Financial Analysis of Ecovacs Based on the Harvard Analysis Framework

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Abstract: As a leader in the robotic vacuum cleaner industry, Ecovacs has been deeply involved in the field since its establishment in 1998. This paper is based on Ecovacs' financial statements from 2019 to 2022 and conducts a comprehensive analysis of Ecovacs from the perspectives of strategy, accounting,finance,and prospects based on the Harvard framework. It identifies current issues and provides suggestions,aiming to provide more possibilities and reference value for Ecovacs' future development direction.
Keywords: Harvard Analysis Framework; Financial Analysis; Ecovacs

1. Introduction

The robotic vacuum cleaner industry is currently in a stage of continuous upgrading and innovation. The industry is highly competitive yet dynamic. However, the difficulty of breaking through existing technological barriers is increasing, leading to severe product homogeneity issues. As a well-established company, Ecovacs has invested heavily in technological research and development. It continuously overcomes technical challenges while strengthening brand building and expanding sales channels. As a result, its revenue has maintained stable growth, allowing it to maintain a leading position in the fierce industry competition.

2. Overview of the Harvard Analysis Framework

The Harvard Analysis Framework[1-3] is a method developed by professors Krishna G. Palepu, Paul M. Healy, and Victor L. Bernard of Harvard University, which combines strategic analysis and financial analysis. It integrates financial and non-financial information to provide a comprehensive evaluation of operational performance. The framework includes four dimensions: strategic analysis, accounting analysis, financial analysis, and prospective analysis. Strategic analysis examines the industry and internal/external environments, while accounting analysis ensures reliable financial data. Financial analysis uses specific indicators to identify problems and their causes. Prospective analysis considers future risks and development direction. The Harvard Analysis Framework is widely used in financial analysis to guide companies' future development.

3. Financial Analysis of Ecovacs based on the Harvard Framework

3.1 Strategic Analysis

Strategic analysis, including SWOT analysis[4], can encompass both internal and external factors. Therefore, this paper selects SWOT analysis for strategic analysis.

3.1.1 Analysis of Strengths (S)

Ecovacs, an experienced company in intelligent manufacturing, lays a solid foundation for product manufacturing with excellent cost, quality, and production capacity control. Using advanced technologies like autonomous mapping, navigation, obstacle avoidance, and AI semantic recognition, Ecovacs achieves functional innovation. Moreover, Ecovacs expands into major overseas markets and establishes itself as a global brand in home service robots, benefiting from its prominent brand advantage and significant investments in advertising and marketing.

3.1.2 Analysis of Weaknesses (W)

Ecovacs faces weaknesses in their product structure, lacking smart home products for ordinary consumers, which could limit their market competitiveness. Moreover, an imbalance in market input and output leads to high sales expenses and low profit margins.

3.1.3 Analysis of Opportunities (O)

The emergence of the "Z generation" in the workforce and their demand for smart homes is expected to drive industry growth. This, coupled with increasing per capita income and changing consumer attitudes, creates market opportunities for smart home products. Moreover, the government's tax incentives for high-tech enterprises, such as Ecovacs, encourage innovation and research and development. Additionally, as the pandemic subsides and the economy recovers, there will be an upswing in demand for high-end consumer goods, including robotic vacuum cleaners, further supporting Ecovacs' growth.

3.1.4 Analysis of Threats (T)

Ecovacs faces risks from market demand changes and strong competition due to technological advancements and shifting consumer preferences. Government policies supporting AI and service robot companies have led to the establishment of numerous robot industrial parks, intensifying market competition. Overseas high inflation, coupled with uncertain economic prospects and rising material costs in the US and Europe, can negatively impact demand.

3.2 Accounting Analysis

3.2.1 Accounting Policies and Estimates

Ecovacs' financial reports show stable accounting policies and estimates. In 2020, a revision in revenue recognition standards increased operating costs by CNY 186 million, but did not affect profits. Changes in lease accounting standards in 2021 had minimal impact on revenue and expenses.

Key accounting items, such as inventory, accounts receivable, and fixed assets, make up a significant portion of total assets. Research and development expenses and sales expenses have a high proportion of operating income, warranting further analysis for valuable insights.

Analysis of Inventory

Ecovacs' inventory has shown consistent growth, reaching 2.906 billion yuan in 2022, a 20.23% increase since the start of the period. This exceeds the growth rate of operating costs and revenue, which rose by 16.61% year-on-year. As of March 2023, the inventory further rose to 2.98 billion yuan. Ecovacs exhibits a relatively high inventory growth rate and an increasing proportion of inventory goods.This may be attributed to the higher prices of S Company's products, resulting in some inventory backlog.

Accounts Receivable Analysis

The aging structure of Ecovacs' accounts receivable was analyzed, and as of December 31, 2022, the proportion of accounts receivable within 1 year reached 95.51%. This indicates that the quality of accounts receivable is relatively high.

Fixed Assets Analysis

The proportion of fixed assets to total assets has been decreasing over the years. It decreased from 17.88% in 2019 to 7.01% in 2022. This suggests that Ecovacs has been consolidating its equipment.

Analysis of R&D and Sales Expenses

Ecovacs' R&D expenses have consistently grown from 2019 to 2022, reaching 744 million yuan by December 31, 2022. In 2022, the investment in sales expenses accounted for 30.16% of the operating income, indicating a substantial increase that exceeds the industry average of 10%.

3.3 Financial Analysis

Based on the financial reports ofEcovacsfrom 2019 to 2022, a vertical analysis of Kovos' finances was conducted. Taking into account factors such as scale and primary business type, a horizontal comparison was made with Stonetech. Financial analysis is a crucial part of the Harvard analysis framework, which uses specific financial data and key financial ratios to quantitatively draw financial conclusions.[5]

3.3.1 Debt-paying Ability

Ecovacs' debt ratio has been consistently increasing but remains below the industry average of 55%, indicating a healthy debt level. The equity ratio, current ratio, and quick ratio are lower than Stonetech but remain stable and above the industry average.Stonetech, however, exhibits significant fluctuations in debt-paying ability. These differences can be attributed to their different stages of development and business model backgrounds.

3.3.2 Operating Capability

Table 1: Key Indicators of Operating Capability

Indicators	Accounts Receivable Turnover		Inventory Turnover	
Year	Ecovacs	Stone Technology	Ecovacs	Stone Technology
2019	5.87	14.49	3.02	9.35
2020	6.53	27.09	3.62	6.51
2021	8.52	44.71	3.44	6.2
2022	8.2	29.28	2.79	5.22

Data Source: Compiled from financial statements for the years 2019-2022

Ecovacs has lower accounts receivable turnover and inventory turnover rates compared to Stone Technology. However, Ecovacs shows a stable trend with a steady increase in accounts receivable turnover, while Stone Technology exhibits fluctuations and a declining trend in inventory turnover. Ecovacs' operating capability can be improved by relaxing credit sales policies and strategically reducing product prices.

3.3.3 Profitability

Kovos has consistently outperformed Stonetech in terms of gross profit margin. However, its return on total assets, return on equity, and net profit margin are significantly lower than those of Stonetech. This can be attributed to Kovos' higher sales expense investment, leading to a higher expense ratio and lower profitability compared to Stonetech. In 2021, Ecovacs saw significant fluctuations in various indicators, primarily due to a substantial increase in sales expenses by 107.38% compared to the previous year. The high proportion of expense-driven costs resulted in a decline in overall profitability. It is recommended for Ecovacs to properly control sales expense investments to improve profitability.

3.3.4 Growth Capacity

Kovos underwent strategic adjustments in 2019, leading to negative growth rates in revenue and profit. [6]They shifted from outsourcing to in-house production and focused on expanding the service robot business globally while discontinuing ODM operations. They also increased investment in research and development, particularly in hardware and software development, and recruited high-level R&D talents. R&D expenses surged by 35%, with a 70 million yuan increase compared to the previous year. Kovos also invested more in brand marketing, launching the "Tianke" brand to compete in the smart home market.Despite the temporary decline in profits, these strategic adjustments set the stage for future growth and profitability, demonstrating Kovos' long-term vision.

3.3.5 DuPont Analysis

Table 2: Key Indicators of DuPont Analysis

Year	2019		2020		2021		2022	
Company	Ecovacs	StoneTech	Ecovacs	StoneTech	Ecovacs	StoneTech	Ecovacs	StoneTech
Equity Multiplier	1.71	1.49	1.87	1.15	2.06	1.13	2.08	1.14
Net Profit Margin	2.27	18.62	8.86	30.23	15.36	24.03	11.08	17.85
Asset Turnover Ratio	1.24	0.66	1.38	0.66	1.55	0.66	1.27	0.64

Source: Compiled from 2019-2022 financial statements

According to Table 2, the equity multiplier of Ecovacshas been increasing year by year and is consistently higher than that of StoneTech. This indicates that Ecovacs has a higher leverage usage compared to StoneTech. The net profit margin of Ecovacs is relatively low, highlighting the need to focus on improving profitability. The asset turnover ratio has also maintained a steady upward trend and is significantly higher than that of its peer, StoneTech. The DuPont analysis suggests that Ecovacs exhibits overall good financial data quality, showing a stable and improving trend. However, specific attention should be paid to the net profit margin and measures should be taken to enhance the company's profitability.

3.4 Prospects Analysis

3.4.1 Macro Environment Analysis

The stable domestic political environment in China benefits Ecovacs' long-term development. The company can take advantage of tax incentives as a high-tech technology company. However, trade tensions between China and the United States have affected Ecovacs' foreign sales business. Economically, the global market demand for home service robots, particularly floor-cleaning robots, is increasing due to advancements in software and hardware technology.

3.4.2 Industry Risk Analysis

Competition in the floor-cleaning robot industry is intense, posing risks for Ecovacs. Domestically, Ecovacs competes with 18 other companies, including smart hardware manufacturers, traditional home appliance companies, and internet companies. These companies recognize the industry's high-profit potential and have entered the market. However, the industry's technology-driven nature makes it difficult to overcome existing technological barriers, resulting in significant product homogeneity. New entrants with unique features also threaten Ecovacs' market position. Internationally, iRobot, known for its military robots, leads in technology research and development, intensifying competitive pressure on Ecovacs.

3.4.3 Company Prospects Analysis

Although Ecovacs faces intense competition, such as the pressure from numerous small and medium-sized brands seizing market share through price advantages, it possesses strong technological support and brand advantages, which objectively contribute to its promising future prospects.

4. Development Recommendations

4.1 Strengthen control over inventory goods.

Data shows that Ecovacs has a relatively high growth rate and proportion of inventory goods, indicating a certain backlog of inventory. To address this issue,Ecovacs should strengthen sales efforts to reduce the backlog of inventory goods.

4.2 Improve profitability.

Ecovacs' gross profit margin exceeds industry average, but its net profit margin is not high. This is due to relatively high sales and R&D expenses, resulting in a high expense ratio that reduces the net profit margin. To maintain profitability, Ecovacs should improve the efficiency of sales expenses and maximize the return on investment in R&D expenses, avoiding excessive sales costs or inefficient R&D investments.

4.3 Build a closed-loop ecosystem.

Ecovacs has entered the commercial robot market with its intelligent lawn mowing robot. To seize the significant growth potential, the company should accelerate the development of commercial robots, creating an opportunity for strategic expansion in this field.

4.4 Accelerate the development of commercial robots.

Ecovacs has made initial forays into the commercial robot field with the launch of its intelligent lawn mowing robot. It should accelerate the development of commercial robots as this sector has great potential for rapid growth.Ecovacs should seize the opportunity and steadily expand its presence in this field.

5. Conclusion

Through Harvard framework analysis, Ecovacs is found to have a positive development status. It should be mindful of industry competition and leverage its technological and brand advantages to maintain a leading position. Developing commercial robots can further solidify its position. Financially, Ecovacs is stable and improving, with manageable debt risk and sufficient short-term debt repayment ability. The overall operational capability is strong, with fast capital turnover and strong product realization ability, but inventory backlog should be addressed. Profitability is steadily improving, but the net profit margin is relatively low compared to competitors, indicating room for improvement. In terms of growth capability, strategic adjustments and planning are reasonable, and the company has a strong ability to sustain growth, placing it in a leading position in the industry with promising prospects.

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