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Generational Dynamics of Innovation Adoption in Chinese Consumer Markets: A Comprehensive Analysis

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Abstract: This extensive and comprehensive study delves into the intricate dynamics of generational responses to innovative marketing strategies within the dynamic landscape of the Chinese consumer market. Given China's rapid economic growth and technological advancements, it has become imperative for businesses and marketers to grasp how different generations engage with marketing innovations. This study encompasses Baby Boomers, Generation X, Millennials, and Generation Z, each shaped by unique life experiences and societal contexts, resulting in distinct preferences and behaviors. Furthermore, the study offers a thorough analysis of how diverse generations in China interact with and respond to innovative marketing strategies, providing academic researchers and businesses operating in the rapidly evolving Chinese consumer marketing landscape with actionable insights. Understanding these generational dynamics is crucial for developing marketing strategies that resonate with diverse generational segments and harnessing the power of technology to connect with consumers across all age groups. The dynamic landscape is further enriched by the proliferation of digital technologies, social media platforms, and e-commerce ecosystems. This study scrutinizes how these generational cohorts interact with innovation in marketing, considering preferences, technological adoption patterns, cultural influences, and attitudes toward trust and privacy. Additionally, it examines generational disparities in marketing channel preferences, offering valuable insights for companies aiming to tailor their marketing strategies to effectively engage diverse generational segments in China. Importantly, this research underscores the strategic significance of understanding generational differences in marketing innovation adoption. It emphasizes that this knowledge is not solely an academic pursuit but rather a critical necessity for companies seeking to thrive in one of the most competitive consumer markets globally. By acknowledging and responding to the distinct preferences and behaviors of various generational cohorts, businesses can forge meaningful connections, optimize return on investment, and adeptly navigate the evolving consumer landscape.

Keywords: Innovation adoption; Consumer markets; Generations; Digital technologies; Social media platforms; E-commerce ecosystems

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1. Introduction

China has emerged as a global powerhouse owing to its rapid economic growth, technological progress, and expansive consumer market. In response to this dynamic environment, marketing strategies and technologies have undergone significant evolution to capture the attention and loyalty of a diverse consumer base. Understanding the generational dynamics of innovation adoption in Chinese consumer markets is a crucial aspect of this evolution.

This article examines how various generations in China respond to innovative marketing strategies. The study encompasses Baby Boomers, Generation X, Millennials, and Generation Z, each characterized by distinct preferences, values, and behaviors influenced by unique life experiences and social contexts.

The proliferation of digital technologies, social media platforms, and e-commerce ecosystems has added complexity to the dynamics of innovation adoption in the Chinese marketing environment. This study aims to discover how these generations interact with marketing innovation by analyzing their preferences, technological adoption patterns, cultural influences, and attitudes toward trust and privacy.

Additionally, the study investigates generational differences in marketing channel preferences and incorporates relevant case studies to offer practical advice for companies seeking to tailor their marketing strategies for effective engagement with diverse generational segments in China.

Highlighting the strategic importance of understanding generational differences in marketing innovation adoption, this study asserts that it is not merely an academic pursuit but an absolute necessity for businesses aiming to thrive in one of the world's most dynamic and competitive consumer markets.

2. Discussion on the concept of generational dynamics of innovation adoption in Chinese consumer markets

This study underscores the strategic significance of understanding generational differences in marketing innovation adoption. It emphasizes that this understanding is not merely an academic pursuit but an absolute necessity for businesses striving to thrive in one of the world's most dynamic and competitive consumer markets.

Acknowledging the diversity of China's population, spanning generations such as Baby Boomers, Generation X, Millennials, and Generation Z, this study reveals distinct patterns in adopting and embracing innovative products and technologies. Aligned with the established theory of innovation adoption, which posits that consumer adoption behaviors are influenced by their unique characteristics and perceptions of innovation attributes, this concept is crucial in the context of China's dynamic consumer landscape.

Comprehending how each generation responds to innovations is imperative for businesses and marketers in China. For instance, younger generations like Millennials and Generation Z may exhibit greater readiness to embrace digital innovations [1], while older generations such as Baby Boomers may adopt a more cautious approach. This concept underscores the necessity of crafting tailored marketing strategies to effectively engage with diverse generational segments within China's consumer market. Understanding these generational dynamics is not only an academic pursuit but a strategic imperative for success.

Considering variables such as age, cultural values, socioeconomic status, and technological exposure, this field of study sheds light on the intricate dynamics of innovation adoption in China. Younger generations in China, such as Generation Z and Millennials, may be more likely than older generations, such as Baby Boomers and Generation X, to rapidly adopt digital innovations and novel consumer technologies. Recognizing these generational differences can contribute to the success of businesses operating in the Chinese consumer market

by informing marketing strategies, product development, and approaches to market entry.

3. Significance of the study

This study holds paramount importance across various dimensions, profoundly influencing the landscape of business strategies and consumer engagement. It carries significant implications for strategic marketing in China, revealing how different generations respond to innovative marketing techniques and providing businesses with a strategic advantage. Understanding these dynamics allows companies to tailor their strategies, enhancing their efficiency in reaching and engaging diverse generational segments.

In China's fiercely competitive consumer market, gaining a competitive edge is crucial, and this study provides precisely that. Recognizing generational differences in innovation adoption enables organizations to maintain a competitive advantage over rivals [2]. By anticipating market trends and recognizing growing consumer categories, businesses may strategically position themselves, aligning product development and marketing tactics with changing customer preferences.

The study also has implications for maximizing return on investment (ROI). Tailoring marketing strategies to generational preferences allows firms to maximize their ROI, as targeted marketing methods are more likely to provide favorable results, minimizing wasted resources on initiatives that do not resonate with the intended demographic.

Moreover, generational preferences can significantly impact product development tactics. Aligning products and services with the beliefs and expectations of various generations raises the probability of successful market penetration and acceptance, fostering corporate expansion.

A key aspect of the study is its potential to foster cross-generational engagement. Understanding how various generations interact with marketing innovations can create opportunities for businesses to bridge generational gaps. Shared experiences across generations can lead to intergenerational discussions and potentially expand the customer base [3].

In a culturally diverse nation like China, recognizing the impact of cultural elements on generational responses to marketing advances is essential. This study highlights the significance of cultural sensitivity in marketing strategies [4]. Marketing consistent with cultural values and conventions improves brand reputation and develops consumer trust. Recognizing differing levels of digital usage across generations is essential for sustaining relevancy in China's rapidly developing digital landscape. This allows businesses to maintain a prominent online presence while also catering to customers who prefer traditional means.

Ultimately, the significance of this study lies in its ability to equip businesses with the knowledge needed for long-term success. As China continues to evolve as a global economic powerhouse, the ability to navigate the everchanging consumer landscape is vital. Businesses that grasp the generational dynamics of innovation adoption are better positioned to thrive, connect meaningfully with consumers, and drive sustainable growth in one of the world's most dynamic and competitive consumer markets.

4. Pedagogical implications of the study

The study on the generational dynamics of innovation adoption in Chinese consumer markets holds significant pedagogical implications that extend to both academic and practical domains, providing valuable insights and opportunities for learning and professional development.

This research enhances academic contexts by shedding light on the changing landscape of Chinese consumer behavior and marketing techniques. It serves as a significant resource for educators and curriculum

developers, offering case studies and real-world examples that can be included in marketing, consumer behavior, sociology, and psychology classes. Professors can ensure their students have a comprehensive and current understanding of how generational dynamics affect marketing innovations by incorporating these results. Moreover, this work opens up options for further academic investigation. Specific features of generational responses to innovation adoption might be studied by students pursuing degrees in marketing, business, or similar subjects. Various research possibilities can help the growth of knowledge in these fields, creating a greater comprehension of consumer behavior and generational patterns. On the other side, marketing and advertising experts stand to acquire valuable information from this study. The research findings can be applied directly to their work, affecting the creation of marketing strategies. The findings can be used by marketers to create campaigns that resonate more effectively with specific generations, resulting in enhanced marketing performance and higher consumer engagement, which is ultimately advantageous for organizations. Additionally, market researchers can leverage the study's methodology and insights to conduct more targeted and insightful research. By understanding the preferences and behaviors of different age groups, businesses can enhance market segmentation and product development efforts. For marketing professionals, the study serves as a valuable resource for professional development. Training programs and workshops can incorporate the study's findings to equip marketers with the skills and knowledge needed to tailor marketing strategies to diverse generational segments. This practical training can lead to more successful marketing campaigns and better career prospects.

On cross-cultural understanding, the study's emphasis on the impact of cultural characteristics on generational responses to marketing innovations has implications for global marketing. These insights can be utilized by professionals and students active in international marketing to adjust campaigns to various cultural situations. This cross-cultural understanding improves the efficacy of cross-border marketing operations, allowing organizations to successfully navigate worldwide marketplaces. In addition, the study increases cultural sensitivity, which is beneficial not only in marketing but also in other professional contexts, including cross-cultural relationships. It encourages professionals and students to take cultural differences into account when formulating strategies and making judgments.

The dynamic nature of generational responses to innovations highlights the necessity for marketing professionals to engage in lifelong learning. In a continuously changing consumer world, it is crucial for career longevity and success to be current on changing generational trends and preferences. This study serves as a reminder of the need for ongoing adaptation and education in the marketing profession. The findings might also contribute to arguments over ethical marketing practices. Students and professionals can investigate the intersection of ethical considerations and generational responses to marketing advancements. This research recommends marketing techniques that consider generations and adhere to ethical standards.

In conclusion, the study on the generational dynamics of innovation adoption in Chinese consumer markets has varied and far-reaching educational consequences. They enrich academic courses, improve the skills and knowledge of marketing professionals, stimulate lifelong learning, create cross-cultural understanding, and promote ethical marketing practices. Individuals and institutions can better prepare for success in China's dynamic and competitive consumer market and beyond by implementing the findings of this study into educational and professional contexts.

5. Conceptual Framework

The conceptual framework underlying the study on the generational dynamics of innovation adoption in Chinese

consumer markets elucidated foundational concepts and intricate relationships guiding the exploration of how different generations of Chinese consumers engaged with and adopt innovative products and technologies [5]. At its core, this framework revolved around two key concepts: generational cohorts and innovation adoption. Generational cohorts represented distinct age groups, including Baby Boomers, Generation X, Millennials, and Generation Z, each characterized by unique experiences, values, and preferences. Innovation adoption, on the other hand, encompassed the process by which consumers became aware of, evaluated, and eventually embraced novel products, services, or technologies. These concepts formed the cornerstone for investigating the diverse responses of Chinese consumers across generations.

To comprehend the nuances of innovation adoption within generational cohorts, the framework delved into the innovation attributes that influenced this process. These attributes, drawn from Rogers' diffusion of innovations theory [6], encompassed five critical dimensions: relative advantage, compatibility, complexity, trialability, and observability. They served as lenses through which the analysis was conducted to understand how Chinese consumers perceived and engaged with innovations.

Marketing techniques, another pivotal element of the framework, represented the strategies and approaches employed by businesses to introduce and promote innovations to consumers [7]. These techniques were not only influenced by the characteristics of innovations but also by the unique characteristics and behaviors of generational cohorts. Thus, they played a central role in shaping the adoption landscape.

Finally, consumer behavior encompassed the actions, attitudes, and decision-making processes of individuals within various generational cohorts as they responded to marketing efforts and innovations. This element reflected the dynamic nature of consumer engagement and highlighted the need to tailor strategies to different generational preferences and behaviors.

As the study progressed, this conceptual framework served as a roadmap, guiding the exploration of the multifaceted interactions and influences that underlie the generational dynamics of innovation adoption in Chinese consumer markets. Through this lens, the study aimed to offer valuable insights into effective marketing strategies, shed light on the strategic significance of generational understanding, and contribute to the broader discourse on consumer behavior and innovation adoption in the rapidly evolving Chinese marketplace [8,9].

6. Theoretical framework

The framework for comprehending the generational dynamics of innovation adoption in Chinese consumer markets is based on well-established theories of consumer behavior, innovation adoption, and generational cohorts. This framework offers a structured method for analyzing and explaining how various generations of Chinese consumers adopt and respond to innovations. It integrates key concepts from marketing, sociology, and psychology to provide insights into the complex interaction of generational factors, cultural context, and technological advances in shaping consumer preferences and behaviors.

Rogers' diffusion of innovations theory is a foundational framework for understanding how innovations are adopted by individuals and groups over time [9]. This theory suggests that innovation adoption follows an S-shaped curve, with innovators, early adopters, early majority, late majority, and laggards. This theory helps explain, within the context of generational dynamics, how different generations in China may occupy different positions on the adoption curve, thereby influencing the rate and scope of innovation adoption within each cohort.

The generational cohort theory emphasizes that people with similar birth years share similar life experiences, values, and cultural influences. Generations in China are frequently classified as Traditionalists,

Baby Boomers, Generation X, Millennials, and Generation Z. Each cohort possesses unique characteristics that influence their attitudes and behaviors toward innovations. This theory provides a framework for understanding how generational cohorts in China may exhibit distinct innovation-related preferences, expectations, and adoption patterns.

Hofstede's cultural dimensions theory applies to comprehending the impact of cultural values on innovation adoption across generations [4]. The cultural context of China, including factors such as collectivism, uncertainty avoidance, and long-term orientation, can influence how various generational cohorts perceive and accept innovations. This theory clarifies how cultural values may influence the receptivity of various generations to new technologies and products.

The technology acceptance model (TAM) of Davis focuses on the factors that influence individuals' acceptance and use of technology [10]. TAM can be used to determine how generational cohorts in China perceive the usability and perceived utility of innovations within the context of generational dynamics. Understanding these perceptions is necessary for predicting the adoption behavior of different generations.

Social influence theories, such as Bandura's social learning theory and Cialdini's principles of persuasion, help to explain how peers, family, and social networks may influence generational cohorts in China to adopt innovations [11]. These theories emphasize the importance of social norms, reference groups, and word-of-mouth when it comes to consumer behavior.

Figure 1, the theoretical paradigm of the study integrates multiple perspectives to provide a comprehensive understanding of the generational dynamics of innovation adoption in Chinese consumer markets. By drawing upon the diffusion of innovations theory, generational cohort theory, cultural dimensions theory, TAM, and social influence theories, researchers and marketers can explore how different generations in China respond to and embrace innovations, ultimately guiding the development of effective marketing strategies and product offerings tailored to specific generational preferences and behaviors.

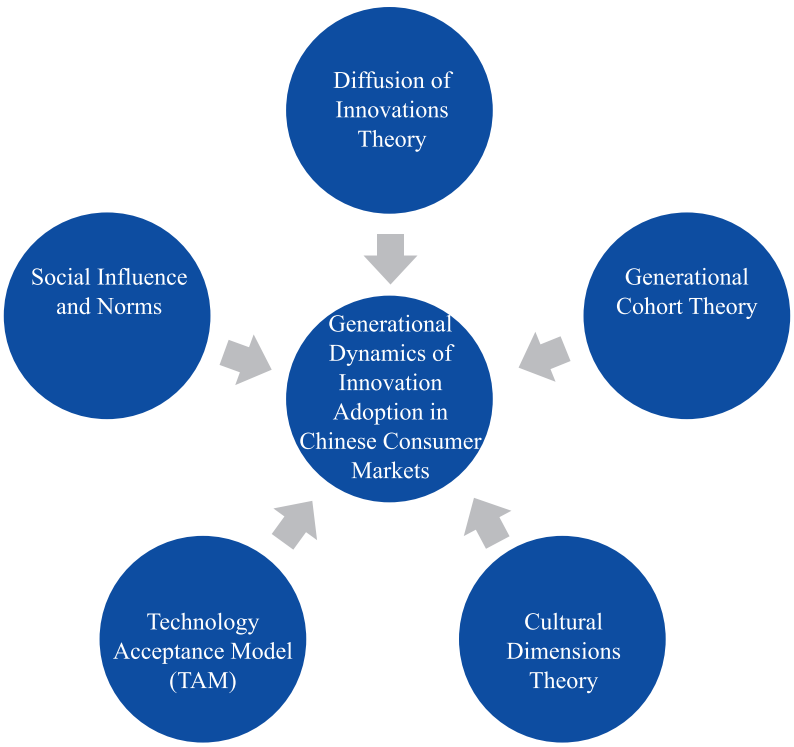


Figure 1. Theoretical paradigm of generational dynamics of innovation adoption in Chinese consumer markets

7. Main objectives of the study

The objectives of this research study are crafted to unveil the intricate dynamics of generational responses to innovative marketing techniques within the vibrant landscape of Chinese consumer markets. In an era marked by China's remarkable economic growth, technological advancements, and the ascent of a diverse and discerning consumer base, understanding how different generations interact with and embrace innovative marketing strategies becomes paramount. This research embarks on a comprehensive exploration, encompassing the distinctive generational cohorts of Baby Boomers, Generation X, Millennials, and Generation Z. Shaped by their unique life experiences and societal contexts, these cohorts exhibit varying preferences, values, and behaviors that influence their engagement with marketing innovations. The proliferation of digital technologies, the omnipresence of social media platforms, and the rise of intricate e-commerce ecosystems have further enriched this dynamic tapestry. This study seeks to elucidate the multifaceted facets of generational engagement with marketing innovations, considering a spectrum of factors, including preferences, technological adoption patterns, cultural influences, and attitudes regarding trust and privacy. Additionally, it delves into the nuanced realm of generational disparities in marketing channel preferences [12]. By incorporating relevant case studies, this investigation aims to provide actionable insights and guidance for businesses navigating the intricacies of the Chinese consumer market, where understanding generational dynamics is not merely an academic pursuit but a strategic imperative for thriving in a fiercely competitive landscape.

To reiterate, the objectives were:

(1) Examine generational responses to innovative marketing techniques: Investigate how different generational cohorts in China respond to innovative marketing strategies and technologies. Understand their receptivity, engagement, and attitudes toward novel marketing approaches.

(2) Analyze generational differences: Analyze and compare the responses and behaviors of Baby Boomers, Generation X, Millennials, and Generation Z concerning marketing innovations. Identify key differences in preferences, values, and behaviors across these generations.

(3) Explore the impact of digital technologies and social media: Examine the influence of digital technologies, social media platforms, and e-commerce ecosystems on generational dynamics in marketing innovation adoption. Understand how these technologies shape the interaction between generations and marketing innovations.

(4) Consider cultural influences: Investigate how cultural factors impact generational responses to marketing innovations. Analyze how cultural values and norms influence the adoption and acceptance of innovative marketing techniques.

(5) Highlight strategic significance: Emphasize the strategic importance of understanding generational disparities in marketing innovation adoption. Showcase that this understanding is not only an academic pursuit but a critical imperative for businesses aiming to thrive in China's dynamic and competitive consumer market.

These objectives collectively aim to provide a comprehensive analysis of how different generational cohorts in China engage with and respond to innovative marketing techniques, offering valuable insights to both academic researchers and businesses operating in the rapidly evolving landscape of Chinese consumer marketing.

8. Results and discussion

8.1. Generational responses to innovative marketing techniques

Upon examination, real-life scenarios illustrate how different generational cohorts in China react to novel

marketing approaches.

In Social Media Influencer Campaigns, a skincare brand in China launches an influencer marketing campaign on Weibo, featuring a popular Generation Z influencer and a Baby Boomer influencer. The campaign promotes the same skincare product but targets different generational segments. The findings show that the Generation Z audience may respond more positively to the influencer from their own generation, while Baby Boomers may relate better to the older influencer. This demonstrates that generational alignment between influencers and target audiences can impact receptivity.

In E-commerce Live Streaming, an e-commerce platform conducts a live-streaming event to showcase fashion products. Millennials and Generation Z viewers engage actively in the live chat, asking questions and making instant purchases. Meanwhile, Generation X and Baby Boomers watch the stream but are less likely to participate in real-time interactions. The findings revealed that the scenario highlights that younger generations are more inclined to actively engage with innovative marketing techniques like live streaming, while older generations may prefer a more passive role [13].

Furthermore, in personalized recommendations, a food delivery app uses artificial intelligence (AI) to provide personalized restaurant recommendations. Millennials and Generation Z users find the recommendations highly relevant and often use the app's suggestions. In contrast, Baby Boomers and Generation X users are more skeptical and prefer to rely on their own choices. Here, the findings show that different generations exhibit varying levels of trust in AI-driven recommendations, with younger generations being more receptive to personalized marketing.

Augmented reality (AR) experiences [14], on the other hand, show that a cosmetic brand launched an AR app that allows users to try makeup products virtually. Millennials and Generation Z users enthusiastically download and use the app, sharing their AR makeup looks on social media. Baby Boomers and Generation X are less likely to embrace the technology. This example illustrates that younger generations tend to adopt and engage with AR-based marketing innovations more readily, while older generations may require more persuasion to participate.

An athletic wear brand in China initiates a user-generated content challenge on a popular social media platform. Millennials and Generation Z users actively participate by creating and sharing content featuring the brand's products. Baby Boomers and Generation X are less likely to join in when it comes to user-generated content challenges. As findings, younger generations often exhibit higher enthusiasm for participating in user-generated content challenges [15], while older generations may need additional motivation or incentives.

These real-world scenarios demonstrate that different generations in China respond differently to innovative marketing techniques. Understanding these variations is crucial for businesses to tailor their strategies effectively and engage diverse generational segments within the Chinese consumer market.

8.2. Analyze generational differences

Analyzing and comparing the responses and behaviors of Baby Boomers, Generation X, Millennials, and Generation Z regarding marketing innovations reveals intriguing generational trends and distinctions in preferences, values, and behaviors.

Starting with Baby Boomers, this generation, often considered digital immigrants, adopted digital technologies later in life. As a result, they tend to favor traditional marketing channels, such as television, print, and radio. They are more likely to trust brands with which they have established long-term relationships or those recommended by friends and family [16]. In essence, Baby Boomers appreciate marketing campaigns that emphasize trust, reliability, and the human touch.

In contrast, Generation Z, true digital natives, possesses an innate familiarity with digital technologies. They exhibit a strong preference for marketing innovations rooted in the digital realm. Interactive content, social media engagement, and mobile apps resonate with them. Generation Z places a high value on authenticity, often seeking out peer reviews and conducting thorough online research before making purchasing decisions [17]. They are keen to discover new products and experiences through digital channels.

Generation X occupies an intermediate position between Baby Boomers and Generation Z. They value concise and informative content and are responsive to email marketing. While Generation X may not be as tech-immersed as Millennials and Generation Z, they still engage with social media for information and may actively seek out personalized messaging [18]. They are open to trying new products and services, particularly if these offerings align with their specific needs and preferences.

Lastly, Millennials, often associated with being early adopters of digital technologies, exhibit a multifaceted approach to marketing innovations. They are active users of social media platforms and are receptive to personalized marketing efforts. Millennials value experiences and often engage with brands that offer unique and immersive experiences, both online and offline. They are inclined to follow trends and may be drawn to brands that align with their social and environmental values [19].

In summary, these generational cohorts present diverse responses and behaviors when it comes to marketing innovations. Baby Boomers lean towards traditional, relationship-focused marketing, while Generation Z thrives in the digital realm, seeking authenticity and peer validation. Generation X bridges the gap, appreciating personalized content and social media. Meanwhile, Millennials, driven by experiences and values, are early adopters of innovative marketing strategies. Recognizing these generational distinctions is essential for businesses seeking to engage effectively with diverse consumer demographics and tailor their marketing innovations accordingly.

8.3. Explore the impact of digital technologies and social media

Examining the influence of digital technologies, social media platforms, and e-commerce ecosystems on generational dynamics in marketing innovation adoption offers a captivating glimpse into the evolving landscape of consumer behavior and engagement. These technologies have become integral to people's daily lives, profoundly impacting how different generations interact with marketing innovations and each other [17-19].

Digital technologies have emerged as both dividers and bridges among generations. For instance, Baby Boomers, often digital immigrants, may initially resist the rapid digitalization of marketing but eventually adapt. They may use email for communication and research products online. In contrast, Generation Z, the digital natives, seamlessly integrate technology into their lives, enthusiastically embracing innovations such as AR and virtual reality (VR) experiences for product discovery. This generational gap is evident in how various age groups navigate digital marketing landscapes.

Additionally, social media platforms have redefined how generations engage with marketing innovations. Millennials and Generation Z, in particular, are avid users of platforms like Instagram, TikTok, and Snapchat, where visual content and influencer marketing thrive. These platforms have become powerful tools for product discovery, brand engagement, and even purchase decisions [17]. Meanwhile, Generation X and Baby Boomers may favor platforms like Facebook for connecting with friends and family, but they, too, are increasingly exposed to marketing content [16].

Further, e-commerce ecosystems have revolutionized the shopping experiences of different generations. Millennials and Generation Z, accustomed to online shopping, embrace innovations such as personalized recommendations, chatbots, and one-click purchasing [20]. They value the convenience and efficiency offered

by e-commerce platforms. On the other hand, Generation X and Baby Boomers, while adopting e-commerce at varying rates, may still appreciate the tactile experience of physical stores. However, they, too, are increasingly influenced by online marketing innovations that enhance their shopping journeys.

Interestingly, digital technologies, social media, and e-commerce ecosystems have the potential to bridge generational gaps. Shared experiences, such as online shopping for family occasions or participating in viral social media challenges, create common ground for different generations to interact with marketing innovations. These shared experiences often transcend age boundaries, fostering cross-generational interactions and discussions about innovative marketing campaigns.

In conclusion, the influence of digital technologies, social media platforms, and e-commerce ecosystems on generational dynamics in marketing innovation adoption is profound and multifaceted. While generational differences in technology adoption and preferences exist, these technologies also serve as bridges that enable various generations to engage with marketing innovations in both distinct and shared ways. Understanding these dynamics is essential for businesses seeking to craft effective marketing strategies that resonate with diverse generational segments and leverage the power of technology to connect with consumers of all ages.

8.4. Consider cultural influences

Investigating the influence of cultural factors on generational responses to marketing innovations reveals a dynamic interplay between age-based preferences and deeply rooted cultural values and norms. These cultural elements significantly shape how different generations perceive and embrace innovative marketing techniques [11].

Cultural values play a pivotal role in guiding generational responses. For instance, collectivist cultures, prevalent in many Asian societies, emphasize close-knit family and community bonds. In such contexts, older generations like Baby Boomers may prioritize collective decision-making and be strongly influenced by recommendations from family and community members. Marketing innovations that highlight familial or communal involvement tend to resonate deeply with them. Conversely, individualistic cultures, often found in Western societies, may see younger generations like Millennials and Generation Z as more inclined toward self-expression and personal experiences. Marketing innovations that celebrate individuality, offer personalized experiences, and encourage self-discovery tend to capture their attention [4].

Cultural norms further influence generational responses to marketing innovations. Norms regarding tradition and progress, for instance, can shape these responses significantly. In cultures with strong traditional norms, older generations may prefer marketing campaigns that align with established traditions and values. In contrast, younger generations in cultures that promote progress and change may be more receptive to marketing innovations that challenge the status quo and offer forward-thinking experiences.

Communication styles, often influenced by cultural norms, also affect how marketing innovations are received. Cultures that highly value indirect and polite communication may see Baby Boomers responding well to subtle and nonintrusive marketing tactics. In contrast, Millennials and Generation Z may be more receptive to direct and engaging communication styles, as seen in influencer marketing and interactive content.

Moreover, cultural dimensions like long-term versus short-term orientation play a role in generational responses. In cultures with a long-term orientation, older generations may prioritize brand loyalty and relationship building. This preference could influence their response to loyalty programs and traditional marketing campaigns. In cultures with a short-term orientation, younger generations may seek immediate gratification and quick rewards, making them more responsive to marketing innovations offering instant benefits and engaging experiences [4].

Understanding the intricate relationship between cultural factors and generational preferences is essential

for businesses seeking to create marketing strategies that resonate with diverse generational segments. By aligning their campaigns with cultural values and norms, marketers can navigate this complex terrain effectively, crafting innovative and culturally sensitive campaigns that connect meaningfully with their target audiences.

8.5. Highlight strategic significance

Understanding generational disparities in marketing innovation adoption is not merely an academic pursuit but a critical imperative for businesses seeking success in China's dynamic and competitive consumer market. The strategic significance of this understanding lies in its potential to unlock tailored strategies that resonate with diverse consumer segments, spanning Baby Boomers, Generation X, Millennials, and Generation Z. By delving into the unique characteristics, behaviors, and preferences of each generational cohort, businesses can fine-tune their marketing techniques to align with the distinct needs and expectations of these groups.

In a landscape where innovation is constant, recognizing the varying rates at which different generations adopt new products and technologies becomes a strategic advantage. This awareness empowers businesses to implement targeted and effective marketing campaigns, ensuring that their innovations are not only noticed but embraced by the intended audience. For example, Baby Boomers may prioritize reliability and functionality, while Generation Z might gravitate towards cutting-edge and socially conscious innovations. Tailoring marketing approaches accordingly allows businesses to navigate the nuances of each generation, fostering stronger connections and brand loyalty.

Moreover, in a market as diverse as China, cultural nuances play a significant role in consumer behavior. Aligning marketing strategies with generational cohorts enables businesses to navigate these cultural intricacies effectively. By recognizing the influence of cultural dimensions on innovation adoption, companies can position their products in a way that aligns with the values and expectations of each generation.

The strategic importance extends beyond immediate sales to long-term brand positioning and sustainability. Businesses that invest in understanding and responding to generational dynamics are better equipped to build enduring relationships with consumers. This not only fosters loyalty but also positions the brand as forward-thinking and adaptive, essential qualities in a rapidly evolving market.

In essence, recognizing the generational dynamics of innovation adoption is a strategic compass for businesses navigating the intricacies of the Chinese consumer market. It transcends academic interest, offering a pragmatic roadmap for businesses to thrive amidst the complexities and fierce competition, ensuring that they not only keep pace with change but lead it.

9. Proposed output of the study

The study revealed findings that can be disseminated through various channels and programs. Firstly, research seminars and workshops can be organized to facilitate discussions among researchers, educators, and marketers, fostering a deeper understanding of generational dynamics in marketing innovations. Online educational modules can be developed to provide accessible learning resources for academic institutions and marketing associations, offering insights through video lectures, case studies, and quizzes. Academic publications in reputable journals will contribute to the scholarly discourse and engage researchers worldwide.

Moreover, practical guidebooks tailored for marketing professionals and businesses can offer actionable recommendations based on the study's insights, promoting effective strategies for engaging different generational cohorts in the Chinese market. Business consultation services staffed by experienced professionals can provide personalized guidance to companies seeking to adapt their marketing strategies. Marketing

certification programs focusing on generational dynamics can enhance the expertise of marketing professionals, and cross-cultural training programs can help individuals navigate diverse cultural contexts in international marketing.

Online webinars and podcasts featuring discussions with researchers, industry experts, and marketers can provide ongoing insights and updates on generational dynamics. Market research tools and surveys can be developed to assist organizations in assessing generational preferences and behaviors within their target audience. Collaborative research projects with academic institutions, marketing associations, and businesses can lead to more extensive studies and practical applications in the field. Interactive online platforms or communities can be created to facilitate knowledge exchange among professionals.

In addition to the aforementioned programs and outputs, the study's findings can also be leveraged for policy development and advocacy. Collaborations with governmental bodies and consumer protection agencies can lead to the establishment of guidelines and regulations that promote ethical marketing practices, particularly in the context of generational dynamics. Educational institutions can integrate this research into their curricula, ensuring that future marketing professionals are well-equipped to navigate the complexities of generational differences.

Furthermore, industry conferences and summits can be organized, bringing together marketing leaders, business executives, and policymakers to discuss and implement strategies that align with the study's insights. These events can serve as platforms for sharing best practices and fostering collaboration among stakeholders in the marketing ecosystem. Additionally, industry-specific awards and recognition programs can be initiated to celebrate businesses that excel in adapting their marketing approaches to effectively engage diverse generational segments.

To ensure the accessibility and longevity of the study's impact, an online knowledge hub can be established, housing a repository of research papers, reports, and resources related to generational dynamics in marketing. This hub can serve as a go-to source for academics, professionals, and students seeking the latest insights and data on this topic. Regularly updated blogs and articles can keep the community informed about emerging trends and developments in generational marketing.

Ultimately, the suggested programs and outputs should aim to bridge the gap between research and practical application, fostering a culture of continuous learning and adaptation in the marketing field. By disseminating knowledge, promoting best practices, and encouraging collaboration, this study can have a transformative influence on how businesses engage with diverse generational cohorts in the dynamic and competitive landscape of Chinese consumer markets.

Lastly, public awareness campaigns can emphasize the importance of understanding generational dynamics in marketing and promote responsible marketing practices. These comprehensive programs and outputs will ensure that the study's insights have a lasting impact, benefiting academia, the marketing industry, and society by contributing to informed decision-making, improved marketing strategies, and a deeper understanding of how generational dynamics shape consumer behavior in the Chinese market.

10. Conclusions

(1) While Baby Boomers tend to favor traditional marketing channels and value trust and reliability, Generation Z is highly receptive to digital innovations and places a premium on authenticity and peer validation. These generational differences underscore the need for businesses to adopt a multichannel marketing approach that caters to diverse preferences.

(2) Generation X, positioned between Baby Boomers and younger generations, appreciates concise and informative content and engages with social media for information. Millennials, on the other hand, prioritize experiences and authenticity. To effectively engage these generations, marketers may craft campaigns that balance information, engagement, and authenticity.

(3) Analyzed generational differences in marketing innovation adoption highlight the critical need for businesses to craft nuanced strategies that resonate with diverse consumer preferences and behaviors.

(4) Digital technologies, social media platforms, and e-commerce ecosystems have become integral to the daily lives of all generations. However, younger generations, such as Millennials and Generation Z, are more immersed in these digital spaces, while older generations, like Baby Boomers, are adapting gradually. This underscores the importance of businesses having a strong online presence while also maintaining traditional channels to cater to varying degrees of digital adoption.

(5) Digital technologies and social media have transformed the way generations interact with marketing innovations. Millennials and Generation Z actively seek personalized experiences, while older generations value familiar and trusted brands. This indicates that businesses must strike a balance between innovation and continuity in their marketing strategies to appeal to both the digitally savvy and the more traditional consumer segments.

(6) Cultural values and norms significantly influence generational responses to marketing innovations. For instance, collectivist cultures emphasize family and community, affecting the preferences of older generations like Baby Boomers. In contrast, individualistic cultures shape the inclinations of Millennials and Generation Z, who prioritize self-expression. Businesses must adapt their marketing campaigns to align with these cultural nuances.

(7) The highlighted strategic significance of understanding generational disparities in marketing innovation adoption underscores that this knowledge is not just a competitive advantage but a vital imperative for businesses seeking success in China's dynamic and fiercely competitive consumer market. Businesses that recognize the strategic importance of tailoring their marketing approaches to diverse generational segments are poised to create meaningful connections, maximize ROI, and navigate the evolving landscape effectively.

11. Recommendations

(1) Given the generational disparities in marketing preferences, businesses may adopt a multichannel marketing approach to cater to the diverse preferences of both Baby Boomers and Generation Z.

(2) Marketers may craft campaigns that strike a balance between concise information, engaging experiences, and authenticity to effectively engage Generation X, Millennials, and other generations.

(3) To succeed in the dynamic consumer landscape, businesses must craft nuanced marketing strategies that resonate with the diverse preferences and behaviors of different generational segments.

(4) Businesses may maintain a strong online presence while also embracing traditional channels to cater to varying degrees of digital adoption among different generations in China.

(5) Achieving marketing success requires businesses to find a balance between innovative digital approaches that appeal to Millennials and Generation Z and continuity in strategies that resonate with older generations valuing familiar and trusted brands.

(6) Businesses operating in culturally diverse markets like China may adapt their marketing campaigns to align with specific cultural values and norms that influence generational responses.

(7) Recognizing the strategic imperative of understanding generational disparities, businesses may tailor their marketing approaches to diverse generational segments to thrive in China's competitive consumer market, maximizing ROI and fostering meaningful connections.

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Research on the Spillover Effects of Digital Transformation on the Sustainable Growth of Green Schools

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Abstract: The development of society and the advancement of science and technology have led to the widespread integration of digital transformation in the field of education. However, the current establishment of green schools faces various challenges, including non-environmental building facilities, high renovation costs, low organizational management efficiency, high energy consumption, outdated office tools, and insufficient environmental awareness among teachers and students. Through thorough research and analysis, it becomes evident that digital technology can play a pivotal role in addressing these challenges and contribute to all aspects of green school establishment. The incorporation of digital thinking concepts is essential for the construction of ecologically civilized campuses and inclusive innovation. The process of digital design and transformation proves instrumental in optimizing both software and hardware facilities within the campus, thereby reducing energy consumption. Simultaneously, comprehensive digital teaching management enhances overall efficiency in management and service delivery. Innovative digital teaching and learning models emerge as transformative tools, providing new avenues to create low-carbon, green classrooms for both teachers and students. By exploring the application of digital transformation in establishing green schools and examining the resulting spillover effects, valuable insights can be gained. These insights, in turn, serve as reference points for building diversified digital technology paths on campus and fostering the creation of green schools.

Keywords: Digital transformation; Green schools; Spillover effect

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1. The research project's importance and the current status of related studies

1.1. Theoretical and practical significance

In recent years, numerous universities have proactively responded to the call of the "double carbon" policy, implementing strategies for energy conservation and emission reduction, and endeavoring to establish green

schools. The opportune establishment of green schools owes much to the flourishing digital technology.

The term "spillover effect," also known as "externalities" [1], is prevalent in both the economy and society. It denotes that when an organization engages in an activity, it produces expected effects that impact people or society beyond the organization. In essence, the development of one aspect drives the development of others. "Externalities" can be classified into two types: positive and negative. Those that benefit other aspects are positive externalities ("external economy"), while those causing losses are negative externalities ("external diseconomy"). This article concentrates on the positive externalities generated by green campus construction within the context of digital transformation.

With the initiation and progression of the "double first-class" construction strategy in Chinese higher education institutions, substantial reforms have unfolded in various facets of college teaching management and campus hardware facilities. Digital technology has permeated all dimensions of social development, revolutionizing higher education's development and reform. Education and teaching, teaching assistant management, and methods of facilities and equipment construction are all undergoing profound changes. Simultaneously, promoting personalized education, fair sharing of education, and lifelong learning has become integral to educational development in the new era.

As higher education institutions fulfill their role in teaching and educating, they concurrently shape ecologically civilized and green campuses, leveraging the benefits of digitalization to drive the modernization of education. This serves as a potent driving force and crucial support for China's progression toward becoming an "educational power." This topic delves into the deep integration of digital technology and education, presenting novel ideas and assumptions for the "double first-class" construction of schools.

1.2. Current status of related domestic and international studies

A review of relevant literature reveals that both domestic and foreign scholars have explored technology spillover effects and knowledge spillover effects, particularly in research on technology spillover effects for enterprises. They delved into the impact of spillover effects on corporate performance, analyzing technology spillover effects on macroeconomic growth and highlighting the role of shared prosperity [2]. Noteworthy studies include domestic scholars Bin Zhang *et al.*'s focus on the construction path of the "double first-class" higher education institutions through the digital transformation of education [3], Zhiyao Li and Mengsi Zhang's discussion on the digital transformation of university governance [4], Yuan Ouyang and Xu Fan's studies on universities' digital transformation from the background of applied undergraduates [5,6], and Chuan Fu's elaboration on the significance and role of digital transformation in higher education institutions regarding education [7].

2. The alignment of digital transformation with green school establishment

In recent years, the extensive integration of digital technologies, such as artificial intelligence (AI), the Internet of Things (IoT), big data, and cloud computing, has brought disruptive innovations to human life and production. Digital management has played a crucial role in enhancing enterprise quality, efficiency, energy conservation, and emissions reduction. The digitalization wave is transforming both the Internet and industrial sectors, yielding remarkable results. Higher education institutions, with their social functions of talent cultivation and continuing education, are committed to applied teaching and industry-university-research cooperation. Consequently, they are undergoing a digital transformation revolution that aligns with current trends, affecting both organizational culture and software and hardware facilities.

Digital transformation not only directly enhances educational economy activities, such as improving teaching and management efficiency, but also generates diverse spillover effects, such as contributing to the

creation of green schools. It is believed that now is an opportune moment to establish green schools with ecological civilization and sustainable development through digital thinking concepts, digital platform software, digital technology facilities and equipment, and digital shared resources. Therefore, this study focuses on investigating the spillover effects of digital transformation in universities on the creation of green schools, aiming to make academic contributions to related theoretical and practical fields.

The concept of "green schools" was initially introduced in the 1996 "National Environmental Publicity and Education Action Plan." It emphasizes the integration of environmental awareness and action into school management, education, teaching, and construction, guiding teachers and students to address environmental issues. Creating a "green school" inspires teachers, students, families, and communities, becoming a vital vehicle for implementing quality education and an effective method of environmental education in the current context. Scholars such as Yubao Chen and Xinmeng Wan, Cailing Li *et al*., and Xiaoqi Ouyang have contemplated and explored the path of green school construction [8-10].

The digital transformation strategy of higher education institutions aligns with the green school establishment concept, dedicated to improving quality and efficiency, energy conservation, and emission reduction. It serves as an essential "thinking transformation," "technological innovation," and "platform tool" for creating green schools. However, few scholars have investigated specific digital transformation scenarios in creating green schools within higher education institutions, and this study aims to fill that research gap. Starting from the spillover effect (positive externality) of the promotion and application of digital technology in higher education institutions on the establishment of green schools, digital technology can directly or indirectly contribute to the establishment of "green schools."

Therefore, this article's exploration of diversified digital technology paths offers reference ideas for creating green schools. Digital transformation has brought forth multiple positive spillover effects, including enhancing low-carbon awareness among teachers and students, cultivating diversified human capital, innovating industrial ecosystems, stimulating employment, and activating industrial growth. These positive economic externalities underscore the significant role of digital transformation in establishing green schools and provide new insights for achieving sustainable development and environmental responsibility [11].

3. The spillover effects of digital transformation on green school establishment

3.1. Foster low-carbon awareness and instill environmental responsibility

The integration of digital technologies into education, known as digital transformation, has given rise to the concept of green schools, which are educational institutions committed to ecologically conscious practices. Higher education institutions leverage digital technologies to enhance the learning experience, reduce resource consumption, and instill sustainable values among students. The widespread use of digital tools in teaching and management, such as online learning platforms, digital office software, virtual classrooms, and intelligent energy management systems, empowers green schools to optimize resource utilization, curtail carbon emissions, and nurture students' environmental awareness.

Beyond the immediate school environment, the broader environmental impacts and positive spillovers of digital transformation extend to ecological sustainability. Firstly, the application of digital technology in green schools encourages a transition to paperless learning and office work, safeguarding forest resources and mitigating paper waste, which is a significant factor contributing to deforestation and carbon emissions. Additionally, the adoption of intelligent energy management systems based on the IoT ensures automatic regulation of lighting, heating, and cooling based on occupancy patterns. This not only reduces energy consumption but also sets an energy-saving example for the wider community. Therefore, the energy-saving

practices of green schools not only cultivate environmental responsibility but also promote the judicious use of resources, transforming teachers and students into long-term practitioners of low-carbon living.

3.2. Promote talent cultivation and enhance human capital

The digital transformation of higher education institutions has yielded significant positive economic externalities by enhancing human capital in the establishment of green schools. Through digital technology, green schools can create a more flexible learning environment, encouraging students to engage in in-depth learning and independent exploration while experiencing the engaging teaching brought about by digital technology. Digital resources, such as personalized learning plans, virtual laboratories, and online collaboration tools, not only provide students with diverse learning paths but also cultivate their abilities in information acquisition, analysis, and application. This training helps students better adapt to changing workplace demands, thereby improving the overall quality of the labor market. In addition, digital education transcends traditional constraints of time and space, enabling students to cross national borders and access global knowledge and culture, further advancing the globalization of human capital.

3.3. Promote an innovation ecosystem and enhance educational development feedback

Digital transformation has ignited a vibrant innovation ecosystem, representing another spillover effect of establishing green schools. The establishment of digital green schools has fueled growth in the education technology industry, spanning various fields such as software and hardware development, AI, and educational data analysis [12]. This innovative ecology not only offers schools advanced technical support but also generates fresh business opportunities for entrepreneurs. For instance, the empowerment of data technology has led to the continuous emergence of innovative educational applications and intelligent learning tools, propelling ongoing innovation in digital educational content and platforms. Additionally, digital transformation has accelerated progress in educational research, including the application of educational data analysis and the advancement of educational psychology, further fostering innovation and progress in education.

3.4. Stimulate employment and activate multifaceted industrial growth effects

The emergence of digital green schools has triggered various effects on employment and industrial growth at the economic level, constituting a crucial component of positive externalities in the economy. With the widespread adoption of digital education, educational technology companies have become pivotal partners for green schools. This collaboration is alleviating pressure on the job market by creating new employment opportunities for diverse professions, including architectural designers, software engineers, education experts, content creators, and more. Simultaneously, the successful business model of green schools provides reference experiences for other educational institutions, stimulating the overall development of the education industry. This healthy cycle of competition and cooperation fosters diversified and innovative growth in the education sector, thereby strengthening the spillover effect of creating digital green schools.

4. Difficulties in establishing green schools and their root causes

4.1. Non-environmental friendly infrastructure and funding constraints

Establishing green schools necessitates investment in environmentally friendly building designs, energy-efficient equipment, and sustainable water treatment systems. Many schools' existing structures and infrastructure fall short of environmental standards, exhibiting low energy efficiency, thereby impeding efforts towards energy conservation and environmental protection. However, the adoption of these environmental

measures often comes with substantial costs, exerting significant pressure on school finances. Moreover, large-scale infrastructure improvements may demand substantial modifications to existing campuses, disrupting regular school operations and compounding the challenges. Consequently, the complex issues of construction conditions, funding availability, and technical support for updating and transforming the original infrastructure present formidable obstacles.

4.2. Inefficiencies in school organization and management and resource management shortfalls

In the pursuit of green schools, the prevailing teaching management model can give rise to various issues, particularly concerning resource waste and environmental awareness. Concerns over paper resources and consumable wastage are particularly noteworthy. Traditional teaching models heavily rely on paper resources, such as textbooks and exercise books, contributing to resource depletion and exacerbating environmental problems such as deforestation. Additionally, the use of disposable consumables such as plastic stationery and packaging materials contributes to environmental pollution.

During visits and surveys, three “soft power” deficiencies in fostering a green organizational atmosphere were identified in universities compared to advanced enterprises. Firstly, there is a technological and tools gap: some faculty members may lag in adopting updated office software and technical tools, leading to low management efficiency and hindering digital transformation and green office initiatives. Secondly, there are multiple and complex organizational processes: The layered approval processes within schools may impede decision-making speed and innovation, hindering the swift advancement of environmental advocacy and green development. Lastly, there is a deficiency in resource management: the absence of a modern resource management system may result in the inefficient use of energy, water resources, etc., limiting the implementation of sustainable development and resource conservation.

4.3. Inadequate environmental awareness and low-carbon lifestyle concepts among teachers and students

This deficiency may be linked to certain limitations of the traditional education model. Traditional education tends to prioritize the impartation of knowledge and the development of subject-specific skills, often neglecting the comprehensive cultivation of students’ environmental awareness and sustainable lifestyles. Consequently, students may lack a profound understanding of low-carbon, environmentally friendly values, and struggle to integrate these values into their daily lives as they grow up. Another factor contributing to this shortfall is potential shortcomings in the education system’s teacher training. Without a thorough understanding of the importance of low-carbon and environmental awareness and behavior, teachers may find it challenging to effectively convey these values during the teaching process. Thus, it is imperative to train teachers, providing them with adequate environmental protection knowledge and advocacy skills as a prerequisite for nurturing students’ relevant awareness and behaviors.

5. Research on digital technology paths for green school establishment

5.1. Application of digital design and transformation to optimize green campus software and hardware facilities

Efficient utilization of existing campus structures and cost-saving measures are imperative in the establishment of green schools. Exploring lightweight facility renovation and optimization, coupled with resource recycling strategies through diversified digital technologies, is essential.

Firstly, digital modeling facilitates the transformation or construction of campus buildings and facilities. Designers conceptualize, analyze, and optimize architectural designs in a virtual environment. For instance, they simulate the effects of various energy efficiency measures, such as wall insulation materials or solar photovoltaic panels on teaching building roofs. By comparing the energy efficiency performance of different solutions, designers can select the most economical option.

Secondly, energy management systems monitor energy consumption in school buildings, ensuring efficient energy utilization. Digital technology integrates building equipment with energy management systems, enabling real-time data collection and analysis. The system identifies peak energy consumption hours and areas of waste, adjusting equipment operating modes automatically to curtail energy consumption.

Thirdly, intelligent monitoring technology, using sensors and data analysis, provides real-time monitoring of parameters such as temperature, humidity, and lighting within buildings. This data helps administrators detect abnormalities promptly, adjust equipment status, and predict equipment failures in advance, reducing maintenance costs.

5.2. Comprehensive digital teaching management for cost-effective and efficient green campuses

Digital transformation facilitates collaborative office work, reduces operating costs, elevates management service levels, and enhances the soft power of green school establishment. Diverse digital technologies enable teachers and students to transition to cloud services, visualizing and tracing work processes. Various departmental data platforms foster data sharing through “appointment and supervision” channels. School-enterprise collaboration creates digital platforms for personalized campus services, emphasizing a people-oriented, high-quality development concept.

Several universities have spearheaded digital reforms with impressive outcomes. For instance, Zhejiang University’s “Zhejiang University Ding” offers multi-module functions for paperless learning and campus office life. The Zhejiang Technical Institute of Economics has introduced a “one-step completion” function, streamlining all major and minor tasks for teachers and students, significantly enhancing campus management efficiency and overall satisfaction. In another example, students at Zhejiang Gongshang University utilized Real Intelligence Company’s RPA software platform to develop software robot automation processes suitable for campus management and industrial applications.

Simultaneously, the establishment of green schools necessitates a reevaluation of curriculum design and resource management approaches. Digital technology can promote electronic textbooks, online learning platforms, and other measures to reduce paper resource usage. Schools can implement resource conservation policies, encouraging the use of sustainable materials and reducing disposable consumables. Management can establish a resource usage monitoring mechanism, regularly evaluating and optimizing resource usage to minimize waste.

5.3. Innovating digital teaching and learning models for low-carbon green classrooms

The creation of low-carbon green classrooms for teachers and students stands as a prominent trend in educational development. The application of digital technology innovates the digital teaching and learning model, providing a more efficient and convenient learning method for teachers and students, effectively enhancing teaching outcomes, and saving teaching costs. Digital teaching technology is predominantly employed in the following aspects.

5.3.1. Establishing a digital teaching platform for hybrid teaching

Leveraging digital technology supports functions such as sharing classroom content, integrating teaching resources, and collaborating on teaching activities. This provides teachers and students with richer and more diverse learning resources and experiences. The Internet facilitates the sharing of low-cost global educational resources, allowing students to remotely participate in open courses from renowned universities worldwide through video conferencing, broadening their horizons. Simultaneously, online learning platforms enable students to study anytime and anywhere, breaking free from the constraints of time and location.

5.3.2. Developing virtual laboratories and educational games

Virtual laboratories, a vital application of digital technology in education, offer a cost-effective and flexible alternative to physical laboratories. By simulating experimental scenarios, students can experience a safer and more convenient experimental environment, fostering the improvement of their experimental and innovative abilities. Encouraging teachers to design and develop educational games using digital technology introduces gamification elements into the teaching process, enhancing student interest and enthusiasm, and consequently, improving learning outcomes.

5.3.3. Cloud-based learning data and progress tracking

Digital technology contributes to intelligent management, elevating the quality of education and teaching. The student information management system allows tracking and evaluating students' learning status, enabling prompt identification and resolution of issues. Furthermore, it advocates for transcending the confines of purely subject-based cramming education. The construction of digital green schools emphasizes curriculum design that integrates content related to environmental protection. This approach ensures students comprehend the limitations of ecosystems, resources, and personal impact. The lifelong benefit education concept of a low-carbon lifestyle and environmentally friendly behavior habits is integrated into all-encompassing educational aspects such as "labor education," "cultural education," and "ideological and political education." This effort strives to enrich the connotation and scope of green school construction [13].

6. Conclusion

While the creation of green schools encounters challenges, achieving campus ecological civilization is possible through multidimensional digital technology paths. This study reveals that digital transformation and green campus construction are not just individual pursuits; they complement each other. Digitalization significantly aids in establishing and constructing green schools, while ecologically civilized campus construction amplifies the impact of digital reform.

The integration of green schools within the context of digital transformation yields positive externalities across various economic facets. This includes the establishment of low-carbon lifestyles and long-term environmental protection concepts for teachers and students, the promotion of talent training and enhancement of human capital, the innovation of the educational technology ecological industry chain, and the stimulation of employment and activation of multiple spillover effects such as industrial growth. These positive economic externalities underscore the pivotal role of digital transformation in the creation of green schools and offer fresh insights for achieving sustainable development and environmental responsibility.

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Impact of Energy Efficiency and Financial Support on Green Upgrading in China's Industrial Sector

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Abstract: The report from the 20th National Congress of China emphasizes the importance of focusing on the clean, low-carbon, and efficient use of energy, increasing financial support, and promoting green upgrading within the industrial sector. This paper, based on annual data, employs the entropy weight method to construct a comprehensive index reflecting the impact of green upgrading in industrial sectors. To delve deeper, it utilizes the DEA model to measure energy efficiency and its subdivision BCC model to break down energy efficiency into technical and scale efficiency. The financial support landscape is examined from the vantage points of both direct and indirect financing. Using a multivariate time series model, this paper thoroughly investigates the influence of energy efficiency and financial support on the green upgrading of the industrial sector. The findings reveal a significant positive impact of both energy efficiency and financial support on green upgrading in industrial industries. Notably, scale efficiency emerges as the primary driver of energy efficiency. Moreover, indirect financing proves to be more effective in promoting financial support than direct financing. The empirical results retain their robustness even after substituting explanatory variables. The study concludes by contextualizing the research findings within the current real-world scenario, offering practical insights, and proposing specific recommendations.

Keywords: Energy efficiency; Financial support; Industrial green upgrading; DEA-BCC model

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1. Introduction

China has actively engaged in global climate change governance. experiencing remarkable growth over the past few decades. However, this success has presented certain challenges. Due to the current stage of development, China's industrial production has predominantly relied on a resource-intensive and high-pollution growth model, leading to relatively low industrial efficiency and severe environmental pollution. With growing attention from both the government and society on environmental issues in recent years, addressing pollution and accomplishing a green transformation and upgrade of the industrial sector has become imperative.

The economic essence of industrial green upgrading can be defined as a high-level overhaul of the industrial structure, involving a continual rise in the proportion of industries producing high-value-added products and a general increase in value-added products across various industrial sectors. Existing research

indicates that the green upgrading of industrial industries can effectively reduce industrial energy consumption, diminish industrial pollution, and contribute to the attainment of carbon peaking and carbon neutrality.

In the ongoing efforts to promote and develop the green transformation and upgrading of industrial industries, the significance of energy efficiency and financial support has become increasingly prominent. Clarifying these aspects is crucial for achieving the green transformation of industrial industries.

2. Review of domestic and international research

Presently, there exists a significant body of research on the green upgrading of industries, predominantly focusing on two main aspects: the theory of industrial green upgrading and the impact of energy efficiency and financial support on industrial green upgrading.

Drawing on scholarly work, Chuanwang Sun and Wenyue Zhang developed a twelve-indicator system for industrial green upgrading, encompassing three dimensions: technological innovation, structural upgrading, and energy saving and emission reduction [1]. They measured the comprehensive index of industrial green upgrading effect, offering a more comprehensive depiction of the distribution dynamics in the evolution of industrial green upgrading levels and the overall status of regional industrial green transformation nationwide [1]. Zongbing Deng *et al*. established a five-dimensional industrial green development level index system that includes green total, green innovation, green efficiency, green security, and green governance [2].

Regarding the impact of energy efficiency and financial support on the green upgrading of industries, some scholars' research suggests that energy efficiency exerts a positive influence on industrial green upgrading [3,4]. Liang-Jun Wang *et al*. argued that industrial energy efficiency is pivotal for achieving energy transformation, carbon emission reduction, and promoting industrial green transformation [5]. Karasek *et al*. employed data envelopment analysis (DEA) to evaluate energy efficiency in European Union (EU) countries from a dynamic perspective [6].

In summary, the combination of energy efficiency and financial support to explore the operational mechanism of achieving green upgrading in industrial sectors from two perspectives holds both theoretical and practical significance.

3. Research design

3.1. Variable selection

In the realm of energy efficiency indicators, careful consideration is given to the pivotal variable of financial support. Input variables encompass energy consumption and labor, while industrial GDP stands as the output variable. China's energy efficiency is gauged through DEAP2.1. The financial support dimension encompasses credit and securities, with Nanan Cao *et al*. opting to measure financial support through loan size and [7], drawing inspiration from Nan Li [8], in terms of stock market capitalization. Green upgrade indicators, derived from Sun and Zhang [1], describe the effect of industrial green upgrading, extending to two indicators: innovation input and innovation output. The data undergo standardization using the dimensionless method, and weights are assigned to the indicators through the entropy weighting method to measure the comprehensive index of the green upgrading effect. In alignment with existing research, this paper introduces a set of control variables into the benchmark model to mitigate any potential omitted variable bias.

3.2. Econometric model construction

Utilizing macroeconomic data collected from 2005 to 2020 in China, a multivariate time series is chosen to

unravel the effects of energy efficiency and financial support on the green upgrading of industrial industries. The regression model is set as follows:

In this equation, *IGTE* represents the industrial green upgrade effect, *Efficiency* signifies energy efficiency, *LS* denotes loan size, *SV* stands for stock market value, *X* encompasses a set of control variables, including industry size, environmental regulation, and the degree of openness to the outside world, and $\varepsilon_{(t)}$ is the random disturbance term.

Interpreting the equation, the subscripts signify the time dimension. Coefficients measure the effects of energy efficiency and financial support on industrial green upgrading. A significantly positive coefficient for energy efficiency implies that it enhances the effect of industrial green upgrading. Meanwhile, a positive coefficient for financial support, considering loan size and stock market value, suggests that financial support contributes to the conclusion of industrial green upgrading. The adoption of the logarithmic form aids in addressing the non-stationarity of time series data and mitigates heteroskedasticity. Additionally, it provides economic insights into the elasticity of estimated parameters, enhancing the model's interpretability.

4. Empirical results and analysis

4.1. Benchmark model regression analysis

To ensure the availability and relevance of sample data, this paper conducts empirical analysis using national macroeconomic data from 2005 to 2020. In the model selection process, two types of models were employed: Model I, which excludes control variables, and Model II, which comprehensively incorporates the impact of each control variable on the dependent variable. The empirical results, generated by StataMP17, are summarized and organized in **Table 1**.

Table 1. Empirical test results on the factors influencing industrial green upgrading

Variables	Model I	Model II
ln *Efficiency*	2.2859*** (0.20)	2.3673*** (0.23)
ln *LS*	0.6828*** (0.15)	0.6392** (0.16)
ln *SV*	0.0489* (0.03)	0.0681** (0.03)
Scale		-5.93e-07* (3.03e-07)
Open		-0.1352 (0.26)
Regulation		-0.1058 (15.01)
Constant	-2.7136*** (0.06)	-2.4680*** (0.15)
R^2	0.9920	0.9946
F Statistic	496.74	277.83
Observed values	16	16
D.W. values	1.1974	1.4111

Note: The standard errors in parentheses are represented by *, **, and ***, respectively, which represent significant values at the 10%, 5%, and 1% levels.

Upon comparing and analyzing the regression results of the two models presented in **Table 1**, it becomes evident that the positive effect of loan scale on industrial green upgrading surpasses that of stock market value on the same. This indicates that the influence of indirect financing support from financial institutions, such as

banks, in the industrial sector is more substantial than that of direct financing support from the capital market. The estimation results shed light on the challenges and limitations faced by the industrial sector in securing financial support through direct financing methods such as issuing stocks to promote enterprise development, as opposed to the relatively more accessible channels of indirect financing, such as loans from financial institutions.

4.2. Residual sequence autocorrelation test

An autocorrelation test was executed on the residuals derived from the regression results of Model II, as detailed in **Table 2**. The first 12-order autocorrelation coefficients were found to be significantly 0 at the 5% level. This suggests an absence of autocorrelation in the sequence, affirming that the model did not overlook key variables and aligns with the stipulated model requirements.

Table 2. Residual autocorrelation data

Order Number	AC	PAC	Q-Stat	Prob
1	0.252	0.252	1.2161	0.270
2	0.172	0.116	1.8262	0.401
3	-0.275	-0.371	3.5028	0.320
4	-0.070	0.078	3.6216	0.460
5	-0.155	-0.045	4.2488	0.514
6	-0.065	-0.148	4.3695	0.627
7	-0.343	-0.334	8.1289	0.321
8	-0.266	-0.185	10.679	0.221
9	-0.203	-0.057	12.380	0.193
10	0.068	-0.048	12.602	0.247
11	0.191	0.051	14.707	0.196
12	0.101	-0.169	15.444	0.218

To bolster the reliability of the regression results, a robustness test is employed using the variable replacement method. In this instance, the explanatory variable indicator system undergoes a substitution wherein the number of industrial sector patents is replaced with the number of industrial sector patent applications. Additionally, the number of per capita industry patents is substituted with the number of per capita industry patent applications for innovation output. Similarly, the entropy weight method is applied to assign values to the innovation input, and the green upgrading effect index of the industrial sector is recalculated.

Upon reviewing the organized results, it becomes apparent that this modification supports the conclusion that energy efficiency and financial support exert a positive impact on the green upgrading of the industrial sector. This further reinforces the robustness and validity of the research findings.

5. Conclusions

Drawing on theoretical research, this paper constructs a multiple time series model and conducts empirical analysis on the impact of energy efficiency and financial support on the green upgrading of industrial sectors. The following conclusions emerge:

(1) Energy efficiency impact:
- The enhancement of energy efficiency exhibits a significantly positive effect on the green upgrading of the industrial sector.
- This underscores the substantial promoting influence of energy efficiency on the green upgrading of the industrial sector.
- The driving factors behind this positive impact include effective energy conservation, alleviating challenges posed by energy depletion, and ensuring normal daily production operations within the industrial sphere.
- The process of improving energy efficiency often intertwines with technological innovation, resulting in reduced pollution emissions, improved pollution treatment, and a shift towards green production, ultimately fostering the overall green upgrading of the industrial sector.

(2) Loan scale impact:
- The scale of loans demonstrates a positive effect on the green upgrading of the industrial sector.
- Indirect financing through loans plays a pivotal role in promoting the green upgrading of the industrial sector.
- Possible explanations include commercial banks' rigorous control over fund flows, active implementation of green credit-related policies, and effective allocation of funds to support industrial green upgrading.
- Post-loan supervision and management by commercial banks ensure that funds are utilized to promote green upgrading.
- In response to national and governmental calls, commercial banks actively promote the development and utilization of new energy projects, contributing to novel approaches for industrial green upgrading.

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Disclosure statement

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Analysis of the Development Environment and Trend of Cross-Border E-commerce in China

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Abstract: With the conclusion of the novel coronavirus pandemic and the increasingly complex market environment, China's cross-border e-commerce has entered a new phase of development. The external landscape is evolving rapidly, and there is a gradual improvement in laws and regulations governing cross-border e-commerce, coupled with increased government support. Despite the impact of the COVID-19 pandemic on the market economy, overall development has been steadily improving. The Internet population is expanding, the online retail market is experiencing rapid growth, the consumption structure is undergoing transformation and upgrading, and the e-commerce market is demonstrating significant potential. The advancement of technologies such as big data, artificial intelligence, blockchain, and supply chain has provided more efficient operational support for the cross-border e-commerce industry. Against the backdrop of the emergence of new forms of cross-border e-commerce in China post-pandemic, this paper utilizes the PEST model to analyze the macro environment of cross-border e-commerce in China and project its future development trends.

Keywords: Cross-border e-commerce; Environmental analysis; Development trend

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1. Introduction

The cross-border e-commerce market is undergoing rapid transformations, with the industry's development being significantly influenced by various factors, including the recent pandemic. These changes have presented both opportunities and challenges for the cross-border e-commerce sector. This paper employs the PEST model to conduct a comprehensive analysis of cross-border e-commerce, focusing on four key dimensions: policy, economy, society, and technology. The goal is to scrutinize the developmental trajectory of cross-border e-commerce in China. The underlying premise of this paper is that enterprises must thoroughly comprehend the macro environment and discern future development trends to attain high-quality growth.

2. Analysis of cross-border e-commerce development environment

2.1. Policy environment

In recent years, China's cross-border e-commerce has experienced robust growth, supported by a continuous improvement in laws and regulations alongside increased government backing. Commencing in 2020, China initiated an extensive expansion of the pilot scope for cross-border e-commerce comprehensive pilot zones and bolstered assistance for small and medium-sized enterprises, particularly during the challenging times of the pandemic. Presently, cross-border e-commerce stands as a crucial catalyst for promoting the transformation and advancement of foreign trade, solidifying the external cycle and garnering support from multiple policies.

Reviewing **Table 1** for pertinent policies in China's cross-border e-commerce, these encompass reforms in import and export procedures, overseas warehousing, and logistics, all of which have played pivotal roles in propelling the industry's growth.

Table 1. Support policies related to China's cross-border e-commerce

Time	Department	Policy	Main contents
2023.4	General Office of the State Council	Opinions on Promoting Steady Scale and Excellent Structure of Foreign Trade	Strengthen trade promotion and expand markets Stabilize and expand the import and export of key products Increase fiscal and financial support Improve the environment for foreign trade development
2022.12	The State Council	The 14th Five-Year Plan for the Modern Logistics Development	International logistics network continues to extend Overseas warehouse and landing distribution of enterprises are accelerating the layout Overseas logistics service capacity is steadily improving Build international and domestic logistics channels
2022.9	The State Council	Opinions on Further Optimizing the Business Environment and Reducing Institutional Transaction Costs of Market Entities	Explore solutions to cross-border e-commerce returns and exchanges.
2022.1	The State Council	The 14th Five-Year Plan for the Construction of a Modern Circulation System	Develop new forms of foreign trade Promote diversified development of trade Encourage cross-border e-commerce platforms to improve their functions Guide enterprises to optimize the layout of overseas warehouses
2021.7	General Office of the State Council	Opinions on Accelerating the Development of New Forms and Models of Foreign Trade	Improve policies to support cross-border e-commerce Expand the scope of pilot comprehensive pilot zones for cross-border e-commerce

China has diligently aligned its regulatory policies on cross-border data flows with international digital norms. In 2021, China announced its accession to the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and the Digital Economy Partnership Agreement (DEPA), aimed at fortifying global digital economic and trade cooperation and facilitating seamless cross-border data flows. In January 2023, China unveiled the White Paper on Global Digital Governance, outlining its proposal to build a global security consensus and share the dividends of digital economy development [1].

2.2. Economic environment

The economic environment encompasses state economic policies, the national economic development status, production mode, industrial structure, and relevant infrastructure. In 2022, China pursued seven key economic policies, collectively aimed at "driving forward," ensuring "stability," enforcing "standardization," promoting "smooth" operations, fostering "new" initiatives, encouraging "vitality," prioritizing "cooperation," and ensuring "protection." These policies were instrumental in actively responding to and mitigating the challenges faced by the Chinese economy amidst greater downward pressure under the pandemic [2].

The national economy exhibited consistent growth, with per capita income on the rise. According to data from the National Bureau of Statistics, the gross domestic product (GDP) for 2022 reached 12,1020.7 billion yuan, reflecting a 3.0% year-on-year increase. Gross national income saw a 2.8% year-on-year increase, reaching 11,97215 billion yuan, while the per capita disposable income of Chinese residents reached 36,883 yuan, a 5.0% year-on-year increase. This growth in GDP was accompanied by steady development across various industries, an increase in residents' employment rates, and a rise in per capita income levels [3].

In recent years, amid shifts in the global political and economic landscape and the accelerated development of digital technology, the significance of the digital economy has become increasingly pronounced. The "China Digital Economy Development Report (2023)" anticipates continued improvement in China's digital economy. By 2022, the scale of China's digital economy is projected to reach 50.2 trillion yuan, constituting 41.5% of the GDP. The digital economy is set to play a more stable and supportive role in the overall national economy.

Simultaneously, the scale of e-commerce transactions in China is on an upward trajectory, securing the top spot in the global online retail market. According to the "China Cross-Border E-commerce Market Data Report 2023 (Part 1)," the first half of 2023 witnessed a 15.49% year-on-year increase, with the cross-border e-commerce market reaching 8.2 trillion yuan. With the evolving consumption patterns in China and an expanding user base, the cross-border e-commerce sector is attracting more talents and practitioners. The domestic online retail market is also steadily growing, facilitating increased participation in "global buying and selling" by enterprises and users [4].

As the online retail market continues to expand, efforts to enhance user stickiness and meet diverse user needs have prompted continuous improvements in the global e-commerce infrastructure of the retail industry. Various business formats, spanning from online to offline, are evolving to cater comprehensively to user demands.

2.3. Social environment

As the online retail market continues its expansion and the mobile Internet deeply permeates society, the Internet industry witnesses a vast user base, with the number of online shopping users steadily growing. By June 2023, China's Internet user count had soared to 1.079 billion, marking an 11.09 million increase from December 2022, with an Internet penetration rate of 76.4%. In the realm of mobile network development, as of June 2023, China boasted 11.29 million total mobile phone base stations, including 2.937 million 5G base stations, constituting 26% of the overall base station count. The cumulative mobile Internet traffic reached 142.3 billion GB, reflecting a 14.6% year-on-year increase, while the landscape of mobile Internet applications flourished.

Analyzing the structure of online shopping users reveals that the 80–90 generation netizens exhibit a high online shopping use rate of 93%, and the consumption ratio among the 95 generation stands at 41.9%, surpassing other age groups and emerging as the cohort with the highest consumption potential.

Education levels per capita have steadily risen, alongside improvements in social and cultural standards, accelerated urbanization, a faster pace of life, and evolving consumption concepts. The pursuit of diversified, convenient, and efficient consumption patterns underscores a transformation and upgrading of the consumption structure. Higher education is on a steady trajectory, with a total of 529,300 colleges and universities of various types in China. The average length of schooling for the working-age population has reached 10.9 years, contributing to an improved per capita literacy level [5].

In the first three quarters of 2023, due to the implementation of policies promoting consumption, the market's vitality significantly increased. New forms and hotspots of consumption emerged, indicating a stable

recovery of the consumer market. Sales performance remained robust, witnessing significant increases in both basic living goods and upgraded goods. Online consumption growth outpaced others, and the demand for service consumption continued to rise.

During the COVID-19 pandemic, the offline retail industry faced challenges due to lockdown measures in high-risk areas, whereas the online retail sector seized better development opportunities. The "micro shopping + live streaming/mini program" social shopping model spurred the rapid growth of community commerce during the pandemic. Post-pandemic, in the first three quarters of 2023, online retail sales of physical goods increased by 8.9% year-on-year, constituting 26.4% of total retail sales of social consumer goods (a 0.7% points increase from the same period last year). Notably, sales of food, clothing, and durable goods increased by 10.4%, 9.6%, and 8.5%, respectively. In the closely related postal express delivery industry, business volume and income increased by about 16.4% and 11% year-on-year, respectively (**Figure 1**).

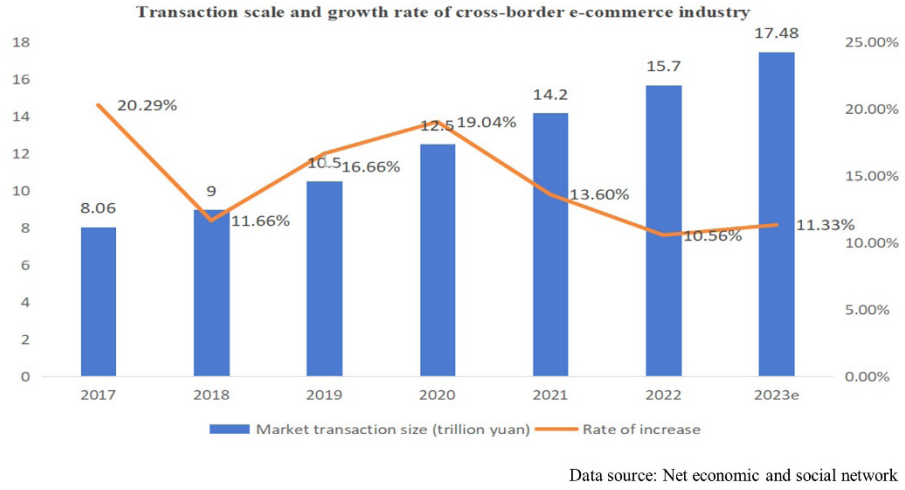


Figure 1. Transaction scale and growth rate of the cross-border e-commerce industry

2.4. Technical environment

Cross-border e-commerce involves the intricate interplay of logistics, capital, and information flows [6]. Numerous enterprises in this domain grapple with challenges such as data analysis, precision marketing, logistics operations, after-sales service, and currency exchange. Thanks to the ongoing advancements in big data technology, artificial intelligence (AI), blockchain technology, and supply chain finance models, there has been significant progress in enhancing product selection efficiency, ensuring product quality, and improving users' overall cross-border payment and after-sales service experience.

(1) Big data technology: By linking and analyzing user search records, browsing history, purchase behavior, and comments, cross-border e-commerce enterprises leverage big data technology to identify target consumer groups and predict customer preferences [7]. The robust data storage, mining, and analysis capabilities of big data enable the capture and utilization of massive user data, creating clear user-profiles and three-dimensional consumer labels for targeted marketing and promotion.

(2) Artificial intelligence: Generative AI analyzes extensive user data and preferences to provide intelligent product recommendations and selection suggestions for enterprises. It also matches more personalized marketing and promotion strategies with user profiles. In sales and after-sales interactions, AI serves as intelligent customer service, enhancing user satisfaction, improving overall

enterprise efficiency, and reducing operational costs.

(3) Blockchain technology: Grounded in a consensus mechanism and utilizing mathematical principles, blockchain ensures the authenticity of linked data through a distributed ledger and joint maintenance by all participants. Each transaction includes a time stamp [8], rendering it tamper-proof and traceable. This characteristic effectively strengthens quality assurance for cross-border e-commerce products and builds trust in cross-border payments.

(4) Supply chain finance: By transforming the uncontrollable risks faced by individual enterprises into manageable risks across the entire supply chain, supply chain finance enables the effective integration of resources. Cross-border e-commerce enterprises leverage supply chain finance to access faster and less risky financing channels, minimizing risks in the process.

3. Analysis of development status and challenges

3.1. Development status

3.1.1. Expanding cross-border e-commerce market with slowing growth rate

The global impact of the COVID-19 pandemic has heightened the downward pressure on world trade. However, China's cross-border e-commerce market has continued to expand, supported by the national "Belt and Road" strategy and the development of innovative cross-border e-commerce formats. In 2022, the transaction scale of China's cross-border e-commerce market reached 15.7 trillion yuan, indicating a 10.56% increase from the previous year. Projections for 2023 estimate a further growth to 17.48 trillion yuan, reflecting an 11.33% increase. While the market continues to expand, the growth rate has noticeably decelerated.

3.1.2. Multilateralization of operation models to cater to diverse preferences

In the evolution of cross-border e-commerce transactions, the management of information flow, commodity flow, logistics, and capital flow has shifted from traditional bilateral structures to multilateralization [9]. China's domestic cross-border e-commerce has traversed three pivotal stages. Initially, it relied on large platforms like Amazon for transactions. The second stage involved building websites using the Software as a Service (SaaS) model. Presently, the trend is towards the "independent station" model, employing a Direct-to-Consumer (DTC) approach to reach overseas consumers. With stringent policies on many e-commerce platforms, independent stations have gained favor among sellers for their flexibility, detailed operation, and increased authority. This model allows sellers to collect firsthand consumer data, adapting to personalized needs. As of 2023, China has seen over 100,000 cross-border e-commerce entities, with more than 200,000 independent stations, and projections suggest the market to reach 557.9 billion US dollars by 2025.

3.1.3. Upgraded consumer demands with a focus on product brands

In response to changing consumer demands, the protection of genuine products tops the priority for 60.10% of cross-border e-commerce user platforms, followed by considerations of after-sales service quality and price. Notably, only a third of users prioritize price factors (**Figure 2**). Chinese cross-border e-commerce users exhibit an evolving consumer demand landscape, shifting away from a price-sensitive focus. When selecting products on imported cross-border e-commerce platforms, 60.7% of users consider the factor of "product brand," with over 50% also emphasizing "product quality parameters" and "product price" (**Figure 3**). This indicates a growing emphasis on brand factors and cost-performance considerations among Chinese import cross-border e-commerce users.

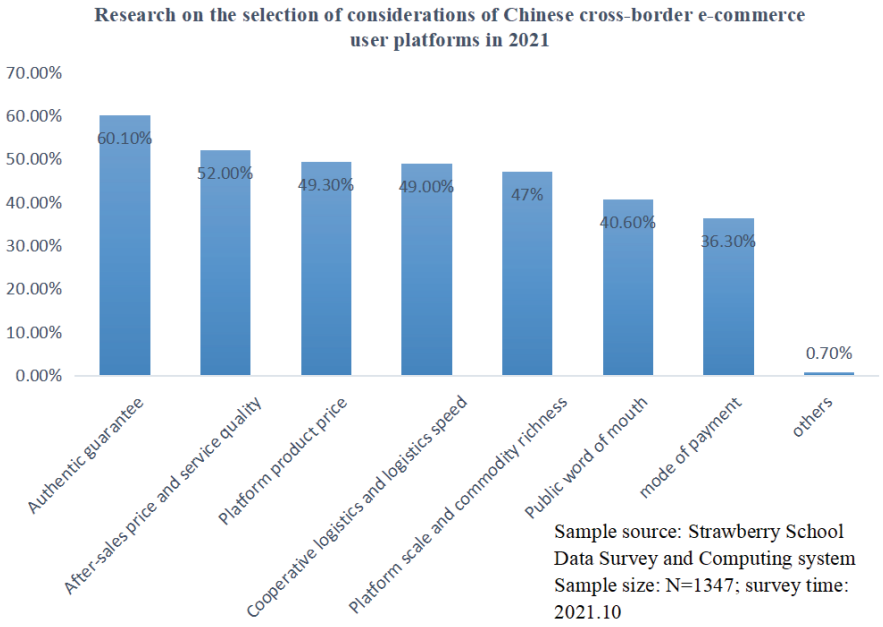


Figure 2. Research on the selection of considerations of Chinese cross-border e-commerce user platforms in 2021

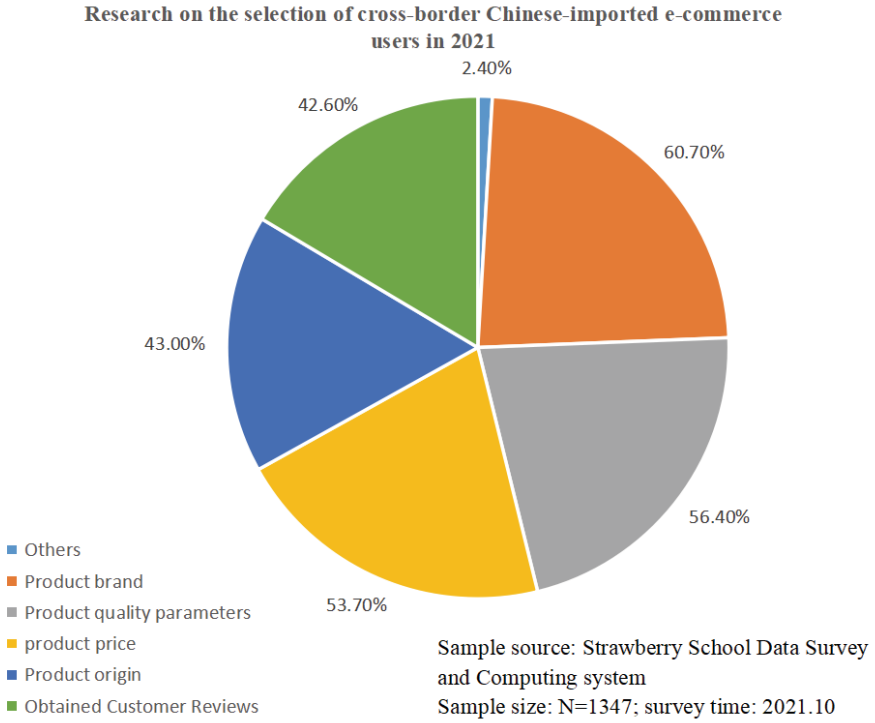


Figure 3. Research on the selection of cross-border Chinese-imported e-commerce users in 2021

3.2. Problem analysis

Upon scrutinizing the aforementioned status quo, it becomes evident that China's cross-border e-commerce still grapples with certain issues impeding the industry's further development. In recent years, several factors have contributed to a significant slowdown in the growth rate of China's cross-border e-commerce. The growth appears somewhat feeble. Moreover, there is a noticeable influx of small and medium-sized enterprises entering the cross-border e-commerce arena. This surge has led to the diversification of commodities, varied presentation

formats, heightened differentiation strategies by enterprises, and escalating demands for personalized services. Consequently, the industry is experiencing intensified competition.

4. Development trend of cross-border e-commerce

4.1. Branding

Amidst shifts in the overseas consumption landscape, unbranded low-quality products are losing favor among consumers. The traditional spread arbitrage model may struggle to sustain a long-term virtuous circle in development. Consequently, the establishment of independent brands has become a key driver for cross-border e-commerce. From 2020 to 2022, the impact of the COVID-19 pandemic led to a shrinkage in users' consumption radius, emphasizing experience-driven and personalized shopping services. Now, with the pandemic behind us and daily life returning to normal, enterprises are no longer constrained in offline marketing activities. In response to this market shift, the previous mode of buying low, selling high, and surviving by volume or squeezing supplier loans is no longer aligned with current market demands. Enterprises must focus on enhancing brand awareness, building their own brands, and integrating online and offline development to offer offline service quality online and establish long-term customer relationships.

4.2. Decentralization

In the dynamic era of the digital economy, traditional centralized e-commerce models are losing momentum. The rise of decentralized new e-commerce aligns with the trends of the social digital economy, shaping a new economic model for e-commerce. Technological progress and economic development have spurred a consumer shift towards higher quality of life and ultimate cost performance. Private e-commerce platforms that emphasize quality domestic goods and services are gaining favor among users. For instance, SHEIN, in contrast to platforms like Amazon, Wish, and eBay, employs an independent station model, focusing on content marketing, private traffic, and users to establish itself as a brand seller. The upgrading of the Internet has also driven the growth of live broadcast and graphic e-commerce, providing users with detailed and comprehensive product information. This immersive, impulsive, isolated, and individually evaluated consumption scenario can better induce consumer spending. Traditional e-commerce platform marketing is evolving, with more merchants adopting social media and influencer marketing to enhance brand influence and overall traffic transformation. Social media marketing, including live broadcasts and short videos, is proving more popular with users, yielding significant improvements in product exposure and conversion rates. Social media channels are emerging as important marketing platforms.

4.3. Digitalization and intellectualization

Recent years have witnessed the pervasive influence of digital technologies such as big data, cloud computing, artificial intelligence, and blockchain on every facet of the cross-border e-commerce industry chain. These technologies have become crucial drivers for iterative innovation in the industry. Merchants and platforms leverage big data and cloud computing to analyze user profiles and order characteristics, providing more accurate personalized recommendations and services. The development and maturity of generative AI offer better product selection and marketing suggestions, while the widespread use of intelligent customer service enhances the overall shopping experience. Secure payment technology further reduces payment risks for consumers. The extensive application of digitalization and intellectualization in cross-border e-commerce opens up more development opportunities and room for innovation.

4.4. Refinement and differentiation

In addressing past challenges, such as logistics costs, platform commissions, advertising and marketing, human resources, and a focus on single categories, cross-border e-commerce is undergoing a transformative shift. Sellers are adopting a fine operational management concept, addressing these challenges through the "intensive cultivation" mode. Beyond regular tasks such as product selection, listing, and advertising, sellers optimize store products, content, and services through data analysis results to enhance user conversion rates. As customer needs become more diversified and personalized, cross-border e-commerce platforms are continuously expanding product categories, moving from a single or main product focus to overall category transformation and development. In-depth analysis of user behavior, shopping preferences, and feedback informs operational strategies that differentiate platforms, improve efficiency, and enhance competitiveness.

5. Conclusion

This paper extensively references numerous literature sources and research reports to gather the latest data supporting its content. Against the backdrop of the evolving landscape of cross-border e-commerce in China post-pandemic, the PEST model has been employed to analyze and explore the macro-environment influencing the development of cross-border e-commerce in China. The paper further forecasts the developmental trajectory of cross-border e-commerce. Armed with a comprehensive understanding of the macro environment and insights into the development trend, we are confident that China's cross-border e-commerce is poised for a steadfast future. Continuous improvement and the prospect of better development await as the industry adapts to emerging trends and challenges.

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Author contributions

Z.P. conceived the idea of the study. L.Y. and X.C. analyzed the data and wrote the paper.

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Empirical Analysis of the Impact of Green Finance and Technological Progress on Total Factor Productivity in China's Industrial Sector

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Abstract: The enhancement of industrial green total factor productivity is pivotal for achieving high-quality and sustainable economic development. This study assesses China's performance using the SBM-GML model, employing province-level panel data spanning from 2004 to 2020. Furthermore, we examine the influence of green finance and technological progress on industrial green total factor productivity using a spatial econometric model. The findings uncover that the relationship between the level of green financial development and industrial green total factor productivity follows a U-shaped curve. Initially, low levels of green financial development exert a suppressive effect on industrial green total factor productivity, proving ineffective in the short term. However, with the progression of green finance development, a positive and significant long-term impact on industrial green total factor productivity emerges. Moreover, technological progress demonstrates a noteworthy promotional effect on industrial green total factor productivity. The analysis delves deeper into revealing that industrial structure and environmental regulation intensity exhibit a significant negative relationship with industrial green total factor productivity. In contrast, both energy structure and education level showcase a substantial positive relationship with industrial green total factor productivity.

Keywords: Industrial green total factor productivity; Green finance; Technological progress

Online publication: December 22, 2023

1. Introduction

The 20th Party Congress report advocates for expediting the construction of a modernized economic system with a primary focus on enhancing total factor productivity. The industrial sector, being instrumental in national economic development, plays a pivotal role in fostering high-quality economic progress. Despite the remarkable advancements in the industry over the past forty years of reform and opening, China's manufacturing value added has consistently ranked first globally for over a decade. However, the conventional rugged industrial development model has resulted in excessive energy consumption and environmental pollution.

Between 2012 and 2021, China's industrial value-added consumed nearly 70% of its energy, emitting almost 80% of sulfur dioxide and 60% of nitrogen oxides [1]. To propel high-quality and sustainable economic development, an imperative shift toward green and low-carbon transformation in the industry is crucial. Traditional total factor productivity (TFP), not accounting for environmental pollution and resource consumption [2], necessitates the introduction of industrial green TFP. By incorporating environmental and resource measures [3], this framework accurately portrays the current state of China's industrial economic development in the new era.

Therefore, optimizing China's industrial green total factor productivity emerges as the key strategy to advance high-quality and sustainable economic development in the industrial sector. This optimization is integral to realizing the green and low-carbon transformation imperative for the industrial sector's future.

2. Literature review

In our research context, existing literature has delved into various factors influencing China's industrial green total factor productivity. These factors encompass environmental regulation, forward direct investment (FDI), outward foreign direct investment (OFDI), land resource mismatch, financial aggregation, industrial agglomeration, and financial mismatch, among others. Taking a perspective rooted in green finance, Ziju Yin *et al*. employed a spatial Durbin model and concluded that the level of green finance development exhibits a U-shaped relationship with green total factor productivity [4]. Notably, both showcase a distribution pattern of being "high in the east," "flat in the middle," and "low in the west." Research conducted by Chong Wang and Lei Wang reveals that green credit influences green total factor productivity through two distinct pathways: industrial structure upgrading and green innovation [5]. Yanwei Lyu posits that digital finance indirectly fosters the enhancement of industrial green total factor productivity by driving technological innovation, facilitating industrial upgrading, and invigorating entrepreneurial vitality [6]. Baolong Yuan and Chen Li contend that innovation in invention patents serves as a pivotal driver for achieving green growth in the Chinese industry [7]. Empirical evidence provided by Haibo Sun [8], utilizing Tobit and Panel Smooth Transition Regression (PSTR) models, substantiates the positive impact of technological innovation on industrial green total factor productivity. The collective insights from these studies contribute to a comprehensive understanding of the multifaceted dynamics shaping China's industrial green total factor productivity.

3. Model construction, data source, and variable measurement

The objective of this paper is to explore the influence of green finance and technological progress on industrial green total factor productivity, along with their respective impact paths. Consequently, the independent variables in focus are green finance and technological progress, while the dependent variable is industrial green total factor productivity. To assess their impact and pathways, this study adopts spatial econometric models as proposed by the spatial econometric theory of Cliff and Ord [9], specifically the spatial lag model (SLM), spatial error model (SEM), and spatial autoregressive model introduced by Anselin [10]. The following equation represents the model constructed in this study:

In the equation, represents industrial green total factor productivity. The variables include and (error terms for spatial and temporal fixed effects), (green finance), (the square term of GF), (technological progress), (industrial structure), (energy structure), (educational attainment), and (environmental regulation intensity). is a random disturbance term, denotes the 30 individual provinces and cities, and represents time. is a vector of independent variable coefficients, and is a spatial lag coefficient of the error term .

This study encompasses data from 30 provinces in China spanning from 2004 to 2020, with Tibet, Hong Kong, Macao, and Taiwan regions excluded due to data availability and completeness constraints.

4. Empirical results and explanations

4.1. Estimation results of panel data model and spatial correlation test

To assess the suitability of the spatial econometric model for the study's content, this paper employs the widely used panel data analysis method. Subsequently, a spatial autocorrelation test is conducted on the residuals. **Table 1** presents the estimation results of the four models, with model selection guided by a comparison of statistical indicators.

Table 1. Estimates and test results of panel data models

Variables	Mixture	Space fixed effect	Time fixed effect	Two-way fixed effects
GF	8.792***	16.1445***	-4.6744	-4.6744
	(3.1931)	(7.0141)	(-1.6418)	(-1.6418)
AGF	-27.6575***	-23.4576***	-3.979	-3.979
	(-4.4883)	(-5.3464)	(-0.655)	(-0.655)
TP	-0.5938	0.8343	-1.253***	-1.253***
	(-1.1515)	(1.1465)	(-2.6751)	(-2.6751)
IS	0.6306***	-0.6601***	0.4374***	0.4374***
	(3.6888)	(-2.6293)	-2.7983	(2.7983)
ES	-0.5924	-1.0788*	-0.9142**	-0.9142**
	(-1.2526)	(-1.665)	(-2.1416)	(-2.1416)
EDU	0.6738***	1.3083***	0.5728***	0.5728***
	(2.7607)	(2.5909)	-2.6134	(2.6134)
ERI	-33.6729*	-49.8931***	-7.5553	-7.5553
	(-1.8305)	(-3.4346)	(-0.4345)	(-0.4345)
R-squared	0.1005	0.6663	0.2769	0.7305
Log-L	-792.3294	-539.4621	-736.6702	-484.9882
DW	1.9166	1.8886	2.1555	2.1444
LM-sar	1.2548	1.2039	14.1047***	12.8824***
Robust LM-sar	52.5763***	31.2807***	0.0088	11.024***
LM-err	0.3389	0.7615	14.7412***	18.7697***
Robust LM-err	51.6604***	30.8382***	0.6453	16.9113***

Note: *, **, and *** denotes significance levels at 10%, 5% and 1%, respectively

Table 1 reveals that the two-way fixed effect model boasts the highest coefficient of determination (0.7305) and the most favorable fitting effect, as indicated by the "Log-L" statistic (-484.9882). In contrast, the mixed model registers the lowest coefficient of determination (0.1005) and the least satisfactory fitting effect, reflected in a "Log-L" statistic of -792.3294. Therefore, the two-way fixed effects model emerges as the most suitable for the research objectives outlined in this paper.

4.2. Estimation results of the spatial panel data model

Building on the analysis of the impact of green finance on industrial green TFP, **Table 2** demonstrates that the coefficient of green finance (GF) is negative, while its quadratic (AGF) coefficient is positive. Both coefficients are statistically significant at the 1% and 5% significance levels, respectively. This further validates Hypothesis 1, with the U-shaped inflection point value identified as 0.5727.

Table 2. Estimation results of spatial panel data model (two-way fixed effect model)

Variables	SEM	SLM
GF	-11.7947***	-9.7508***
	(-3.2109)	(-2.7137)
AGF	13.5085**	10.5325*
	(2.3569)	(1.8644)
TP	1.1883*	1.1697*
	(1.6632)	(1.7114)
IS	-1.1171***	-1.0585***
	(-4.4883)	(-4.0864)
ES	1.2833**	0.8195
	(2.031)	(1.2948)
EDU	0.8845*	0.6868
	(1.8593)	(1.4323)
ERI	-22.9589*	-24.3655*
	(-1.6492)	(-1.6642)
W*dep.var.		-0.2072***
		(-3.3386)
spat.aut.	-0.2622***	
	(-4.1298)	
R-squared	0.7296	0.7409
Log-L	-473.39124	-477.4345

Note: *, **, and *** denotes significance levels at 10%, 5% and 1%, respectively

Regarding the technological progress variable, this paper explores its influence on industrial green TFP. The results indicate that the coefficient of technological progress (TP) is positive and significant, confirming Hypothesis 2. This underscores the crucial role of technological progress in realizing green and sustainable development within the industrial production environment, thereby facilitating the transformation and upgrading of industrial development.

To ensure the robustness of the impact of green finance and technological progress on industrial green TFP, this paper introduces the economic spatial weight matrix for a robustness test, replacing the adjacency matrix. While the robustness test yields results somewhat different from the initial empirical analysis, the influence direction and coefficient size of the core variables – green finance, its quadratic term, and technological progress – remain largely consistent. This indicates the credibility and robustness of the conclusions drawn regarding the impact of green finance and technological progress on industrial green TFP.

5. Conclusions

This paper employs the SBM-GML model to measure the industrial green TFP across 30 provinces from 2004 to 2020. Additionally, it establishes a spatial econometric model to investigate how green finance and technological progress impact industrial green TFP. The key conclusions are outlined below:

Firstly, industrial green TFP exhibits a U-shaped trend with the progression of green finance levels. The underdevelopment of green finance hampers the enhancement of industrial green TFP. However, as green finance develops, there is an optimization of industrial green TFP. Technological progress significantly promotes industrial green TFP.

Secondly, in practical terms, industrial green TFP is influenced by other factors. Notably, industrial structure and the intensity of environmental regulation have a substantial negative impact, while energy structure and education level demonstrate a significant positive influence.

The prolonged reliance on the "Extensive type" growth model within input-intensive industries has resulted in a rapid surge in energy consumption and carbon emissions. This unsustainable development model curtails the potential and competitiveness of the economy. Consequently, China must expedite the green transformation of its industry, transitioning to a low-carbon, clean, and efficient production mode. This shift should prioritize fostering a mutually beneficial relationship between the economy and the environment.

To achieve these goals, it is imperative to enhance the green financial system and bolster the capacity of green finance. This involves establishing government-led, market-oriented green finance rooted in enterprise needs and infrastructure. Leveraging the synergy between green finance professional institutions and talents, the establishment of specialized green finance service institutions and talent training becomes crucial. Simultaneously, playing an open role in green financial trading platforms, setting environmental performance thresholds, disclosing enterprise environmental information, and utilizing diverse means such as green credit and green bonds will help mobilize idle financial capital in society, fostering the development of green finance. This comprehensive approach is essential for steering China toward a sustainable, environmentally friendly economic trajectory.

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Examining the Trends and Influencing Factors of International Trade in the Era of New Economic Globalization

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Abstract: In the context of the new era of economic globalization, the development of international trade holds immense significance in fostering global economic recovery and advancing the process of global economic integration. Against this backdrop, aspects such as trade liberalization, digital trade, trade in services, and the influence of multinational companies are becoming increasingly prominent. Concurrently, factors encompassing economic, political, technological, and environmental considerations, as well as regional economic integration, will exert influence on the trajectory of international trade development. This paper aims to comprehensively explore the development trends of international trade and the myriad influencing factors within the framework of the new economic globalization.

Keywords: New economic globalization; International trade; Trade liberalization

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1. Introduction

In recent years, with the deepening development of economic globalization, international trade has emerged as a pivotal force driving world economic growth. Against the backdrop of the new economic globalization, the development trend of international trade has manifested numerous new features, including the continued evolution of trade liberalization and the robust expansion of digital trade. Simultaneously, economic, political, technological, environmental, and regional economic integration factors exert significant influence on the trajectory of international trade development.

2. The importance of international trade development in the context of new economic globalization

Amid the new economic globalization, the development of international trade assumes heightened significance, facilitating the efficient allocation of resources and fostering deep economic integration among nations. International trade sparks competition and innovation, offering enterprises access to expansive markets and

abundant raw materials, playing a central role in constructing global value chains. Concurrently, trade propels the swift dissemination of technology and information, boosting production efficiency, nurturing the emergence of new industries, and providing avenues for industrialization and modernization in developing countries. Furthermore, international trade expands exports, stimulates increased employment and income, and elevates living standards. Nevertheless, globalization introduces challenges, such as escalating trade protectionism, heightened uncertainty in the international market, and the fragility of global supply chains. Addressing these challenges necessitates international collaboration to establish a fair and rational multilateral trading system while promoting the transparency and inclusiveness of trade policies [1]. Propelled by digital and information technology, international trade has undergone a transformation, with digital trade emerging as a new driver of growth.

3. Development trend of international trade under the background of new economic globalization

3.1. The deepening trend of trade liberalization in the new economic globalization

Fueled by the dynamics of new economic globalization, trade liberalization is undergoing further deepening. This is evident in the positive advancements of multilateral trade negotiations and the increasing proliferation of regional trade agreements. Noteworthy examples include the establishment of multilateral trading systems such as the Trans-Pacific Partnership (TPP) and the Regional Comprehensive Economic Partnership (RCEP), which has significantly facilitated the smooth flow of trade among member states. These agreements have strengthened market access and investment liberalization by reducing or eliminating tariff and non-tariff barriers. Additionally, they address emerging issues such as the protection of intellectual property rights, e-commerce, and government procurement, contributing to the modernization of global trade rules. Furthermore, trade liberalization creates opportunities for developing countries to access larger markets, aiding their integration into the global economy and enhancing export competitiveness.

3.2. Future growth trajectory of digital trade

The development trend of digital trade in the new economic globalization indicates rapid growth, positioning it as the primary force propelling innovation and reform in international trade. The widespread application of digital technologies, including artificial intelligence (AI), big data, and cloud computing, has not only transformed the production and distribution of traditional goods and services but has also given rise to new trade models and business opportunities. The surge of e-commerce has significantly lowered the costs and barriers associated with cross-border transactions, providing small and medium-sized enterprises with global market access. The cross-border flow of data and the transaction of digital content have heightened the demand for data protection and cybersecurity, leading to the formation of relevant international rules and standards. In response, governments and international organizations are actively exploring policies and frameworks to align with the development of digital trade, with the aim of fostering the healthy growth of the digital economy while safeguarding consumer rights and promoting data privacy protection [2]. The flourishing development of digital trade signals the onset of a new era characterized by greater interconnectedness and innovation-driven global trade.

3.3. Rising strategic position in the growth of trade in services

As the global economic structure undergoes transformation, the significance of service trade continues to escalate, emerging as a pivotal driver of international trade growth. In the realm of new economic globalization,

the expansion of trade in services transcends traditional sectors such as tourism, transportation, and insurance, encompassing high value-added industries such as finance, education, healthcare, culture, and professional services. Technological advances, particularly in the field of information and communication technology (ICT), facilitate the cross-border delivery of services, providing technical support and a platform for the internationalization of service trade. Moreover, the development of trade in services stimulates industrial upgrading and fosters high-quality economic development, playing a central role in enhancing national competitiveness. Simultaneously, the openness and international cooperation of trade in services pose new challenges to the global economic governance system [3]. Addressing issues such as intellectual property protection and optimizing the regulatory environment for trade in services requires collaborative efforts from the international community.

3.4. Transnational companies' greater role in promoting trade

In the era of new economic globalization, multinational corporations, positioned as key players in international trade, have assumed an increasingly prominent role in propelling global trade. Through cross-border production and the strategic layout of global supply chains, these companies not only facilitate the cross-border flows of goods and services but also play a pivotal role in advancing technology transfer, capital flow, and the efficiency of global resource allocation. By establishing branches in various countries through outward direct investment (ODI), multinational companies contribute to accelerating the industrialization process, creating employment opportunities, and cultivating local talents, thereby enhancing the competitiveness of local economies. Additionally, the expansion of global value chains enables the production processes of products and services to span multinational boundaries, intensifying the interdependence of national economies. In managing supply chains optimally, multinational companies enhance operational efficiency, reduce costs, and improve product competitiveness through economies of scale in this process.

4. Factors affecting the development trend of international trade

4.1. Influence of economic factors on international trade

The development trend of international trade is shaped by numerous economic factors. Among these, fluctuations in the global macroeconomic landscape, including the economic growth rate, exchange rate variations, inflation, and interest rate level, exert a significant impact on trade flows and structures. With the deepening integration of the global economy, regional economic cooperation and development further propel international trade. Examples include the integration of regional economies such as the European Union and the North American Free Trade Agreement, fostering trade growth among member states [4]. Additionally, changes in international commodity prices, especially for export-dependent economies heavily reliant on commodities such as crude oil, assume paramount importance. Adjustments in the terms of trade, such as modifications to tariff and non-tariff barriers, and the stability of international financial markets, directly influence the costs and benefits associated with cross-border trade. Economic policies, encompassing the formulation and implementation of monetary, fiscal, and trade policies, decisively shape the international trade environment. Lastly, shifts in domestic and foreign demand, changes in consumer preferences, and alterations in demographic structures indirectly impact the development of international trade by altering the dynamics between supply and demand.

4.2. Influence of political factors on international trade

Political factors play a pivotal role in the development of international trade. Political stability serves as the

foundation for the growth of international investment and trade, while political upheavals may result in a reduction or restructuring of trade activity. Businesses and investors typically favor countries with stable political environments. Geopolitical changes, such as regional conflicts, sanctions, and trade wars, can significantly alter the trade patterns of specific countries or regions. The evolution of international relations, particularly those between major economies, profoundly influences the formulation of global trade policies and rules. Complex political dynamics, such as the reform of the multilateral trading system and the negotiation of bilateral and regional free trade agreements, shape the landscape of international trade [5]. In addition, domestic political policies, such as the rise of trade protectionism, impact international trade. Measures aimed at safeguarding domestic industries through increased tariff barriers may provoke retaliatory actions from other countries, escalating international trade tensions.

4.3. Influence of technical factors on international trade

Technical factors represent key driving forces shaping the development trend of international trade. Technological advancements, particularly the revolutionary strides in ICT, have substantially reduced trade costs, enhanced trade efficiency, and catalyzed the emergence of innovative business models such as e-commerce and digital services. The application of modern technologies, including the Internet of Things (IoT), big data analytics, AI, and machine learning, is reshaping product design, marketing strategies, supply chain management, and customer service. This, in turn, impacts the commodity structure and service modes within international trade. The progression of automation and intelligent manufacturing technologies, such as 3D printing, is altering the geographic layout of production, potentially leading to the repatriation of manufacturing from countries with low labor costs to technologically advanced countries. Concurrently, technological innovation is fostering the development of new industries, with renewable energy being a prime example, and its rise promises to disrupt traditional international trade models.

4.4. Environmental factors and their impact on international trade

The influence of environmental factors on the development of international trade is becoming increasingly significant. With the escalating impact of global climate change, environmental protection has emerged as a pivotal factor constraining and guiding international trade policies. The surge in extreme climate events poses challenges to agricultural production, resource allocation, and the stability of supply chains, thereby affecting the global trade landscape. Governments and the international community are increasingly focusing on sustainable development, resulting in the implementation of green trade policies and environmental regulations. These measures, such as restrictions on carbon emissions and higher environmental standards, not only alter the cost structure of trade in products and services but also have the potential to create new markets and industry standards. Additionally, heightened consumer awareness of environmental protection and social responsibility is driving the trend of green consumption, further promoting international trade in environmental protection technologies and products [6]. Consequently, to adapt to these changes and maintain competitiveness, enterprises must consider integrating more environmental sustainability measures into production and supply chain management.

4.5. Impact of regional economic integration on international trade

Regional economic integration entails the process of dismantling trade barriers, coordinating macroeconomic policies, and fostering the flow of capital and labor among countries. Through the establishment of free trade zones, customs unions, common markets, and even economic alliances, this approach reduces transaction costs within the region, enhancing the competitiveness of enterprises and promoting trade and investment among

member states. Notable examples of regional economic integration include the European Union (EU), the North American Free Trade Agreement (NAFTA), the US-Mexico-Canada Agreement (USMCA), the Association of Southeast Asian Nations (ASEAN), and the Southern Common Market (MERCOSUR) [7]. These regional groups have increased trade flows and economic vitality by standardizing product rules, reducing trade barriers, fostering technological exchanges, and improving administrative efficiency.

5. Conclusion

In the context of the new economic globalization, the development trend of international trade has exhibited several new features, including the continued evolution of trade liberalization and the robust growth of digital trade [8]. To adapt to this trend, governments worldwide must formulate corresponding international trade policies to promote the sustainable development of international trade. This, in turn, will contribute to global economic prosperity, as well as fostering world peace and stability.

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The Current Status and Prospects of China's Low-Carbon Economic Development

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Abstract: This paper aims to explore the importance of developing a low-carbon economy in China and presents a series of key recommendations. Firstly, it emphasizes the adverse impact of economic development on the natural environment and highlights the unsustainable nature of China's previous pursuit of economic growth at the expense of its ecological surroundings. Subsequently, the paper provides specific recommendations in response to the pressing resource and environmental challenges in current economic and social development, along with the urgent need to accelerate the transition towards a greener, low-carbon economy to achieve carbon peak and carbon neutrality goals. The key recommendations include continually enhancing the legal framework for a low-carbon economy, optimizing the energy structure, improving energy efficiency, and optimizing the industrial structure. These proposals aim to offer concrete actions to support the development of a low-carbon economy in China, encompassing legal support, energy transformation, and industrial upgrading. Ultimately, this paper underscores China's potential in developing a low-carbon economy and calls for resolute actions to strengthen legal frameworks, foster technological innovation, and promote industrial restructuring. These actions will guide China towards a more sustainable and environmentally conscious economic future, aligning its growth trajectory with the global imperative to reduce carbon footprints.

Keywords: Low-carbon economics; Green development; Chinese economy

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1. Introduction

In the wake of global concerns about environmental sustainability and the urgent need to mitigate the impact of economic development on the natural world, China finds itself at a pivotal juncture. While the country has experienced unprecedented growth over the past forty years, it has also faced substantial environmental challenges, prominently manifested by a concerning surge in carbon emissions.

This discourse delves into the multifaceted landscape of fostering a low-carbon economy in China, exploring critical areas that demand strategic attention and proactive measures. Addressing the imperative for change, the discussion commences by shedding light on the current status of China's carbon emissions, elucidating how the nation's standing as the world's largest emitter mandates a fundamental shift toward sustainable development.

Key recommendations emerge as crucial drivers in this transformative journey. These recommendations involve a comprehensive review and strengthening of the legal frameworks governing a low-carbon economy, underlining the significance of structural and technological reforms to recalibrate the energy landscape and industry dynamics. The discourse emphasizes the pivotal role of research and development in cultivating innovative low-carbon technologies and industry structures essential for China's pursuit of sustainable economic growth.

In conclusion, this exploration underscores the urgency and significance of embracing a low-carbon economic model in China. By adopting these recommendations and fostering collaboration, the nation can steer its developmental course toward a sustainable and environmentally conscious future. This approach addresses the urgent global call to reduce carbon footprints, paving the way for a more resilient and eco-friendly economic trajectory.

2. Background of a low-carbon economy

The concept of a low-carbon economy first emerged in the early 21st century in the United Kingdom, inspired by the idea of the circular economy [1]. An analysis of the similarities between the circular economy and the low-carbon economy reveals a shared emphasis on prioritizing resource conservation and environmental protection as paramount requirements in economic development. Both concepts advocate for environmental preservation as the ultimate goal, with energy efficiency and emission reduction as fundamental approaches. However, they diverge in focus. The circular economy places greater emphasis on resource recycling and reuse, highlighting resource utilization, while the low-carbon economy concentrates on reducing carbon emissions. Its primary objective is to mitigate the threat of global warming to humanity, centering on carbon emission reduction.

3. The current status of China's carbon emissions

Over the past forty years of reform and opening up, China's economic development has achieved remarkable success on a global scale. However, under an extensive economic growth model driven by various factors, the pressure on resource sustainability has continued to rise, resulting in a persistent increase in carbon emissions. According to World Bank data, China's carbon dioxide emissions per capita rose from 2.7 metric tons per person in 2000 to 7.6 metric tons per person in 2019. As the world's largest emitter, China's carbon dioxide emissions reached 11.9 billion tons in 2021, accounting for 33% of the global total of 36.3 billion tons, significantly surpassing other nations and regions.

China's response to climate change holds immense importance on both domestic and international fronts, carrying implications for long-term and overall development. President Xi Jinping has articulated a vision targeting carbon peaking by 2030 and carbon neutrality by 2060 on multiple major international occasions [2]. The timeframe for achieving these dual carbon goals in this nation (10 years from peaking to neutrality, 30 years in total) is significantly shorter than that of developed nations (the EU took 30 years to peak and has 60 years from peaking to achieve neutrality by 2050).

Addressing this unprecedented challenge necessitates breaking away from the traditional industrial development path reliant on high energy consumption, high emissions, and high pollution. It requires comprehensively promoting the green transformation of the economy and society. This entails adhering to a path of coordinated development, energy security, and sustainable development, which is a uniquely Chinese approach to modernization.

4. The importance of developing a low-carbon economy

The detrimental impact of economic development on the natural environment has significantly affected the survival and progress of humanity, gradually capturing global attention. As the world's largest developing country, China's previous pursuit of economic growth at the expense of ecological surroundings through an extensive development model is no longer sustainable for the new era's economic and social development. This has garnered substantial attention from China's top decision-makers.

This research aims to provide insight into addressing the pressing resource and environmental challenges faced in the current economic and social development. It seeks to accelerate the transition toward a greener, low-carbon economy and drive the timely achievement of carbon peak and carbon neutrality goals.

5. Several recommendations for developing a low-carbon economy

5.1. Continuously improving the legal framework for a low-carbon economy

A low-carbon economy involves every aspect of a nation's livelihood, requiring a coordinated low-carbon transition across all societal domains. A robust legal system serves as both a constraint and a guide. Presently, China has enacted various legal systems such as the 'Law of the People's Republic of China on Renewable Energy.' However, achieving comprehensive development in the realm of a low-carbon economy necessitates not only a transformation in energy structure but also involvement in critical areas like transportation, construction, and industrial manufacturing. Therefore, China needs to further refine and improve legal systems related to the low-carbon economy in various fields according to the actual development of each economic and social domain, providing a solid legal safeguard for the development of a low-carbon economy.

5.2. Optimizing energy structure and enhancing energy efficiency

An energy structure heavily reliant on coal inevitably results in high levels of carbon dioxide emissions. Therefore, for China to achieve a low-carbon economy, a shift in energy structure and an improvement in energy efficiency are imperative. During industrialization, enhancing energy efficiency emerges as the most effective means of reducing carbon emissions, and the potential for improvement is substantial. For example, in developed economies, one-third of emissions originate from buildings, another third from transportation, and the remaining from industrial sources. Currently, China's emissions are predominantly from industrial sources, with comparatively lower emissions from transportation and buildings. However, with improving living standards and increasing residential space, there is significant potential in adopting zero-emission building practices, following Europe's lead in energy-efficient building construction.

The potential for enhancing energy efficiency in the industrial sector is also substantial. As a developing country, China encompasses both cutting-edge and outdated technologies. In the steel industry, for instance, while leading technologies exist in large and medium-sized enterprises with relatively low comprehensive energy consumption per ton of steel, small-scale steel production and outdated technologies consume more energy and emit higher levels. This necessitates the expedited phasing out of obsolete production capacity.

In response, this paper proposes three suggestions:

(1) Increasing research and development investment in the energy sector, actively advancing coal-to-oil and olefin technologies, exploring secondary re-heating of coal for electricity generation, and promoting the large-scale development of low-grade coal utilization to maximize coal energy and achieve clean and efficient coal utilization.

(2) Intensifying the process of natural gas replacing oil: Importing natural gas from abroad through

various channels and establishing domestic strategic energy reserves lay the foundation for energy security while paving the way for low-carbon energy [3].

(3) Vigorously developing clean energy sources: China possesses natural advantages in regions like the northwest, southwest, and southeastern coast for developing solar, hydro, wind, and tidal energy. Leveraging these favorable conditions, China should strongly promote the industries of hydroelectric, wind, and solar power generation to foster a low-carbon economy through green energy development. Additionally, China should diversify the development of clean energy sources based on scientific assessment and evidence, encouraging the development of nuclear power to drive the diverse development of clean energy in the country. The introduction of carbon pricing schemes or "feed-in-tariffs," which require the use of green energy, has a positive and significant impact on green investment. Other interventions, such as biofuel support, do not appear to be associated with higher green investment [4].

5.3. Optimize industrial structure

The industrial structure directly determines the mode of economic development. To foster a low-carbon economy, the low-carbon transformation of the three major industries must be realized. First, China should vigorously promote ecological and circular agriculture while strengthening and consolidating the agricultural foundation, thereby reducing greenhouse gas emissions in agricultural production. Second, there should be a strong emphasis on developing new energy-saving and environmentally friendly industries, utilizing market forces to drive low-carbon development in the industrial sector. Third, China should expedite the development of the service industry, increasing its contribution to the national economy, and optimizing and refining the industrial structure of the nation [5].

6. Conclusion

China's remarkable economic growth, while commendable, has been accompanied by a concerning surge in carbon emissions, indicating an urgent need for immediate action. This analysis highlights crucial recommendations to initiate and guide the transformation towards a low-carbon economy.

The necessity for a robust legal framework to underpin and guide this transformation emerges as a foundational requirement. It emphasizes the importance of aligning laws and regulations with the dynamic requirements of a low-carbon economy across multiple sectors. Additionally, the strategic imperative to enhance technological research and development emerges as a key driver, providing innovative solutions to address challenges in energy efficiency, industry dynamics, and the broader socio-economic landscape.

The path to a low-carbon economy in China is undoubtedly intricate, requiring concerted efforts, collaboration, and sustained commitment. However, with a resolute commitment to the outlined recommendations – strengthening legal frameworks, fostering technological innovation, and restructuring the industry – China stands poised to chart a transformative course toward a more sustainable and environmentally conscious economic future. This aligns its growth trajectory with the global imperative to reduce carbon footprints, securing a resilient and eco-friendly tomorrow.

Disclosure statement

The author declares no conflict of interest.

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Optimization of Rural Governance Structure under the Development of New Agricultural Management Entities

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Abstract: The positive impact of the development of new agricultural business entities and their institutional systems on the optimization of rural governance structures can be examined from various perspectives, including the state, market, rural society, urban-rural relations, and grassroots governance structure in rural communities. The development of these new agricultural business entities has not only redefined but also restructured the power distribution and governance patterns in rural developing countries, markets, and villages. The rural social order has evolved into a ternary mutual structure governance pattern, often referred to as the "state market rural" model. This transformation has prompted adjustments in the national economic and social policy structure and management systems at both macro and micro levels. It has led to the reshaping of power dynamics, benefit distribution, and governance structures in both urban and rural areas, resulting in significant changes to the economic and social fabric of rural regions. Furthermore, the grassroots governance structure in rural society, characterized by "township governance and village governance," is undergoing continuous development and improvement. This transition is marked by a shift towards a collaborative governance structure that encourages diverse participation. Building upon the aforementioned optimizations, the rural governance structure now exhibits new characteristics. These include a more extensive and diverse range of rural governance mechanisms, increased openness in governance processes, and a heightened synergy among various governance mechanisms. This dynamic evolution reflects a richer, more diverse, and more open approach to rural governance, fostering a stronger collaborative effort in the pursuit of effective governance.

Keywords: New agricultural business entities; Rural governance; Structural optimization

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1. Introduction

The optimization of the rural governance structure constitutes a crucial component of rural revitalization. The emergence of a new type of agricultural business entity plays a pivotal role in advancing the strategy for rural revitalization, influencing rural governance across various dimensions, including the nation, market, rural society, and urban-rural relations. The involvement of these new agricultural business entities in rural

governance, along with the concurrent optimization of the rural governance structure, is intrinsic to fostering high-quality development of agriculture and rural areas. This integration represents an inevitable choice in constructing a modern rural governance system, propelling the agenda for rural revitalization, and facilitating the overall modernization of national governance.

2. Transformation of rural governance structure toward a diversified and coordinated framework under the development of new agricultural management entities

The evolution of new agricultural management is driving a profound shift in the rural governance structure toward a more diversified and collaborative framework. On a macro scale, the governance structure is progressively transitioning into a tripartite macro subject mutual structure, encompassing national entities, market entities, and rural social entities. At the micro level of grassroots governance in rural areas, the fundamental governance structure has undergone a transformation toward collaborative governance, incorporating a variety of governance entities within rural society.

2.1. The transformation of macro governance structure toward a "state-market-rural" tripartite interdependence model

The household system stands as the foundational tradition in rural China society [1]. This traditional system has shaped a three-dimensional interactive governance pattern, fostering mutual benefit and balance among the state, market, and rural in traditional Chinese society. While the 1980s saw the implementation of a dual-layered household contract management system, combining centralized and decentralized management, the household of farmers remained the primary unit of agricultural management. Agricultural production, in reality, continued to echo the traditional household system.

The emergence of new agricultural management entities has disrupted the traditional household-centric pattern, altering the organizational structure and institutional foundation of rural agricultural management. These entities have evolved into advanced and fundamental production and management units in rural areas. The new type of agricultural management entity represents a modern form of agricultural production organization, steering away from traditional household management.

This shift poses a challenge to the traditional household system, impacting the social foundations of the conventional family governance pattern. Simultaneously, with the development of these entities and the establishment of support systems, state power and market forces are deeply embedded in rural areas. State power now directly engages with new agricultural management entities, and market mechanisms have been introduced into agricultural production and organizations.

As new agricultural management entities replace and impact traditional household agricultural management, and with the resurgence of state power and market mechanisms, the rural social order has transitioned to a tripartite governance pattern of "state-market-rural." The traditional governance model of "state-market-rural" under the household system has transformed into the governance model of "township government-village governance," ultimately culminating in the "state-market-rural" triple structure.

The return of national power to rural areas coincides with an increase in market forces. New agricultural management subjects emerge as products of the organic combination of market-oriented production factors, such as land, capital, and management. These entities act as producers and operators of agricultural commodities, embodying attributes of a market subject and contributing to the development of the market economy.

In the traditional structure, where farmers serve as the primary constituents and production organizations

of rural society, the level of commodification development in rural areas has historically been constrained by the necessity for survival rather than for commodity exchange and profit. The development of new agricultural management entities, being market-oriented, is expected to significantly boost the rural market economy.

Support policy frameworks are also designed with a market-oriented approach, emphasizing the construction of market mechanisms and the role of the mark in policy implementation. The government provides the institutional foundation for market operation while playing a supportive, nurturing, guiding, and regulatory role. The market plays a fundamental and decisive role in resource allocation.

Land reform aims to promote land transfer and establish a unified urban-rural land factor market for market-oriented land factor allocation. The reform of the registered residence system encourages the flow of urban and rural labor forces and the establishment of a unified labor allocation market. Fiscal and financial support policies focus on leveraging commercial and social capital to invest in agriculture and rural areas. Within the policy system supporting new agricultural management entities, market mechanisms have become crucial tools for achieving support goals.

With the development of new agricultural management entities, market-oriented allocation systems for factors such as land, talent, and capital have gradually infiltrated rural society. These mechanisms have become new operational rules and institutional systems for the rural economy and society, with the market economy system emerging as a novel governance mechanism for rural economic operation.

Under the resurgence of the state and market, rural society is gaining strength, and the governance structure is taking on a three-element coordinated framework known as the “state-market-rural” structure. The intervention of both the state and market contributes to the establishment of rural governance order, achieved through the integration and mutual construction of state, market, and rural elements.

With the return of national influence and market forces, rural areas are experiencing progressive development and growth, fostering the endogenous development of rural regions. The establishment of support policy systems for new agricultural management entities signifies a process of redistributing political and economic power to farmers and rural society under the guidance of national political authority. It is also a process where industry feeds back into agriculture and cities to support rural areas.

As rural populations and land factors gain increasing economic and political power comparable to their urban counterparts, various economic resources are directed toward rural areas through policies supporting and benefiting agriculture. The market economy’s operating mechanism infiltrates rural areas, and the governance mechanisms for rural agriculture at all levels of the political party and the state are becoming more robust. The supply of high-quality economic resources, production factors, and institutional support enables rural society to access equal economic, political, and social development rights, resources, and opportunities, mirroring urban society.

This process is conducive to activating the endogenous development momentum of rural areas, propelling the expansion of farmers and rural power. It promotes the development and growth of the rural economy and society, significantly elevating the status of rural areas within the entire country. The nation has once again reached rural areas through resource input and institutional supply. The development of the market economy and market mechanisms in rural areas has led to an unprecedented and robust embedding of the state and market as the main external conditions driving rural socio-economic changes.

Rural society undergoes constant reshaping through mutual construction with the state and market, and the traditional boundaries of rural areas are becoming increasingly blurred under the influence of the state and market. Rural governance is achieved through the coordination efforts of the state, market, and rural components.

2.2. The diversified collaborative governance pattern within rural society

External conditions significantly shape the effectiveness of rural governance systems, acting as structural constraints that these systems must operate within [2]. While the urban-rural dual structure in China remains fundamentally unchanged, the contrast coefficient for urban-rural duality in developing countries typically falls between 0.31 and 0.45, whereas in developed countries, it ranges from 0.52 to 0.86. As of 2016, China's urban-rural contrast coefficient was only 0.25, highlighting the continued sharpness of the urban-rural dual structure [3]. However, entering the new century, the sustained and rapid growth of China's economy, coupled with increased national strength, has created more favorable conditions for industry feedback into agriculture. Urban-rural relations and agricultural/rural policies have undergone a transformation from "taking" to "giving," with policies such as "coordinated urban-rural development," "integrated urban-rural development," and "urban-rural integration." These policies, along with institutional mechanisms, have propelled urban-rural relations towards integration.

The resurgence of the country and market in rural areas, coupled with the growth of the rural economy and society, has resulted in a governance structure characterized by triple synergy, known as the "state-market-rural" model. This has become a crucial external constraint influencing the adjustment and optimization of rural governance mechanisms.

The nation's objective in returning to rural areas is to nurture agriculture and rural regions. This is evident in the government's continuous increase in resource investment in agriculture and rural areas, improving urban-rural relations through direct resource input, and enhancing institutional supply to break the binary system mechanism of urban-rural separation. This continuous effort essentially grants equal economic and social rights to farmers, rural areas, and cities, integrating them into the country's modernization process.

The equal status and economic and social empowerment of rural and urban entities, along with production factors such as population and land, fundamentally enhance the economic and social status of farmers and rural areas. The Third Plenary Session of the 18th Central Committee of the Communist Party of China, proposing to "innovate the social governance system" and achieve the transformation from "social management" to "social governance," emphasizes the establishment of a new modern social governance pattern of "co-construction, sharing, and co-governance" under government leadership. For rural governance, establishing a new governance pattern with the participation of diverse social entities in rural areas is a necessary choice for significant changes in the external conditions and social environment of rural society. The development and growth of rural society, guided by government-led resource input, lay a social foundation for the development of a diverse and collaborative governance pattern in rural areas.

The market mechanism is increasingly embedded in rural society, enabling various market entities, represented by new agricultural management entities, to fully develop. Various market-oriented governance entities, including new agricultural management entities and market mechanisms, are playing an increasingly crucial role in rural governance, expanding from economic governance to political, social, and other governance fields. With the development of new agricultural management entities and market mechanisms in rural markets, factors such as land, labor, and capital are increasingly allocated according to market value laws. The relationship between rural areas and the market is becoming closer, and the significant position and role of market entities in rural governance are becoming more evident.

Entities such as family farms, farmer professional cooperatives, agricultural leading enterprises, and new professional farmers have become leading forces in the development of the rural market economy and agricultural modernization. Agricultural management organizations, represented by new agricultural management entities, play a dual role as important entities in rural market and economic governance and

bridges between agriculture and rural areas. Their influence extends beyond the economic realm, impacting various aspects of the rural economy, society, and culture.

Economic elites from new agricultural management entities, such as family farmers, cooperative leaders, professional tycoons, and agricultural enterprise owners, directly participate in rural governance through party membership, village cadre elections, and other means. Some new agricultural management entities leverage their economic strength and social influence in rural society to seek institutional agents through "elite capture," particularly in cases involving industrial and commercial capital entering rural areas.

New agricultural management entities not only assume roles in rural economic and political governance but also serve as providers of public goods. These entities can supply public goods to rural areas independently or under the leadership of village committees. Various new types of agricultural operators play essential roles in the provision of rural public goods, contributing to the governance of the rural economy, politics, society, and other fields. Social and economic organizations dominated by new agricultural management entities play crucial roles as governance entities in rural governance, contributing to the overall diversity of the governance system.

3. New features of rural governance structure

3.1. Transformation from binary governance with urban-rural differentiation to unified governance with urban-rural integration

The separation and imbalance in resource allocation, based on different institutional arrangements between urban and rural areas, have been significant factors contributing to the dual structure of urban and rural regions. The establishment of a policy support system for the development of new agricultural management entities has progressively dismantled the urban-rural economic and social governance framework. Reforms in population management, cultivation systems, and rural land governance mechanisms have empowered both urban and rural populations, as well as other entities, to increasingly enjoy equal economic and political power. As market factors, they have attained equal economic and social status, and their operational frameworks, institutional rules, and management mechanisms are becoming more interconnected and unified.

Support policies in fiscal and financial aspects have constructed a fiscal and financial operation and management system and a market operation mechanism for rural economic development from two dimensions: government and market. This marks the expansion of the urban modernization fiscal and financial system mechanism into rural areas and the transformation of rural areas, integrating them into the urban modernization fiscal and financial system. Policy and institutional arrangements that previously adhered to urban-rural dualism are now shifting toward a unified urban-rural system and policy arrangements under the new policy support system. The dual governance pattern of urban-rural integration is also transitioning toward a unified governance pattern of urban-rural integration.

The new type of agricultural management entity serves as a crucial organizational carrier and practical force for promoting urban-rural integration and development. This entity represents the carrier of resource element combinations, and its development results from the optimized allocation of factors such as land, population, and capital. The growth of these entities leads to the equal and free flow, as well as optimized allocation, of factors between urban and rural areas. It signifies a process of breaking the mechanism of input differentiation between urban and rural areas, the market system separation, and the industrialization model differences. This process is also about forming a progressively consistent urban-rural governance system and achieving integrated urban-rural development through factor integration and optimization.

New agricultural management entities and their organizational systems possess robust integration capabilities. Their development necessitates the free flow and allocation of elements between urban and rural

areas, acting as a link to establish institutional and elemental connections and a bridge to smooth out the disparities in institutional and resource allocation between urban and rural areas. The development of new agricultural management entities and the construction of their policy support system facilitate the dismantling of the urban-rural dual governance structure. This fosters the formation of a more unified urban-rural governance structure, addressing aspects of resource allocation, rule mechanisms, and economic and social governance mechanisms. Essentially, the development of new agricultural management entities serves the function of breaking the urban-rural dual structure and propelling the integration of industry, agriculture, and urban areas. It has become a crucial element in enhancing the system, mechanisms, and policy framework for urban-rural integrated development. The development of new agricultural management entities and the construction of their policy system lay the economic and institutional foundation for urban-rural integration.

3.2. More diverse and varied rural governance mechanisms

The development of new agricultural business entities has instigated both "land movement" and "people movement," resulting in a more robust and in-depth governance mechanism around "land" and "people." The governance mechanism related to "land" involves reforms such as the "three rights separation" and "three plots of land," the "governance mechanism before, during, and after the land transfer," and the "industrial and commercial capital leasing land supervision mechanism." Simultaneously, the governance mechanism concerning "people" encompasses the "reform of urban and rural registered residence system," "institutional mechanisms for equalization of urban and rural public services," "employment systems," and "mechanisms for cultivating new types of professional farmers." Building upon this foundation, various systems have emerged, including the "new agricultural management system construction," "agricultural support and protection system," "coordinated urban-rural integration system and mechanism," "grassroots party building," "grassroots democratic management system," "spiritual civilization construction," and "administrative law enforcement system reform." Consequently, rural governance mechanisms have become more diverse across fields such as economy, politics, society, culture, and ecology. Simultaneously, rural governance mechanisms and models have become more varied and diversified. In other words, due to differences in economic, social, cultural, and other aspects of rural development in various regions, there are noticeable regional disparities in rural governance mechanisms. This diversity is also reflected in the diversification and variation of rural governance.

The diversity of innovation is evident in the new agricultural management system and mechanism. The diverse innovation in the new agricultural management system and mechanism is a significant manifestation of the varied nature of rural governance mechanisms. The innovation in the new agricultural management subject system and mechanism results from the amalgamation of central policy spirit and local reality. It is the product of local governments and village committees adapting to local conditions to implement the central spirit. Each region is encouraged to demonstrate initiative and creativity, actively explore, and choose distinct development paths based on the actual economic and social conditions of the local area. Noteworthy examples include the "Renfa Model" in Heilongjiang, the agricultural cooperation system in Chongzhou, Sichuan, the land trusteeship model in Zhoukou, Henan, the land trusteeship service in Jining, Shandong, the Anhui Agricultural Industry Federation, and the innovative agricultural public welfare service supply mechanism in Zhangjiagang, Jiangsu [4]. A commonality among these successful models is the active role played by the government. The government provides support and promotes policy support, while village committees coordinate land transfer, and modern agricultural service system construction is carried out under government guidance. Additionally, these models emphasize the establishment of scientific and democratic management systems for various new agricultural management entities, along with fair and reasonable mechanisms for sharing benefits.

The diversity of innovation is also evident in the system and mechanism for cultivating new professional farmers. The cultivation mode of new professional farmers is significantly influenced by the local context, with the development status of the local economy, politics, culture, and other factors impacting the path of cultivating new professional farmers. The eastern region opts for a non-governmental-led cooperative organization or industrial promotion model, the central region adopts a government-enterprise cooperation model, and the western region favors a government-led model. Overall, the new vocational farmer training model can be classified into three types and eleven subtypes: government-led, government-enterprise cooperation, and market operation [5]. Various regions are actively exploring and continually introducing some typical models, such as the Chongzhou model in Sichuan, the Nanling model in Anhui, the Ankang model in Shaanxi, and the Xiayi model in Henan. These models are government-led and can be described as a "government+" model.

3.3. The openness and collaborative enhancement of rural governance mechanisms

Openness is evident in both horizontal and vertical dimensions within rural governance. On a horizontal level, rural governance has surpassed the constraints of traditional rural and local administrative divisions, leading to closer connections and interactions between various administrative divisions and regions. When viewed horizontally between urban and rural areas, the mechanism of urban-rural integration governance is progressively becoming more refined and robust, fostering increased openness and integration between these two spheres. On a vertical level, the links between villages, townships, provinces and cities, and the central government have strengthened, resulting in a flatter and more connected administrative structure. The establishment of information platforms, from the central to grassroots levels, covering aspects such as land, e-commerce, and logistics, is gradually unfolding. This has led to flat information transmission and dynamic governance. Simultaneously, the synergy of governance is on the rise, a necessary requirement for openness. Vertically, the dynamics and synergy of central and local governance are heightened, while horizontally, there is a coordinated governance approach spanning "economy, politics, society, culture, and ecology" in rural governance.

The establishment of party organizations on the industrial chain is a significant manifestation of the openness and diversity of grassroots party organizations. As party-level organizations build on the industrial chain, they are becoming increasingly open, flat, and diverse. The influence of new types of agricultural operators and related informal organizations is growing, expanding their role in rural economy, politics, and social life, thereby altering the structure and pattern of rural governance [6]. To thrive in the new development situation, the party must transform its organizational form in rural areas. Building a party on the industrial chain has become a prevalent organizational approach. This shift in organizational form has given rise to the coexistence of party organizations on the industrial chain and those originally established based on administrative divisions. Consequently, changes in the organizational form and structure of the party have necessitated adjustments in its management methods. The development scale of new agricultural management entities varies, with some spanning industries and others spanning regions. Addressing how to integrate the relationship between party organizations within the industry and local party and government organizations becomes a major concern. Many regions have adopted flexible and open methods such as "land-based industry" or "all-round management function" (i.e., managing industrial party organizations within the jurisdiction through local all-round party organizations), "party building groups," or "joint meetings." The establishment methods and working mechanisms of party organizations are becoming increasingly flexible and open.

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Research on the Impact of Low Carbon Economy on China's Foreign Trade

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Abstract: Considering the growing prominence of global environmental issues, a low-carbon economy has emerged as a crucial direction for economic development across various countries. As the world's second-largest economy, China has also witnessed the influence of a low-carbon economy on its international trade development. This article aims to commence with an exploration of the development background, meaning, and significance of a low-carbon economy. Subsequently, it delves into an in-depth analysis of the impact that a low-carbon economy has on China's international trade. The article concludes by proposing pertinent countermeasures and suggestions.

Keywords: Low carbon economy; Foreign trade; Trade structure; Trade barrier

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1. Introduction

The convening of the Copenhagen Climate Change Conference in 2009 marked the establishment of a global consensus on a low-carbon economy, characterized by low energy consumption, minimal pollution, and reduced emissions. As an approach to economic development, the low-carbon economy, guided by the principles of sustainable development, strives to minimize the use of high-carbon energy sources, such as coal and oil. Its objectives include the reduction of greenhouse gas emissions and the pursuit of a mutually beneficial model that intertwines economic and social development with ecological environment protection, which is achieved through diverse means, including technological innovation, institutional reform, industrial transformation, and the development of new energy sources [1]. Across the globe, developed economies view the development of low-carbon economies – encompassing new energy, automotive power, clean energy, and the biotechnology industry – as pivotal for overcoming the international financial crisis.

In its quest for a development path aligned with national conditions, China has introduced a series of development concepts in the 21st century, such as "new industrialization," "circular economy," "two-oriented society," and "low-carbon development." Notably, the 18th National Congress of the Communist Party of China identified "green development, circular development, and low-carbon development" as crucial to ecological

civilization construction. The subsequent 19th National Congress officially proposed the establishment and enhancement of a green, low-carbon, and circular development economic system. As the world's largest carbon emitter, China, in September 2020, explicitly set goals for “peaking carbon emissions by 2030” and achieving “carbon neutrality by 2060”. The 20th National Congress emphasized that “promoting green and low-carbon economic and social development” is a pivotal element for achieving high-quality development.

From the aforementioned context, it is evident that low-carbon development has become a universal direction for economic progress globally. Consequently, understanding the precise impact of the low-carbon economy on China’s foreign trade and implementing corresponding measures to foster the sustainable development of China’s foreign trade has emerged as a central issue.

2. The impact of low carbon economy on China’s foreign trade

2.1. Adjustment of trade structure

Against the backdrop of global climate change, nations worldwide, particularly developed ones, are actively championing the “low-carbon revolution,” emphasizing high energy efficiency and low emissions. This drives the development of “low-carbon technologies” and necessitates significant adjustments to policies related to industries, energy, technology, trade, and others to capitalize on opportunities to promote industrial development.

Historically, China’s exported products have been predominantly resource-intensive and high in carbon emissions. The advent of the low-carbon economy is steering a transformation in the trade structure. On one hand, the push for a low-carbon economy prompts enterprises to embrace low-carbon production technologies, fostering the production of environmentally friendly and energy-efficient products that exhibit high demand in the global market.

Exporting these low-carbon technologies and green products becomes a catalyst for industrial restructuring. It mitigates reliance on traditional high-carbon products, broadens export markets, disrupts conventional trade structures, and enhances international market competitiveness. This shift is particularly noticeable in China’s new energy vehicle exports. According to data from the China Association of Automobile Manufacturers, in the period from January to August 2023, China’s automobile exports surged to 2.941 million units, a remarkable year-on-year increase of 61.9%. Notably, the export of new energy vehicles reached 727,000 units, a year-on-year increase of 1.1 times. China’s new energy vehicle production and sales have maintained global dominance for eight consecutive years. The diverse product range and exceptional quality of Chinese brand-new energy vehicles have earned widespread recognition in the international market. The increasing popularity of domestic new energy vehicles overseas is now a pivotal force propelling China’s automobile exports.

On the other hand, the adjustment in trade structure is fostering the establishment of more diversified trade partnerships with other nations. It facilitates the breakdown of technological barriers, achieving a diversification of trade partnerships. By engaging in low-carbon product trade with multiple countries, China is reducing its dependence on specific trade partners, promoting a more resilient and varied international trade landscape.

2.2. The increase in trade costs

2.2.1. Cost of technological upgrading, research and development, and transformation

As the world’s second-largest trading economy and the largest goods trading country, China enjoys the advantage of lower labor costs and more affordable raw materials in international trade. Consequently, numerous multinational companies with high energy consumption and significant pollution opt to establish factories in China. Simultaneously, domestic enterprises have historically paid scant attention to environmental

considerations in their production processes.

The transition to a low-carbon economy necessitates a fundamental shift in the corporate mindset, urging enterprises to prioritize low-carbon production processes and adopt technologies aligned with green energy practices. Achieving this shift requires substantial upgrading and transformation of technical equipment, involving tasks such as acquiring new equipment, overhauling production lines, and training employees. These endeavors contribute to an increase in enterprise costs. Additionally, the expenses incurred during the research and development phase, coupled with the upgrading of technology and equipment, may compel enterprises to offset these costs by either raising product prices or reducing profits. This, in turn, diminished the price competitive advantage for export enterprises, leading to an increase in overall trade costs.

2.2.2. The increase in carbon emission costs and green certification standard costs

In numerous countries and regions, especially developed ones, stringent environmental quality standards and regulations surpass those of their developing counterparts in the name of environmental protection and energy conservation. Notably, common environmental trade barriers, such as “carbon tariffs” and “carbon labels,” are prevalent in the international market.

Consequently, Chinese export enterprises aiming to access markets in such countries or regions must comply with green certification or carbon emission certification requirements. The entire process, from application to testing and certification completion, not only amplifies the time cost for export enterprises but also escalates intermediate and additional costs [2]. These elevated costs directly contribute to the production costs of enterprises, thereby influencing the competitiveness and trade costs of products in the international market.

Despite the short-term financial and technological challenges associated with establishing a low-carbon trade structure – leading to increased production and management costs, and a subsequent squeeze on corporate profits – research indicates a positive correlation between carbon emission rights constraints and China’s exports. This correlation is primarily attributed to technological advancements and the cost-effectiveness of trade. Although disparities exist in environmental regulations between China and foreign countries, the primary role of trade lies in reducing environmental costs through technological progress. Consequently, in the long run, this endeavor can indeed stimulate high-quality and sustainable development in international trade, promote enterprise modernization, augment the role of technological factors in international trade, facilitate the expansion of international trade on a global scale, and contribute to the establishment of a positive, green, and sustainable low-carbon trade structure.

2.3. The increase in trade barriers

The trade barriers discussed here primarily pertain to the emergence of “low-carbon” barriers following the implementation of a low-carbon economy. These represent a novel form of non-tariff trade barriers designed to safeguard the environment and foster sustainable development by constraining carbon emissions. By implementing environmental regulations and increasing carbon emission costs, these barriers aim to curtail products and services with high carbon emissions, thereby impeding the progress of international trade liberalization.

2.3.1. Setting stricter environmental standards

China’s export regions are predominantly concentrated in developed countries. However, the advent of the low-carbon economy has prompted many developed nations to establish exceedingly rigorous environmental standards and regulations. Additionally, disparities in the environmental standards and certification systems

required for a low-carbon economy exist among countries. These differences make it challenging for China's exported products to meet the environmental standards of importing countries, thus becoming a hurdle to trade.

2.3.2. Imposing additional trade restrictions

Amidst the Green Industrial Revolution, a new wave of green trade barriers is taking shape, reshaping trade rules and dynamics. This transformation includes deeper rule changes, with new trade relations based on "climate" and "carbon emissions." These relations are characterized by the establishment of new trade rules involving carbon tariffs and carbon trade. In the European Union, for instance, one ton of carbon dioxide is valued at 700–800 Chinese Yuan (CNY), while in China, it may be priced at 70–80 CNY. This stark difference has raised concerns among some developed countries about "carbon leakage." Consequently, economies are promoting zero-carbon transformations through mechanisms like carbon border adjustments, such as carbon tariffs or similar measures, to encourage green industrial upgrading and safeguard their own industries. This dynamic stands as a significant factor contributing to the rise in trade barriers.

2.3.3. Environmental subsidies and technological barriers

Certain countries may offer subsidies to support their own low-carbon industries, influencing the competitiveness of products from other countries in the international market. Moreover, within the realm of the low-carbon economy, China encounters substantial competitive pressure in key technologies and patents related to low-carbon technologies. Some importing countries may set excessively high thresholds for the technical specifications and equipment of imported products from China. These situations collectively contribute to the formation of trade barriers.

3. Development strategies for China's international trade under a low-carbon economy

3.1. Optimizing the export industry structure and promoting the transformation of foreign trade enterprises

In the context of a low-carbon economy, the government must implement corresponding measures to realign the domestic industrial structure and facilitate low-carbon development for China's foreign trade, ensuring its sustainability. Firstly, the government can employ economic and administrative measures to formulate pertinent policies, and institute tax incentives, fiscal subsidies, and other interventions. These actions aim to channel resources towards low-carbon industries, curbing the growth of high-carbon industries [3], and motivating enterprises to undertake low-carbon transformations and industrial upgrades.

Secondly, the government should foster cooperation and mutually beneficial relationships among enterprises within the industrial chain. This can be achieved through policy guidance and market mechanisms, urging enterprises to establish green supply chain management systems for effective green management and optimization of the supply chain. This collaborative effort contributes to the shared goal of achieving low-carbon development. Moreover, encouraging enterprises to augment investments in technology research and development is crucial. This involves promoting technological innovation, facilitating the transformation of achievements, and enhancing product technology content and competitiveness.

Furthermore, various government departments need to enhance collaboration and leverage information technology to construct a comprehensive information database. Summarizing the low-carbon standards of various countries, this database aids enterprises in querying pertinent information during international trade activities. Such measures not only attract and aggregate global innovation factor resources but also focus on

global industry leaders and foreign research and development institutions possessing key core technologies or enriched application scenarios. This concerted effort accelerates the construction of an international innovation ecosystem.

3.2. Increasing investment and enhancing the innovation capability of enterprises

The innovation capability of enterprises is directly intertwined with the sustainability of China's foreign trade development. Therefore, in the era of the low-carbon economy, enterprises must fortify their innovation capabilities to navigate new challenges and seize emerging opportunities. Recognizing that innovation capability is pivotal for enterprise development, it not only provides a competitive edge in intense market competition but also propels sustainable growth.

In the low-carbon economy era, enterprises should continually pioneer new technologies aimed at reducing carbon emissions, enhancing energy efficiency, and mitigating environmental pollution. Achieving technological innovation can be realized through the adoption of advanced technologies, robust independent research and development, and collaborations with scientific research institutions. Simultaneously, enterprises must prioritize the practicality and marketability of technological innovations. Aligning these innovations with market demands ensures they meet consumer needs, thereby bolstering market competitiveness.

Establishing comprehensive systems, encompassing innovation incentive mechanisms, intellectual property protection systems, and talent training mechanisms, is paramount. Through these mechanisms, enterprises can attract and retain high-level technical talents. Furthermore, enterprises need to elevate their innovative awareness and concepts through training, fostering the continuous development and transformation of the enterprise.

Moreover, companies should reassess their business models, striving for approaches that curtail carbon emissions, enhance energy efficiency, and mitigate environmental pollution. Embracing green supply chain management, championing circular economy models, and implementing energy-saving and emission-reduction measures are avenues through which enterprises can trim costs, amplify efficiency, bolster profits, and heighten their sense of social responsibility and brand image.

3.3. Strengthening international and regional exchanges, cooperation, and improving low-carbon emission reduction mechanisms

The widespread adoption of the low-carbon economy has precipitated transformative shifts in international trade rules, reshaping traditional trade patterns. To adeptly navigate the impact of these changes on international trade, China must deepen economic and trade cooperation between global regions. By establishing a community that promotes the development of international trade, China can augment its influence in global trade discussions and refine low-carbon emission reduction mechanisms [4].

China can fortify regional collaboration with developed nations like the European Union, the United States, and Japan. This collaboration can manifest in cross-border projects and collaborative research and development initiatives in the renewable energy sector. This proactive approach is a strategic response to potential technological trade barriers associated with the introduction of low-carbon technologies. The establishment of a cross-border carbon trading market is another avenue for incentivizing enterprises and countries to implement more robust emission reduction measures. This market would enable different countries and regions to engage in the trading of carbon emission quotas.

In addressing green trade barriers or technical trade barriers arising from "carbon tariffs" and "carbon labels," China can actively engage in regional economic and bilateral trade cooperation and explore the establishment of "common but differentiated" international trade carbon emission standards and rules [5].

Simultaneously, China can expand its low-carbon economic cooperation with countries along the "Belt and Road" through initiatives such as green investment and low-carbon technology trade. Since the implementation of the Regional Comprehensive Economic Partnership (RCEP) agreement, it has played a constructive role in China's economic green recovery in collaboration with other member countries. Strengthening communication and experience sharing among member countries on low-carbon product standards and low-carbon industry policies, along with reinforcing collaboration in green trade, green finance, and green investment, will further catalyze the exchange and integration of green technologies.

Disclosure statement

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Unlocking Societal Recognition and Acceptance: A Case Study of Python

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Abstract: This study employs Python, a high-level programming language, as a case study. By analyzing the inherent characteristics of Python within its social context, this study explores its advantages in meeting social needs, influencing social psychology, and garnering external support. The primary objective of this analysis is to disrupt the established monopoly held by older programming languages such as Java, Rust, and C++. As a result, Python has emerged as the most widely utilized and popular programming language globally. Using Python as a representative example, this study extends its focus to examine the conditions under which products across various societal domains not only gain recognition but also find widespread acceptance and application in the world. Through thorough scrutiny within the demanding landscape of society, the study contends that products meeting such conditions are well-positioned to contribute significantly to societal progress.

Keywords: Python; Society; Acceptance

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1. Why Python is so popular

Python, a prevalent high-level programming language in the contemporary era, was conceived in the early 1990s by Guido van Rossum at the National Research Center for Mathematics and Computer Science in the Netherlands, emerging as a successor to the ABC language. Over approximately three decades, Python has evolved into the versatile and widely used language we encounter today, undeniably impacting various facets of our lives.

This study seeks to elucidate the factors contributing to Python's widespread popularity within the societal framework. Python serves as a representative case to clarify the conditions under which other scientific products gain societal acceptance. The primary significance of this exploration manifests in two key aspects: firstly, aiding relevant organizations, enterprises, or individuals in crafting products that genuinely resonate with society; and secondly, facilitating the fine-tuning of exceptionally meritorious products, ensuring their alignment with societal needs, widespread adoption, and resilience against being overshadowed by the currents of societal change.

1.1. Development needs

In today's society, the shift from informatization to digitalization and intelligence is evident. The straightforward dissemination of simple information no longer suffices to meet the basic needs of society. The pivotal factor influencing and driving this transformation is the development of artificial intelligence, and the emergence of Python is a response to these evolving development needs.

Firstly, let's address the issue of development efficiency. It is crucial to understand that digitalization and intelligence are concentrated in a technological product, that is, artificial intelligence. Python, in many ways, stands out as the optimal programming language for the development of artificial intelligence. While some programmers or computer-related practitioners argue that Python's running and computing speed is slower compared to languages such as Java and C++ [1], they often overlook a significant aspect, that is, development efficiency.

Java and C++ exhibited complex syntax and high development difficulty, challenges that Python adeptly circumvents. Python's syntax is simple, its structure is clear, and what might take a hundred lines of code in a Java algorithm can be accomplished in approximately thirty lines in Python. For the sake of clarity, complex code is not presented here. As an illustration, consider a simple example of web page title crawling. The author conducted relevant experiments, and the code volume can be compressed up to five times, especially when dealing with anti-crawling mechanisms, as exemplified in the attached code page.

Python code sample:

```
import requests
from bs4 import BeautifulSoup
url = 'http://example.com/'
response = requests.get(url)
soup = BeautifulSoup(response.text, 'html.parser')
title = soup.title.string
print(title)
```

C++ code sample:

```
#include <iostream>
#include <fstream>
#include <string>
#include <cstdlib>
#include <cstdio>
#include <cstring>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <netdb.h>
using namespace std;
int main() {
```

```
const char* url = “http://example.com/”;
const char* filename = “output.txt”;
ofstream outfile;
outfile.open(filename);
if (!outfile) {
   cerr << “unable to open document” << filename << endl;
   return 1;
}
string request = “GET” + string(url) + “HTTP/1.1\r\nHost:” + string(url) + “\r\n\r\n”;
const char* request_cstr = request.c_str();
int sockfd = socket(AF_INET, SOCK_STREAM, 0);
struct sockaddr_in serv_addr;
bzero((char*)&serv_addr, sizeof(serv_addr));
serv_addr.sin_family = AF_INET;
serv_addr.sin_addr.s_addr = inet_addr(“8.8.8.8”)
```

Considering the contemporary landscape’s increasing demand for algorithms characterized by robust scalability, particularly within the realm of artificial intelligence, a compelling need arises for the seamless integration of multiple algorithms to ensure optimal functionality. The intricate nature of these functions establishes an inherent interconnection. Consequently, the paramount focus shifts to the development efficiency of each individual function.

Chatgpt4, a forefront language model robot of recent years, features an operational structure encompassing approximately nine core functions. These include “natural language processing,” “call knowledge base and background knowledge,” “natural language generation,” and “language translation.” The successful execution of each function relies intricately on the functionality of the preceding ones. Within the development process, a meticulous approach to testing and debugging becomes imperative, occurring sequentially to guarantee the timely release of the language model robot for effective service to humanity and the community. In the context of this era’s technological landscape, a pivotal question emerges: Which holds greater significance, the speed of execution or the efficiency of development? Undoubtedly, the latter takes precedence.

1.2. Alignment with the social psychology of young people

This aspect resonates well with the social psychology of young individuals, primarily fueled by two key factors. Firstly, there is a profound curiosity regarding the underlying principles of the Internet. Delving into the period spanning the early 21st century to around 2012, a pivotal historical stage for the Internet unfolds, from its introduction to widespread integration into households. During this epoch, societal expectations and enthusiasm for the transformative potential of the Internet were palpable, particularly among children. Exposed to various small and large online games since childhood, these experiences sowed the seeds of a desire to explore the intricacies of the Internet. Programming emerged as the optimal avenue for comprehending and navigating the underlying principles of Internet computers. While several programming languages were available, the high entry threshold of Java and C++ posed a barrier for many young computer enthusiasts. Python, with its concise syntax and clear structure, became the first programming language for numerous young individuals. Fond memories often include the initial execution of “print (‘hello world’)” or successfully copying a browser’s

request header for a crawler, which is an enchanting initiation into the world of programming.

Another noteworthy aspect is Python's resonance with the psychology of young people who aspire to showcase their skills. In the realm of psychology, money and knowledge stand out as sources of superiority. Given the challenges in accumulating significant wealth for young individuals due to diminishing academic qualifications and limited social inclusion, there arises a pursuit of advanced and practical knowledge to establish a sense of superiority. Fields such as economics prove less effective, while philosophy has a limited audience. In contrast, computer programming technology, with its strong operability and broad audience, becomes the preferred choice. Python, with its user-friendly attributes – simple syntax, clear structure, and ease of initiation – once again emerges as the favored language for young individuals seeking logical clarity.

It is essential to clarify the emphasis on young people in this section. This choice stems from the understanding that the generation and evolution of most innovations and ideas in society are predominantly driven by the youth. Children and the elderly typically have limited influence on these developments, while many middle-aged individuals, having settled into stable lives, often adhere to concepts of the old era and display limited interest or resistance to emerging societal trends. Consequently, this section excludes them as research subjects.

1.3. Assistance from external forces

The emergence and subsequent surge of the short video industry have had a profound impact on the dissemination and consumption of information, including programming knowledge such as Python. In this context, "short" denotes brevity, catering to individuals with limited time spans and a preference for content that is both concise and engaging. The minimal time investment required for these videos, coupled with their high completion rates, has contributed significantly to their widespread popularity. People are drawn to these short videos due to their low cost of acquiring knowledge. However, this accessibility comes with its drawbacks. Some knowledge-focused bloggers use this platform primarily to generate traffic, resulting in content that may lack depth or expertise.

Within this landscape, Python has emerged as a pivotal programming language prominently featured across various short video platforms. The simplicity and ease of understanding Python make it a perfect fit for the short video format. It aligns well with the audience's fragmented time and relatively low demand for technical depth, fostering a consensus between content creators and viewers. A quick search for keywords such as "computer programming" on major short video platforms worldwide yields a plethora of Python-related content, solidifying its dominant presence. The fusion of Python with the short video industry underscores its adaptability and suitability for a format where brevity and simplicity prevail. This convergence effectively bridges the gap between bloggers seeking traffic and viewers seeking easily digestible programming knowledge. Consequently, Python has become a prominent fixture in the realm of short-form educational content. In fragmented time, short video users occasionally receive information about Python. Even if some users are not initially interested, repeated exposure strengthens their memory of Python. Some short video platform users may be influenced and even change the direction of their lives. At this juncture, the significance of the short video platform in disseminating Python-related content is most apparent.

Another contributing factor is the global initiative by governments to incorporate computer programming skills into compulsory courses in secondary schools and universities. In China, for instance, most provinces and cities have integrated Python programming into compulsory high school courses. Requirements from the "Information Technology Curriculum Standards for General High School (2017 Edition)" include units such as "Initial Understanding of Data and Calculation," "Programming Calculation," "Understanding Data," and

"Calculation and Problem Solving." In Russia, computer programming became compulsory in 2009, with Python widely introduced into the education system. European and American countries, including Finland, Britain, and Canada, have similarly embraced computer programming as part of the education system, with Python as the preferred language for its ease of comprehension. This global educational shift has played a crucial role in Python's international popularity.

In the preceding discussion, the multifaceted reasons behind Python's popularity were explored, shedding light on why this seemingly ordinary programming language has been embraced by society. Through the analysis of Python, the essential conditions for scientific and technological products can be distilled to gain acceptance within society.

2. Essential conditions

2.1. Aligned with the development trend of society

To understand the development trend of society, it must be recognized as a guiding direction that propels progress, exemplified by contemporary themes such as energy conservation, environmental protection, and sustainable development.

Society operates as an intricate ecosystem, requiring adaptation to myriad influences such as scientific and technological development, population dynamics, cultural shifts, and progress in various domains. Failure to align with the developmental trajectory of these factors can lead to elimination. A compelling example is Kodak, once the largest film production company of the last century. Established in 1880, Kodak thrived during the era of film cameras, leveraging excellent film production technology and widespread sales channels. However, as the late 20th century ushered in the digital camera era, Kodak faltered in adapting to the changing landscape. Lagging behind competitors such as SONY, Canon, and Nikon, Kodak missed the critical moment for digital business development, resulting in a drastic decline. Sales plummeted from $14 billion to $4.2 billion, prompting a desperate shift from film to digital. Even this move was not successful, with Kodak losing money on every digital camera sold. By 2012, facing bankruptcy, Kodak had to sell several assets, including its digital camera and medical imaging businesses, with only $5.1 billion in assets and $6.8 billion in liabilities [2].

Kodak's downfall underscores the importance of adaptability, strategic vision, and market insight. Companies must maintain a keen understanding of market dynamics and exhibit an innovative spirit to navigate the evolving market environment. The lesson from Kodak's story is clear: to be chosen by society, organizations must align with the development trend of society and synchronize with the various directional factors shaping its course.

2.2. In accordance with the will of humanity

Society, fundamentally composed of individuals, interprets social choices as a narrower form of human choice. All humans share a common trait, that is, the pursuit of convenience. Hence, aligning with the general inclinations of humanity, rooted in one or more aspects of human affection, becomes a pivotal condition for societal acceptance.

An observable phenomenon in daily life involves enterprises and organizations frequently prompting users to complete various questionnaires using diverse methods and for different reasons. Despite many individuals developing a numbed response to these requests, few pause to consider the underlying motive, often driven by the profit and long-term development perspectives of enterprises and organizations. These questionnaires serve the purpose of gathering customer opinions to enhance products, foster customer retention, and attract new customers. A contemporary example of adapting to human preferences is evident in museums transforming

historical artifacts into digital images to captivate public interest [3]. Museums, such as the National Museum of China, employ large screens allowing people to zoom in on cultural relics' details. Questionnaires represent only a fraction of the methods devised by enterprises to understand people's sentiments and grasp evolving trends.

Generally, when a product aligns with the societal development trend, it naturally resonates with people's preferences. The reciprocal relationship between people's preferences and societal trends is subtly interconnected, akin to a two-way arrow symbolizing mutual influence and interaction. In essence, the will of people often shapes societal trends, illustrating the intricate connection between the two forces.

2.3. Social opportunities

The concept of opportunity often appears intertwined with luck, prompting contemplation on instances of prosperity throughout history, both ancient and modern, that transcended reliance on luck alone. Even when inevitabilities are present, the role of luck can influence the duration or various aspects of these occurrences.

In the pivotal year of 1974, Bill Gates made a strategic decision to depart from college, foreseeing the widespread utilization of personal computers. Collaborating with Paul Allen, they embarked on crafting a software system for the Altair 8800 microcomputer, overcoming the hurdle of limited hardware access. After two months of programming, Allen conducted the inaugural test of the software on the Altair in New Mexico. The success of their innovative software venture laid the foundation for Microsoft, now recognized as the world's largest software company.

The question arises: Did Bill Gates leave Harvard with a calculated gamble or a meticulously planned roadmap to success? Even with a well-defined plan, the establishment and developmental phases of any enterprise introduce a myriad of challenges. Navigating these challenges necessitates more than strategic planning; it often requires a touch of luck to calmly navigate through crises.

This phenomenon is not unique to Bill Gates or his company; it is a universal truth applicable to businesses, individuals, and organizations alike. Drawing a parallel to the earlier discussion on Python, its global prominence owes much to the rise of the short video industry. Without this pivotal trend, Python's historical inevitability might not have garnered as much attention. In essence, the short video industry, or what may be termed as Python opportunities, foreshadowed this situation.

Crucially, this research carries profound significance in aiding emerging products within society to secure acceptance. The primary objective is to extend assistance to more individuals, enterprises, and organizations for their success. The targeted service focuses on products in the research and development stage or those with greater scalability potential. Instead of drawing comparisons with existing structures and entrenched industry products, the emphasis is on the malleable developmental stages.

The first two essential conditions presented in this research propose actionable measures for product developers. They can strategically align with current social development patterns and leverage insights into human nature. The third point, being inherently more challenging to predict, underscores the importance of diligently addressing the first two conditions.

3. Conclusion

In the unforgiving landscape of societal preferences, the market unfolds as a battleground where countless products vie for attention. Amidst this fierce competition, successful products invariably share certain traits: a keen alignment with social development trends, a profound understanding of human nature, and a touch of serendipity. Identifying and embracing these shared characteristics in advance significantly enhances the

likelihood of success in the competitive market environment. In conclusion, navigating the intricate dynamics of societal choices requires a strategic grasp of these fundamental elements, guiding product developers towards a path of increased market resilience and acceptance.

Disclosure statement

The author declares no conflict of interest.

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Digital Marketing and B2B Cross-Border E-Commerce: A Case Study of Alibaba International Station in China

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Abstract: The rapid development of the "Internet+" has ushered in a new era of global digital technology innovation. Concurrent with the deepening trends of economic globalization and integration, international trade is progressively undergoing extensive digitization, with cross-border e-commerce emerging as a significant manifestation of this transformation. Within this landscape, the cross-border e-commerce B2B platform is anticipated to become a pivotal driver for China's cross-border trade growth, representing a strategic opportunity for trade transformation. This paper provides a comprehensive examination of the concepts, characteristics, and development status of cross-border e-commerce and B2B platforms, considering both global and Chinese perspectives. Focusing on a prominent case study, Alibaba International Station, a B2B cross-border e-commerce platform, the paper delves into its business model and core competencies, offering a thorough analysis of its role in the intricacies of international e-commerce and its contribution to the field. Drawing on insights gained, the paper concludes by presenting targeted recommendations from both the platform and government perspectives. These suggestions are informed by a nuanced understanding of the development opportunities and challenges facing China's cross-border e-commerce B2B platforms.

Keywords: Digital economy; Cross-border e-commerce; B2B platform 2.0; Business model analysis; Alibaba International Station

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1. Introduction

The rapid evolution of "Internet+" has instigated a paradigm shift in global digital technology innovation. Aligned with the deepening processes of economic globalization and integration, international trade is unmistakably veering toward digitization. The advent of cross-border e-commerce has not only revolutionized the global business landscape but has also redefined the international trade model, emerging as a crucial manifestation of the digitization of global trade. Business-to-business (B2B) platforms, acting as pivotal connectors between diverse businesses, are instrumental in altering conventional business paradigms. Their

operational model effectively navigates the complexities of transactions, enabling companies to adapt and cultivate new business approaches amid the globalizing landscape.

Alibaba International Station is a trailblazer in cross-border e-commerce and a quintessential B2B platform. This paper scrutinizes its business model and competitiveness using the Strengths, Weaknesses, Opportunities, and Threats (SWOT) model. Furthermore, it delves into the intricate realm of cross-border e-commerce development, exploring its multifaceted nature. The paper also investigates the substantial contribution of B2B platforms to the evolution of international e-commerce. The overarching objective is to provide targeted recommendations aimed at addressing the current stage of cross-border e-commerce development in China.

2. Literature review

2.1. Cross-border e-commerce and B2B platform

Cross-border e-commerce entails international business activities wherein trading entities at different customs borders engage in transactions, make payments through e-commerce, and deliver goods to complete the transaction via cross-border logistics [1]. Chinese scholars commonly categorize cross-border e-commerce using traditional e-commerce model classifications, such as B2B, B2C, and C2C, each with distinct meanings and differences as outlined in **Table 1** [2]. In the contemporary era, with the continual evolution of the Internet, cross-border e-commerce, characterized as a novel business model and an emerging trade method, occupies a vast market space with promising development prospects [3].

Table 1. Current major business models of cross-border e-commerce models

Models	Participation subjects	Characteristics of transactions	Representative websites
B2B	Business-to-business transactions	Large volume Small batch Centralized orders	Alibaba Made-in-China
B2C	Business-to-consumer transactions	Small volume Multiple batches Scattered orders	Amazon Dunhuang
C2C	Consumer-to-consumer transactions	Small business transactions	eBay

B2B e-commerce involves the online marketing and selling of products between two businesses, aiming to expand customer reach and reduce cost-to-serve, thereby driving increased revenue for the businesses involved. As one of the fastest-growing sales models, the global B2B e-commerce market size is anticipated to reach USD 9,209.33 billion in 2023, with a projected Compound Annual Growth Rate (CAGR) of 20.2% from 2023 to 2030 [4]. The onset of COVID-19 has accelerated the demand for e-commerce amidst a backdrop of slowing economic activity. Faced with stay-at-home restrictions, numerous consumers and businesses embraced digitalization to conduct transactions for goods and services online. Additionally, the surge in web applications and cloud services has further fueled this demand. B2B platforms, serving as conduits for cross-border e-commerce transactions, are increasingly becoming pivotal drivers for the digital transformation of small and medium enterprises (SMEs) [5].

2.2. Related analysis of e-commerce development in China

Globally, it is estimated that over 1 billion people engage in cross-border online shopping, with the Asia-Pacific region emerging as the fastest-growing cross-border e-commerce area [6]. China stands out as a prominent representative of cross-border e-commerce within the Asia-Pacific region.

Against the backdrop of global epidemics and economic restructuring, China has introduced a novel economic paradigm known as "dual circulation," significantly advancing the development of the country's cross-border e-commerce industry. In 2022, the number of cross-border e-commerce entities in China surpassed 100,000, with over 200,000 independent stations established and approximately 690 cross-border e-commerce industrial parks in comprehensive pilot zones [7]. China has entered into bilateral e-commerce cooperation memorandums with 29 countries, particularly those involved in the "Belt and Road" initiative, resulting in rapid growth of e-commerce transactions.

China's cross-border e-commerce B2B platform has experienced swift development, characterized by market specialization and application diversification. In 2020, its market size constituted about 72.8% of the entire cross-border e-commerce market, with the "agricultural and sideline products" market holding a substantial share. The growth of China's B2B platforms is intricately tied to the support of government policies, encompassing tax incentives, streamlined customs clearance processes, international cooperation agreements, a well-established supply chain system, and a robust manufacturing base. Additionally, continuous innovation in China's digital technologies, such as artificial intelligence (AI) and big data analytics, has played a pivotal role in this evolution.

3. Case study: Alibaba International Station

Established in 1999, Alibaba International Station represents the inaugural business segment of the Alibaba Group and has evolved into the primary platform driving the digitalization of foreign trade [8]. With a cumulative service record exceeding 26 million active corporate buyers across more than 200 countries and regions [9], it has solidified its status as a preferred network platform for export companies seeking to expand their international trade ventures [10]. Notably, on September 14, 2023, Alibaba International Station announced its comprehensive nationwide operations, signaling its intent to undertake refined operations tailored to the unique characteristics of different countries and markets. This involves leveraging online national pavilions and other strategic methods [11].

3.1. Business model analysis

Alibaba International Station operates on an innovative business model with intricate mechanisms designed to forge connections between foreign buyers and sellers in the realm of electronic shopping, providing a comprehensive solution for global trade in the Internet environment. The company boasts an e-market platform, transportation and logistics service, payment and financial solutions, as well as data analytics and digital advertising devices. Serving as an online marketplace, Alibaba International Station facilitates the easy global sale of products for SMEs, minimizing cross-border trade barriers. Collaborating with various logistic service providers ensures timely delivery, thereby supporting international trade and elevating customer satisfaction.

The platform prioritizes secure transactions, utilizing payment options such as Alipay and Ant Financial to instill trust in aspects such as safe payments, funding, credit security, and foreign exchange. Alibaba International Station features a flexible financial system with a diverse array of deals. Leveraging big-data intelligence to monitor buyers' purchasing behaviors and market trends empowers sellers to refine both their products and marketing strategies. This data-driven decision-making process greatly enhances the overall buying experience for consumers. The platform's commitment to regularly upgrading its data tools enables it to adapt effectively to evolving market needs.

3.2. Competitive analysis

Alibaba International Station's global footprint is evident in markets worldwide, offering a distinctive convergence point for overseas vendors and purchasers. Its robust structural framework provides sellers with multiple entry points and consumers with diverse options. The platform boasts an efficient global supply chain, integrating warehouses and custom logistics for streamlined and effective delivery.

However, challenges persist. Diverse laws and regulations across regions introduce risk and complexity. Transaction satisfaction is impacted by the platform's limited direct control over product quality, compounded by the presence of numerous competing global e-commerce platforms.

Despite these challenges, opportunities for market growth abound, including expanding into more developing countries and embracing sustainability approaches to meet evolving customer needs. The integration of technologies such as blockchain and AI can enhance platform functions and bolster security, representing crucial elements for performance improvement and a secure online environment.

Nevertheless, threats loom on the horizon. Geopolitical tensions may disrupt international trade, and emerging e-commerce platforms pose challenges to market shares due to intensified competition. Legal changes and trade disputes among nations can potentially affect business operations. Addressing these challenges while capitalizing on opportunities will be pivotal for Alibaba International Station's sustained success in the dynamic global marketplace.

4. Suggestions and conclusions

The intricacies surrounding Alibaba International Station and cross-border e-commerce underscore the pivotal role of technology, compliance, and sustainability in shaping the landscape of international trade. These platforms must carefully navigate the delicate balance between innovation, adherence to regulations, and sustainable practices to determine their future trajectory, growth, resilience, and user experiences in the global markets.

From the platform's standpoint, there is a need for comprehensive support to sellers in risk management and compliance, including the provision of educational resources and robust assessment systems. Enhancing credibility could involve providing Internet-based legal consulting services. Embracing sustainability initiatives, such as encouraging sellers to minimize wastage or adopt renewable sources, is crucial. Continuous focus on technical innovation is imperative to enhance user experiences, maintain competitiveness in today's dynamic markets, and pave the way for a more progressive future.

From the government's perspective, there are several key recommendations. Firstly, the government should enhance the existing legal and regulatory framework, streamlining export procedures, and adjusting tariffs based on the current developmental stage. Secondly, the government should actively encourage and support technological innovation through financial subsidies, particularly in the application of AI, big data, and blockchain in cross-border e-commerce. Lastly, strengthening supervision of cross-border e-commerce platforms is essential to safeguard consumer rights, instill confidence in cross-border shopping, and foster a secure marketplace.

In summary, as globalization accelerates, cross-border e-commerce is emerging as a crucial component of export trade for various countries. It is believed that with concerted efforts from the government, enterprises, and platform operators, along with close international cooperation, the future of cross-border e-commerce holds vast prospects.

Disclosure statement

The authors declare no conflict of interest.

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Understanding Credit Risk in Internet Consumer Finance: An Empirical Analysis with a Focus on the Young Generation

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Abstract: In recent years, internet finance has garnered increasing attention from the public. Online lending, emerging within the framework of Internet finance as a pivotal component, has witnessed substantial growth. While online credit, within the realm of Internet finance, presents numerous advantages over traditional lending, it concurrently exposes a plethora of credit risk issues. This study aims to facilitate the effective utilization of online credit tools by the young generation within the context of Internet finance. Additionally, it seeks to ensure the overall stability of the Internet finance environment and mitigate risks for the youth. Given the significance of understanding credit risk management for college students in the age of internet finance, this paper adopts the logistic model to evaluate credit risk in internet consumer finance and provides pertinent recommendations from the perspective of the young generation.

Keywords: Young generation; Credit risk in Internet consumer finance; Influencing factors; Logistic model

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1. Introduction

On December 8, 2018, the Office of the P2P Online Lending Risk Rectification Leadership Group issued a notice titled “Notification on the Issuance of the Implementation Plan for the Risk Rectification of Online Microloan Business of Small Loan Companies” to financial offices across various regions. Simultaneously, the 2018 rectification timeline for online platforms was also released [1].

In 2019, consumer finance institutions prioritized expanding their customer base as a key developmental task. They consistently heightened their investment efforts and embraced strategies actively exploring new consumption scenarios. These initiatives included strengthening brand promotion, collaborating with renowned Internet companies and traffic platforms for traffic diversion, and engaging in joint lending. These efforts effectively resulted in an increase in the scale of customer service.

Currently, consumer finance companies are widely viewed as enterprises with high-risk costs. According to a survey involving 24 institutions, a substantial 16 institutions selected “high risk-control costs” as a significant

factor impacting company development (the most frequently chosen response). Overall, consumer finance companies confront significant risks, and the industry's non-performing loan rate remains notably high. The report indicates that the non-performing loan rate of consumer finance companies in 2019 stood at 2.63%, slightly surpassing the average for credit cards [2].

To bolster the core competitiveness of consumer finance, companies heavily leaned on the power of financial technology in 2019. They adhered to a tech-driven development philosophy, actively researching leading technologies such as 5G, artificial intelligence, big data, cloud computing, and blockchain. These technologies were then integrated into precision customer identification, enhanced process tracking, intelligent marketing, and product process transformation [3]. These measures brought notable improvements to the efficiency, efficacy, and quality of customer service, further highlighting the industry's "finance + technology" characteristics [4].

The report notes that most institutions in the industry allocated more than 5% of their annual 2019 budget to research and development. Nearly all institutions achieved intelligent marketing, post-loan management, and big data risk control. Some even pioneered applications like blockchain-based internet court collections. Additionally, a few institutions externally deployed their fintech capabilities, injecting fresh momentum into the consumer credit industry [5].

2. Empirical analysis of the impact factors of Internet consumer finance credit risk

2.1. Data sources

2.1.1. Design and distribution of the survey questionnaire

The recent surge of Internet consumer finance among the young demographic in China necessitates an in-depth exploration of usage patterns and an analysis of factors influencing credit risks for college students. To achieve this, a questionnaire survey was employed to collect pertinent data. The survey focused on three main areas: usage patterns of Internet consumer finance among young individuals, factors affecting their credit risks, and manifestations of these credit risks. Dissemination occurred online, primarily through platforms such as WeChat and QQ groups, targeting the desired demographic. In total, 500 questionnaires were distributed, resulting in 385 responses and a response rate of 77%.

2.1.2. Selection of survey participants

The study's target demographic encompassed young individuals aged 18 to 40 with a proclivity for Internet consumption.

2.1.3. Data processing

For the empirical research, this study utilized data from 385 valid questionnaires to conduct a descriptive statistical analysis. Of these, 382 responses indicated that respondents have already commenced using Internet consumer finance products, serving as the primary data source. Data analysis was facilitated using SPSS 22.0 software and Excel 2016.

2.2. Selection and explanation of variables

2.2.1. Selection and classification of personal credit risk evaluation indicators

Derived from the personal credit risk assessment system employed by domestic commercial banks and considering the nuances of both online consumer finance platforms and the young demographic, the principles guiding the establishment of personal credit evaluation indicators, based on statistical analysis, exhibit the

following features:

(1) Universality of the applicable subjects: In determining evaluation indicators, the consideration of common characteristics across all evaluated subjects was prioritized. Failure to do so may result in inconsistencies during the scoring process, where evaluators might employ different assessment criteria, rendering the evaluation results incomparable.

(2) Information comprehensiveness: The selected indicators should encompass information from all departments or organizations relevant to credit. To ensure the evaluation's comprehensiveness and reliability, data must be sourced from various domains. Emphasis is placed on standardizing the names of these indicators for clarity and non-controversial definitions and scope. Simultaneously, the authenticity of the data is paramount; reliable data is a prerequisite for conducting a meaningful evaluation. Even easily accessible data becomes futile if it is distorted [6]. Refer to **Table 1** for detailed references.

Table 1. Preliminary index for analysis of internet financial credit risk factors in the young population

Level-I indicators	Level-II indicators	Level-III indicators
Basic information	Gender Age Occupation Marital status	-
Credit behavior	Activity in credit behavior	Annual credit card expenditure
	Creditworthiness	Overdue repayment situation
Trustworthiness	Income	Average annual personal income Primary sources of personal income
	Consumption	Annual repayment amount for items such as housing, cars, etc.

2.2.2. Explanation of variables

In this study, three-tier indicators are chosen as relevant variables, with 'y' serving as the dependent variable.

2.3. Model establishment and dummy variable transformation

This empirical research employed the SPSS software and logistic regression. The formulated model is expressed as: $\ln y = \beta_0 + \beta_1 X_1 + \beta_1 X_2 + \beta_1 X_3 + \cdots + \beta_i X_i + \zeta$.

The independent variables, denoted as X_1, X_2, X_3,$\cdots X_i$, represent the influencing factors of online consumer financial credit risk. These factors encompass elements such as gender, age, occupation, marital status, annual credit card expenditure, overdue repayment status, average annual personal income, primary source of personal income, and annual repayment amounts for items. Refer to **Table 2** for detailed information.

The dependent variable 'y' signifies the performance occurrence ratio of online consumer finance users, y=1 denotes user performance (fulfillment), while y=0 indicates user default. 'ζ' represents the random variable, accounting for unconsidered unknown influencing factors in this paper, as well as data observation errors and other disturbances [7].

Table 2. Conversion table for dummy variables

Factors	Characteristic values	
Gender	Male	$X_1 = 1$
	Female	$X_1 = 0$
Age	36–40 years old	$X_2 = 0, X_3 = 0, X_4 = 0$
	31–35 years old	$X_2 = 1, X_3 = 0, X_4 = 0$
	26–30 years old	$X_2 = 0, X_3 = 1, X_4 = 0$
	18–25 years old	$X_2 = 0, X_3 = 0, X_4 = 1$
Occupation	White-collar	$X_5 = 0, X_6 = 0, X_7 = 0, X_8 = 0$
	Civil servant	$X_5 = 1, X_6 = 0, X_7 = 0, X_8 = 0$
	Ordinary worker	$X_5 = 0, X_6 = 1, X_7 = 0, X_8 = 0$
	Student	$X_5 = 0, X_6 = 0, X_7 = 1, X_8 = 0$
	Others	$X_5 = 0, X_6 = 0, X_7 = 0, X_8 = 1$
Marital status	Married	$X_9 = 1$
	Single	$X_9 = 0$
Annual credit card expenditure	0–2,000 CNY	$X_{10} = 0, X_{11} = 0, X_{12} = 0, X_{13} = 0$
	2,001–5,000 CNY	$X_{10} = 1, X_{11} = 0, X_{12} = 0, X_{13} = 0$
	5,001–10,000 CNY	$X_{10} = 0, X_{11} = 1, X_{12} = 0, X_{13} = 0$
	10,001–20,000 CNY	$X_{10} = 0, X_{11} = 0, X_{12} = 1, X_{13} = 0$
	> 20,000 CNY	$X_{10} = 0, X_{11} = 0, X_{12} = 0, X_{13} = 1$
Overdue repayment situation	Repaid on time	$X_{14} = 0, X_{15} = 0, X_{16} = 0$
	Late repayment once	$X_{14} = 1, X_{15} = 0, X_{16} = 0$
	Late repayment twice	$X_{14} = 0, X_{15} = 1, X_{16} = 0$
	Late repayment ≥ 3	$X_{14} = 0, X_{15} = 0, X_{16} = 1$
Average annual personal income	> 50,000 CNY	$X_{17} = 0, X_{18} = 0, X_{19} = 0$
	20,001–50,000 CNY	$X_{17} = 1, X_{18} = 0, X_{19} = 0$
	10,001–20,000 CNY	$X_{17} = 0, X_{18} = 1, X_{19} = 0$
	0–10,000 CNY	$X_{17} = 0, X_{18} = 0, X_{19} = 1$
Primary sources of personal income	Self-employed/Company owner/Shareholder	$X_{20} = 0, X_{21} = 0, X_{22} = 0$
	Employed for wages	$X_{20} = 1, X_{21} = 0, X_{22} = 0$
	Borrowing	$X_{20} = 0, X_{21} = 1, X_{22} = 0$
	Other	$X_{20} = 0, X_{21} = 0, X_{22} = 1$
Annual repayment amount for items such as housing, car, etc.	< 5,000 CNY	$X_{23} = 0, X_{24} = 0, X_{25} = 0$
	5,001–10,000 CNY	$X_{23} = 1, X_{24} = 0, X_{25} = 0$
	10,001–20,000 CNY	$X_{23} = 0, X_{24} = 1, X_{25} = 0$
	> 20,000 CNY	$X_{23} = 0, X_{24} = 0, X_{25} = 1$

2.4. Parameter estimation

Table 3 shows the variables in the equation for the regression model. Hence, the equation of the regression model is: $y = 15.142 + 23.102x_1 - 7.201x_2 - 19.188x_3 - 3.266x_4 + 2.352x_5 + 2.748x_6 + 4.364x_7 + 9.282x_8 - 3.076x_9 - 10.234x_{10} - 8.005x_{11} - 2.096x_{12} - 6.223x_{13} + 5.481x_{14} - 6.913x_{15} + 7.245x_{16} - 6.119x_{17} + 0.379x_{18} - 3.014x_{19} - 6.519x_{20} - 10.624x_{21} - 7.051x_{22} + 11.037x_{23}$

Table 3. Variables in the equation for the regression model (step 1a)

Intercept	Regression coefficient (β)	Standard error (SE)	Weighted-average least squares (WALS)	Degrees of freedom (df)	Significance (sig)	Odds ratio [Exp(B)]
x_1	23.102	0.250	0.168	1	0.000	1.108
x_2	-7.201	0.267	0.571	1	0.012	0.818
x_3	-19.188	0.295	0.406	1	0.000	0.829
x_4	-3.266	0.284	0.875	1	0.000	0.767
x_5	2.352	0.289	1.482	1	0.023	1.422
x_6	2.748	0.302	6.114	1	0.013	2.113
x_7	4.364	0.269	1.839	1	0.010	1.440
x_8	9.282	0.263	1.149	1	0.040	1.326
x_9	-3.076	0.252	0.090	1	0.010	0.927
x_{10}	-10.234	0.263	0.791	1	0.040	0.792
x_{11}	-8.005	0.258	0.000	1	0.040	0.995
x_{12}	-2.096	0.257	0.139	1	0.020	0.909
x_{13}	-6.223	0.259	0.745	1	0.000	0.800
x_{14}	5.481	0.253	3.608	1	0.010	1.618
x_{15}	-6.913	0.252	13.118	1	0.000	0.401
x_{16}	7.245	0.258	0.903	1	0.020	1.278
x_{17}	-6.119	0.247	0.231	1	0.000	0.888
x_{18}	0.379	0.249	2.317	1	0.128	1.461
x_{19}	-3.014	0.242	0.003	1	0.000	0.987
x_{20}	-6.519	0.249	4.327	1	0.000	0.595
x_{21}	-10.624	0.248	6.312	1	0.012	0.536
x_{22}	-7.051	0.249	0.042	1	0.000	0.950
x_{23}	11.037	0.246	0.023	1	0.110	0.964
Constant	15.142	0.512	0.077	1	0.010	0.867

2.5. Model fit test and parameter significance test

From the Hosmer and Lemeshow test (**Table 4**), it was found that the significance value is less than 0.01, indicating that the model has a good fit. The Pearson significance level is 1, further suggesting a high level of model fit (**Table 5**). **Table 6** shows the likelihood ratio test results.

Table 4. Hosmer and Lemeshow test

Step	χ^2	df	Sig
1	0.283	0.165	0.000

Table 5. Goodness-of-fit

	χ^2	df	Sig
Pearson	7.259	0.018	1.000
Deviance	4.122	0.018	1.000

Table 6. Likelihood ratio test

Effects	Model fit criteria	Likelihood ratio test		
	-2 log-likelihood of the simplified model	χ^2	df	Sig
Intercept	91.362	0.000	1	-
Gender	98.955	7.594	1	0.015
Age	93.781	2.420	1	0.000
Occupation	96.126	4.746	1	0.000
Marital status	91.273	-	1	0.000
Annual credit card expenditure	1.006×10^2	9.223	1	0.002
Overdue repayment situation	97.698	6.337	1	0.000
Average annual personal income	94.587	3.121	1	0.000
Primary sources of personal income	93.273	-	1	0.000
Annual repayment amount for items such as housing, car, etc.	91.781	-	1	0.000

2.6. Summary of empirical analysis results

(1) Gender: At the 5% significance level, with a parameter value of 0.00, it is evident that gender plays a significant role among the influencing factors of Internet consumer finance credit risk. Distinct roles and consumption patterns between men and women contribute to varying credit perceptions. Young men, focused on career-building, often incur higher default rates due to increased loan and credit card usage for major purchases. Conversely, women's expenditures, concentrated around events such as the "Singles' Day" shopping festival, result in different risk profiles. Gender emerges as a substantial influencer of credit risk in online consumer finance.

(2) Age: At the 5% significance level, with a parameter value less than 0.05, age significantly impacts Internet consumer finance credit risk. The study's demographic, aged 18 to 40, reveals distinct borrowing patterns. The younger demographic (18–25) have lower incomes, leading to more frequent but smaller loan amounts driven by heightened consumption desires. In contrast, those aged 25–30 borrow more often and in larger amounts, often motivated by a desire to affirm their social status. Individuals aged 30–40 exhibit a more uneven distribution of loan frequency and amount. These findings highlight age-related variations in consumption motivations and financial behavior.

(3) Occupation: At the 5% significance level, with a parameter value less than 0.05, occupation

significantly influences Internet consumer finance credit risk. White-collar workers and students emerge as the most influenced groups, with white-collar employees living paycheck to paycheck, and students, driven by curiosity and the desire to fit in their social circle, relying on credit cards or internet-based peer-to-peer lending platforms for advanced consumption. While many students take up part-time jobs, their earnings are often insufficient to cater to their consumption needs. The white-collar demographic, mostly forming the lower-middle class of society, has basic expenses like rent. Coupled with recent graduates eager to establish social status, there is a trend toward premature consumption through online channels [8].

(4) Marital status: At the 5% significance level, with a parameter value less than 0.05, marital status notably impacts Internet consumer finance credit risk. Married individuals, burdened by mortgages and car loans, often turn to online lending for short-term solutions despite the high interest rates. Conversely, unmarried individuals, unencumbered by such obligations, typically borrow smaller amounts compared to their married counterparts.

(5) Credit activity: At the 5% significance level, with a parameter value less than 0.05, the level of credit activity significantly influences Internet consumer finance credit risk. Larger borrowers, making minimum repayments or paying in installments, face a higher probability of defaults. Conversely, smaller borrowers can typically repay debts with their subsequent month's salary.

(6) Creditworthiness: At the 5% significance level, with a parameter value less than 0.05, creditworthiness considerably affects Internet consumer finance credit risk. Multiple instances of overdue repayments indicate higher financial credit risk. Financial institutions often enforce policies barring customers with repeated overdue repayments from borrowing for extended periods.

(7) Income: At the 5% significance level, with a parameter value less than 0.05, both income level and its source significantly influence Internet consumer finance credit risk. Higher-income brackets exhibit better financial risk awareness, while lower-income individuals, typically at the lower echelons of society, demonstrate lower personal credibility and poor financial risk awareness. Income level, especially from wage-earning and borrowing, significantly affects credit risk.

(8) Consumption: At the 5% significance level, with a parameter value less than 0.05, consumption has a significant influence on Internet consumer finance credit risk. Default rates are lower for smaller repayment amounts but considerably higher for larger amounts. Higher consumption correlates with greater repayment pressure, leading to higher chances of overdue payments and accumulating debts. Consumption patterns significantly impact credit risk in online consumer finance.

3. Preventative measures and recommendations to mitigate credit risk in China's Internet consumer finance

3.1. Enhancing financial income for young adults while prioritizing academics

From the preceding discussions, it is apparent that young adults, particularly students, frequently engage in impulsive spending. Given this demographic's general lack of stable income and financial capability, it is imperative to assist them in finding ways to augment their income. While these young individuals primarily focus on education, the following suggestions aim to acquaint them with societal responsibilities and simultaneously enhance their personal income.

3.1.1. Part-time jobs to supplement income without compromising academics

During their spare time, young adults can take up part-time jobs to leverage their accumulated knowledge and

skills. For instance, they can utilize their academic strengths to become tutors, assisting other students and earning compensation in return. Alternatively, they might opt for manual labor tasks, such as distributing flyers, working as waitstaff, or taking up promotional roles in supermarkets. Through these endeavors, they can earn money to support repayments and daily expenses.

While income from part-time jobs may not be substantial, most of these roles offer daily or short-term payments. This allows students to make the best use of their free time and vacations for work, providing them with valuable foundational work experience and a modest income. Regardless of the type of part-time job they undertake, the effort and labor they invest result in some form of remuneration, addressing immediate financial needs.

3.1.2. Entrepreneurship without sacrificing academic commitments

Young adults possess the vigor of youth, and both schools and governments encourage their entrepreneurial endeavors. These individuals can seek collaboration opportunities, leveraging their entrepreneurial skills to acquire capital. By teaming up with friends or classmates, they can embark on a business venture, working diligently and utilizing each other's strengths to earn their initial capital. This not only alleviates the pressures of debt but also ensures they have a financial source for repayments.

A brilliant innovative idea, when combined with sound financial backing, can pave the way for a fresh business venture. By leveraging their unique strengths and ensuring their academics are not compromised, young adults can enhance their capabilities, learn how to manage their own enterprises, gain entrepreneurial experience, and secure assistance from friends. Such an entrepreneurial journey not only provides financial support but also offers rich experiential learning.

3.1.3. Internships without impacting academic responsibilities

Young adults, armed with the knowledge acquired during their educational journey, are well-prepared to enter the job market. Their academic achievements can serve as a foundation during job interviews. They can capitalize on their free time by taking up internships, enriching their work experience and practical skills while also earning additional income. This can be particularly beneficial in mitigating credit risks arising from unstable income or financial shortages.

Internship roles offer a degree of stability and serve as a foundational step before fully entering the workforce. They provide a platform for accumulating substantial work experience, enabling young adults to gain valuable insights into professional life while securing a stable income source. This can be instrumental in addressing debt issues stemming from credit-based spending.

3.2. Guiding young adults to establish correct consumer values and integrity awareness

As evident from the analysis in this paper, young adults often lack a strong sense of self-protection and prudent spending habits. In this context, they can easily succumb to temptations. Thus, establishing a correct and rational consumption perspective can help avoid such scenarios more effectively.

3.2.1. From a family perspective

The family, often the first teacher in a child's life, should assist in instilling appropriate consumption and value perspectives. In daily life, parents can teach their children about the judicious use of Internet financial products. By enlightening them on the terms and conditions of various financial agreements and capping their allowances, parents can diminish the tendency among children to engage in comparative or competitive consumption. Parents should guide their children to make choices based on their individual financial situation rather than

societal pressures.

Parents, due to the significant time spent with their children, can leverage their seniority and experience to better educate their offspring about Internet financial institutions. They can impart appropriate value systems and consumption habits, introduce them to the concept of credit-based spending in a controlled manner, and use dialogues to communicate the risks associated with credit. In the process, parents themselves subtly reinforce good consumption values and, in tandem with their children, jointly foster a growth-oriented mindset and behavior.

3.2.2. From the perspective of schools

Educational institutions can offer courses and lectures related to consumer finance, using classroom teachings to help young adults establish benchmarks for consumption and value perspectives. Outside of classroom hours, relevant school clubs or student associations can organize integrity education activities for the youth to help them develop a sense of honesty and enhance their creditworthiness. Cultivating students' personal qualities can elevate not only their individual competencies but also raise the overall standard of the school.

Schools, whether as university administrators or as guardians of students, should assist students in shaping correct value and consumption perspectives. They should guide students towards prudent spending without overextending their credit and curb impulsive desires. Helping students move beyond mere trend-following can satisfy their daily needs and psychological well-being without necessarily being in vogue. Such changes represent not only an evolution for the students but also an enhancement and leap in their value perspectives, consumption habits, and overall personal qualities.

3.2.3. From the students' perspective

Students, as the direct recipients of credit risk, are better served by self-regulation than mending after mistakes. They should immerse themselves in financial management information and learn personal finance techniques to establish scientific money management methods. When confronted with material temptations and peer comparisons, students should be equipped to stay firm and resist these temptations. Moreover, sharing their management styles with peers, learning from others, and compensating for their own shortcomings can further reinforce the right consumption values and integrity awareness. Establishing appropriate value and consumption views can better prepare them for future life experiences.

As they are on the cusp of entering society and leaving the protection of family and school, the lack of experience necessitates further enhancement in other aspects. By setting up a sound value and consumption perspective, they can engage in economic activities more effectively, rationally resist temptations, and self-improve, which is purely beneficial.

Of course, establishing a robust financial management system and fostering the right consumption and value perspectives can offer invaluable assistance. Learning to increase income and save wisely, making thoughtful arrangements, and preparing for future necessities, the accumulation of experience, and personal growth will better equip them to stand firm in society and excel in life.

3.3. Enhancing the operation and policies of internet platforms

As digital financial institutions represent an emerging industry, traditional regulatory and policy frameworks may not comprehensively cover all its facets. Young adults frequently face situations where inadequate information disclosure, insufficient monitoring, and limited recourse after deception are prevalent. In light of this, it is imperative to bolster the operations and policies concerning digital financial entities.

3.3.1. Refining laws and regulations pertaining to credit consumption

Given that digital financial institutions diverge from their traditional counterparts, there is a need to enhance their management from both legislative and law enforcement perspectives. It is essential to solidify the legal foundation. Building on the legal basis of traditional finance, refining related laws can help create a secure and stable online information environment, providing legal protection for young adults. Concurrently, when rolling out credit information platforms for the younger demographic, it is vital to establish comprehensive credit information networks, ensuring full understanding and disclosure while intensifying regulatory procedures.

As protectors of the young generation and the broader public, the refinement of laws and regulations is of paramount importance. People coexist under the protective umbrella of legal frameworks, and it is due to these rules that individuals can conduct their daily lives confidently. As digital finance is a nascent domain, much of it remains unfamiliar or concealed. Establishing a comprehensive legal system can offer safety guarantees for consumers and simultaneously promote the prosperous and stable growth of digital finance.

3.3.2. Standardizing digital financial institutions

Addressing the nature of digital financial entities, there is a primary need to standardize credit application criteria. By appropriately elevating prerequisites, situations where young individuals secure loans merely based on student IDs and national identity cards may be avoided. Institutions should raise their credit rating standards, placing those with questionable credit histories on a blacklist, and ensuring that approvals are only granted to those meeting the criteria with no recent infractions. Furthermore, these entities should evaluate the debt repayment capabilities of the youth, rating their credit risk and capacity to endure such risks. For individuals with malicious defaulting behavior, legal actions should be initiated to recover owed funds.

3.3.3. Establishing third-party fund protection agencies

When young adults engage in credit-based transactions, most of their engagements pertain to unsecured loans. At this juncture, the establishment of third-party fund protection agencies is paramount. Leveraging credit default swaps can serve as a hedge against credit risks, facilitating the repayment of portions of the debt that students cannot address. A fraction of the interest revenue generated by students would also be allocated to these third-party entities.

Implementing online financial loan insurance can safeguard the rights and interests of both young individuals and lending institutions. When young adults tap into digital financial loans, this insurance can better ensure their protection. In scenarios where they face credit risks, such insurance can swiftly intervene, mitigating the adverse impacts of potential losses. This not only safeguards online financial lending but, through timely premium payments, also ensures that young adults do not lapse into overdue behaviors.

4. Conclusion

Through this study, it's evident that the Internet frequently offers endless conveniences to people. In today's rapidly progressing society, with swift economic growth and increasing prosperity, technology has been evolving and improving alongside economic advancements. Student demographics, acting as credit recipients, often engage in transactions with e-commerce platforms, digital finance companies, online consumer loans, and traditional commercial bank credit cards. It is imperative for these students to augment their financial literacy. Being sufficiently informed about specialized areas in their lives, especially in areas of credit consumption, becomes a crucial element.

For the youth demographic, regardless of whether they engage in digital financial consumption or other

tasks, effective and informed use is paramount. Establishing robust fund protection agencies benefits not just the young consumers but also the digital financial institutions themselves. When confronted with credit risks, safeguarding the mutual interests of both parties ensures stable transaction processes. It is vital to shield students from potential rights infringements and to ensure that digital financial entities can mitigate their losses when faced with adverse situations.

Disclosure statement

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Discussion on Statistical Monitoring and Evaluation of High-Quality Development of County Economy

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Abstract: The county economy serves as the fundamental unit in China's economic development and construction. There exists a significant correlation between the quality and level of county economic development and the overall economic construction level of the country. In recent years, China's economy has experienced rapid growth, contributing to an improved living environment and substantial economic income for its citizens. However, this progress has also brought to light certain issues, such as an unbalanced industrial structure and inefficient resource utilization, leading to problems such as low efficiency and severe environmental pollution. Therefore, it becomes imperative to enhance the statistical monitoring and evaluation of high-quality county economic development. This approach aims to gather insights into the development status of the county economy and provide essential data support for decision-making in county economic development. Consequently, this paper proposes development suggestions for the statistical monitoring and evaluation of high-quality county economic development, serving as a crucial starting point for future initiatives.

Keywords: County economy; High-quality development; Statistical monitoring and evaluation

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1. Introduction

In the new era of developing socialism with Chinese characteristics in China, the statistical monitoring and evaluation of county economic development are indispensable. This process constitutes a crucial aspect of promoting the high-quality development of the county economy. Furthermore, it plays a pivotal role in refining the county economic development model and catalyzing the vitality of the county economic growth. As a result, this contributes to generating more substantial economic income for the county's residents and elevating the overall level and quality of the county economic development.

Given these considerations, it becomes imperative to place greater emphasis on the statistical monitoring and evaluation of high-quality county economic development. This focus aims to explore innovative channels for development, serving as a foundation to propel the county economy towards achieving growth of the highest quality.

2. The significance of statistical monitoring and evaluation in the high-quality development of the county economy

In the course of developing and constructing the county economy, it becomes paramount to comprehensively grasp its level and quality of development. This understanding serves as the foundation for formulating effective county economic policies and establishing clear development directions. Consequently, there is a compelling need to enhance the statistical monitoring and evaluation of high-quality county economic development, thereby providing profound insights into the current state of the county's economy.

For instance, through meticulous statistical monitoring and evaluation, a comprehensive understanding of the county economy's overall development, its distinctive features, and evolving trends can be obtained. This process reveals the strengths and weaknesses of the county's economic development, enabling the formulation of targeted strategies for sustainable growth. Strengthening statistical monitoring and evaluation not only facilitates the prompt identification of challenges and issues in county economic development but also aids in making well-informed decisions.

Moreover, an emphasis on statistical monitoring and evaluation contributes to fostering healthy and stable development within the county economy. By promptly identifying problems and challenges, decisions can be made with agility, providing valuable data references for stakeholders. This, in turn, guides the county economy toward innovative and sustainable development. Simultaneously, it plays a crucial role in gauging the living standards and quality of life within the county, allowing for the timely detection of various social development and construction issues. This proactive approach enables the county government to formulate policies conducive to promoting a high-quality county economy. Ultimately, this contributes to the harmonious and stable development of the nation's economy and society, creating an improved living environment for its people.

3. Analysis of the necessity of statistical monitoring and evaluation in the high-quality development of the county economy

In the ongoing development and construction of China's county economy, the implementation of statistical monitoring and evaluation for county economic development is not just a recommended practice but a necessary measure. These components stand as integral elements in propelling the county economy towards achieving growth of the highest quality.

In practical terms, statistical monitoring and evaluation play a crucial role in ensuring a balanced distribution of development resources throughout the county's development process. This, in turn, becomes a fundamental necessity in advancing the statistical monitoring and evaluation of high-quality county economic development. By employing statistical monitoring and evaluation practices, county governments can gain a comprehensive understanding of the unique development needs and resource advantages present in various regions within the county. Subsequently, targeted resource allocation in county economic construction and development can be achieved. This approach not only enhances the efficiency of resource utilization in county development but also prevents resource waste and redundant investments. As a result, it effectively promotes the coordinated and balanced development of the county economy [1].

Furthermore, statistical monitoring and evaluation of high-quality county economic development ensure the establishment of scientifically sound development goals. Through the evaluation of county economic development, the economic development levels and potentials of each region within the county can be assessed. This information serves as the basis for formulating more precise and scientific economic construction goals tailored to the economic development potential and current level of each region. The outcome is not only the

assurance of achievable and assessable financial construction goals within the county but also the promotion of high-quality development within the county economy. This, in turn, effectively elevates the overall level and quality of county development.

Therefore, active promotion of statistical monitoring and evaluation in the high-quality development of the county economy is essential to ensure its stable and efficient development.

4. Suggestions for statistical monitoring and evaluation in high-quality county economic development

As the development and construction of the county economy are advancing, it is imperative to institute a suite of scientific and rational statistical monitoring and evaluation methods to facilitate high-quality county economic development. This involves a gradual exploration of avenues that foster such development, ensuring the systematic advancement of all facets of county economic development. This concerted effort is crucial for driving the continuous optimization and enhancement of the development level within China's socialist economic construction.

4.1. Establishing a scientific statistical indicator system

In the developmental phase of constructing a statistical monitoring and evaluation system aimed at promoting high-quality county economic development, the initial imperative is to establish a scientifically sound statistical indicator system. This crucial step is designed to attain effective feedback on county economic development through a comprehensive set of indicators [2]. Throughout this process, due consideration should be given to the actual conditions and developmental characteristics of the county economy. The selection of indicators should prioritize representativeness, operability, and sustainability, ensuring a scientific, objective, and holistic reflection of the county's economic development level.

Firstly, the selection and assessment of county economic development indicators, including regional gross product, per capita gross regional product, fiscal revenue, industrial added value, agricultural added value, tertiary industry added value, etc., are necessary. These indicators collectively provide a comprehensive overview of the county's economic development [3]. Furthermore, it is essential to delve into residents' living indicators within the county, such as per capita disposable income, income ratio between urban and rural residents, Engel coefficient of residents, rural poverty incidence, etc. Through the analysis of these indicators, the quality of life for the county's residents can be effectively gauged [4].

Additionally, social construction indicators within the county, including the nine-year compulsory education consolidation rate, the number of beds in medical and health institutions per 1,000 people, the area of public cultural facilities per 10,000 people, and the coverage rate of urban and rural residents' pension insurance, should be investigated. These indicators, when surveyed, reflect the status of social public service construction within the county [5]. Moreover, ecological environment indicators within the county, such as energy consumption per 10,000 Chinese Yuan (CNY) of GDP, water consumption per 10,000 CNY of GDP, county forest coverage rate, and the rate of excellent ambient air quality, are also crucial. A thorough understanding of these indicators reflects the county's efforts in ecological and environmental protection [6].

Finally, exploring innovation-driven indicators, such as the intensity of research and development (R&D) investment, contribution rate to scientific and technological progress, the number of high-tech enterprises, and the number of invention patents per 10,000 people, is imperative. This exploration allows an insight into the county's implementation of the innovation-driven strategy. The comprehensive feedback derived from these indicators enables the county government to formulate more comprehensive regional development policies,

thereby promoting the healthy and sustainable development of the regional economy.

4.2. Enhancing data collection and processing

To further enhance the quality and effectiveness of statistical monitoring and evaluation in the high-quality development of the county economy, it is essential to strengthen data collection and processing. This involves the comprehensive utilization of various data to reflect the level of county economic development through thorough data analysis, effectively steering the county towards achieving high-quality development [7].

During the data collection phase, emphasis must be placed on establishing a multi-channel and multi-level data collection mechanism to ensure the accuracy and timeliness of data. Simultaneously, there is a need to focus on reinforcing data preprocessing, eliminating outliers, and rectifying missing values to ensure data integrity and reliability. This sets a robust foundation for subsequent data analysis in county economic development [8].

Firstly, meticulous attention is required to ensure the accuracy of collected data. This entails the establishment of a complete data collection mechanism, with dedicated personnel formulating a comprehensive data collection plan. This plan should clarify the data objects, collection time, methods, and standards while ensuring accuracy and effectiveness. Additionally, the training of data collection personnel must be strengthened, ensuring their proficiency in various data collection techniques and methods. After data collection, it is imperative to enhance the quality evaluation of the data, ensuring its accuracy and completeness [9].

Secondly, there is a need to bolster the effectiveness of data processing. This involves the formulation of unified data processing standards, ensuring a standardized, scientific, and transparent process. Simultaneously, data mining and analysis should be strengthened to extract valuable information from massive research data, providing a scientific basis for decision-making in county economic construction.

Finally, attention should be directed towards strengthening the value analysis and benefit development of county economic development survey data. This involves establishing a data-sharing platform to enhance the circulation and sharing of economic development data among county government departments. This ensures that decision-makers can base their decisions on data feedback, implementing development measures that align with county development goals. This approach stimulates the vitality of county economic development and fosters the sustainable optimization of county economic development levels [10].

4.3. Enhancing the comprehensive application of data analysis methods

Advancing the high-quality development of the county economy necessitates a robust application of data methods to conduct thorough analyses of various data pertaining to county economic development. Through data analysis, the deficiencies and challenges in the county economy can be promptly identified, facilitating a balanced allocation of resources that promotes stable and efficient development [11].

For instance, the descriptive statistical analysis method proves valuable in scrutinizing county economic development data. This method comprehensively analyzes statistical indicators such as the average, median, mode, and standard deviation of county economic data. Accurately describing the central tendency and dispersion degree of data helps portray the overall scenario of county economic development. This, in turn, provides decision-makers with a comprehensive understanding of county economic development [12].

Additionally, the chronological analysis method is another effective approach. This method models surveyed data and conducts a comprehensive analysis based on chronological order, enabling the prediction of future trends in county economic development and construction. This aids decision-makers in formulating more scientific county economic development plans, delving into the in-depth value of county economics.

Furthermore, the cluster analysis method proves instrumental in comprehensively evaluating county economic data. This method conducts cluster analysis on multiple variables within the county economy, grouping similar objects together. In the context of promoting county economic development, monitoring, evaluation, and cluster analysis can be employed to categorize economically similar areas. This facilitates a more in-depth comparison of development conditions among different areas, offering insights into development disparities. Through such analyses, the goal of promoting county economic development and continuously optimizing construction levels is achieved, ultimately enhancing the quality of county economic development [13].

4.4. Enhancing the construction of talent teams for county economic development

In the ongoing development and construction of the county economy, generating effective feedback on its progress through statistical monitoring and evaluation is paramount. To facilitate the successful execution of this initiative, it is crucial to have a cadre of exceptional talents as a foundational support for the county's economic development. Ensuring the seamless advancement of each developmental aspect necessitates a robust focus on strengthening the construction of talent teams dedicated to county economic development, guaranteeing a continuous supply of skilled individuals for statistical monitoring and evaluation work [14].

The introduction of outstanding talents becomes imperative. This involves actively attracting high-caliber individuals to work in the county by enhancing preferential policies, bolstering welfare benefits, and implementing other measures. Concurrently, fostering collaborative relationships with regional universities and scientific research institutions encourages talents to engage in innovation and entrepreneurship within counties, thereby securing support from outstanding individuals for county economic development [15].

Moreover, counties must emphasize talent training. Elevating the comprehensive quality and skill level of relevant personnel involves enhancing the training of existing talents. Encouraging continuous professional development and skill improvement through rigorous evaluation processes ensures that the county economy can proficiently execute statistical monitoring and evaluation tasks of high quality during development and construction. This, in turn, promotes the stable development of the county economy.

5. Conclusion

In conclusion, a profound understanding of the county economy's development status is imperative in the ongoing development and construction processes. It enables the adoption of tailored and effective countermeasures aligned with the county's unique developmental circumstances, fostering a balanced allocation of resources within the county. This, in turn, propels the county towards stability and efficient development. Therefore, this paper has undertaken a comprehensive analysis centered on the statistical monitoring and evaluation of high-quality county economic development, putting forth corresponding development strategies for collective discussion and exchange.

Disclosure statement

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A Brief Discussion of Audit Risks and Their Causes

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Abstract: As a crucial supervisory department overseeing economic operations, the audit department plays a pivotal role in safeguarding the healthy development of the country's economy, exposing corruption, and effectively maintaining social and economic peace and stability. The work of auditing involves detecting existing issues, providing remedies, and consistently contributing to national governance. However, as the market economic environment undergoes continuous changes, legal systems advance, and the audit environment becomes more complex, audit risks have gradually gained prominence. The prevention of audit risks has increasingly captured the attention of audit agencies at all levels. This necessitates audit institutions to continually adapt to new challenges, comprehend risks, and exert effective control over them. This article delves into the causes of audit risks, exploring ways to effectively identify and respond to these risks within a complex and ever-changing environment. The objective is to ensure the objectivity and accuracy of audit reports, allowing the audit function to truly serve as an "immune" system, protecting public interests.

Keywords: Audit risk; Reasons; Audit environment

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1. Introduction

In China's economic and social development, auditing emerges as a vital component in maintaining social and economic peace and stability, functioning as an independent supervision mechanism. Given the continuous changes in the market economic environment, effective prevention of audit risks has progressively become the focal point of both audit practice and research. Therefore, delving into audit risks and their underlying causes holds significant practical importance for enhancing the quality of audit work and ensuring the fairness and accuracy of audit results [1].

2. Audit risk concept

National audit risk encompasses various risks that may arise due to actions or inactions of the audit agency and auditors during the audit process, influencing the healthy development of the audit industry. In simpler terms, it pertains to the financial revenue and expenditure of the audited unit, with a potential for significant errors and frauds escaping auditor detection, leading to inappropriate audit conclusions. At the core of this concept lies

the inherent uncertainty in audit work, highlighting the possibility that, even when adhering to audit standards and procedures, not all financial errors may be uncovered. The presence of audit risks necessitates auditors to exercise professional judgment in performing their duties and adopt suitable audit strategies to diminish the likelihood of errors in audit opinions, ensuring the reliability of audit quality [2].

3. The composition and main characteristics of audit risk

3.1. Inherent risks

Inherent risk encompasses the likelihood that specific account balances or transaction types may be inaccurately presented, even within an effective internal control environment. This risk arises from the inherent nature of the audited unit, the operational context, and the intricacy of financial reporting itself. It is distinct from the design and implementation of the unit's internal control system, instead being influenced by external factors and the unit's attributes. For instance, in the case of public institutions, units relying on operating income may face higher inherent risks compared to those relying solely on fiscal appropriation income, given their more complex economic and financial systems. Additionally, units receiving significant special funds at various levels may incur greater inherent risks. When evaluating inherent risks, auditors must consider multiple dimensions, such as unit characteristics, operating conditions, and the unit's financial status, to identify areas with higher risks and adjust the audit plan accordingly [3].

3.2. Control risks

Control risk represents the likelihood that an entity's internal control system will fail to prevent, promptly detect, and correct misstatements in financial reports. This risk indicates that, despite the presence of internal controls, they may be ineffective due to poor design or implementation. For example, a unit might have established an attendance system with a time clock machine, but internal control failure may occur if employees manipulate clock-in entries through various methods, indicating a failure in adherence to internal control procedures due to inadequate supervision or resource allocation. Control risks encompass improper failures, such as insufficient workforce in key audit links and defects in technical systems [4].

3.3. Inspection risks

Inspection risk pertains to the risk that the auditor's audit procedures may fail to uncover material misstatements, even if such misstatements exist in the financial statements. This risk is connected to the auditor's selection and execution of audit procedures. The magnitude of inspection risk is influenced by the appropriateness and effectiveness of the audit procedures, including whether they are designed to capture potential misstatements and whether auditors can execute these procedures effectively. To mitigate inspection risks, auditors must design appropriate audit methods to ensure the adequacy and appropriateness of audit evidence [5].

3.4. Objectivity and controllability of risks

Audit risks are objective, and auditors cannot completely eliminate them. However, auditors can employ various measures and methods to strictly adhere to audit procedures, continually enhance audit methods, and strive to minimize audit risks and potential losses. This implies that, while risks are inherent, they are also controllable through proactive audit practices [6].

4. Causes of Audit Risks

4.1. Limitations of audit information

There exists an asymmetry of information between the audit agency and the audited unit. The audit agency typically possesses less relevant economic information than the audited unit, and the information it acquires is relatively limited. Auditors often conduct reviews based on the information provided by the audited unit, making necessary extensions before rendering audit judgments. However, these materials may not fully represent the entirety of the reviewed matters, and some might have been tampered with. Auditors, lacking expertise in discerning truth from forgery, may form audit conclusions that carry inherent audit risks.

4.2. Restrictions on auditing methods

Modern auditing methods highlight the delicate balance between audit costs and risks. The adopted audit procedures allow for the presence of certain audit risks. Auditors must navigate the challenges of heavy workloads, limited personnel, and tight deadlines. Most audits resort to sampling methods, inherently prone to errors due to their nature of inferring population characteristics based on samples. Regardless of the chosen sampling method and size, there are always certain errors, introducing audit risks to varying extents. Unlike departments such as the Discipline Inspection Commission and Public Security, auditors are constrained in employing strong measures when scrutinizing key matters. The limitations of auditing methods create a challenging situation, exposing audit work to the risk of insufficient scrutiny and incomplete discovery [7].

4.3. Inadequacy of laws and regulations

The legal environment constitutes a crucial component of audit risk, regulating the financial and auditing conduct of audited units through the formulation and implementation of laws, regulations, standards, and policies. However, with the continuous evolution of the economy and society, relevant laws and regulations often lag behind and lack comprehensive coverage. Consequently, certain economic matters lack clear regulatory guidance. Auditors find themselves unable to resolve specific issues based solely on existing laws and regulations, relying instead on professional judgment. This, to a certain extent, heightens the difficulty of auditing and introduces audit risks [8].

4.4. Imperfect quality control of audit institutions

The internal quality control system of an audit institution is pivotal for ensuring the quality of audit work and minimizing risks. This system encompasses the standardization of audit processes and methods, and the supervision and evaluation of audit results. If an audit institution fails to establish an effective quality control system or if the system is flawed, the audit work may struggle to adapt to the complex and dynamic audit environment, thereby increasing audit risks. For instance, a lack of appropriate supervision mechanisms may lead the audit team to adopt inadequate audit methods or overlook key audit evidence, ultimately resulting in errors in audit opinions [9].

4.5. Low quality of the auditors

The professional quality and personal ethics of auditors significantly influence the control of audit risks. The strength of auditors' judgment directly impacts the quality of their work, necessitating comprehensive qualities such as professional ability, ethics, and prudence. For example, a low overall quality of auditors during the sample selection process can lead to errors such as missing items and audit inaccuracies, posing risks. Simultaneously, if auditors lack sufficient professional caution, it may result in deviations in audit behavior,

influencing the final audit results and introducing unnecessary audit risks. The risk becomes critical if auditors compromise their professional ethics and engage in private dealings with the audited unit on major issues.

5. Audit risk prevention and control

5.1. Actively create a favorable audit environment

To prevent and control audit risks, it is imperative to actively construct and maintain a conducive audit environment. Firstly, there is a need to foster broader oversight by enhancing public awareness of audit reports and the significance of audits. Social scrutiny can compel audited units and audit institutions to adhere to higher standards, reducing the likelihood of corruption and errors. Secondly, by promoting legal literacy, the public's accurate understanding of auditing work is heightened, creating societal pressure for the expectation and standardization of auditing work [10]. Furthermore, collaborative efforts to promote and supervise the development of industry standards through oversight and guidance from higher-level agencies, along with disciplinary inspection linkages, are crucial aspects of cultivating a positive audit environment. These measures cultivate an environment that is more tolerant, understanding, and supportive of audit work, consequently mitigating audit risks.

5.2. Establish and improve internal operating mechanisms

For audit institutions, the establishment and enhancement of internal operating mechanisms serve as the bedrock for preventing and controlling audit risks. This necessitates the design and implementation of internal control measures to ensure the quality and efficiency of audit work. In this process, the development of a rigorous quality management system is essential, encompassing various aspects such as the formulation of audit plans, the collection and evaluation of audit evidence, and the preparation and review of audit reports. Regular internal quality reviews should be conducted by audit institutions to ensure alignment with professional standards and regulatory requirements, promptly identifying and rectifying any issues that may compromise audit quality.

5.3. Risk prevention and control during the audit process

5.3.1. Planning stage

As Benjamin Franklin once said, "By failing to prepare, you are preparing to fail." A well-crafted audit plan can significantly reduce audit risks. The planning stage of the audit requires a deep understanding of the audited unit's business environment, internal control system, and historical financial information, with the identification of potential audit risk points. In this phase, the institution should use professional judgment to formulate audit and implementation plans, determining resource allocation, key audit areas, and specific matters requiring attention. Simultaneously, to enhance the effectiveness of risk prevention and control, the audit plan should assess the nature, timing, and scope of audit evidence. Through meticulous audit planning, we ensure that the focus of the audit work aligns with the most critical risk areas, thereby improving the relevance and effectiveness of risk prevention and control.

5.3.2. Implementation stage

During the audit implementation stage, auditors rigorously execute audit procedures and carry out specific tasks in line with the audit plan. This includes collecting and analyzing audit evidence, testing the effectiveness of internal controls, and conducting substantive audit procedures. Risk prevention and control in the audit implementation phase require auditors to maintain a high level of professional skepticism, assess the reliability and sufficiency of evidence, and thoroughly investigate any anomalies or inconsistencies discovered. Auditors

should utilize appropriate audit techniques and tools to ensure the accuracy and completeness of audit evidence. Simultaneously, effective communication among audit teams and the appropriate peer review of significant judgments and estimates are necessary to enhance audit quality.

5.3.3. Audit report stage

At this stage, the auditor needs to form an audit opinion based on the collected audit evidence and completed audit work. To ensure the accuracy and fairness of the audit opinion, auditors should conduct a comprehensive evaluation of the audit evidence, confirming the adequacy and appropriateness of the evidence supporting the audit opinion. When drafting an audit report, the conclusions should be expressed clearly and accurately to prevent misunderstandings and ensure the objectivity and validity of problem descriptions. Additionally, the audit institution should implement a structured audit report review process to guarantee that all significant audit findings are appropriately reflected, thereby preventing and controlling risks arising from omissions or misstatements of information.

5.4. Comprehensively improve the comprehensive quality of auditors

Firstly, strengthening the study of professional knowledge forms the foundation. Audit institutions can regularly organize internal training to update auditors on the latest auditing standards, audit reporting standards, and innovative auditing technology methods. Simultaneously, auditors are encouraged to participate in external seminars and engage in "review instead of training," fostering increased communication with audit leaders to glean insights into cutting-edge auditing technologies and methods.

Secondly, to enhance auditors' practical ability, simulated audit cases can be incorporated, allowing auditors to engage in practical exercises in a simulated environment. This approach fortifies their capability to navigate complex audit situations, fostering adaptability and judgment. Beyond cultivating professional skills, emphasizing professional ethics education is crucial. Audit institutions should conduct regular ethics training to bolster auditors' professional ethics and adherence to independence principles. Through case analysis, auditors can grasp the pivotal role of professional ethics in audit work and the severe consequences stemming from professional misconduct.

Finally, audit institutions should establish a supportive learning culture, motivating auditors to continually improve themselves. Providing auditors with learning resources such as online courses, professional books, and the latest research reports further contributes to a culture of continuous improvement.

6. Conclusion

In summary, effective management of audit risks is the linchpin for ensuring the quality and reliability of audit results. A thorough analysis of the causes of audit risk reveals a diverse set of factors that are interrelated and mutually influential. Consequently, audit institutions and auditors must establish a comprehensive and systematic risk management system. This should begin with optimizing the audit environment, assessing the risks associated with the audited unit, rigorously implementing audit procedures, and ultimately improving the overall quality of auditors. This multifaceted approach ensures the effective identification, assessment, and control of audit risks.

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Optimization of Corporate Financial Management from the Perspective of Industry-Finance Integration

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Abstract: Enterprises can enhance their financial management by integrating their business and financial departments, facilitating the seamless sharing of information and resources. This integrated management model not only aids in lowering operating costs but also boosts market competitiveness. In the contemporary, highly competitive business landscape, the amalgamation of business and finance has become a prerequisite for corporate development. This article delves into the significance of industry-finance integration in corporate financial management, scrutinizes existing challenges in corporate financial management, and puts forth tailored solutions to optimize the overall system.

Keywords: Integration of industry and finance; Enterprise; Financial management

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1. Preface

In today's era of global economic integration, the significance of corporate financial management has gained increasing prominence. Financial management not only impacts the economic benefits of the enterprise but also plays a crucial role in its survival and development. The optimization of financial management and the enhancement of market competitiveness have become pressing challenges for many enterprises. As a novel financial management model, business-finance integration seamlessly blends business and finance, offering fresh ideas and methods for enterprises to refine their financial management.

2. The significance of industry-finance integration in corporate financial management

For corporate financial management, the integration of industry and finance holds profound significance, primarily manifested in the following five aspects.

2.1. Improve decision-making quality

Industry-finance integration can furnish decision-makers with more comprehensive and accurate information, enabling them to make more scientific and reasoned decisions. Traditional financial management often concentrates solely on financial data, neglecting the importance of business data, which hampers decision-makers in making accurate judgments. Industry-finance integration harmoniously combines financial and business data, providing decision-makers with a deeper understanding of the company's operating conditions and market trends. Consequently, this improves the scientific nature and accuracy of decision-making [1,2].

2.2. Optimize resource allocation

Business-finance integration optimizes the allocation of enterprise resources, enhancing resource utilization efficiency and cost savings. Through the integration of business and finance, companies can better discern market and customer needs, leading to more precise resource allocation. Moreover, business-finance integration fosters communication and collaboration between different departments, breaking down barriers and facilitating resource sharing and optimal allocation. This not only heightens operational efficiency but also reduces costs, ultimately improving enterprise profitability.

2.3. Reduce operational risks

The integration of business and finance contributes to the reduction of operational risks within enterprises, encompassing risk prevention and loss reduction. Companies, through this integration, gain a better understanding of market and business risks, enabling the implementation of more effective measures for prevention and control [3]. Furthermore, business-finance integration promotes the establishment of internal supervision and restriction mechanisms, strengthening oversight and control of internal power, thus mitigating risks and losses within the enterprise [4].

2.4. Enhance corporate competitiveness

The integration of industry and finance enhances the competitiveness of enterprises, involving the expansion of market share and the advancement of technological innovation capabilities. Through business-finance integration, companies gain a deeper insight into market and customer needs, allowing for more accurate positioning of products and services. Additionally, the integration of industry and finance supports the establishment of innovation and research and development (R&D) mechanisms within enterprises, reinforcing investment in technological innovation and elevating the technological level and innovation capabilities. This not only improves market competitiveness but also lays a robust foundation for the long-term development of enterprises [5].

2.5. Achieve sustainable development

Industry-finance integration constitutes a vital component of the sustainable development of enterprises, offering a more environmentally friendly and healthy development path. By integrating business and finance, companies can prioritize sustainable development issues such as environmental protection and social responsibility, leading to more proactive and effective management and practices. In addition, industry-finance integration fosters the popularization of green management and environmental awareness within enterprises, bolstering investment and support in environmental protection, social responsibility, and other aspects. This contributes not only to the long-term social and economic benefits of the enterprise but also makes a positive contribution to its sustainable development.

3. Current status of corporate financial management under the background of industry-finance integration

3.1. Insufficient awareness of industry-finance integration

Corporate financial management grapples with the issue of inadequate awareness regarding business-finance integration. This manifests in several ways. Firstly, business and finance operate independently, lacking effective communication and collaboration. This results in problems such as deficient information flow and coordination in the financial management process, impacting overall operational efficiency [6]. Secondly, disparities in data calibers hinder seamless data sharing and integration, affecting the efficiency and accuracy of financial management. Simultaneously, there are deficiencies in the overall conceptual framework. Some employees lack a holistic perspective, focusing solely on the interests of their specific department or position, neglecting the broader interests of the enterprise [7,8]. This can lead to issues such as irrational resource allocation and unscientific decision-making.

3.2. Financial accounting process is not standardized

In enterprise financial management, the standardization of financial accounting processes holds paramount importance for operational development. However, numerous companies currently exhibit irregularities in their financial accounting processes, somewhat impeding their financial management effectiveness and operational development. The specific irregularities are outlined in **Table 1** below.

Table 1. Irregular performance of the financial accounting process

Performance	Importance	Specific manifestations and hazards
Irregular report preparation	Financial statements are an important tool for corporate financial management.	Some companies have irregularities in report preparation, such as irregular filling of report items and lax review of reports, etc. This not only affects the accuracy of financial information but also easily leads to distortion of financial statements.
Irregular filling of vouchers	Vouchers are important documents for recording corporate financial activities.	Some companies have irregularities in filling in vouchers, such as incomplete vouchers, incorrect vouchers, etc. This not only affects the accuracy of financial information but also easily leads to financial risks.
Irregular financial reporting	Financial reporting is an important tool for companies to provide financial information to the outside world.	Some companies have irregularities in financial reporting, such as irregular preparation of financial reports and insufficient disclosure of financial reports. This not only affects the accuracy of financial information but also easily leads to untrue information disclosure.
Irregular accounting files	Accounting files are one of the important materials for corporate financial management.	Some companies have irregularities in accounting files, such as irregular storage of accounting files and lax access to accounting files. This not only affects the security of financial information but also easily leads to information leakage.
Irregular internal control	Internal control is one of the important guarantees of corporate financial management.	Some enterprises have irregularities in internal control, such as imperfect internal control systems and lax implementation of internal controls. This not only affects the operational stability of the enterprise but also easily leads to the occurrence of financial risks [9].

3.3. The quality of financial personnel needs to be improved

In enterprise financial management, the quality of financial personnel significantly influences operational development. However, in many enterprises, the quality of financial personnel requires enhancement, impacting the effectiveness of financial management and operational development. Firstly, some enterprises' financial personnel lack essential professional skills and expertise in financial management, accounting, and related areas, negatively affecting the accuracy and reliability of financial information and potentially leading to financial risks [10]. Secondly, the professional standards of financial personnel in some enterprises need improvement, with insufficient attention to professional ethics and responsibility. This introduces safety hazards to the quality of financial management work, potentially fostering illegal activities. Additionally, communication skills pose a challenge for some financial managers, impacting the efficiency of financial management work and leading to information asymmetry and decision-making errors. Furthermore, some older financial personnel lack learning ability and fail to master new knowledge and skills, hindering the innovative development of financial management work.

3.4. Inadequate degree of digitalization

The current state of corporate financial management grapples with insufficient digitalization, giving rise to various issues: (1) Lack of digital strategic planning prevents effective utilization of digital technology during the digital transformation process; (2) Insufficient data integration and processing hinder the full exploitation of data value, impeding effective decision-making; (3) Shortage of digital talents limits the application of digital technology in financial management; (4) High information security risks arise due to inadequate network security protection or lack of information security awareness among employees, making financial information susceptible to leaks or attacks; (5) Inadequate digital application prevents the full realization of digital technology advantages, impacting the efficiency and accuracy of corporate financial management [11].

3.5. Insufficient financial risk management

From the perspective of industry-finance integration, financial risk management in corporate financial management exhibits the following shortcomings: (1) Lack of comprehensive risk awareness among enterprise employees leads to poor business decision-making and potential risks during execution; (2) Imperfect risk assessment mechanisms prevent accurate identification, evaluation, and response to potential financial risks, hindering quick responses when risks occur; (3) Inadequate risk response strategies result in enterprises lacking effective measures to reduce or resolve risks promptly, causing losses to the enterprises.

4. Optimization paths for corporate financial management from the perspective of industry-finance integration

4.1. Establish a robust awareness of business and financial integration

To begin, an effective communication mechanism must be instituted to enhance collaboration between business and financial departments. Achieving deep integration involves regular cross-department meetings, information sharing, and collaborative formulation of financial management strategies. Secondly, a unified data caliber and management mechanism should be implemented to ensure standardization and consistency in business and financial data. By establishing data specifications and a sharing platform, businesses can seamlessly integrate and share data. Simultaneously, cultivating employees' overall awareness is crucial. Through training and case sharing, employees can comprehend the advantages and importance of industry-finance integration, enhancing their overall awareness [12].

4.2. Optimize financial accounting process

In today's rapidly evolving business landscape, optimizing financial accounting processes is paramount for improving financial management levels. Enterprises must conduct a comprehensive analysis and evaluation of existing financial accounting processes, identifying unnecessary links and bottlenecks for simplification. For instance, automating or semi-automating highly repetitive and low-value accounting tasks can reduce manual operations, enhance efficiency, streamline processes, minimize error rates, and improve data quality. Additionally, enterprises need to standardize the management of financial accounting operations by developing unified accounting methods and operating specifications. This ensures that all accounting tasks adhere to standards for data consistency and comparability. With advancing technology, automation tools and software can be employed to automate routine accounting tasks. For example, automated accounting processing systems and artificial intelligence audit systems can significantly reduce manual operations, improving efficiency and quality. Establishing a complete information-sharing mechanism breaks down barriers between different departments, facilitating data sharing and transfer. This enables the financial department to better understand the operations of other departments, adjust accounting strategies in a timely manner, and enhance data quality and decision support effects [13]. Information sharing also strengthens collaboration and communication between departments, enhancing overall operational efficiency.

4.3. Strengthen the construction of financial talent teams

Primarily, enterprises should intensify the training of financial personnel, elevating their professional quality and professionalism through regular professional skills training and ethics education. This fosters normative awareness, enhances operational skills, and reduces the occurrence of irregular behaviors. Secondly, incentive mechanisms should be established to encourage financial personnel to proactively enhance their own quality. Implementing a reward system, providing promotion opportunities, and other measures stimulate enthusiasm and continuous improvement [14]. Enterprises should also focus on team building, striving to improve team cohesion and collaboration capabilities. This can be achieved through team activities, strengthened team communication, and other measures [15].

4.4. Promote digital financial management

Initiating a digital strategic plan is the first step, clarifying goals and paths for digital transformation based on the enterprise's actual situation. This involves analyzing the infrastructure, talents, and technologies required, and formulating corresponding implementation plans. A complete data integration and processing mechanism must be established, utilizing big data technology and artificial intelligence algorithms for in-depth mining and analysis.

Strengthening the cultivation and introduction of digital talents and improving existing employees' digital skills and qualities through training and practice are essential. Establishing a comprehensive information security protection system covering network security, data security, and privacy protection is crucial. This includes enhancing information security awareness among employees and developing emergency plans for timely response to information security incidents. Actively promoting the application of digital technology in financial management, such as cloud computing for efficient data storage and calculation, big data technology for in-depth data mining, and artificial intelligence for process automation and intelligence, will continuously improve the efficiency and accuracy of corporate financial management.

4.5. Establish and improve risk warning and response mechanisms

To strengthen financial risk management from the perspective of industry-finance integration, enterprises

can take the following steps: (1) Enhance comprehensive risk awareness through training and case sharing to improve the risk awareness of all employees, particularly financial personnel. Establishing risk awareness within the corporate culture ensures ongoing attention to risk management; (2) Improve the risk assessment mechanism by establishing a comprehensive risk assessment system, conducting regular assessment of various business activities, and ensuring timely discovery of potential risks; (3) Develop response strategies based on different risk types and situations, including risk transfer, reduction, and escalation. Real-time monitoring of major risks ensures timely and effective resolution, supported by an emergency plan for swift response to unexpected risk events [16].

5. Conclusion

Viewed through the lens of industry-finance integration, the optimization of corporate financial management emerges as an inevitable and forward-looking trend. Through the profound integration of business and financial departments and the facilitated sharing of information and resources, companies can make substantial strides in enhancing decision-making quality, refining resource allocation, mitigating operational risks, bolstering market competitiveness, and ultimately achieving sustainable development. As we gaze into the future, corporate financial management stands poised to confront new challenges and embrace novel opportunities, with the advent of artificial intelligence, big data applications, and the evolution of comprehensive budget management. In navigating these future dynamics, companies must embark on a continuous journey of exploration and innovation in financial management models. This adaptability is vital for staying attuned to the ever-changing market environment and meeting the evolving social needs of tomorrow.

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The Construction and Implementation Path of the Audit System for Quality Control in the Big Data Era

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Abstract: In the era of big data, the construction and implementation of a quality control audit system are particularly crucial. This article delves into the impact of big data technology on quality control auditing, establishes a quality control auditing system in the big data era, and elucidates the pathway to realizing this system. Through the application of big data technology to quality control audits, there is an enhancement in audit efficiency, the attainment of more accurate risk assessment, and the provision of robust support for the sustainable development of enterprises.

Keywords: Big data; Quality control; Audit system

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1. The importance of building a quality control audit system in the era of big data

1.1. Improve audit efficiency and accuracy

The utilization of big data technology enables auditors to collect, process, and analyze massive amounts of data more efficiently, thereby enhancing the precision and effectiveness of audits. Establishing a quality control audit system allows for the in-depth mining and intelligent analysis of various data types using big data technology. This results in the automation and intelligence of the entire audit process, minimizing human errors and omissions and ultimately elevating the quality of audits [1]. For instance, in financial auditing, issues such as abnormal transactions and erroneous records can be promptly identified through the analysis of extensive financial data, thus improving the accuracy and efficiency of the auditing process.

1.2. Strengthen risk control capabilities

The construction of a quality control audit system in the era of big data aids auditors in comprehensively and timely understanding a company's operating status and risk situation, thereby enhancing risk control capabilities. Real-time monitoring and analysis of various enterprise data types enable the detection of potential risks and issues, offering timely warnings and mitigating or preventing risk losses. Additionally, big data technology facilitates multi-dimensional and multi-level analysis of historical data, enabling the prediction of future development trends and potential risks, thereby providing enterprises with a more valuable foundation

for decision-making [2].

1.3. Promote sustainable development of enterprises

The establishment of a quality control audit system contributes to assisting enterprises in achieving their sustainable development goals. On one hand, through comprehensive, objective, and accurate analysis and evaluation of various data types in the enterprise's operation process, the system helps enterprises identify strengths and weaknesses, clarify development directions and goals, optimize resource allocation, and enhance overall operational efficiency. On the other hand, the quality control audit system aids enterprises in establishing and refining internal control systems, standardizing management processes, improving corporate governance, and enhancing risk prevention capabilities, thereby offering a robust guarantee for the sustainable development of enterprises.

2. Problems and shortcomings in the construction and operation of the current quality control audit system

2.1. Diversified data sources and insufficient data standardization

As enterprise business expands and information technology undergoes rapid development, the volume of data generated and received by enterprises is on the rise, leading to increasingly complete data sources. The differences between data from various business departments and information systems pose compatibility challenges, necessitating intricate processes for data integration, processing, and analysis. Addressing the issues of diversified data sources and inadequate data standardization is imperative, as failure to do so directly impacts the efficiency and quality of audit work, elevating the risk of audit errors [3]. Furthermore, the establishment of more unified data standards is crucial, given the often substantial disparities in data between different business departments and information systems. Achieving compatibility in the data integration, processing, and analysis process is challenging, demanding considerable time and effort for data cleaning, transformation, and standardization.

2.2. Limited popularity and adaptability of big data analysis technology

Despite the widespread application of big data technology across various industries, its integration into the audit field remains in its infancy. Auditors face challenges in understanding and mastering big data analysis technology, with many lacking the necessary skills and knowledge. This limitation hinders their ability to effectively leverage big data technology for audits. Additionally, the application scenarios for big data analysis technology are restricted, with most audit work relying on traditional methods and tools [4]. Insufficient research and practice exist on applying big data analysis technology to intricate audit scenarios, such as fraud detection and risk assessment. The adaptability and reliability of big data analysis technology also require enhancement, as practical applications may encounter challenges such as low data quality, slow data processing speed, and high model false alarm rates. Addressing these issues is crucial to ensuring the accuracy and credibility of audit results.

2.3. Urgent need for improvement in auditor professional quality and skills

In the current step of the quality control audit system, a pressing issue is the professional quality and skills of auditors. Economic and technological advancements bring forth increased challenges in audit work, necessitating auditors to possess higher professional qualities and skills.

Auditors require expanded knowledge of new technologies and methods, with many yet to receive

systematic training in technical and data analysis within the existing audit system. This gap hampers their ability to effectively utilize new technologies and methods, thereby affecting the efficiency and effectiveness of auditing and limiting innovation in auditing work.

Moreover, auditors need interdisciplinary knowledge and skills, as audit work often spans multiple fields such as finance, law, and information technology. A comprehensive understanding of audit objects and related businesses is vital for improved quality and effectiveness in audits.

Finally, auditors need greater motivation for continuous learning and self-improvement. This ever-evolving nature of auditing standards and requirements, coupled with ongoing economic and technological developments [5], underscores the necessity for auditors to stay abreast of new concepts and methods. A lack of motivation for continuous learning and self-improvement may impede the quality and progress of audit work.

3. Implementation paths for building a quality control audit system in the era of big data

3.1. Promote data standardization and improve data source control capabilities

In the era of big data, the sheer volume and complexity of data sources have presented both challenges and opportunities for constructing quality control audit systems. To effectively build and maintain such a system, the initial step involves promoting data standardization and enhancing data source control capabilities.

(1) Define and implement data standards: In both internal and external data collection, storage, and utilization, it is crucial to define and implement unified data standards. This ensures consistency in data format, classification, accuracy, and encoding. Correspondingly, the formulation of data quality standards and data management specifications clarifies requirements and responsibilities, preventing data inconsistencies and errors.

(2) Data cleaning and integration: Addressing abnormal data and error messages during data collection requires thorough data cleaning and integration efforts. This involves removing duplications, correcting errors, and filling in missing values to enhance data quality and reliability.

(3) Strengthen data source control: The diversity of data sources poses a significant challenge in the big data era. Hence, controlling data at its source is imperative. This involves clearly defining responsibilities and obligations for data sources. For key data sources, implementing reasonable monitoring and management practices ensures the reliability and stability of the data source.

By implementing these measures, enterprises can effectively promote data standardization, improve data source control capabilities, and establish a robust foundation for building a quality control audit system in the big data era.

3.2. Popularize big data analysis technology and improve its adaptability and application effect

Effective quality control audits in the era of big data hinge on mastering relevant technologies. Organizations must ensure that audit departments and staff are well-versed in big data analysis technology, including data mining, data warehousing, and data visualization.

To optimize the application of big data technology:

(1) Ensure mastery of big data analysis technologies.

(2) Establish an efficient and stable data analysis platform with robust computing and storage capabilities.

(3) Strengthen data mining and analysis during audits to discover potential patterns and risks, providing a reliable basis for quality control audits.

By popularizing big data analysis technology and enhancing its adaptability and application effect, organizations can unlock the full potential of data for comprehensive and accurate audit analysis.

3.3. Strengthen training and further education of auditors to improve their professional quality and skill level

In response to the demands of the big data era, organizations must urgently address the professional quality and skills of auditors. This involves:

(1) Ongoing training and further education opportunities to improve auditors' professional skills, including data analysis, mining, and visualization techniques.

(2) Cultivating compound talents with interdisciplinary knowledge, fostering a comprehensive understanding of business processes, a data analysis mindset, and collaborative teamwork [6].

By strengthening training initiatives, organizations can create a highly skilled audit team capable of navigating the challenges of quality control audits in the big data era. Continuous learning and self-improvement will further ensure auditors' adaptability, providing a stable and reliable talent base for organizational development.

3.4. Improve the quality control audit system and timely update and improve the existing audit system

The quality control audit system is at the core of audit work, directly influencing its quality and efficiency. To adapt to the requirements of the big data era, improvements are necessary in the following areas:

(1) Strengthen research on audit theory: Conduct in-depth research on the impact of big data technology on audit work. Explore and adopt advanced auditing theories and practical experiences globally to develop theories and methods suitable for the big data era.

(2) Improve audit management system: Formulate detailed audit plans and standards to ensure standardization and scientificity. Promptly update and improve various auditing standards to align with the evolving needs of the times. Strengthen the management of the audit process, including data collection, sorting, analysis, and storage.

(3) Enhance risk management and control: Conduct a comprehensive risk assessment of various data businesses. Identify and manage possible risks in a timely manner, developing distinct response measures for different risk levels.

By addressing these aspects, organizations can improve the quality control audit system, ensuring its adaptability to the challenges presented by the big data era.

4. Conclusion

In summary, the construction of a quality control audit system in the big data era holds significant practical implications and enduring value. This initiative stands to enhance audit efficiency and precision, fortify risk control capabilities, and propel the sustainable development of enterprises. Key considerations in developing such a system encompass factors such as data security, processing efficiency, and accuracy.

Simultaneously, the integration and judicious utilization of data must align with the actual business needs of the enterprise to achieve comprehensive, efficient, and accurate quality control auditing. An active exploration and study of the application and practice of big data technology in the audit field are essential. This involves refining data collection and processing processes, establishing a robust data analysis platform, elevating the overall proficiency of auditors, optimizing audit processes, and fostering innovation in audit

methods and technologies.

By earnestly addressing these aspects, enterprises can effectively enhance the efficiency and precision of quality control audits, thereby promoting the development and progress of the audit industry.

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Positioning Analysis of AY Field Brand

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Abstract: For a considerable duration, the traditional dairy product market in China has been dominated by a dual oligopoly, primarily led by Mengniu and Yili. Regional brands such as Guangming, Junlebao, and Sanyuan have engaged in staggered competition, contributing to a pattern of feudal separatism among local brands. AY Group, positioned as a significant independent player in the China dairy industry, has strategically extended its reach downstream in the supply chain, establishing the consumer brand AY Field. Despite possessing a robust advantage in self-owned ranches and delivering high-quality products, AY Field grapples with challenges related to unclear market positioning and low brand awareness among final consumers. This study employs a SWOT analysis to delve into identifying a market positioning strategy that best suits the AY Field brand. The research reveals that the current dynamics of competition in the dairy industry market are predominantly concentrated in the high-end and low-end segments, leaving a noticeable gap in the middle market. Leveraging the natural, high-quality, and competitively priced attributes of AY Field milk, the recommended market position involves supplying ambient liquid milk that aligns with the consumption habits of young individuals and office workers. This strategic positioning aims to offer high-quality products at moderate prices, addressing the specific needs of the identified consumer demographic.

Keywords: Milk; SWOT analysis; Market positioning; Supplier brand

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1. Introduction

Established in 2009, AY Group has grown to be recognized as one of the top five dairy farm operators in China, boasting over 100,000 cows. AY Group's primary competitive edge lies in its capacity to consistently provide large-scale supplies of high-quality, traceable raw milk. Among its notable clientele are industry giants such as Mengniu, Guangming, Meiji, Junlebao, New Hope, Jiabao, Kashi, Yuanqi Forest, and Simple Love. In 2014, AY Group embarked on a new venture by introducing the AY Field brand, signaling its entry into the dairy product market.

Despite the inherent advantage of a strong self-owned ranch, AY Field has grappled with the challenge of low brand awareness among end consumers, impeding significant sales growth. This study concentrates on a comprehensive market positioning analysis of the AY Field milk brand. By assessing the strengths

and weaknesses intrinsic to AY Group and considering external opportunities and challenges, tailored recommendations for AY Field's market positioning are presented.

Drawing on contemporary research, Lili Gai applied the 4V marketing theory to meticulously analyze the marketing model and strategy of the Adopt A Cow brand within the dairy industry market from four aspects: differentiation, functionalization, value-added, and resonance. Gai emphasized that differentiated marketing and adoption models significantly elevate a brand's popularity and foster emotional resonance with customers [1]. Liufang Cao succinctly outlined successful marketing models for the Adopt A Cow brand, highlighting transparent pastures, multi-platform online marketing, and brand personalization through high-frequency interaction [2]. In their review of China's dairy industry in 2022 and outlook for 2023, Jiajia Liu *et al*. noted the challenges faced by dairy companies due to overcapacity in raw milk production and elevated feed costs, leading to diminished profits in cow ranching [3].

Furthermore, Liwei Wang *et al*. proposed that the high-end ambient liquid milk market has matured and solidified, with Mengniu and Yili's duopoly commanding a 97% market share in online sales and 45% in offline sales. In contrast, opportunities persist in the high-end low-temperature milk market, where the duopoly's market share stands at 37% in online sales and 39% in offline sales [4,5].

2. SWOT analysis of enterprise brand competitiveness

2.1. Strengths

2.1.1. Independent large-scale dairy cattle ranch

As of June 2023, AY Group operates 11 large-scale dairy farms, primarily situated in Hebei, Shandong, and Chifeng, housing a total of 124,200 cows. AY Group stands out as the first Chinese dairy farm operator to conceive, construct, and operate a large-scale and standardized 10,000-head dairy farm. This emphasizes an integrated, diversified, and large-scale production chain layout. Notably, AY Field Modern Ranch, an industry benchmark, is the sole dairy farm in China acknowledged by the Ministry of Agriculture and Rural Affairs as a cow tuberculosis-free and cow immune brucellosis-free community.

2.1.2. High position in the market through technology support

AY Group has been at the forefront of commercial genetic breeding technology in the Chinese dairy industry since 2018, implementing a genetic improvement program. Prioritizing animal welfare, hygiene, and comfort in the growth environment, AY Group ensures robust cattle breed advantages. Consequently, AY Group achieves a notable milk production per unit of cows at 13.4 tons/year, surpassing industry (8.7 tons/year) and top-five domestic dairy farm (11.5 tons per year) averages. AY Group even outperforms the global leader, Israel, with a production rate of 11.85 tons/year.

2.1.3. High-quality milk with a significant price advantage

AY Field ranch, strategically located in the internationally recognized golden milk source zone, boasts a temperate monsoon climate with a latitude between 37 degrees to 50 degrees north. This ideal setting, combined with Holstein cows known for high milk production and a milk protein content of 3.42%, contributes to AY Field's production of premium-quality milk. Employing advanced production processes, AY Field maintains a total bacterial count of less than 10,000, a mere one-tenth of the most stringent EU standards. Despite its superior quality, the selling price of AY Field's 250 mL × 10 gift box is competitively set at 29.9 CNY per liter, approximately half of the high-end brands.

2.2. Weaknesses

2.2.1. Low brand awareness

While AY Group enjoys high brand awareness in the raw milk supply market, AY Field struggles with low recognition among terminal consumers. In a market already dominated by the duopoly of Mengniu and Yili, along with regional brands competing in a staggered manner, AY Field faces substantial entry barriers for emerging brands. The brand's insufficient investment in promotion and a lack of powerful marketing tools hinder its ability to swiftly capture market attention.

2.2.2. Simple product category and single sales channel

AY Field's sales constitute only about 10% of the group's overall raw milk sales. With a product portfolio limited to four categories – boxed ambient liquid milk, low-temperature refrigerated milk, flavored yogurt, and chocolate milk – AY Field faces challenges in diversifying its product range. Initial attempts to enter supermarkets were hindered by low brand awareness, leading to withdrawal. Presently, AY Field relies on major customers including Starbucks, Luckin, Costa, and other coffee shops or roasteries, offline sales in convenience stores such as Convenience Bee and Yuanfuda, and online platforms such as WeChat mini programs, Meituan Selection, and JD platform.

2.3. Opportunities

2.3.1. National policy support and broad market prospects

The Ministry of Agriculture and Rural Affairs' "14th Five-Year Plan for Improving the Competitiveness of the Dairy Industry," issued in February 2022, emphasized optimizing milk source regions, developing local brands, and meeting differentiated market demands. The plan aligns with the rising per capita consumption of dairy products by Chinese residents, reaching 14.4 kg in 2021 according to China Business Intelligence Network, reflecting a year-on-year increase of 10.6%.

2.3.2. Construction of smart platforms to attract consumers

The integration of Smart Interconnection into daily life presents an opportunity for AY Field. Establishing smart network platforms allows consumers to observe the production process, accurately locate each cattle, and foster brand recognition. This technological integration extends to online sales platforms, providing a diverse channel for consumers to learn about and purchase products.

2.4. Threats

2.4.1. Fierce market competition

China's dairy industry currently exhibits a competitive landscape with two major powers (Mengniu and Yili) holding a market share of 43% and multiple strengths represented by local and emerging internet brand forces. Regional brands, like Hebei Junlebao Dariy, Shanghai Guangming Dairy, Beijing Sanyuan Dairy, and Heilongjiang Wandashan Dairy exert additional pressure. Emerging brands, including Adopt A Cow, Kashi, and Simple Love, further contribute to the competitive intensity.

2.4.2. Rising breading costs

Persistently high feed raw material costs contribute to elevated breeding expenses, with feed accounting for 77.34% of overall expenses per cattle (refined feed accounting for 55.50% and stored feed accounting for 21.84%). Refined feed is mainly composed of corn and soybean meal, hence changes in corn and soybean meal prices significantly impact dairy farming costs. Despite AY Field's self-owned ranch, the reliance on imported

feed exposes it to market price fluctuations, resulting in a scenario of "increasing income without increasing profits."

2.4.3. Changes in consumer tastes

Evolving consumer preferences in quality, flavor, packaging, and product diversity pose a challenge. With an increasing array of choices available to consumers, enterprises must continually innovate and adjust product design and production strategies to align with evolving consumption patterns and preferences.

3. Brand positioning

3.1. Natural and safe good milk

Unlike competitors like Mengniu and Yili, who predominantly target the high-end market, AY Field strategically positions itself in the mid-range market. While other brands aim for a high protein content benchmark of 3.6 g/100 mL or even 3.8 g/100 mL, AY Field stands out by maintaining a natural protein level of 3.2 g/100 mL. Achieving this without resorting to the costly reverse osmosis (RO) concentration technique, AY Field prioritizes producing "natural milk" that meets basic nutritional needs, is easily absorbable, and provides a price advantage, catering to the daily consumption habits of the mass market.

The "good" in AY Field milk reflects meticulous control across all production links, from its 11 ranches strategically distributed in the golden milk source belt to comprehensive modern scientific management. AY Group's focus on Holstein cows, rigorous vaccination practices for collective immunity, spacious living conditions, and advanced production processes result in milk quality meeting the strictest EU standards. AY Field's positioning in the mid-range liquid milk market targets offline brand stores with high-quality requirements and high demand, including branded coffee shops, milk tea establishments, and bakeries. Simultaneously, it caters to young consumers with ambient liquid milk and yogurt products, aligning with the preferences of students and office staff with casual and irregular dietary habits.

3.2. Low-price route

AY Field's ambient milk adopts a mid-range mass market approach, adhering to the high-quality, low-price route. With over 80% of AY Group's revenue coming from its raw milk business (2019–2023), serving as an upstream raw milk supplier to major dairy companies, AY Field leverages its low-price advantage in raw milk supply. In 2021, the top six dairy companies in the market accounted for approximately 83% of AY Group's total raw milk business revenue, while emerging dairy companies accounted for approximately 15%. By not pursuing excessively high protein content, AY Field achieves a cost-effective, high-quality ambient milk product with a competitive edge in the market. This positioning resonates with cost-conscious consumers seeking quality products at affordable prices.

3.3. Occupy the advantage of upstream milk sources

Recognizing the growing importance of upstream milk sources, AY Group distinguished itself as the largest "independent dairy farm operator" in China, maintaining primary equity control over its large-scale dairy farms. In contrast to other dairy companies with multi-party participation in animal husbandry ventures, for instance, Mengniu Dairy took over Modern Animal Husbandry as early as 2017, and it became the largest single shareholder of China Shengmu by increasing its holdings in stocks in 2020, AY Group's strict control over its own dairy farms ensures the supply of high-quality, low-priced raw milk. This upstream advantage positions AY Field as a reliable source of quality milk, standing out in a market where control over milk sources

is increasingly considered a strategic advantage by major dairy companies.

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Author contributions

X.L. conceived the idea of the study. L.Z. and Q.F. performed the investigations. H.D. and P.Y. analyzed the data and wrote the paper.

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Impact of State-Owned Capital Participation on ESG Performance of Private Enterprises

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Abstract: As global investors and stakeholders increasingly prioritize environmental, social, and governance (ESG) performance, corporate social responsibility and sustainability have become crucial factors in determining corporate success. In the context of China's robust economy, the involvement of state-owned capital exerts a profound impact on the ESG performance of private enterprises. This paper, starting from the perspective of ESG, analyzes how state-owned capital participation influences the ESG performance of private enterprises. Additionally, it proposes recommendations for the involvement of state-owned enterprises in private enterprises, aiming to foster the sustainable development of private enterprises and enhance their social responsibility.

Keywords: State-owned capital; Private enterprises; ESG; Sense of social responsibility

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1. Introduction

As the global focus on corporate social responsibility and sustainable development continues to grow, environmental, social, and governance (ESG) factors are becoming increasingly prominent in investment decisions and business operations. The impact of state-owned equity participation on the ESG performance of private enterprises is also gaining attention. Given their significance in China's economic development, it is essential to study the effects of state-owned enterprises' equity participation on the ESG performance of private enterprises.

2. Environmental, social, and governance (ESG)

ESG, an acronym for environmental, social, and governance, is a critical standard for assessing a listed company's social responsibility. The ESG rating system, also known as ESG rating, is developed by commercial and non-profit organizations to evaluate how well a company's commitment, performance, business model, and structure align with the Sustainable Development Goals [1].

Primarily utilized in the investment field, ESG imposes more specific requirements on corporate

information disclosure. It necessitates a shift from flexible to specific disclosure content, with an emphasis on disclosing corporate governance performance. Specifically, the environmental aspect focuses on the impact of enterprises on the environment, climate change, and natural resource protection. The social aspects emphasize corporate social responsibility and employee welfare, while corporate governance focuses on the structure and risk management of corporate governance.

ESG investing is a form of responsible investment that aims to promote sustainable development. Investors can evaluate the contribution of investment objects to sustainable economic development, environmental protection, and social responsibility by screening or evaluating ESG indicators [2,3]. Furthermore, ESG ratings are also employed by other stakeholders, such as job seekers and clients, to assess business relationships.

Currently, ESG investing is gaining increasing attention worldwide, with many institutional investors and asset owners incorporating ESG factors into their investment decisions. Simultaneously, ESG investment plays a role in promoting sustainable practices and innovation.

3. The impact of state-owned capital participation on the ESG performance of private enterprises

3.1. Funding support

As market competition intensifies, numerous private enterprises encounter funding shortages. The involvement of state-owned capital can offer stable financial support, aiding private enterprises in alleviating financial pressures and facilitating the effective implementation of ESG strategies. Furthermore, state-owned capital typically possesses substantial assets and robust investment capabilities, enabling the attraction of additional social capital into private enterprises. This not only eases the financial burdens on private enterprises but also fosters their rapid development, transformation, and upgrading. Simultaneously, state-owned capital participation enhances the credit ratings of private enterprises, increasing their credibility. This, in turn, facilitates access to more financing channels and reduces debt financing costs, effectively mitigating the challenges of “difficult financing” and “expensive financing” for private enterprises [4-6].

3.2. Policy guidance

Upon state-owned capital participation in private enterprises, it can guide them toward sectors such as green environmental protection and high-tech industries encouraged by the state’s industrial policy. This strategic direction not only positions private enterprises advantageously in market competition but also contributes to the overall economic development of the country. State-owned capital participation is often aligned with national fiscal policies, allowing the government to guide private enterprises through financial subsidies and tax incentives toward increased investment in environmental protection and ESG actions such as cleaner production. Such policy guidance reduces costs for private enterprises, enhances market competitiveness, and fosters the green development of society at large. Additionally, state-owned capital, wielding significant influence in the financial field, can offer green financial products and services for private enterprises, including low-interest loans and support for green bond issuance, addressing financial challenges and promoting green development [7].

3.3. Change of governance structure

The entry of state-owned capital into private enterprises may reshape the board of directors’ structure. The addition of directors with national backgrounds can steer board decision-making toward long-term development and social responsibility. State-owned capital can also intensify supervision and guidance by appointing

directors or independent directors to curb violations and enhance enterprise ESG performance [8]. Concurrently, state-owned capital's entry may prompt private enterprises to elevate their focus on improving corporate governance levels. Enhanced corporate governance provides a stable and standardized internal management environment, facilitating private enterprises in fulfilling ESG responsibilities more effectively [9].

3.4. Demonstration effect

State-owned capital exhibits a notable demonstration effect in fulfilling social responsibilities. Upon entering private enterprises, state-owned capital can transfer this effect, actively promoting green investment, environmental protection projects, support for public welfare initiatives, and a commitment to social responsibilities. This serves as an example for private enterprises to actively fulfill social responsibilities. Additionally, state-owned capital reinforces the supervision of private enterprises, encouraging them to prioritize information disclosure. Increased information disclosure enhances enterprise transparency, enabling better understanding by investors and the public, improving ESG performance, and subsequently enhancing market reputation and social responsibility [10]. This positive impact is particularly pronounced in private enterprises subject to strong government intervention, intense industry competition, high supply chain concentration, and significant media attention [11]. Moreover, state-owned capital, assuming a leadership role in technological innovation and industrial upgrading, can transfer this role to private enterprises, motivating them to focus on environmental protection and social responsibility in innovation and development. For instance, state-owned capital can guide private enterprises to increase investment in environmental protection technology, new energy, and other fields, fostering green development and industrial upgrading [12].

4. Suggestions on the participation of state-owned enterprises in private enterprises

4.1. Suggestions on state-owned enterprises' participation in private enterprises

4.1.1. Establishing a sound fund system

In the participation of state-owned enterprises in private enterprises, the supervision of funds should be strengthened. State-owned enterprises should establish a robust fund management system to regulate the use and management of funds in private equity enterprises. It is essential to clarify the scope and purpose of fund utilization, prevent misappropriation and abuse of funds, and ensure effective fund utilization. Establishing a risk early warning mechanism is necessary to discover and prevent potential capital risks promptly, ensuring capital security [13].

4.1.2. Strengthening internal audit and supervision

State-owned enterprises should enhance the internal audit and supervision of private enterprises with equity participation to ensure the rationality and standardization of fund usage. Regarding internal audit, a comprehensive internal audit system should be established to regularly audit the financial status of enterprises, ensuring compliance with relevant laws, regulations, and ESG requirements. In terms of supervision, a capital supervision plan should be formulated, improving the supervision mechanism, strengthening internal control, and increasing internal control implementation. Regular or irregular methods can be adopted to audit and supervise the use of funds by participating private enterprises, promptly correcting and addressing identified issues [14].

4.1.3. Cooperation with third-party regulators

State-owned enterprises can collaborate with third-party supervisory organizations to jointly strengthen the

supervision of the funds in private enterprises in which they participate. Third-party supervisory organizations can provide professional supervisory services and risk assessments to help state-owned enterprises better understand the use of funds and the risk status of the private enterprises in which they have participated.

4.1.4. Strengthening legal and compliance awareness

Both state-owned enterprises and private enterprises with equity participation should enhance their awareness of law and compliance, adhering to relevant laws, regulations, and fund management provisions. Instances of fund use violations should be addressed in accordance with the law, and criminal responsibility pursued if it constitutes a crime.

4.2. Improving the information disclosure mechanism

4.2.1. Formulation of information disclosure policies and norms

State-owned enterprises should formulate information disclosure policies and norms to clarify specific content, manner, and time requirements for information disclosure in participating private enterprises. These policies and norms should align with national and local laws and regulations while considering practicality and sustainability.

4.2.2. Strengthening the supervision of information disclosure

State-owned enterprises should enhance the supervision of information disclosure in private enterprises with equity participation to ensure timely, accurate, and complete information disclosure. Regular or irregular inspections and evaluations of information disclosure by participating private enterprises should be conducted, and identified problems corrected promptly [15].

4.2.3. Establishment of an information-sharing and communication mechanism

State-owned enterprises should establish an information-sharing and communication mechanism with participating private enterprises to enhance information communication and collaboration. Through information sharing, they can gain timely insights into the operation and ESG performance of participating private enterprises, providing support and reference for corporate decision-making. Simultaneously, this mechanism can convey the policies and requirements of state-owned enterprises to participating private enterprises promptly, strengthening guidance and assistance.

4.2.4. Utilizing the assessment and certification role of third-party institutions

State-owned enterprises can involve third-party organizations in assessing and certifying the ESG performance of private companies in which they participate. These organizations can offer professional assessment and certification services to help state-owned enterprises better understand the ESG performance and social responsibility fulfillment of private companies with equity participation, further enhancing the supervision and guidance on information disclosure.

4.2.5. Strengthening education and training

State-owned enterprises should intensify education and training on information disclosure for relevant personnel in private enterprises with equity participation. This effort aims to improve enterprises' attention to information disclosure and their ability to disclose information. Through education and training, the awareness and ability of enterprises to disclose information can be enhanced, further promoting the improvement and standardization of information disclosure.

4.3. Building cooperation mechanisms

4.3.1. Joint formulation of strategic planning

State-owned enterprises and private enterprises can collaborate to formulate strategic plans, clarifying the direction and goals of development. When formulating strategic plans, considerations should be given to ESG factors, incorporating sustainable development and social responsibility into development strategies to jointly promote the healthy development of enterprises.

4.3.2. Establishment of joint working groups

State-owned enterprises and private companies can establish a joint working group to implement the strategic plan and promote cooperation in ESG. The joint working group, comprising senior executives, heads of relevant departments, and ESG experts from both sides, ensures efficient and professionalized cooperation.

4.3.3. Strengthening information sharing and communication

State-owned enterprises and private enterprises can strengthen information sharing and communication, staying abreast of each other's ESG performance and needs, and working together to solve problems encountered in cooperation. Regular meetings and exchange visits can be held to enhance mutual understanding and trust, laying the foundation for further cooperation.

4.3.4. Promoting technological innovation and green development

State-owned enterprises and private enterprises can jointly promote technological innovation and green development, such as jointly developing green technologies and promoting environmentally friendly products. Through technological innovation and green development, they can enhance the competitiveness of enterprises and realize sustainable development.

4.3.5. Establishment of benefit-sharing mechanisms

State-owned enterprises and private enterprises can establish a benefit-sharing mechanism to rationally distribute the benefits of cooperation. In this mechanism, ESG factors can be fully considered, incorporating environmental protection and social responsibility performance appraisal and other measures to ensure that both parties benefit from the cooperation.

4.3.6. Building long-term cooperation mechanisms

State-owned enterprises and private enterprises can build long-term cooperation mechanisms, such as signing long-term cooperation agreements and forming joint ventures. The long-term cooperation mechanism can stabilize the cooperation relationship between the two parties, jointly promoting progress and development in ESG.

5. Conclusion

In summary, the participation of state-owned capital has a positive impact on the ESG performance of private enterprises, making a significant contribution to enhancing the sustainable development of these enterprises and promoting overall economic sustainability. As technology continues to innovate and industrial upgrading accelerates, state-owned capital's involvement in private enterprises is poised to encounter both opportunities and challenges. Moving forward, it is imperative for the government, regulators, investors, and other

stakeholders to collaborate in fostering an environment that encourages enterprises to consistently enhance their ESG performance.

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Research on Influencing Factors and Countermeasures of Risk Control of State-Owned Enterprises under the Background of Big Data

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Abstract: This study explores the risk control and response strategies of state-owned enterprises in the context of big data. Global economic uncertainty poses new challenges to state-owned enterprises, necessitating innovative risk management approaches. This article proposes response strategies from four key aspects: establishing a proactive risk management culture, building a foundation in technology and data, conducting big data-driven risk analysis, and implementing predictive analysis and real-time monitoring. State-owned enterprises can foster a proactive risk management culture by cultivating employee risk awareness, demonstrating leadership, and establishing transparency and open communication. Additionally, data integration and analysis, leveraging the latest technology, are crucial factors that can help companies better identify risks and opportunities.

Keywords: State-owned enterprises; Risk management; Big data; Risk control

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1. Introduction

State-owned enterprises have always played a crucial role in the national economy. However, in the context of the new era, they now confront uncertain global economic challenges. Specifically, the global epidemic has adversely affected economic growth, amplifying risk uncertainty. This section aims to explore how state-owned enterprises can enhance risk control in the big data era to align with the high-quality development goals of central enterprises in this new era.

2. Application of big data technology in the risk control of state-owned enterprises

2.1. The impact of big data on risk control

Big data technology supports state-owned enterprises amidst the current severe global economic situation. It provides more timely and comprehensive data, enabling state-owned enterprises to identify, assess, and manage risks more accurately [1]. By offering a deeper understanding of market trends, customer needs, and competitor

actions, big data technology assists companies in formulating risk control strategies [2]. The introduction of this new technology equips state-owned enterprises with essential tools for better understanding and responding to risks.

2.2. Application of big data in the risk control of state-owned enterprises

Big data furnishes state-owned enterprises with robust supply chain management tools. By monitoring the entire supply chain in real time, companies can more effectively manage inventory and demand, thereby reducing supply chain risk [3]. Real-time data analysis and optimization contribute to reducing inventory backlog, enhancing delivery efficiency, and lowering operating costs.

Moreover, big data technology provides state-owned enterprises with more accurate market risk prediction capabilities. Businesses can gain a better understanding of market dynamics by analyzing trends, competitor actions, and customer needs [4]. This enables companies to adjust strategies quickly, adapting to market changes and minimizing market risks. Accurate market risk prediction helps enterprises maintain a competitive advantage in a highly dynamic market.

In addition, big data plays a pivotal role in financial risk management. Companies can monitor their financial health through real-time data analytics, including revenue, costs, and profits [5]. This helps ensure financial soundness and early detection of potential financial risks. Simultaneously, big data technology assists companies in developing more effective financial strategies, encompassing cost control and profit maximization.

3. Factors influencing risk control of state-owned enterprises

3.1. Risk management culture

3.1.1. Establishing risk awareness

The core of a proactive risk management culture lies in ensuring that all employees are aware. State-owned enterprises should instill the importance of risk awareness through training and education programs, enabling employees to identify and understand risks and proactively report potential risks at work.

3.1.2. Demonstration by leadership

Leadership plays a key role in establishing a proactive risk management culture. Senior leaders should set an example by actively participating in risk management and viewing risks as opportunities rather than threats. This means that leadership should support risk management measures and actively participate in the risk identification and response process. They should encourage employees to ask questions, propose solutions, and feel safe sharing risk information. Leadership support and active engagement help employees better understand the strategic importance of risk management, sending a strong message that risk management is an important task across the organization and everyone has a responsibility.

3.1.3. Establish transparency and open communication

Building a proactive risk management culture requires open and transparent communication channels. State-owned enterprises should establish mechanisms to encourage employees to actively report risks and make suggestions for improvement while properly handling these reports. Transparent communication can be achieved through various means, including anonymous feedback channels, regular risk meetings, and information-sharing platforms. This helps prevent risk information from being withheld or misinterpreted. Employees should understand that their reports are welcomed, not punished. In addition, state-owned enterprises

can also establish reward mechanisms to encourage employees to actively participate in risk management, such as rewarding employees who make suggestions that help reduce risks.

3.2. Technology and data foundation

3.2.1. Data integration and analysis

State-owned enterprises must establish a robust data foundation, including data collection, integration, and analysis capabilities. In the era of big data, data is no longer limited to a specific department or business process but is scattered throughout the organization. Therefore, data integration becomes critical. State-owned enterprises should adopt big data technology and advanced analysis tools to obtain data from various departments and business processes, achieving a comprehensive data view. This helps in identifying risks and opportunities more effectively. Companies can obtain more comprehensive and timely data through data integration to better understand their internal operations and external markets.

Data analysis is also a critical step. Big data technology enables state-owned enterprises to conduct advanced data analysis to discover patterns and trends hidden in massive amounts of data. This includes using data mining, machine learning, and predictive analytics. Through these technologies, state-owned enterprises can more accurately assess risks, identify potential problems, and formulate corresponding risk control strategies.

3.2.2. Leverage the latest technology

State-owned enterprises should fully leverage the latest technologies, including artificial intelligence (AI), machine learning, and automation tools, to improve the efficiency of risk control. These technologies have enormous potential to automate risk analysis, reduce human error, speed up decision-making, and provide more accurate results.

AI technology can analyze large amounts of data, automatically detect anomalies, predict risk events, and propose countermeasures. For example, AI can be used to automatically identify financial anomalies, detect fraud, and automate customer service and support. Machine learning algorithms can analyze historical data, identify patterns, and be used for risk prediction. State-owned enterprises can apply machine learning to predict market trends, supply chain issues, and employee behavior. Automation tools can be used to monitor and enforce risk control measures, such as automated transaction monitoring and supply chain inventory management.

Combining these latest technologies, state-owned enterprises can process large amounts of data more efficiently, reduce the cost of risk control, and provide more accurate risk predictions. This will help state-owned enterprises better adapt to the changing business environment, protect their interests, and improve their competitiveness.

3.3. External environmental factors

3.3.1. International situation

The uncertainty of the international situation profoundly impacts the risk control of state-owned enterprises. Enterprises should pay close attention to international political and economic events and formulate response strategies, including diversified supply chains and market adaptability strategies, to mitigate the impact of international situations on business.

3.3.2. Market competition

The intensity of market competition is also crucial in risk control. State-owned enterprises need to regularly

evaluate competitors' strategies and market shares and adjust their strategies according to changes in the competitive environment [6]. This may include product innovation, pricing strategies, and realignment of market positioning, among others.

3.3.3. Laws and regulations changes

Changes in laws and regulations may profoundly impact the risk control of state-owned enterprises. Businesses must establish a legal affairs department or seek legal advice to ensure their business activities comply with the latest regulations and legal requirements [7]. Additionally, companies need to establish compliance training and monitoring mechanisms to ensure employees comply with relevant regulations.

4. Risk control strategies for state-owned enterprises

4.1. Establish a proactive risk management culture

In state-owned enterprises, establishing a proactive risk management culture is paramount. This involves various measures, including developing employee risk awareness, modeling leadership, and establishing transparent and open communication channels.

4.1.1. Cultivating employee risk awareness

Cultivating employee risk awareness forms the foundation of a proactive risk management culture. Through regular training and education programs, state-owned enterprises should ensure that all employees understand the core concepts of risk management [8]. This includes different types of risks, such as market, supply chain, and financial risks. Employees need to learn how to proactively identify these risks and know how to report potential risks.

4.1.2. Leadership as key to establishing a positive risk management culture

Leadership plays a key role in establishing a positive risk management culture. Senior leaders should serve as positive risk management role models, viewing risks as opportunities rather than threats. They should be actively involved in risk management and communicate its strategic importance to the organization [9]. Leadership support and active involvement help employees better understand the strategic importance of risk management.

4.1.3. Establishing transparency and open communication channels

Establishing transparency and open communication channels are crucial components of a proactive risk management culture. State-owned enterprises should establish mechanisms to encourage employees to actively report risks and make suggestions for improvement while properly handling these reports. Transparent communication helps prevent risk information from being withheld or misinterpreted. Employees need to know they can raise concerns about potential risks without fear of consequences. This open culture will help detect and respond to risks early, thereby reducing the impact of potential risks.

4.2. Predictive analysis and real-time monitoring

4.2.1. Predictive analysis

State-owned enterprises can use big data technology to conduct predictive analysis, more accurately predicting future risks. This involves building machine learning models and algorithms that enable businesses to predict market trends, changes in customer demand, and potential supply chain issues. Businesses can gain deep

insights and better understand how different factors are related by analyzing big data sets. For example, companies can use machine learning to analyze historical sales data, market trends, and competitor strategies to generate predictive models, helping companies predict future market demand and formulate corresponding production and supply chain plans to reduce potential market risks.

4.2.2. Real-time monitoring

Real-time monitoring is another important strategy that state-owned enterprises should adopt. Companies can continuously monitor market, supply chain, and financial data changes by establishing real-time monitoring systems. When the system detects anomalies, it can automatically send out alerts, helping companies take quick action to mitigate the impact of potential risks. This real-time monitoring covers internal and external data, such as market news, changes in policies and regulations, etc., to fully understand the risk situation. For example, in supply chain management, companies can establish real-time monitoring systems to monitor data on each supply chain link, such as transportation time, inventory levels, supplier performance, etc. If the system detects any anomalies in the supply chain, it can immediately send out alerts, helping businesses take steps to prevent or respond to potential supply chain risks.

4.3. Build technology and data foundation

4.3.1. Data integration and analysis are crucial

State-owned enterprises need to establish a strong data foundation, including data collection, integration, and analysis capabilities. Big data technology and advanced analysis tools will become powerful tools for state-owned enterprises to obtain data from various departments and business processes to achieve a comprehensive data view. This helps to identify risks and opportunities better. For example, by integrating data from various departments, companies can more accurately understand market trends, customer needs, competitor strategies, and other information, providing more information support for risk management.

4.3.2. Fully leverage the latest technology

It is crucial for state-owned enterprises to fully leverage the latest technology. This includes adopting cutting-edge technologies such as AI, machine learning, and automation tools. These technologies can automate the risk analysis process, reduce human error, speed up decision-making, and provide more accurate results. For example, machine learning algorithms can analyze large amounts of data to help companies better predict market trends, changes in customer demand, and supply chain issues. Automated tools can speed up the generation of risk reports, allowing businesses to react faster. State-owned enterprises should continue to pay attention to and adopt these latest technologies to improve the efficiency and accuracy of their risk control.

4.4. Risk education and training

4.4.1. Employee risk awareness training

Developing employee risk awareness is critical in building a proactive risk management culture. State-owned enterprises should implement risk awareness training programs for all employees to ensure that they understand the core concepts of risk management, can identify different types of risks, and have the ability to report potential risks proactively. These training programs can take many forms, including face-to-face training, online courses, and training materials to ensure employees fully understand the importance of risk management. These measures help ensure that employees can adapt to uncertain environments and effectively respond to risks, enhancing state-owned enterprises' overall risk control and management level.

4.4.2. Continuing education

Risk management continues to evolve, and state-owned enterprises should encourage ongoing employee education. This includes attending training courses, seminars, and workshops to maintain awareness of emerging risks and best practices. Enterprises can establish online learning platforms so employees can obtain the latest risk management knowledge anytime.

5. Conclusion

Through comprehensive risk control strategies, state-owned enterprises can enhance their ability to respond to risks, improve international competitiveness, and achieve high-quality development goals. These strategies will enable businesses to remain agile and competitive, mitigating the adverse impact of potential risks in an ever-changing environment.

Disclosure statement

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Strategies for China's Response to and Improvement of Third-Party Funding in International Investment Arbitration

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Abstract: China should prioritize the establishment and enhancement of a third-party funding system. It should actively refine the existing arbitration rules, addressing any loopholes in the current regulatory framework. Comprehensive measures should be implemented to regulate third-party funding, aligning with international trends. This is crucial not only to safeguard the foreign investment of the Chinese government and enterprises but also to position China as a globally influential arbitration center.

Keywords: Third-party funding; International investment; Arbitration

Online publication: **December 22, 2023**

1. Necessity of introducing third-party funding in China

Generally, third-party funding in international arbitration involves a third-party institution providing financial support to the parties involved in an arbitration case, typically arbitration applicants, primarily investors in international investment arbitration. This financial support is facilitated through a corresponding funding agreement, covering all associated arbitration costs, including fees related to arbitration. The specific support standards are outlined in the funding agreement, and the third-party institution follows a profit investment model, obtaining an agreed proportion of the amount from the winning verdict. If the award determines that the funded party loses the lawsuit, the third party bears the risk of not recovering the invested amount, and receiving no compensation or indemnity.

Prior to 2013, China maintained a conservative stance in the realm of international investment, emphasizing adherence to Chinese domestic law in numerous Bilateral Investment Treaties (BITs) and Multilateral Investment Treaties (MITs) agreements. However, since 2013, China has progressively eased restrictions on both inward and outward foreign investment, particularly through initiatives such as the Belt and Road Initiative. By the end of 2021, China had signed more than 200 cooperation documents with 147 countries and 32 international organizations to build the Belt and Road Initiative, and in 2021, China's

outward foreign direct investment flow reached US$178.82 billion, a 16.3% increase from the previous year, consistently ranking among the top three globally for a decade. The stock of foreign direct investment stood at US$2.79 trillion, maintaining a top-three global position for the fifth consecutive year. To facilitate international investment, China has formulated outward investment cooperation guidelines for 162 countries. These guidelines objectively introduce the investment cooperation environment of each country (region) and provide insights on issues enterprises should consider in carrying out outward investment cooperation, which will play a positive role for enterprises to carry out transnational business activities in the complex and volatile international market, reduce the blindness of investment cooperation, and effectively prevent all kinds of risks.

With the expanding investment market, the number of arbitration cases stemming from investment disputes is on the rise. To address commercial disputes along the Belt and Road Initiative, the Supreme People's Court organized a symposium in December 2018 on the diversified settlement mechanism of international commercial disputes. It subsequently issued and implemented three normative documents, namely the Notice of the General Office of the Supreme People's Court on the Determination of the First Batch of International Commercial Arbitration and Mediation Institutions Incorporated into the "One-Stop" International Commercial Dispute Resolution Mechanism, the Rules of Procedure of the International Commercial Court of the Supreme People's Court (Trial), and the Rules of Procedure of the International Commercial Expert Committee of the Supreme People's Court (Trial).

Despite signing numerous BITs and MITs in recent years, China lacks substantial research and legislative regulation on many issues in the field of international investment arbitration. Consequently, investors and governments often find themselves at a disadvantage after submitting international investment disputes to arbitration. To protect the legitimate rights and interests of domestic investors and their governments, it is imperative to study and implement the third-party funding system, an emerging system widely recognized and accepted in the international investment field.

2. Regulatory model for third-party funding in China

2.1. The proposal document submitted to ICSID advocates a relatively strict regulatory model

China's proposal document to the International Centre for Settlement of Investment Disputes (ICSID) adopts a regulatory model that is relatively strict. While China supports the reasonable regulation, rather than prohibition, of third-party funding in international investment arbitration, its proposed regulation is more stringent than the provisions in the draft revision of the ICSID Arbitration Rules. China emphasizes enhancing transparency in third-party funding in investment arbitration, highlighting ongoing disclosure obligations for the receiving party and the consequences for breaching these obligations. In terms of disclosure content, China proposes a more detailed approach, including information beyond the basic details of the third-party funder required by Article 21(2) of the Arbitration Rules, such as the content of the funding agreement, nationality, shareholding structure, effective controller, and the funder's interest in the arbitration outcome. To prevent potential conflicts of interest, the scope of disclosures is expanded to cover affiliations or other relationships between the funder and the funded party. China also suggests consequences for non-compliance, such as the suspension of proceedings or the bearing of a reasonable amount of proceeding costs by the funded party [1]. It is underscored that a funded party cannot refuse disclosure by claiming that the information is a trade secret.

2.2. Regulation by Chinese arbitration institutions reflects a modest regulatory model

Rules on third-party funding developed by Chinese arbitral institutions align with international standards,

reflecting common international practices in addressing third-party funding issues. For instance, the Arbitration Rules for International Investment Disputes of the China International Economic and Trade Arbitration Commission (CIETAC) address third-party funding regulation. The funded party is required to promptly disclose basic information related to third-party funding after signing the funding contract. The existence of third-party funding and the parties' adherence to disclosure obligations are considered in handling cost-related issues. Both the Arbitration Rules for International Investment Disputes of CIETAC and the CIETAC Hong Kong Arbitration Center Guidelines for Third-Party Funding for Arbitration adopt a moderate regulatory approach. They specify that the arbitral tribunal should consider third-party funding as a relevant factor in cost-related matters, reflecting the evolving trend in reforming the international investment arbitration regime. The challenge now lies in disseminating this exemplary experience in arbitration rule-making to make it a common practice in China.

2.3. Reasonable regulatory posture inferred from alternative forms of funding regulation

Given the current uncertainty in third-party funding regulation in China, an analysis of the regulation of alternative funding forms can offer insights into the anticipated regulatory posture. Drawing parallels with contingent fees and insurance, third-party funding resembles contingent fees, with the primary distinction being the entity providing external funding (a specialized funding company for third-party funding and an attorney-at-low for contingent fee [2]). China's Measures for the Administration of Lawyer's Fees permit risk representation in civil cases not involving identity rights and interests, limiting the lawyer's contingent fee to a maximum of 30% of the contracted amount. Comparatively, third-party funding, being managed by specialized firms, presents a lower cost for clients, allowing lawyers to concentrate on legal matters. In terms of insurance for litigation and arbitration costs, third-party funding and insurance share the commonality of transferring case risk through external funding, with insurance typically receiving a fixed premium benefit. As various insurance policies for litigation and arbitration become more prevalent, it is reasonable to expect that third-party funding, as another risk transfer tool, should be subject to reasonable regulation in China.

3. Suggestions for improving third-party funding in China

3.1. Enhance existing disclosure rules

Paragraph 2 of Article 27 of the Investment Arbitration Rules mandates the grantee to promptly disclose the existence of a third-party funder to the arbitral tribunal. From a fairness perspective, early disclosure benefits arbitrator selection and the progression of arbitration proceedings. However, the term "without delay" introduces ambiguity, as third-party funding agreements may be initiated before the dispute or during the arbitration. The grantee may interpret this term to its advantage, potentially jeopardizing the legal rights of the other party. The provisions of this article are similar to Article 44 of the Hong Kong Rules 2018. To ensure a more reasonable time frame for disclosure, it is recommended to stipulate a specific period, such as within "three days" after signing the funding agreement. This allows the grantee a grace period and effectively mitigates the risk associated with third-party funding in a more rational manner.

3.2. Establish a system for bearing arbitration costs

The lack of provisions regarding the bearing of arbitration costs in international investment arbitration poses challenges, particularly for respondents investing considerable resources to participate in arbitration proceedings. The absence of a cost-bearing system increases the likelihood that claimants may not bear the consequences of an unfavorable arbitration outcome. To address this, there is a need to establish a robust system

for bearing arbitration costs, emphasizing fair protection of the respondent's rights and interests. The criteria for implementing such a system should consider that costs are borne when there is a higher likelihood of the arbitration respondent not obtaining a successful claim [3]. Explicit agreements between the claimant and the third-party funder should be acknowledged, ensuring disclosure of funding agreement terms during arbitration proceedings.

3.3. Limit the time point for third-party participation in arbitration proceedings

A significant drawback of third-party funding is the potential control exerted by the third party over the arbitration process. Third-party funding agreements often grant procedural control rights to the funder, allowing intervention at any point [4]. International perspectives, such as the UK ALF Rule 2018, require that the third party shall not take measures on the final course of the case in litigation or arbitration cases, influence the funded person's lawyers through various means, ensure that the funded person can obtain independent advice from a professional body before signing the agreement. This discouragement of third-party funder procedural control stems from concerns about its impact on the judicial process. To mitigate this, the time point for the third-party funder's participation in arbitration should be strictly limited. An optimal approach involves restricting participation to the funding of fees and the collection of returns. The funder should withdraw after providing fee support, enabling the grantee to independently arbitrate throughout the process. While a strict limitation system may face resistance, a more flexible system could permit limited third-party participation, confined to expressing opinions on arbitration request determination and counsel selection at the commencement, without influencing subsequent stages of the proceedings. Such a balanced approach aims to ensure fair arbitration processes while considering the interests of third-party funders.

4. Conclusion

In recent years, third-party funding arbitration has gradually gained acceptance in China. CIETAC, being the largest arbitration institution in the country, has adopted a policy allowing third-party funding in international investment cases. Additionally, the Supreme People's Court has issued a judicial interpretation providing guidance on the use of third-party funding in international investment disputes.

The development of third-party funding arbitration in international investment marks a significant stride toward fostering a fair and just legal system in China. By enhancing access to third-party funding, claimants can effectively pursue their claims, ensuring a balanced legal process that safeguards defendants from excessive liability. With ongoing legislative and judicial reforms, there is optimism that third-party funding arbitration in international investment will see broader acceptance and utilization in China.

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Analysis of AY Field Brand Planning Based on Raw Milk Traceability

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Abstract: Mengniu and Yili have virtually monopolized the traditional Chinese dairy market, while new media marketing and digital strategies have opened up substantial business opportunities for emerging brands. Leveraging a differentiation strategy, the Adopt A Cow brand has successfully carved out its niche in the market, serving as an exemplary example. However, AY Field, as a self-owned brand by a supplier, faces the challenge of low product awareness among end consumers. This paper primarily concentrates on brand planning for the AY Field milk brand, with a focus on positioning the product for mid-range consumers, including students and office workers. The strategy involves the development of a new logo and packaging design, the selection of sports stars as brand ambassadors, and the implementation of innovative online sales promotions to bolster brand awareness and competitiveness. Research indicates that incorporating raw milk traceability and digital technology to establish a product brand with transparent ranches can significantly enhance AY Field's competitive edge, facilitating the execution of a differentiated marketing strategy.

Keywords: Milk; Brand planning; Supplier brand; Digital marketing

Online publication: December 22, 2023

1. Introduction

Founded in 2009, AY Group stands among the top five operators of dairy cattle ranches in China, enjoying a well-known status and a competitive edge in the raw milk market. In 2014, AY Group took a significant step by introducing the AY Field brand, marking its entry into the final dairy market. While benefiting from high-quality and affordable milk sources as a brand developed by suppliers, AY Field has grappled with the challenge of low brand awareness among end consumers, hindering its ability to achieve consistent sales growth.

During this period, the Adopt A Cow brand, established just in 2016, swiftly gained popularity through differentiated marketing and its unique adoption mode. In less than 5 years, it ascended to become the third-largest online brand, following closely behind industry giants Mengniu and Yili. The rapid success of the Adopt A Cow brand underscores the significance of effective brand planning and serves as a compelling model for AY Field.

Juxiang Yang conducted a statistical analysis on the impact of college students' milk consumption

experiences on brand loyalty. The study revealed that perceived consumption experiences, behavioral consumption experiences, and investment return consumption experiences directly influence brand loyalty among college students [1]. Lili Gai and Liufang Cao attributed the success of the Adopt A Cow model to the adoption of a transparent ranches-based model [2,3]. Ning Li *et al*. empirically analyzed the main influencing factors of consumers' demand for traceable milk. The research found that variables such as food safety perception, understanding of traceable food, traceability importance, trust in certification, and concern about family and personal health significantly impact consumers' willingness to pay [4]. Liwei Wang introduced the term "cloud" to establish a factor model for consumers' evaluation of high-end milk, comparing brand awareness, usage scenarios, and value expectations for different brands of milk. He asserted that "nutrition, nature, and freshness" are the attributes that consumers associate with quality milk [5].

2. Brand element design

Brand element design involves the deliberate creation of a visual brand image through the development of a cohesive system of design elements. The recognition of a brand's vision is the artistic expression of its positioning and personality, encompassing elements such as the brand name, internet domain name (URL), logo, image representative (or brand ambassadors), brand slogan, advertising music, and packaging.

2.1. Brand logo

The brand logo is crafted based on the company's brand slogan, "every drop of milk comes from love," and AY Field's brand values of treating each drop of milk as a piece of work, emphasizing attention to detail and striving for excellence. The goal is to create superior-quality, high-quality, reassuring, safe, fragrant, and healthy fresh milk. Illustrated in **Figure 1**, the logo features the shape of a milk drop as its background, with green symbolizing grass and cows embedded within, highlighting its raw material advantages. The adoption of irregular graphic design adds an appealing touch.

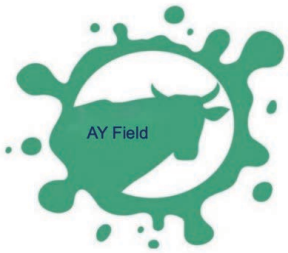


Figure 1. Brand logo

2.2. Color

Color takes center stage in brand design, as it significantly influences the psychology of the brand's audience. Therefore, the effective use of color is a pivotal aspect of design during the brand creation process. Currently, the outer packaging of AY Field is relatively monochromatic, featuring images of grassland, dairy cows, blue sky, and white clouds, with predominant colors of blue, white, green, and black, which is a relatively basic design (**Figure 2**). In this context, inspiration can be drawn from the successful differentiating strategy of the Adopt A Cow brand, which employs more sophisticated colors such as light pink and baby blue to elevate the product's perceived quality and better capture the consumers' preference.



Figure 2. Brand packaging

2.3. External packing

Product packaging serves not only a fundamental role in safeguarding goods and facilitating transportation but also plays a crucial marketing function. High-quality packing not only streamlines the purchasing process for consumers but also generates performance wealth for market promoters. AY Field must prioritize the design of its product packaging. Incorporating interactive content into the packaging allows consumers to emotionally connect with the brand. Opting for a simple and elegant design enhances the product's sense of luxury. A design akin to Luckin Coffee's classic blue can be adopted, leveraging co-branding advantages and increasing brand awareness. The use of a phantom cover design, which is more hygienic and convenient, aligns with the tastes of young consumers and meets the brand's market positioning.

Embracing a traceable package involves adding dynamic QR codes on both the package and bottle caps, providing each product with unique identity information for traceability of milk sources. Customers can glimpse and inquire about the immediate situation of cows and milk processing through the QR code on the packaging, covering aspects such as milk sources, sterilization, canning, and self-inspection processes. This facilitates information and data sharing, allowing for the addition of more product information to stimulate consumer interaction and provide precise feedback on promotional interaction data. Clever use of digital marketing tools and creativity can heighten brand-consumer interaction and enhance product competitiveness.

The adoption of renewable packaging aligns with global consumer preferences, as 84% claim to choose eco-friendly packaging for milk. AY Field can employ FSC® Certified or controlled renewable cardboard to reduce its carbon footprint. Using renewable plastic derived from sugarcane for bottle caps and straws, as well as opting for plant-based packing materials to replace traditional plastic coatings, contributes to a more sustainable approach. Post-consumption, paper packaging can be fully recycled and reused, transformed into eco-friendly paper and chairs through environmentally friendly technologies such as hydraulic pulp crushing, aluminum plastic separation, or plastic wood. This cycle not only promotes environmentally friendly practices but also establishes consumer trust, encouraging them to choose brands that align with their values.

2.4. Image representative (brand ambassadors)

AY Field, targeting young office workers and students, is advised to select sports stars as brand ambassadors. For instance, inviting the young athlete Shuyu Yang, currently serving in the Chinese women's basketball team, as a brand ambassador for endorsements and product promotion. This strategy has multiple benefits. Firstly, it enhances the visibility of the AY Field brand, allowing it to instantly capture consumers' attention through the achievements of sports stars. Secondly, it cultivates consumer brand preferences, as audiences often extend their passion for specific sports stars to the brands they endorse. Lastly, it improves consumer brand loyalty, particularly among those who have already formed brand preferences. Featuring favorite sports stars as brand

ambassadors, especially those achieving remarkable results in their field, showcases quality appreciated by consumers and further strengthens their loyalty, converting more consumers into dedicated users of the brand.

2.5. Brand cultural image

Brand cultural image encompasses the recognition and assessment of a brand's culture or the overall corporate culture as perceived by the public and customers. Corporate culture serves as a concentrated manifestation of a company's business philosophy, values, ethical norms, behavioral norms, and other corporate behaviors. It also reflects a company's spiritual style and subtly influences its consumer group and employees.

In the traditional and well-established dairy market, Adopt A Cow has effectively opened a niche and established the brand image of a "digital dairy enterprise" in the minds of consumers. Drawing inspiration from this success, AY Field can implement a similar adoption model and transparent ranches. By enhancing the promotion of the slogan "every drop of milk comes from love" and employing advertising campaigns, AY Field can provide consumers with insights into AY Group's ranch information. This emphasizes its original identity as a high-quality upstream supplier, effectively targeting high-quality life seekers and mid-range consumer groups.

2.6. Brand reputation

Brand reputation denotes the acknowledgment and evaluation of a brand's trustworthiness by consumers and the general public, with its essence rooted in the product's reputation. Brand reputation acts as a crucial tool for maintaining customer brand loyalty and is an integral component in preserving a brand's allure.

In response to widespread concerns regarding product quality and safety among dairy consumers, Adopt A Cow has strategically positioned itself as "not a company selling milk, but a company that raises cows for users." This approach, which differentiates itself from conventional milk-selling companies, includes initiatives such as allowing users to watch live streams of the ranch 24/7 and inviting families to engage in activities such as adopting cows and parent-child tours. The aim is to achieve transparency in the ranch. AY Field leverages digital technology to create a product brand with innovative transparent ranches, achieving visualization and transparency throughout the entire industrial chain from raw material procurement and dairy farming to milk collection and processing. This not only addresses concerns about product quality but also fosters a strong sense of trust and transparency among consumers.

3. Brand promotion and communication

3.1. Online promotion

Emulating the success of Adopt A Cow, digital energy was harnessed continuously to revolutionize adoption methods and introduce the "cloud adoption" model. In this innovative approach, consumers can adopt cows through gaming experiences, akin to nurturing games, providing a delightful taste of cloud cow farming in the 5G era. This not only enhances user engagement but also fosters loyalty to the brand.

Diversified interactive marketing initiatives around "food, sports, and entertainment" are implemented to continuously fortify the brand image. AY Group can engage in diverse interactive marketing centered on these three themes, intertwining the brand image with concepts of health and generosity. Active outreach to young consumer groups can be achieved through sports marketing by signing athletes as brand ambassadors or collaborating with major sports brands and platforms. In terms of entertainment marketing, AY Group can adapt to the surge in Internet media and cinema development by increasing variety show marketing and initiating movie implantations, closely monitoring shifts in consumer behavior. AY Field can further expand its audience, capitalizing on young users' preference for online shopping. By developing online sales channels on platforms

such as Tmall, JD, Pinduoduo, and WeChat, and leveraging We Media's vertical advertising, live broadcasts, and content seeding platforms, AY Field can circumvent direct competition with traditional dairy product brands and attract over 10 million young consumers.

3.2. Offline promotion

Currently facing challenges with low distribution rates and fluctuating quality, AY Field needs to optimize its industrial chain and enhance product quality stability. Recruiting qualified talents to form a research and development team can significantly reduce the probability of product deterioration within the shelf life. Simultaneously, AY Field should venture into the offline market. Initially, this involves establishing specialty stores in major first-tier cities and independent counters in supermarkets. Subsequently, counters can be established in supermarkets in second-tier and third-tier cities. After securing a significant market share and achieving competitiveness, AY Field can consider joint sales with other milk product brands.

4. Conclusion

In a mature market dominated by Mengniu, Yili, and others, emerging brands can still find opportunities. The success of the Adopt A Cow brand, achieved through a differentiation strategy, serves as a compelling example. AY Field should seize these opportunities, bravely confront challenges, and create a product brand with innovative transparent ranches. Utilizing digital technology, users can witness the unique advantages of AY Field's ranch conditions, fostering confidence in their purchase decisions. Targeting mid-rage consumers, such as students and young office workers, with the slogan "every drop of milk comes from love," AY Field aims to carve its niche. Through a redesigned logo, packaging, and the endorsement of sports stars, online sales promotion models are innovatively utilized. AY Field can further enhance brand popularity through cross-border cooperation and collaborative initiatives with complementary dairy product brands, fostering mutual benefit. Collaborations with relevant brands possessing physical stores can also lead to the creation of innovative check-in stores, attracting more consumer interaction and bolstering user engagement.

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Author contributions

L.Z. conceived the idea of the study. X.L. and Q.F. performed the investigations. H.D. and P.Y. analyzed the data and wrote the paper.

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A Comprehensive Measurement Study Analyzing Cross-Border Logistics in Harbin New District

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Abstract: The business environment is an important index for measuring the international competitiveness of a country or region. Improving the business environment not only helps the logistics industry reduce costs and increase efficiency but also promotes the transformation and upgrading of the logistics sector. This paper focuses on the business environment of cross-border logistics enterprises in Harbin New District as the research object. It constructs the business environment index system of logistics enterprises in Harbin New District through empirical research using the subjective weighting method. The research data are then analyzed to identify the shortcomings in optimizing the business environment of cross-border logistics in Harbin New District. The paper proposes countermeasures and suggestions, aiming to provide a decision-making reference for promoting the high-quality development and all-round revitalization of Harbin New District.

Keywords: Harbin New District; Cross-border logistics; Measurement of business environment; Index system

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1. Introduction

The business environment of cross-border logistics enterprises has a profound impact on the operating efficiency and sustainable development of a country or region. Improving the business environment of logistics enterprises not only helps reduce costs and increase efficiency in the logistics industry but also promotes the transformation and upgrading of the sector.

Harbin New District was approved for establishment in December 2015. The State Council stated that the construction of Harbin New District should facilitate smooth foreign trade channels, establish an international cooperation platform, construct an export-oriented industrial system, and strive to position Harbin New District as a vital area for all-round cooperation between China and Russia. As the only national new district and the northernmost national new district in China with the theme of cooperation with Russia, the business environment of cross-border logistics enterprises is intricately linked to the function of Harbin New District, the layout of national economic development, and the new economic growth pole in Northeast China.

Accelerating the construction of an international logistics channel, focusing on cooperation with Russia and connecting Europe and Asia, is deemed an important national strategy for Harbin New District [1,2].

2. Analysis of the current situation of the cross-border logistics business environment in Harbin New District

2.1. The rapid development of cross-border logistics

(1) China's cross-border logistics market is experiencing rapid growth. The "Implementation Plan for Harbin to Carry Out Modern Logistics Innovation and Development Cities" clearly outlines Harbin's commitment to opening international logistics channels for Russia, Mongolia, and even Europe. The city aims to establish a regional logistics organization center for Russia and build a cross-border e-commerce logistics platform between China and Russia. Against the backdrop of deep integration into the co-construction of the "Belt and Road Initiative," the Harbin Municipal Government has actively implemented central authorities' instructions, establishing itself as a central city for cooperation with Russia. It has initiated the Harbin-Russia train, gradually creating the brand effect of the Harbin-Russia cross-border logistics channel. By the end of June 2020, Harbin shipped 446 trains and 32,800 twenty-foot equivalent units (TEUs) of cargo, with a total value of US$396 million.

(2) Cross-border logistics in the new area is driving the growth of Harbin's import and export trade. Since the establishment of the China (Heilongjiang) Pilot Free Trade Zone in August 2019, Harbin's foreign trade scale has consistently expanded, maintaining a three-digit growth rate of total import and export volume, and showing overall steady and progressive trends. In the first half of 2021, the total import and export volume increased by 279.1% year-on-year. The first case of "Network Freight Road Transportation Business License" approved by a Russian express company in the province was included in the 2020 China International Fair for Trade in Services demonstration case.

(3) Trade facilitation measures are propelling the development of cross-border e-commerce in Harbin New District. In recent years, Harbin Customs has actively promoted the high-level opening and high-quality development of the comprehensive bonded zone. It has introduced 19 measures to support the zone's high-quality development, including 15 tasks aimed at detailed measures. Harbin Customs supports the development of China-Europe trains, introducing measures to enhance trade facilitation in the comprehensive bonded zone. The Customs authority guides and supports the development of new industries and formats, such as cross-border e-commerce, bonded processing, bonded logistics, bonded research and development, and bonded maintenance, within the comprehensive insurance zone. It solidly promotes the implementation of policies such as "Four Simplicities and One Simplification," "Entrusted Processing," and "General Taxpayer." The implementation of measures, such as the classified supervision of warehousing goods based on status, release after sampling, and setting up non-declaration channels in the comprehensive bonded zone, aims to create a favorable business environment for cross-border logistics enterprises [3].

2.2. Construction of the cross-border logistics business environment system

(1) The cross-border logistics policy system in the new district is relatively well-developed. Cross-border logistics, recognized as a key construction industry in Harbin, is experiencing positive growth. Policies such as the "Thirteenth Five-Year Plan" for the development of the logistics industry in Harbin, the implementation plan for the pilot city of modern logistics innovation and development in Harbin, and the three-year action plan for promoting the pilot city of modern logistics innovation and development in Harbin (2016–2018) have been successively promulgated. The economic contribution rate of the cross-border logistics industry has improved, driven by the policy dividends of the Harbin New District Free Trade Zone. In 2021, the regional GDP of Harbin New District reached CNY 85.25 billion, marking a 7% year-on-year increase, contributing 1.1 percentage points to the city's overall

GDP growth.

(2) The cross-border logistics policy system has seen continuous improvement. In 2022, policies and regulations such as "Heilongjiang Province's 14th Five-Year Plan to Optimize Business Environment" and "Harbin Customs' 20 Measures to Promote the Stability and Quality of Foreign Trade" were promulgated. These measures continue to support the healthy and rapid development of cross-border logistics in Harbin New District. The plan emphasizes the vigorous promotion of various open platforms, including Harbin New District and the Pilot Free Trade Zone, Cross-Border Economic Cooperation Zone, and Cross-Border E-Commerce Comprehensive Zone. It aims to provide more efficient and convenient customs clearance services for cross-border logistics, promote the liberalization and facilitation of cross-border trade, and assist Harbin in accelerating the creation of a market-oriented, legal, and international business environment.

3. Harbin New District cross-border logistics business environment survey data analysis

According to the factors affecting the business environment of logistics enterprises, and drawing insights from relevant literature and expert interviews, this research group devised the "Harbin New District Cross-Border Logistics Business Environment Index System." This system comprises 9 first-level indicators and 28 second-level indicators. Correspondingly, a questionnaire for measuring the cross-border logistics business environment in Harbin New District was crafted [4].

3.1. Data analysis of legal environment investigation

Concerning the legal environment, the survey data indicate that law enforcement behavior in the cross-border logistics market in Harbin New District is relatively standardized. Most enterprises are not adversely affected by irregular law enforcement behavior. Even when enterprises engage in illegal activities, they are subject to supervision; however, certain illegal behaviors still go unsupervised. Therefore, the government should strengthen supervision efforts and work towards eliminating illegal practices.

The establishment of early warning indicators (EWI) as well as financial risk prevention and control for cross-border logistics enterprises in the new district is commendable. Nevertheless, there are areas where market early warning and prevention and control mechanisms are yet to be established. To enhance the legal environment and address risks promptly, relevant departments should expedite the establishment of these EWI and prevention and control mechanisms.

3.2. Data analysis of government environmental survey

Concerning the government environment, the survey data reveals that the simplicity of administrative examination and approval procedures for cross-border logistics enterprises in the new district is generally high. However, nearly one-third of respondents still perceive the simplicity as average or not high. Based on the data, there is room for improvement in the simplicity of administrative examination and approval procedures, and the convenience of administrative processes needs strengthening. Government support plays a crucial role in shaping the development trajectory of enterprises. While the majority (over 71.3%) perceive that the new district government supports cross-border logistics, the level of perceived support is not very high. The new district government should prioritize this aspect, encouraging the development of cross-border logistics enterprises, enhancing the construction of cross-border logistics infrastructure, and fostering a favorable government environment for logistics enterprises in the new district.

3.3. Data analysis of market environment survey

The survey data indicates that the high market access standards for cross-border logistics enterprises in Harbin New District do not contribute positively to stimulating the vitality of market players. The government should intervene using invisible hands, lowering the market access threshold, promoting free competition among cross-border logistics enterprises, and cultivating a favorable market environment.

3.4. Data analysis of credit environment survey

According to the survey data, the construction of the credit platform for the cross-border logistics market in Harbin New District has progressed relatively quickly and is essentially complete. However, having the platform is only the foundation for a favorable credit environment; the platform's operation is of paramount importance. Some participants expressed the view that the credit platform has not been well-operated, and the relevant industry associations have not played an effective role. This issue warrants the attention of platform operators and industry associations to establish a more effective operating mechanism and leverage the role of the platform and associations.

Public participation and public opinion supervision in the construction of the credit environment cannot be overlooked. The public in the new district actively engages in the development of the cross-border logistics industry and plays a significant role in public opinion supervision. The establishment of an incentive and penalty mechanism for the trustworthiness of the logistics industry can better encourage enterprises to adhere to corporate credit and standardize their behavior. The current incentive and penalty mechanism for the trustworthiness of the logistics industry in the new district is positive, contributing to the creation of a favorable credit environment.

3.5. Data analysis of land use environment survey

The survey data indicates that, in terms of land use environment, acquiring logistics land in Harbin New District is generally not difficult, and the associated costs are reasonable. This situation has played a role in promoting the development of the cross-border logistics industry in the new district.

3.6. Data analysis of tax business environment survey

The survey data indicates that the optimization of the tax business environment can promote the stable and healthy development of the emergency society. Approximately 61% believe that the degree of tax burden reduction for cross-border logistics enterprises in the new district and the tax burden reduction for businesses transitioning to tax status is high, while 30% consider it average. The reduction in the burden of land use tax is generally perceived to be at a standard level. In the tax environment, appropriate measures should be taken by tax authorities to enhance the degree of burden reduction and optimize the tax environment for the cross-border logistics industry in the new district.

3.7. Data analysis of employment environment survey

Regarding the employment environment, more than 50% of respondents believe that the employee retention rate of cross-border logistics enterprises in the new district is high, with 35% considering it to be average. While the overall employee retention rate for logistics enterprises in the new district is positive, the social training impact of these enterprises needs strengthening. Just over half think that the social training effect of logistics enterprises in the new district is good. Since social training is a crucial method for enhancing employment efficiency, enterprises should ensure they implement effective social training.

In terms of personnel training, most logistics enterprises prioritize investment in this area. Only 34%

of respondents feel that the logistics enterprises in the new district have an average investment in personnel training, while others perceive the investment as high. For enterprises with lower investments in personnel training, it is essential to raise awareness about the importance of personnel training. Insufficient talent reserve is a decisive factor influencing the development prospects of enterprises, demanding attention from both enterprises and the government.

According to the survey data, the supply of logistics talents from colleges and universities in the new district is generally good. However, a few respondents still feel that the supply of logistics talents from colleges and universities is poor. Therefore, logistics enterprises in the new district should engage with colleges and universities to recruit logistics talents and address the supply shortage [5].

3.8. Data analysis of financing environment survey

The financing mode of enterprises significantly influences their capital structure, and the economic development level of the industry is also reflected in the economic system and financial support level. According to the survey data, 62% of the respondents believe that logistics enterprises in the new area have a high degree of choice regarding collateral, while 37% think that these enterprises have a low degree of choice. In the survey regarding the loan amount of logistics enterprises in the new district, half of the respondents believe that the loan amount is not high. When assessing the financing channels of logistics enterprises in the new district, 41% of the respondents perceive these channels as average. These data indicate the need for improvement in various aspects of the financing activities of logistics enterprises in the new district. Both enterprises and the government should focus on enhancing the financing environment to address the financing difficulties faced by enterprises, thereby facilitating the development of logistics enterprises.

3.9. Data analysis of customs clearance environment investigation

Regarding the customs clearance environment, the survey data indicates that 73% of the respondents believe that the customs clearance environment in the new district is good or above, while less than one-fifth view it as average. This suggests that the customs clearance environment of the cross-border logistics industry in the new district is favorable and has the potential for further optimization to achieve an optimal customs clearance environment.

4. Countermeasures and suggestions for the development of cross-border logistics in Harbin New District

4.1. Suggestions for improving the cross-border logistics government environment

To enhance the administrative environment of cross-border logistics in Harbin New District, the government should, first and foremost, coordinate logistics layout, node construction, and route planning. Active fundraising should be pursued to open transportation channels province-wide, implementing a “one-time security inspection” process to alleviate the burden on cross-border logistics enterprises. Simultaneously, adopting random sampling methods for logistics safety supervision is recommended. Secondly, reducing the difficulty of accessing public information from the new district government is advised. Establishing a cross-departmental, all-data, public welfare logistics big data center to facilitate data exchange between government management departments will enable end-to-end data visibility, one-stop service provision, and improved port service level. Thirdly, continuous optimization of the administrative approval process by all government departments in Harbin New District is suggested. This involves further canceling pre-approval procedures, enhancing transparency and timeliness of approvals, providing convenient online and remote approval methods for cross-

border logistics enterprises, and reinforcing supervision during and after the approval process.

4.2. Suggestions for improving the employment environment of cross-border logistics enterprises

Harbin New District should persist in issuing relevant policy documents and intensify the implementation of cross-border comprehensive transportation hub construction. Emphasis should be placed on accelerating the development of the railway cross-border transportation system, Harbin international aviation hub, highway cross-border transportation channel, and communication infrastructure to facilitate a smooth international trade channel. Currently, these policies have yielded remarkable results. According to the official website of Harbin Customs, in the first half of 2022, Heilongjiang Province imported and exported CNY 96.38 billion to countries along the "Belt and Road Initiative," marking a 37% increase, with Harbin accounting for 78.9% of the province's total foreign trade. Among these, exports amounted to CNY 12.28 billion, a 15% increase, while imports reached CNY 84.1 billion, a substantial 40.9% rise.

Despite these achievements, under the grand blueprint of the "Belt and Road Initiative" construction in China, the cross-border logistics industry in Harbin still faces challenges of brain drain and a shortage of high-quality professionals. Presently, many universities in Harbin do not offer cross-border logistics majors, resulting in the inability of these institutions to train talents meeting the requirements of cross-border logistics industries and enterprises for innovative high-quality professionals. Additionally, there is a phenomenon of brain drain in cross-border e-commerce in Harbin New District to varying degrees, demanding sufficient attention from relevant departments.

It is recommended to organize activities such as cross-border e-commerce campus competitions through collaboration between Chinese and Russian e-commerce enterprises. This initiative aims to attract and cultivate cross-border logistics talents, making subject education more practice-driven and further promoting the integration of Industry-University-Research. The goal is to nurture individuals with excellent cross-border logistics practical abilities and to emphasize cultivating students' awareness of cross-border logistics services. This approach aims to reserve rich and high-quality human resources for the cross-border logistics industry in the new district.

4.3. Suggestions for optimizing the investment and financing environment of cross-border logistics enterprises

To enhance the investment and financing environment for cross-border logistics enterprises in Harbin New District, the following specific suggestions are proposed:

(1) Implement the policies of the first batch of comprehensive pilot cities in cross-border electronic commerce, leveraging them to realize the electronic port and cross-border settlement functions of Harbin New District.

(2) Capitalize on national policies to comprehensively deepen the innovation and development of service trade pilot cities. Actively support the development of high-tech and high-value-added service enterprises, solidify the advancement of the "Belt and Road Initiative," and elevate Harbin's strategic position and influence as a central city for cooperation with Russia [6].

4.4. Suggestions on optimizing the market environment of cross-border logistics enterprises

In the optimization of the market environment for cross-border logistics enterprises in Harbin New District, the following recommendations are made:

(1) Establish an international logistics investment service platform in Harbin New District. Increase

information service support for cross-border logistics enterprises concerning overseas market dynamics, customer information, and market demand [7].

(2) Suggest the Harbin New District government to facilitate the establishment of a communication platform with overseas logistics industry associations. Understand and share timely market business information of overseas logistics enterprises. Encourage lead representatives of cross-border logistics enterprises to participate in overseas logistics-related exchange meetings or exhibitions.

(3) Recommend the government of Harbin New District or relevant departments (trade associations) to establish an early warning and information release mechanism for overseas investment risks. Timely forecast overseas political, economic, and social risks. Provide policy information about countries, the logistics industry, and customs. Assist logistics enterprises in "going global" by offering financial and human resources support.

4.5. Suggestions on reducing the tax burden of cross-border logistics enterprises

To alleviate the tax burden on cross-border logistics enterprises, the following suggestions are put forward:

(1) It is recommended that the new district address the issue of insufficient input deduction. Cross-border logistics enterprises often outsource road transportation business, and the special Value-Added Tax (VAT) invoices obtained by individual transport operators for centralized procurement of fuel costs and tolls during transportation should be included in the input deduction of logistics enterprises. The clarification on the management system issuing special invoices for VAT on behalf of individual transport operators in the transportation industry, in conjunction with the launch of the third phase of Golden Tax, can help streamline this process.

(2) It is proposed to replicate and continue the financial subsidy policy initiated by the "reform of the camp." Adjusting the tax rate of transportation services to 6%, aligning it with the tax rate of logistics auxiliary services, and canceling the existing subsidy policy is recommended. However, if the current tax rate is maintained, the subsidy support policy should be extended until there is no difference. The "VAT reform" subsidy policy, based on the disparity between the VAT tax burden and the calculated business tax burden, should be implemented according to the original policy as long as there is a difference.

(3) There is a need to introduce a policy of continuing to levy land use tax by half [8]. For the land used for storage facilities owned or leased by cross-border logistics enterprises, logistics parks, and logistics storage facilities investment operators in the new district, the urban land use tax will be halved according to the applicable tax standard of the land grade. Moreover, there will no longer be restrictions on the types of goods applicable to storage facilities [9].

4.6. Suggestions on reducing the land burden of cross-border logistics enterprises in Harbin New Area.

It is recommended to enhance the formulation and implementation of cross-border logistics planning in Harbin New District. This involves ensuring a stable supply of logistics land indicators and incorporating logistics land into urban infrastructure land planning. Furthermore, the cancellation of unreasonable indicators, such as investment intensity and tax contribution of logistics land, should be considered.

More support should be given to the logistics land that serves the purpose of consumer protection and production support. Making full use of idle resources around the city and reinforcing the centralized layout of logistics land is crucial. This can be achieved by increasing supporting facilities for manufacturing clusters and guiding various modes of transportation, such as railways, into the park. Such measures aim to maximize the

agglomeration effect and provide robust industrial support.

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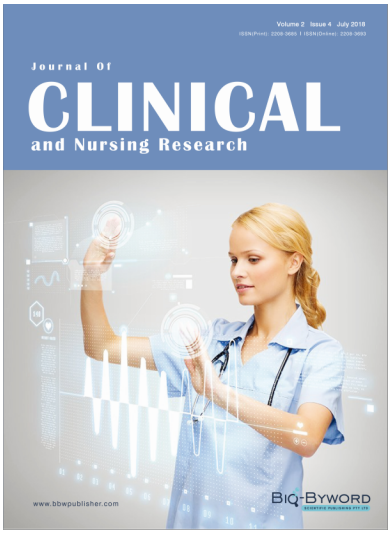
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