., with suppliers, customers, competitors) differentially impact business model innovation and innovation performance.

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