THE MEDIATING ROLE OF RISK MANAGEMENT IN THE RELATIONSHIP BETWEEN TECHNOLOGICAL INNOVATION, MARKET DYNAMICS, AND POLICY EVOLUTION: EVIDENCE FROM CHINA'S NEW ENERGY ENTERPRISES

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Abstract

This study develops an integrated analytical framework that synthesizes innovation theory, open innovation theory, and risk management theory to examine how new energy enterprises achieve sustainable innovation in volatile environments. The research employs Structural Equation Modeling (SEM) to analyze survey data collected from firms in the new energy sector. The SEM results reveal that technological innovation, market changes, and policy adjustments all exert significant positive effects on firms' innovation performance. Moreover, enterprise risk management partially mediates these relationships, indicating that firms with stronger risk management practices achieve higher levels of innovation resilience. The study contributes to theoretical understanding by quantifying the mediating role of risk management within innovation systems and offers practical implications for managers and policymakers aiming to enhance innovation capacity in rapidly evolving energy markets.

Keywords: Innovation, New Energy Enterprises, Market dynamics.

Introduction

The world faces a significant energy crisis due to the limitations of fossil fuels, environmental pollution, and energy security risks. This has spurred the growth of the new energy industry, which utilizes clean, renewable, and low-carbon sources like solar and wind power. To succeed, new energy firms must overcome challenges like technological hurdles and high costs through continuous technological, management, and market innovation. This study proposes a framework that integrates Schumpeter's innovation theory, open innovation theory, and risk management theory. It uses a mixed-methods approach (Structural Equation Modeling and qualitative interviews) to investigate how risk management acts as a mediating factor between technological innovation, market dynamics, and a firm's overall innovation performance.

Research Objectives (1) To investigate how technological innovation, market changes, and policy evolution collectively influence innovation performance in rapidly growing new energy enterprises. (2) To explore the interactions between technological innovation, market changes, and policy adjustments in shaping corporate innovation outcomes during the expansion of new energy industries. (3) To determine whether risk management mediates the relationship among technological innovation, market dynamics, policy adjustments, and innovation performance in new energy enterprises. Scope of time started from August 2024 until July 2025. Literature review use (1) Theoretical and Conceptual Overview. (2) The concept of the development of the new energy industry. (3) Theoretical basis of enterprise innovation management. (4) The factors of innovation performance management in new energy enterprises. Research Methodology use Quantitative research design, Content Validity via IOC (Item-Objective Congruence) and Reliability Assessment (Cronbach's Alpha). Researching the

impact of the new energy industry's development on enterprise innovation management is crucial, as it influences energy optimization, economic growth, environmental protection, and national security. This research provides valuable theoretical and practical guidance, helping enterprises enhance innovation and competitiveness while supporting the sustainable growth of the new energy sector.

Research Objectives

1. To investigate how technological innovation, market changes, and policy evolution collectively influence innovation performance in rapidly growing new energy enterprises.
2. To explore the interactions between technological innovation, market changes, and policy adjustments in shaping corporate innovation outcomes during the expansion of new energy industries.
3. To determine whether risk management mediates the relationship among technological innovation, market dynamics, policy adjustments, and innovation performance in new energy enterprises.

Research Methodology

This study employed a mixed-methods approach with a convergent parallel design, integrating quantitative and qualitative data to investigate how technological innovation, risk management, market dynamics, and policy adjustment influence innovation performance in the new energy sector.

1. Quantitative Component: Data: 324 valid survey responses from managers and professionals in new energy enterprises. Sampling: Stratified and purposive sampling targeting firms of varied sizes, sectors, and roles in the industry chain. Instrument: Structured questionnaire based on validated scales; content validity confirmed via IOC (0.67–1.00); reliability confirmed with Cronbach's Alpha (0.842–0.894). Analysis: SPSS used for descriptive stats, correlation, cluster, and regression analysis; SmartPLS used for PLS-SEM to test hypotheses (H_1–H_7), assess mediation effects, and evaluate model fit (SRMR, R^2).
2. Qualitative Component: Data: 20 semi-structured interviews with industry professionals. Sampling: Purposive selection ensuring representation across enterprise sizes, functions, and innovation roles. Analysis: Thematic coding and content analysis in NVivo; findings triangulated with quantitative results to validate and contextualize statistical relationships.
3. Integration: Quantitative results provided statistical evidence; qualitative insights explained the "how" and "why" behind observed patterns. Both strands were interpreted together to generate a comprehensive framework of innovation management in the new energy sector.

Research Results

A mixed-methods study used both quantitative analysis and qualitative interviews. It also incorporated text mining and other modern technological tools to produce the theoretical findings presented in Table 1.

Table 1 Conclusion of Research

No	Research Questions	Conclusion of Quantitative Analysis	Conclusion of Qualitative Analysis
1	How do technological innovation, market dynamics, and policy evolution influence innovation performance in rapidly growing new energy enterprises?	Technological innovation in new energy enterprises has a significant impact on their innovation performance; Market changes in the new energy industry have a significant impact on their innovation performance; Policy adjustments in the new energy industry have a significant impact on their innovation performance.	(1) The respondents unanimously believe that technological innovation, market changes, and policy adjustments have a positive impact on enterprise innovation performance management. Technology, innovation, market, policy, and management are at the center and have been mentioned multiple times. They also acknowledge that risk management has a positive impact on the innovation performance of enterprises. (2) The interviewees identified several key factors—such as new product development, process improvement, market changes, and government subsidiess—as having a significant impact on innovation performance.
2	What impact does risk management have on innovation performance management in the development of new energy enterprises	The risk management behavior of enterprises in the new energy industry has a significant impact on their innovation performance management.	The interviewees unanimously agreed that risk management has a positive impact on corporate innovation performance management.

No	Research Questions	Conclusion of Quantitative Analysis	Conclusion of Qualitative Analysis
3	Does risk management play a mediating role between technological innovation, market dynamics, policy adjustments, and innovation performance in new energy enterprises?	The results indicate that risk management plays an important mediating role in the relationship between external/internal driving factors (technological innovation, market changes, and policy adjustments) and firm innovation performance	Based on qualitative interviews, this study confirms that technological, market, and policy changes positively impact risk management. Risk management, in turn, is a critical mediator that connects these external factors to a company's innovation performance. The interviewees viewed risk management as a cross-disciplinary theme that both safeguards and drives sustainable innovation.

This study, which used a mixed-methods approach, found that technology, market dynamics, and policy changes positively influence enterprise innovation in China's new energy sector. Risk management plays a crucial role by mitigating uncertainty and acting as a mediator between external forces and innovation performance. The study also revealed that these external factors—technology, market, and policy—significantly shape the development and configuration of a company's risk management systems.

Discussion

This study, based on a mixed-methods approach, conducted standardized quantitative analysis alongside in-depth qualitative interviews. By integrating text mining techniques with management research through the use of modern technological tools, the study produced the following theoretical findings, as presented in Table 5.1. In summary, this study provides robust empirical and qualitative evidence that technological innovation, market changes, and policy adjustments significantly influence innovation performance, both directly and through the mediating role of enterprise risk management. The integration of quantitative and qualitative insights reveals how firms in the new energy sector actively align internal capabilities with external dynamics to sustain innovation outcomes.

More importantly, the findings extend existing theories by highlighting the strategic importance of risk-oriented innovation management in volatile institutional environments. In emerging economies such as China, where regulatory shifts, market fluctuations, and technological disruption frequently co-occur, firms must not only pursue innovation, but also develop dynamic capabilities to manage uncertainty. This research thus advances the theoretical proposition that a risk-oriented innovation strategy serves as a dynamic capability that links institutional volatility with innovation resilience in emerging market contexts. This insight contributes to both innovation management literature and the strategic adaptation discourse, offering practical implications for policymakers and enterprise leaders seeking to foster resilient, future-proof innovation ecosystems.

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