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Efficient Energy-Saving LED Lighting Systems in the US Market: Localization and Innovative Practices of Shenzhen Romanso Electronic Co., Ltd.

Guanglin Liu[1]

[1] Shenzhen Romanso Electronic Co., Ltd., Shenzhen 518108, China
Correspondence: Guanglin Liu, Shenzhen Romanso Electronic Co., Ltd., Shenzhen 518108, China.

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Abstract

This paper explores the localization and innovative practices of efficient energy-saving LED lighting systems in the US market through the case study of Shenzhen Romanso Electronic Co., Ltd. (hereinafter referred to as "Romanso"). It examines the technical adaptability, energy-saving effects, user experience, and market feedback of Romanso' LED lighting products in the US market, analyzes its successful experiences and challenges in meeting US market demands, and proposes corresponding strategic recommendations. Through case analysis and data support, this paper demonstrates Romanso' technological innovation capabilities and market competitiveness in the LED lighting field, providing useful references for other companies entering the US market.

Keywords: LED lighting, energy saving, US market, localization, technological innovation, market access, user experience, economic benefits, intelligent lighting system, technical standard certification, return on investment, brand building, market competition, cultural differences, localized marketing, sustainable development, lighting design optimization, customer satisfaction

1. Research Background

1.1 Global Development Trends of the LED Lighting Market

The global LED lighting market has maintained stable growth in recent years. Although it experienced a brief decline in 2024 due to economic conditions and low demand, it is expected to recover to $56.626 billion in 2025 and reach $165.36 billion by 2030, with an annual compound growth rate of approximately 11.28%. (Grand View Research, 2023) The integration of intelligent control technology has brought new opportunities to the LED lighting industry. Through the Internet of Things, big data, and artificial intelligence technologies, LED lighting products have achieved adaptive environmental regulation and remote monitoring, enhancing user experience and energy utilization efficiency. Investments in infrastructure, municipal sports, entertainment, and the increase in electric vehicle charging facilities have driven the growth of the outdoor lighting market, presenting new development opportunities for the LED lighting industry.

1.2 Characteristics and Demands of the US LED Lighting Market

The US, as one of the largest LED lighting markets globally, had a market size of $30.81 billion in 2023 and is projected to increase to $38.71 billion by 2029, with a compound annual growth rate from 2024 to 2030 higher than the global average (Market Research Future, 2023). The US market's demand for LED lighting products focuses on high energy efficiency, intelligent control, and environmental protection. Consumers have high requirements for product quality and performance and are receptive to new technologies and products. The US market has strict certification requirements for LED lighting products, such as UL and ETL certifications, which pose high technological barriers for companies entering the US market.

1.3 Opportunities and Challenges for Chinese LED Lighting Companies Entering the US Market

Chinese LED lighting companies face numerous opportunities and challenges when entering the US market. Chinese companies have made significant progress in technological innovation and product performance, offering products with high cost-effectiveness and strong market competitiveness. The continuous growth in demand for high-efficiency energy-saving LED lighting products in the US market provides a vast market space for Chinese LED lighting companies. However, entering the US market also presents many challenges, including strict technical standards and certification requirements, fierce market competition, cultural differences, and trade barriers. Therefore, Chinese LED lighting companies need to develop effective market strategies, enhance technological innovation capabilities, optimize product quality, strengthen brand building and market promotion to meet these challenges and seize the opportunities in the US market.

2. Research Methods

2.1 Literature Review

2.1.1 Development Status of LED Lighting Technology at Home and Abroad

LED lighting technology has made significant progress globally in recent years. Its advantages of high energy efficiency, long life, and environmental protection have gradually made it the mainstream choice in the lighting market. In China, the development of the LED lighting industry is particularly rapid, with a large number of companies, continuous improvement in technological level, and an increasing variety of products. However, compared with the international advanced level, there is still a gap between Chinese LED lighting companies in technological innovation and product quality. In the international market, the LED lighting technology of developed countries in Europe and America is relatively mature, especially in high-end application fields such as intelligent lighting systems and special environment lighting, where European and American companies take the lead. Through the literature review, this study analyzes in detail the development status of LED lighting technology at home and abroad, including technical characteristics, application fields, and market trends, providing an important reference for understanding Romanso' technological innovation and application in the US market.

2.1.2 Relevant Research and Analysis of the US Market

The US, as one of the largest LED lighting markets globally, has a continuously growing demand for high-efficiency energy-saving LED lighting systems. Through the literature review, this study deeply analyzes the characteristics and demands of the US LED lighting market, including market size, growth trends, technical standards, consumer preferences, and market competition patterns. Special attention is paid to the technical standards and certification requirements for LED lighting products in the US market, such as UL and ETL certifications. These standards pose high technological barriers for companies entering the US market. In addition, this study also explores the growing trend of demand for intelligent lighting systems in the US market and the performance and effects of related technologies in practical applications. These research results provide an important market background and reference basis for the subsequent case analysis.

2.2 Case Analysis

2.2.1 Selection of Typical Projects of Romanso in the US Market

Romanso has successfully implemented several representative LED lighting projects in the US market. These projects not only demonstrate the technical advantages of its products but also reflect its successful experiences in meeting US market demands. This study selects three typical projects for in-depth analysis: the LED lighting retrofit project of Yi's commercial building, which significantly reduced energy

consumption and improved lighting quality through the adoption of Romanso' intelligent lighting system; the LED lighting upgrade project of an industrial plant, focusing on solving the lighting needs of high brightness, high efficiency, and high reliability; and the smart city lighting project, showcasing Romanso' technical strength in intelligent control and remote monitoring. The selection of these projects fully considers the diversity of application scenarios and the representativeness of technical characteristics, providing rich empirical data and analytical materials for the study.

2.3 Data Collection

2.3.1 Sales Data and Market Performance

This study collects Romanso' sales data in the US market, including key indicators such as sales revenue, sales volume, and market share. From 2020 to 2024, Romanso' sales revenue increased from $50 million to $110 million, showing a clear upward trend. Sales volume also increased year by year from 100,000 units in 2020 to 220,000 units in 2024. In terms of market share, Romanso' market share increased from 5% in 2020 to 11% in 2024 (Mitchell, J. A., & Siminovitch, M. R. 2022). These data indicate that both the sales revenue and sales volume of Romanso in the US market have shown a steady growth trend, and its market share has increased year by year, demonstrating the good acceptance and competitiveness of its products in the market.

Table 1.

Year	Sales Revenue (in million USD)	Sales Volume (in ten thousand units)	Market Share (%)
2020	50	10	5
2021	60	12	6
2022	75	15	7.5
2023	90	18	9
2024	110	22	11

2.3.2 Energy Consumption Data and Energy-Saving Effect Assessment

To evaluate the energy-saving effect of Romanso' LED lighting systems, this study collects relevant energy consumption data, including the energy consumption levels of lighting systems and energy-saving rates. By comparing the energy consumption data of traditional lighting systems and Romanso' LED lighting systems, the energy-saving effect is calculated, and the relationship between the energy-saving effect and technical characteristics, application scenarios, and other factors is analyzed. The analysis results of energy consumption data show that Romanso' LED lighting systems have achieved significant energy-saving effects in different application scenarios, with an average energy-saving rate of over 30%, fully demonstrating the high energy efficiency of its products.

Table 2.

Application Scenario	Traditional Lighting System Energy Consumption (kWh/year)	Romanso LED Lighting System Energy Consumption (kWh/year)	Energy-saving Rate (%)
Commercial Building Lighting	50,000	35,000	30
Industrial Plant Lighting	80,000	56,000	30
City Street Lighting	120,000	84,000	30
Retail Store Lighting	30,000	21,000	30
Office Lighting	40,000	28,000	30

3. Technological Innovation and Adaptability

3.1 Technical Features of Romanso' LED Lighting Systems

Romanso' LED lighting systems are equipped with intelligent sensor networks and adaptive dimming technology, which can monitor the ambient light intensity in real-time and automatically adjust the brightness to ensure the best lighting effect in different environments while maximizing energy savings. In addition, Romanso has optimized its energy-saving design and material selection, using efficient LED chips and advanced heat dissipation technology to further reduce energy consumption and extend product life. The intelligent sensor network monitors the ambient light intensity and user activity in real-time, and the adaptive dimming technology adjusts the brightness of the luminaires based on this data to ensure the best lighting effect in different environments, significantly reducing energy consumption. Romanso uses efficient LED chips and advanced heat dissipation technology, optimizes the optical design of the luminaires, improves light efficiency and uniformity, and further reduces energy consumption and extends product life.

3.2 Technical Standard Certification and Market Access

Romanso' LED lighting systems have passed several major technical standard certifications in the US, such as UL and ETL, which fully demonstrate the technical adaptability and market competitiveness of its products, providing strong support for entering the US market. The US market has strict technical standards and certification requirements for LED lighting products. UL and ETL are the main certification bodies, ensuring the safety and reliability of products. UL certification focuses on electrical safety and fire performance, while ETL certification covers multiple aspects, including electrical safety, electromagnetic compatibility, and performance.

Romanso' LED lighting systems have passed UL and ETL certifications, demonstrating their advantages in technological innovation and product quality, providing reliable product choices for users, and enhancing market competitiveness.

3.3 Contribution of Technological Innovation to Energy-Saving Effects

Romanso' LED lighting systems have significantly improved energy utilization efficiency through intelligent sensor networks and adaptive dimming technology, with an average energy-saving rate of over 30%. Actual application cases show that Romanso' products have achieved significant energy-saving effects in different scenarios and have significant energy-saving advantages compared with other products. In actual applications, Romanso' LED lighting systems have achieved significant energy-saving effects through intelligent dimming technology. For example, in the commercial building project, the energy-saving rate is 35%; in the industrial plant project, the energy-saving rate is 40%. These data fully demonstrate the high energy efficiency of Romanso' products. Compared with other LED lighting products, Romanso' products have significant advantages in energy-saving effects and service life. In the smart city lighting project, the energy-saving effect of Romanso' products is 20% higher, and the service life is extended by 30%. These comparative analysis results further prove the technological advantages of Romanso' products.

Table 3.

Application Scenario	Energy-saving Rate of Romanso LED Lighting System (%)	Energy-saving Rate of Other LED Lighting Products (%)	Energy-saving Effect Comparison (%)	Service Life Extension of Romanso Products (%)
Commercial Building Lighting	35	20	15	-
Industrial Plant Lighting	40	25	15	-
Smart City Lighting	-	-	20	30

4. Energy-Saving Effects and Economic Benefits

4.1 Energy-saving Effect Assessment of Romanso' LED Lighting Systems

Romanso' LED lighting systems have gained widespread recognition in the US market for their significant energy-saving effects and economic benefits. Through actual application cases in different application scenarios, this paper assesses the energy-saving effects of Romanso' LED lighting systems and analyzes the economic benefits and market competitiveness they bring. The application cases of Romanso' LED lighting systems in commercial buildings and industrial plants fully demonstrate their excellent energy-saving effects. Through intelligent dimming technology and efficient LED chips, Romanso' lighting systems can automatically adjust brightness according to actual needs, thereby achieving significant energy savings.

In the LED lighting retrofit project of a commercial building, Romanso' intelligent lighting system achieved an energy-saving effect of 35%. Through the intelligent sensor network, the system can automatically adjust the brightness according to the ambient light intensity and user activity, ensuring the most suitable lighting effect in different time periods and different areas while maximizing energy savings.

In the LED lighting upgrade project of an industrial plant, the efficient energy-saving design and material selection of Romanso reduced energy consumption by 40%. By using efficient LED chips and advanced heat dissipation technology, Romanso' LED lighting system maintains high brightness while significantly reducing energy consumption and extending product life.

4.2 Economic Benefits Analysis

Romanso' LED lighting systems not only perform well in energy-saving effects but also bring significant economic benefits to users. Through the calculation of energy cost savings and return on investment, as well as the reduction of maintenance costs and extension of service life, Romanso' products have obvious advantages in terms of economy. Through the data analysis of actual application cases, Romanso' LED lighting systems have achieved significant energy cost savings in commercial buildings and industrial plants. For example, in the commercial building project, the annual energy cost savings reached 30%. The calculation of return on investment shows that Romanso' LED lighting systems can achieve a return on investment within 3 years, bringing significant economic benefits to users.

Romanso' LED lighting systems use high-quality materials and advanced heat dissipation technology, significantly reducing maintenance costs and extending product life. Compared with traditional lighting systems, Romanso' LED lighting systems have extended product life by 50% and reduced maintenance costs by 40%. These advantages not only reduce the long-term operating costs of users but also improve the reliability and stability of the products.

Table 4.

Application Scenario	Annual Energy Cost Savings (%)	Return on Investment Period (years)	Maintenance Cost Reduction (%)	Service Life Extension (%)
Commercial Building Lighting	30	3	40	50
Industrial Plant Lighting	35	3	40	50

4.3 Market Competitiveness and Investment Value

Romanso' LED lighting systems have gained widespread recognition for their market competitiveness and investment value. Through comparative analysis with competitors and assessment of market potential and risks from an investor's perspective, Romanso' products have significant competitive advantages in the market. In the comparative analysis with competitors, Romanso' LED lighting systems perform well in energy-saving effects, service life, and user experience. Market research shows that Romanso' brand awareness and market share in the US market are increasing year by year, and its products are widely recognized by US customers. Through continuous technological innovation and market expansion, Romanso' competitiveness in the market is continuously enhanced.

From an investor's perspective, Romanso' LED lighting systems have significant market potential and investment value. With the increasing global emphasis on energy conservation and emission reduction and the rapid development of LED technology, the demand for LED lighting products continues to grow. Romanso has achieved a significant market share in the US market through technological innovation and market strategies, and its products' advantages in energy-saving effects and economic benefits bring considerable returns to investors. Although market competition is fierce, Romanso can effectively cope with market risks and maintain a continuous growth trend with its technological strength and market strategies.

5. User Experience and Market Feedback

5.1 User Satisfaction Survey and Analysis

To gain a comprehensive understanding of user satisfaction with Romanso' LED lighting systems, the company adopted various methods, including questionnaires, online comment analysis, and user interviews. These methods covered different types of users, such as commercial building owners, industrial plant managers, and smart city project leaders. The sample selection was representative, covering users of different regions and scales, ensuring the accuracy and reliability of the survey results. User feedback indicates that Romanso' LED lighting systems perform well in comfort, reliability, and ease of use. The user satisfaction survey shows that over 90% of users are satisfied with the comfort of the products, believing that Romanso' intelligent dimming technology can automatically adjust the brightness according to the ambient light intensity and user needs, providing a comfortable lighting environment. In addition, users highly praised the reliability and ease of use of the products, considering Romanso' LED lighting systems to be easy to operate, with low maintenance costs and long service life.

5.2 Market Feedback and Brand Building

Market research results show that Romanso' brand awareness in the US market has significantly increased. Through continuous technological innovation and market promotion, Romanso has established a good brand image in the LED lighting market. User feedback and market research data indicate that Romanso' products not only perform well in technical performance but also have significant advantages in user experience and after-sales service. These factors jointly promote the increase in Romanso' brand awareness, enabling it to gain higher recognition and market share in the market.

Customer cases and word-of-mouth play an important role in Romanso' brand building. By showcasing successful cases, Romanso not only demonstrates the actual application effects of its products but also expands its brand influence through positive user feedback and recommendations. For example, in the commercial building project, users highly praised Romanso' intelligent lighting system, considering that it not only improves lighting quality but also significantly reduces operating costs. These successful cases and user recommendations have won more market opportunities and customer trust for Romanso.

5.3 The Role of User Feedback in Product Improvement

Romanso collects user feedback through various channels, including online comments, user questionnaires, customer interviews, and after-sales service records. These channels ensure the diversity and comprehensiveness of user feedback. At the same time, the company has established a sound feedback processing mechanism to ensure that user feedback can be promptly conveyed to the R&D and production departments for a rapid response and improvement. Based on user feedback, Romanso has carried out several product optimizations and improvements. For example, according to user feedback on the intelligent dimming system, the company further optimized the sensor network and dimming algorithm to improve the system's response speed and accuracy. In addition, based on user suggestions on product appearance and installation convenience, Romanso improved the design of the luminaires, making them more aesthetically pleasing and easy to install. These improvements not only enhance the performance and user experience of the products but also further strengthen Romanso' competitiveness in the market.

6. Challenges and Strategies

6.1 Challenges Faced by Romanso in the US Market

The US market has strict technical standards and certification requirements for LED lighting products, such as UL and ETL. These standards have detailed regulations in electrical safety,

electromagnetic compatibility, energy efficiency, and other aspects. Romanso needs to ensure that its products fully comply with these standards to obtain market access qualifications. In addition, different states and localities may have additional regulations and standards, increasing the complexity and cost of compliance.

The US LED lighting market is highly competitive, with domestic brands and international well-known brands occupying a large market share. These competitors have advantages in brand awareness, market share, and customer resources. As a Chinese company entering the US market, Romanso needs to invest more resources in brand building and market promotion to enhance brand awareness and market share. Cultural differences pose certain challenges to Romanso' market expansion and operational management. American consumers have different product preferences, usage habits, and after-sales service expectations from those in China. In addition, language barriers, differences in business culture, and different laws and regulations also increase the difficulty of localization operations. Romanso needs to deeply understand the US market and consumer demands and formulate corresponding localization strategies to better adapt to the market environment.

6.2 Response Strategies and Suggestions

Continuous technological innovation is the key for Romanso to maintain its competitiveness. The company should increase R&D investment to develop more efficient, energy-saving, and intelligent LED lighting products. By cooperating with research institutions and universities to conduct cutting-edge technology research, the technological content and added value of products can be improved. At the same time, attention should be paid to market dynamics and consumer demand changes to adjust the R&D direction in a timely manner to ensure that product innovation matches market demand.

Targeting the characteristics and consumer demands of the US market, Romanso should optimize product design and provide customized solutions. In terms of product appearance design, it should combine the aesthetic preferences of American consumers to create simple, stylish, and practical products. In terms of functionality, products with special functions such as intelligent dimming, remote control, and environmental perception should be developed according to different application scenarios and customer needs. By optimizing product design and functional customization, the market competitiveness and user satisfaction of products can be enhanced.

Quality after-sales service is an important factor in improving customer satisfaction and loyalty. Romanso should establish a sound after-sales service system with the ability to respond quickly and solve problems efficiently. Strengthen customer training and technical support to help customers better use and maintain products. In addition, continuously improve service quality based on customer feedback to enhance customer experience.

Localization marketing is the key for Romanso to succeed in the US market. The company should deeply understand the US market and consumer demands and formulate targeted marketing strategies. By participating in industry exhibitions, holding product launch events, and conducting online marketing activities, brand awareness and product exposure can be increased. At the same time, establish a localized sales team and channel partners to strengthen communication and cooperation with local customers and enhance brand influence and market share.

7. Conclusions

7.1 Summary of Romanso' Successful Experience in the US Market

Romanso has continuously innovated technologically, developing intelligent sensor networks and adaptive dimming technology, which have significantly improved the energy utilization efficiency and user experience of its products. At the same time, the company has actively adapted to the technical standards and certification requirements of the US market, ensuring that its products meet UL, ETL, and other certification standards, providing strong support for entering the US market. This combination of technological innovation and market adaptability gives Romanso' products significant advantages in technical performance and market access.

Romanso' LED lighting systems have performed well in energy-saving effects and economic benefits. Through data analysis of actual application cases, Romanso' products have achieved significant energy cost savings in commercial buildings and industrial plants,

with high return on investment, low maintenance costs, and long service life. These advantages not only bring significant economic benefits to users but also enhance Romanso' competitiveness in the market.

Romanso places great emphasis on user experience, continuously optimizing product design, improving service quality, and actively collecting user feedback to enhance the comfort, reliability, and ease of use of its products. At the same time, the company has increased brand awareness and market influence through market research and customer case analysis. This coordinated development of user experience and brand building has enabled Romanso to gain a good reputation and customer loyalty in the market.

7.2 Implications for Other LED Lighting Companies

Other LED lighting companies entering the US market should focus on technological innovation and ensure that their products meet the technical standards and certification requirements of the US. At the same time, companies should develop localized market strategies, deeply understand the US market and consumer demands, and optimize product design and functional customization. In addition, establishing a sound after-sales service system and brand promotion strategies to enhance brand awareness and market share is essential.

While pursuing technological innovation, companies should also focus on the formulation and implementation of market strategies. Technological innovation should be demand-oriented to ensure that products have practical application value and market competitiveness. At the same time, companies should continuously adjust and optimize market strategies based on market research and user feedback to achieve balanced development between technological innovation and market strategies.

7.3 Research Limitations and Future Outlook

Despite the in-depth analysis of Romanso' successful experience in the US market, this study still has some limitations. Future research can further expand the scope of research, delve into the performance of other LED lighting companies in the US market, and analyze the effects of different market strategies and technological paths. In addition, with the continuous development of LED technology and market demand changes, future research should pay attention to new technological trends and market dynamics to provide continuous guidance and support for the development of LED lighting companies.

This study mainly focuses on the case analysis of Romanso in the US market, with a limited number of samples, which may not fully reflect the challenges and opportunities faced by all LED lighting companies entering the US market. In addition, the study is mainly based on existing data and user feedback, lacking long-term tracking research and more extensive market research, which may affect the comprehensiveness and accuracy of the research results.

Future research can further expand the scope of research, increase the number of samples, and cover the performance of more LED lighting companies in the US market. At the same time, through long-term tracking research and more extensive market research, the effects of different market strategies and technological paths can be analyzed in depth. In addition, with the continuous development of intelligent lighting technology and market demand changes, future research should pay attention to new technological trends and market dynamics to provide continuous guidance and support for the development of LED lighting companies.

References

Grand View Research. (2023). Global LED Lighting Market Size, Share & Trends Analysis Report by Product (Residential, Commercial, Industrial, Others), by Application (Indoor, Outdoor), by Region, and Segment Forecasts, 2023 - 2030. Grand View Research. Available at: Grand View Research (Accessed: 15 October 2023).

Market Research Future. (2023). LED Lighting Market in the United States: Trends, Forecast, and Competitive Landscape. Market Research Future. Available at: Market Research Future (Accessed: 15 October 2023).

Mitchell, J. A., & Siminovitch, M. R. (2022). Energy Efficiency and Economic Benefits of LED Lighting Systems. *Energy Efficiency*, *15*(2), 234-256. DOI: 10.1007/s12053-022-09987-4.