

Internationalization Strategy of Small and Medium-sized Manufacturing Enterprises Based on Big Data Analysis

Exploration of the Path of Integration with Social Responsibility

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Abstract

Under the background of the rapid development of global digital economy, big data analysis technology provides new opportunities for the integration of internationalization strategy and social responsibility of small and medium-sized manufacturing enterprises. Big data analysis helps enterprises accurately identify international market demand, optimize resource allocation, and reduce international business risks by mining massive market information. The internationalization strategy of small and medium-sized manufacturing enterprises has the characteristics of limited resources and high flexibility, so it is necessary to improve the scientific decision-making with the help of big data analysis. Moreover, corporate social responsibility has become an important consideration for international operations, covering environmental protection, labor rights and interests, community development and other dimensions. Fulfilling social responsibility will not only help to enhance the international image of enterprises but also enhance their long-term competitive advantage. It is found that small and medium-sized manufacturing enterprises can integrate the concept of social responsibility into key links such as product research and development, supply chain management, market development, and establish a scientific supervision and evaluation system by formulating social responsibility objectives that match the internationalization strategy. This integration path can realize the unification of economic benefits and social values and provide theoretical reference and practical guidance for small and medium-sized manufacturing enterprises to achieve sustainable development in global competition.

Keywords

Big data analysis, Internationalization strategy, Concept of social responsibility

Introduction

Under the wave of globalization, small and medium-sized manufacturing enterprises are facing unprecedented opportunities and challenges. With the in-depth development of the digital economy, big data technology is profoundly changing the strategic decision-making mode and international competition pattern of enterprises [1]. The formulation of traditional internationalization

strategies often depends on limited market information and empirical judgment, and big data analysis provides enterprises with a new tool to accurately grasp the international market dynamics and optimize resource allocation [2]. Technological change has created conditions for small and medium-sized manufacturing enterprises with limited resources to achieve international

breakthroughs [3].

Nowadays, corporate social responsibility is becoming a new dimension of global business competition. Consumers and regulators in the international market are increasingly demanding enterprises to fulfill their social responsibilities, so it has become an inevitable choice for enterprises to incorporate social responsibilities into their internationalization strategy. How to balance economic benefits and social values and realize the organic unity of strategic objectives and social responsibilities in the process of internationalization of small and medium-sized manufacturing enterprises has become an important topic worthy of in-depth discussion [4,5].

Big data analysis can not only enhance the international competitiveness of enterprises but also provide technical support for enterprises to identify and deal with risks of social responsibility. Through data-driven decision-making, enterprises can more accurately evaluate the social impact of internationalization strategy and establish a social responsibility system that meets international standards. This integration of technology and strategy provides new possibilities for small and medium-sized manufacturing enterprises to achieve high-quality development under the background of globalization [6].

At present, most of the research focuses on the internationalization strategy of large enterprises or discusses corporate social responsibility alone, and the systematic research on how small and medium-sized manufacturing enterprises use big data technology to realize the coordinated development of internationalization strategy and social responsibility is insufficient. Exploring the integration path of the two will not only enrich the relevant theoretical research, but also provide valuable reference for practice [7,8]. This study will focus on analyzing the interactive relationship between internationalization strategy and social responsibility of small and medium-sized

manufacturing enterprises in the big data environment and build an operable integration framework [9].

Big data analysis and internationalization strategy of small and medium-sized manufacturing enterprises

The meaning and application of big data analysis

Big data analysis refers to extracting valuable information and insights from massive and diverse data through advanced data processing technology. Its core lies in the use of machine learning, data mining and statistical analysis to transform complex data into operational business decision-making basis [10]. In the commercial field, big data analysis has a wide range of applications, including market trend prediction, customer behavior analysis, supply chain optimization and risk management. For manufacturing enterprises, big data analysis can help identify bottlenecks in the production process, optimize resource allocation and improve operational efficiency. Beyond operational improvements, big data also enables manufacturing firms to make more accurate strategic decisions, such as selecting optimal plant locations, forecasting market demand for different regions, and customizing products to meet diverse customer needs. By integrating real-time data from production lines, logistics systems, and market feedback channels, enterprises can establish a closed-loop management system that responds quickly to fluctuations in supply and demand. In China, where regional industrial characteristics vary significantly, such analytical capabilities are particularly valuable for aligning production capacity with local resource advantages and market opportunities. As shown in Figure 1, Guangdong Province has the highest proportion of manufacturing enterprises, reaching 708,000. Jiangsu, Zhejiang, Shandong, and Hebei are close behind, and the enterprises in the above five regions are all located in the eastern coastal areas, which are

the same as those in developed trade areas [11-13]. Make full use of the advantages of division of labor and strengthen mutual assistance to form industrial clusters such as the Chang Jiang Delta and Guangdong-Hong Kong-Macao Greater Bay Area. In addition, by analyzing the international market

data, enterprises can more accurately grasp the demand differences in different regions and provide data support for internationalization strategy. Characteristics and demands of internationalization strategy of small and medium-sized manufacturing enterprises [14].

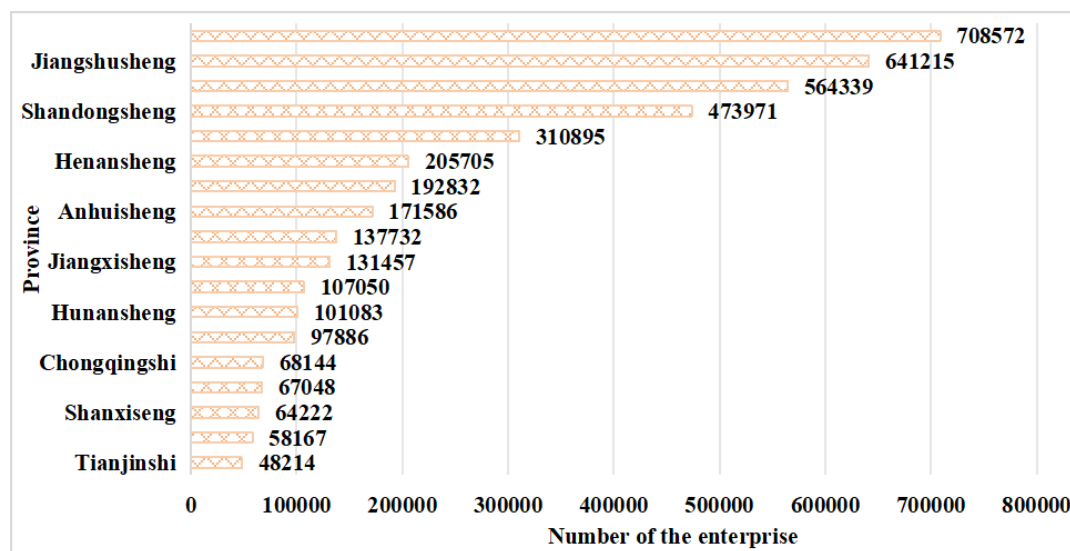


Figure 1. Regional distribution of manufacturing enterprises in China.

The internationalization strategy of small and medium-sized manufacturing enterprises usually has the characteristics of high flexibility and limited resources. Because of their small scale, such enterprises often face many restrictions such as capital, technology, and talents in the expansion of the international market.

However, small, and medium-sized manufacturing enterprises also can quickly respond to market changes and can meet customer needs in different regions through customized products and agile supply chains.

The demand of internationalization strategy focuses on the choice of market entry mode, risk avoidance and localized operation [15].

Enterprises need to comprehensively consider the policy environment, cultural differences and competition pattern of the target market and formulate an internationalization path suitable for their own development.

Big data analysis to support the internationalization strategy of small and medium-sized manufacturing enterprises

Big data analysis provides dedicated support for the internationalization strategy of small and medium-sized manufacturing enterprises. By analyzing the consumption trend and competitive situation of the global market, enterprises can accurately locate the target market and avoid the risks brought by blind expansion. Big data technology can also help enterprises optimize international supply chain management, monitor organization, and inventory in real time, and reduce operating costs. In addition, with the help of social media and e-commerce platform data, enterprises can deeply understand the preferences of overseas consumers and formulate more targeted marketing strategies. Big data analysis not only enhances the competitiveness of small and medium-sized manufacturing enterprises in the international market but also provides a scientific basis for their sustainable development.

The connotation and importance of social responsibility of small and medium-sized manufacturing enterprises

The concept and category of corporate social responsibility

Corporate social responsibility refers to the responsibility of enterprises to employees, consumers, communities, and the environment while creating profits and being responsible to shareholders. This concept originated in the 1950s. After more than half a century's development, its connotation has expanded from the initial charitable donation to the entire process of enterprise management. Modern corporate social responsibility includes four dimensions: economic responsibility, legal responsibility, ethical responsibility, and charitable responsibility. Economic responsibility requires enterprises to maintain profitability; Legal responsibility requires enterprises to abide by laws and regulations; Ethical responsibility requires enterprises to follow business ethics; Charity responsibility encourages enterprises to participate in social welfare. For manufacturing enterprises, environmental responsibility and product quality and safety responsibility are particularly important. With the acceleration of globalization, the standards of corporate social responsibility are becoming increasingly international, which puts higher demands on small and medium-sized manufacturing enterprises.

The significance of small and medium-sized manufacturing enterprises to fulfill their social responsibilities

Small and medium-sized manufacturing enterprises have multiple values in fulfilling their social responsibilities. From the perspective of enterprise's own development, good social responsibility performance can enhance brand image and enhance market competitiveness. Consumers are more inclined to choose enterprise products with social

responsibility, which makes social responsibility an important means of differentiated competition for enterprises. From the perspective of employee management, fulfilling social responsibility is helpful to improve employees' sense of belonging and loyalty and reduce the brain drain rate. From the external environment, actively taking social responsibility can improve the relationship between enterprises, governments, and communities, and gain more policy support and business opportunities. Under the background of globalization, fulfilling social responsibility is a passport for small and medium-sized manufacturing enterprises to enter the international market. Many international buyers regard social responsibility performance as an important criterion for supplier selection. Therefore, small, and medium-sized manufacturing enterprises should incorporate social responsibility into strategic planning to realize the coordinated development of economic and social benefits.

Integration path of internationalization strategy and social responsibility of small and medium-sized manufacturing enterprises

Develop social responsibility goals that match the internationalization strategy.

Small and medium-sized manufacturing enterprises need to define the corresponding social responsibility target system according to the international strategic positioning. The goal setting should be based on an in-depth analysis of the laws and regulations, cultural traditions, and market characteristics of the host country to ensure that it meets the needs of local social development. Protection of labor rights and interests, environmental protection and community development constitute the core dimensions of social responsibility objectives. For labor-intensive manufacturing enterprises, employees' occupational health and skills training should be the key goal; For technology-oriented enterprises, technology transfer and localization innovation have more

strategic value. Target setting needs to quantify specific indicators, such as measurable parameters such as carbon emission reduction ratio, local procurement rate and staff training duration. The target system should reflect the characteristics of differentiation and set different social responsibility targets for developed and developing markets. The goal-setting process needs the participation of stakeholders to ensure the understanding and support of internal employees and external partners.

Integrate social responsibility into the international operation process of enterprises

The concept of social responsibility needs to run through the entire process of international operation of enterprises. In the supply chain management, we should establish a responsible purchasing policy, audit suppliers' social responsibility and promote the overall sustainable development of the supply chain.

Clean production technology is introduced into the manufacturing process to optimize energy efficiency and reduce the impact on the environment. In the product design stage, the

environmental impact of the whole life cycle is considered to improve the recycling rate of materials. Avoid exaggerating publicity in marketing to ensure the transparency and accuracy of product information.

In human resource management, the legitimate rights and interests of employees are guaranteed, and fair career development opportunities are provided. Establish an effective complaint handling mechanism in customer service to respond to consumer demands in a timely manner.

The integration of social responsibility in operational processes requires the corresponding adjustment of organizational structure, the establishment of inter-departmental coordination agencies, and the clarification of the responsible subjects in each link. Process reengineering should be combined with information construction, and digital tools should be used to improve the efficiency and transparency of social responsibility management. The effect of digital transformation of small and medium-sized enterprises is shown in the following Figure 2.

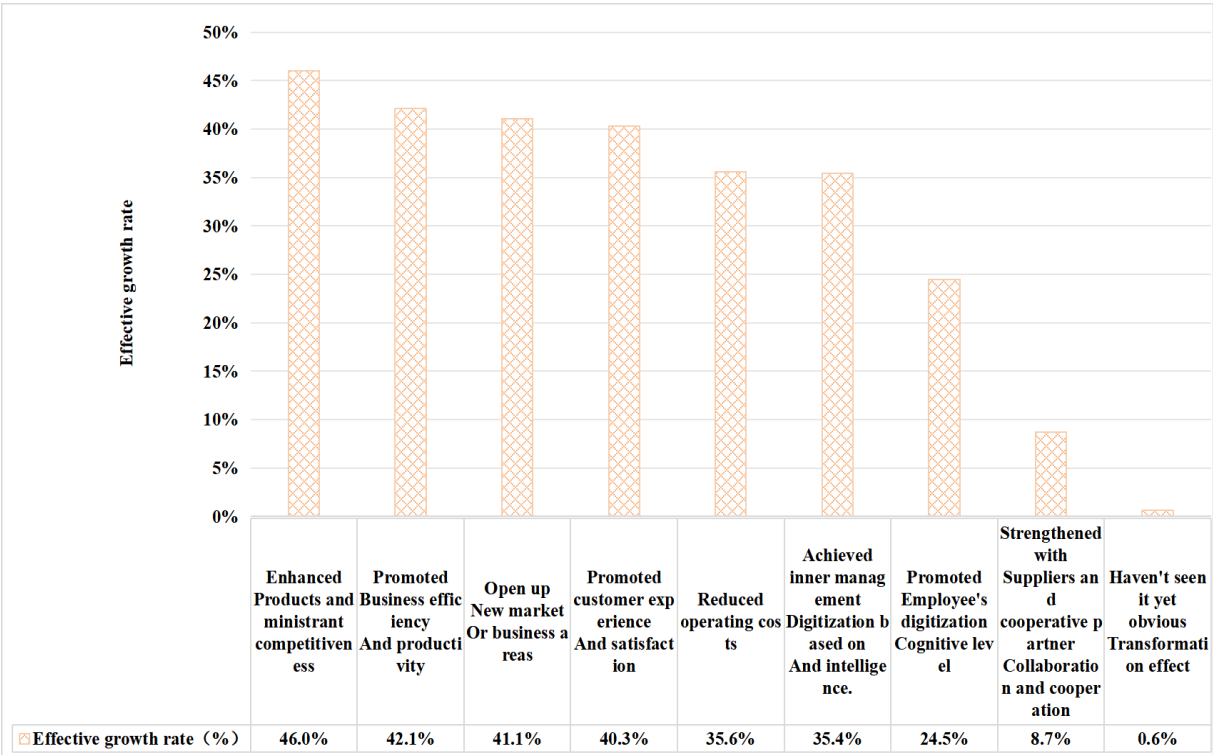


Figure 2. Effect of digital transformation of SMEs.

Establish an effective monitoring and evaluation mechanism

A sound supervision and evaluation mechanism are the institutional guarantee to ensure the continuous integration of social responsibility and internationalization strategy. The supervision mechanism includes internal audit and external certification, and an independent social responsibility audit department is established internally to regularly check the implementation of each business unit; Introduce a third-party certification body from outside to obtain internationally accepted social responsibility standard certification. The evaluation index system should comprehensively cover the three dimensions of economy, society, and environment, and adopt scientific evaluation tools such as balanced scorecards. The evaluation results are linked to the enterprise performance appraisal, and the corresponding reward and punishment system is established. The information disclosure mechanism requires that social responsibility reports be published regularly to disclose the performance to stakeholders. The feedback improvement mechanism ensures that the problems found in the evaluation can be corrected in time. Supervision and evaluation need to make full use of big data technology, establish social responsibility performance databases, and realize real-time monitoring and early warning. Mechanism design should consider the regulatory requirements of different countries and regions to ensure compliance with local laws and norms and international practices.

Conclusion

Under the background of global economic integration and digital transformation, small and medium-sized manufacturing enterprises are facing the dual challenges of international development and social responsibility fulfillment. The rise of big data analysis technology provides new development

opportunities for small and medium-sized manufacturing enterprises, enabling them to formulate internationalization strategies more accurately and integrate the concept of social responsibility into the complete process of enterprise development. Through in-depth analysis of market demand, optimization of resource allocation and improvement of operational efficiency, big data technology not only enhances the international competitiveness of small and medium-sized manufacturing enterprises but also creates conditions for achieving a balance between economic benefits and social values.

In the process of internationalization, small and medium-sized manufacturing enterprises need to regard social responsibility as an important part of strategic development. Social responsibility is not only the moral basis for the long-term development of enterprises, but also the key factor to enhance brand image and gain recognition in the international market. By setting social responsibility goals that match the internationalization strategy, enterprises can achieve sustainable development in the fields of environmental protection, labor rights and interests, community development and so on. Integrating social responsibility into the international operation process can ensure that enterprises can gain wider recognition and support in the global market.

Establishing an effective supervision and evaluation mechanism is an important guarantee to ensure the integration of internationalization strategy and social responsibility. Through big data analysis technology, enterprises can monitor the fulfillment of social responsibility in real time, adjust the strategic direction in time, and ensure the consistency between international development and social responsibility goals. This integration not only helps to enhance the international competitiveness of enterprises but also creates a long-term and stable development environment for enterprises.

Big data analysis provides scientific and technical support for the integration of internationalization strategy and social responsibility of small and medium-sized manufacturing enterprises. Through the rational use of big data technology, enterprises can achieve double the promotion of economic benefits and social values in the global competition and lay a solid foundation for sustainable development. In the future, with the continuous progress of technology, big data analysis will play a more key role in the integration of enterprise internationalization and social responsibility.

Funding

This work was not supported by any funds.

Acknowledgements

The authors would like to show sincere thanks to those techniques who have contributed to this research.

Conflicts of Interest

The authors declare no conflict of interest.

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