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Study on the Application of Harvard Analytical Framework in the Automotive Industry —Taking Lifan Technology (Group) Co., Ltd. as an Example

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Abstract: *Lifan Technology (Group) Co., Ltd. is a large enterprise that develops, manufactures, and sells automobiles, motorcycles, engines, and general motors with the new energy industry as its strategic development direction. However, since 2016, Lifan's performance has started to decline considerably, and even went into bankruptcy and reorganization at the late stage of insolvency. Moreover, this paper uses the Harvard analytical framework to analyze the overall situation of Lifan Technology (Group) Co., Ltd. from four aspects to clarify the reasons for the decline in profit and high debt of Lifan Technology (Group) Co., Ltd. in recent years, to summarize the relevant experience and lessons learned, and to propose relevant suggestions for the future development of Lifan Technology (Group) Co., Ltd.*

Keywords: *Falling profits; Lifan Technology; Harvard analytical framework*

1. Introduction

The automotive industry is a pillar industry of China's economy. However, it has a series of real problems, such as overcapacity, declining performance, and fierce competition in the market, which are of high research value and typical representative significance. In this paper, we take Lifan Technology (Group) Co., Ltd. as an example to understand its development strategy, collect and integrate financial data, and analyze it using Harvard analytical framework to make helpful suggestions for its future development.[1]

2. Research ideas and methodologies

2.1 Research ideas

2.1.1 Determine the research object

Currently, the automotive industry generally faces the problem of overcapacity and performance decline, and the competition is very fierce. After 29 years of hard work, Lifan Technology successfully reorganized itself in 2020 through the efforts of all parties and has established and improved its automotive brand and power exchange brand structure, which has high research value.

2.1.2 Perform internal and external analysis

To comply with the development requirements of the times and maintain the order of market operation, the enterprise must disclose the necessary information. We make preliminary judgments about Lefan Technology's operating conditions based on external academic research and relevant media reports; then, we collect relevant data from internal and external public annual reports to prepare for further analysis.

2.1.3 Harvard analytical framework

The data collected from the internal and external analyses were collated and put together in a Harvard analytical framework to elaborate on Lifan Technology's overall situation from four aspects and use 19 specific indicators to elaborate on the problems that exist in the enterprise's current development.[2]

2.1.4 Make suggestions and summarize

In view of the existing problems, we propose operational suggestions for the future sustainable development of Lifan Technology from four aspects. Additionally, it is hoped that this can be a reference for other automotive enterprises.

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Figure 1 shows the framework of research ideas:

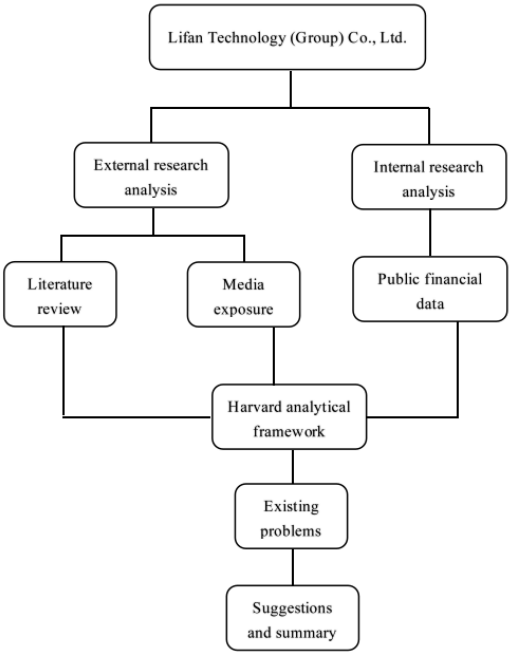

Figure 1. Framework of research ideas

2.2 Research Methodologies

Harvard's analytical framework originated in the United States and is defined as an analytical framework. The Harvard analytical framework stands at the height of the enterprise as a whole to speculate on the development status and future prospects of the enterprise. It includes strategic analysis, accounting analysis, financial analysis, and prospect analysis: namely, to grasp the development direction of the company from the strategic level in general, to analyze the macro and micro environment in which the enterprise is located, to infer the opportunities and challenges it faces, and further to discover the problems that exist through specific data, thus obtaining a correct evaluation of the enterprise's growth ability. (As shown in figure 2)

Strategic analysis: to identify profit drivers and business risks and qualitatively assess the profit model and development direction of the enterprise

Accounting analysis: mainly evaluates the enterprise's accounting, thus reflecting the basic operation scale and development status of the enterprise

Financial analysis: comprehensive analysis of the solvency, operating capacity, profitability, and development capacity of the enterprise

Prospect analysis: make scientific forecasts, point out the direction for enterprise development, and provide decision support for strategic decision-makers

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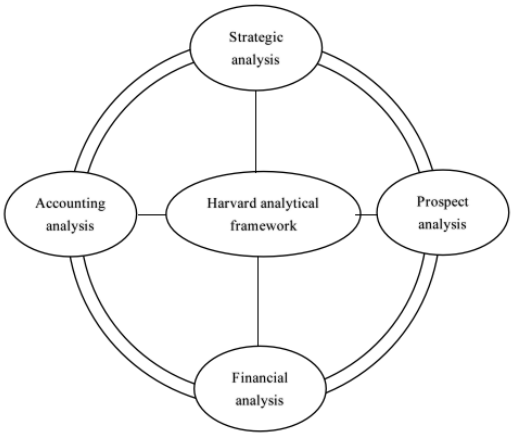

Figure 2. Content structure of Harvard analytical framework[3]

3. Specific analysis

3.1 Strategic analysis

3.1.1 Enterprise's mission and objectives

Through relevant research and analysis, Lifan Technology (Group) Co., Ltd. implements an unrelated diversification strategy and new energy development strategy (Intelligent Blue Strategy). For the unrelated diversification strategy, its business units include the motorcycle business, automobile business, soccer, futures, media, real estate, alcohol, etc. Among them, Lifan Technology has many business segments, the automobile business is a problem business, and the motorcycle business is a cash cow business.

The new energy development strategy can be divided into three core components: product, operation, and service. Moreover, Lifan Technology plans to launch a number of new pure electric and hybrid products by 2020, establish a goal of 500,000 units of cumulative sales of new energy vehicles, and accelerate the adjustment of the internal industrial structure.

3.1.2 External environment analysis

On a macro level, the global epidemic impact has caused the economy to face a severe recession in the short term, import and export consumption of bulk products has been hampered, and the automotive industry is finding it difficult to get rid of the threat posed by the epidemic quickly. On a micro level, the automotive market is in a period of high growth, and there is huge competitive pressure in the market. Furthermore, Lifan Technology is in a disadvantageous position relative to its competitors in the industry; there is no threat of substitution yet, the high industry barriers lead to potential competitors not posing a threat to Lifan Technology, and high-quality automotive parts suppliers have strong bargaining power for Lifan Technology.

3.1.3 Internal conditions analysis

The advantages of Lifan Technology are better domestic and international marketing channels, the motorcycle market is recovering, and it has the ability to research and develop core components. However, its disadvantages are the lack of core automotive technology, the shrinking automotive market, and the lack of mid-to-high-end technology products. The enterprise's research and development department is unable to respond to the change in market development direction in a timely manner, and falling profits are serious.

3.2 Accounting analysis

3.2.1 Accounting estimate identification

This part examines the accounting policies of Lifan Technology (Group) Co., Ltd. based on strategic analysis and further evaluates the quality of accounting information of the enterprise. Through a cross-sectional comparison of important enterprise accounting data, two asset indicators of Lifan Technology's inventory and accounts receivable are selected as the research objects to analyze the enterprise's

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production and operation status.

3.2.2 Analysis of accounting estimates

(1) Inventory analysis

In the automotive industry, the more concerned issue is the sales and inventory of automotive products. The value of automotive products is large, and if the products produced in the current year are not sold in a timely manner, it will cause an inventory backlog problem that will affect the production plan and operating capacity of the coming year. The current year's inventory can only play the most intuitive role in increasing sales revenue if it is sold in the current year.

Table 1. Lifan Technology's inventory position from 2016 to 2020

Balance sheet	2020	2019	2018	2017	2016
Current assets					
Monetary assets	2,462 million	2,039 million	5,403 million	6,698 million	7,315 million
Financial assets that are measured at fair value and whose changes are recorded in profit or loss for the period	____	____	____	66.64 million	79.7 million
Notes and accounts receivable	643.2 million	2,156 million	2,834 million	4,077 million	3,758 million
Among them: are notes receivable	113.3 million	623.5 million	297.1 million	1,129 million	1,276 million
Accounts receivable	529.9 million	1,532 million	2,537 million	2,948 million	2,483 million
Prepayments	533.8 million	188.0 million	622.5 million	656.1 million	489.5 million
Total other receivables	1,062 million	825.6 million	2,038 million	722.8 million	673.9 million
Among them: are interest receivable	29.29 million	107.06 million	47.75 million	81.93 million	43.27 million
Dividend receivable	51.53 million	32.06 million	11.73 million	____	____
Other receivables	____	____	____	640.9 million	630.7 million
Inventory	2,695 million	1,011 million	1,680 million	2,900 million	2,533 million

Table 2. Lifan Technology operating capacity indicators from 2016 to 2020

Operating capacity indicators	20-12-31	19-12-31	18-12-31	17-12-31	16-12-31
Total assets turnover days (days)	1848	1143	946.7	848.6	890.7
Inventory turnover days (days)	203.4	63.12	82.34	89.21	85.99
Days sales outstanding (days)	138.5	120.6	113.0	111.9	130.1
Total asset turnover (times)	0.195	0.315	0.380	0.424	0.404
Inventory turnover rate (times)	1.770	5.703	4.372	4.035	4.187
Accounts receivable turnover (times)	2.599	2.986	3.187	3.216	2.768

According to table 1, Lifan Technology's inventory averaged $2,163.8 million in the last five years, with an inventory ratio of less than 20%. However, observing table 2, Lifan Technology's inventory turnover days averaged 104.812 days, while the average inventory turnover days in the automotive industry were 40.4 days. The average inventory turnover rate of Lifan Technology is 4.0134, while the average inventory turnover rate of the automotive industry in the past five years is 8.26. Furthermore, by comparing the data, Lifan Technology has longer inventory turnover days and weaker product liquidity; the company's inventory turnover rate is lower compared to the average of the automotive industry, which indicates that there are problems of poor operation and poor market at the enterprise.

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(2) Analysis of accounts receivable

Table 3. Accounts receivable of Lifan Technology

Years (year)	2016	2017	2018	2019	2020
Accounts receivable (billions)	24.83	29.48	25.37	15.32	5.299
Prime operating revenue (billions)	110.5	126.0	110.1	74.5	36.37
Accounts receivable / Prime operating revenue	22.47%	23.40%	23.04%	20.56%	15.6%
Days sales outstanding (days)	130.1	111.9	113.0	120.6	138.5
Accounts receivable turnover (times)	2.768	3.216	3.187	2.986	2.599
Asset impairment loss (RMB)	____	____	-768.4 million	-1,904 million	-3,608 million

From the data in Table 3, it can be seen that the average accounts receivable turnover rate of Lifan Technology is at 2.9512 times, and the average accounts receivable turnover rate of the automotive industry is 9.25 (taking 2016 as an example). Lifan Technology's accounts receivable turnover rate is much lower than the industry average, indicating that the enterprise's slow collection rate, long average collection period, and high risk of bad debt loss are unfavorable to the enterprise's normal production and operation.

3.3 Financial analysis

3.3.1 Solvency analysis

(1) Short-term solvency analysis

Table 4. Lifan Technology short-term solvency indicators

Years	2016	2017	2018	2019	2020
Current assets (billions)	159.1	159.2	134.3	66.64	73.78
Current liabilities (billions)	196.3	197.4	187.8	148.9	23.86
Money capital (billions)	73.15	66.98	54.03	20.39	24.62
Inventory (billions)	25.33	29.00	16.80	10.11	26.95
Current ratio	0.811	0.807	0.715	0.447	3.092
Quick ratio	0.682	0.660	0.626	0.380	1.963
Cash ratio	0.373	0.339	0.288	0.137	1.032
Cash flow ratio	−0.046	−0.017	0.003	−0.076	0.098

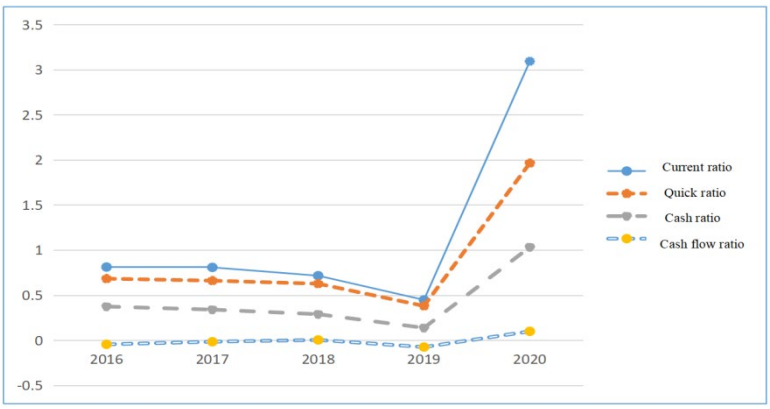

Figure 3. Short-term solvency indicators line graph

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As can be seen from table 4 and figure 3, the changes in each of Lifan Technology's short-term solvency indicators from 2016 to 2019 are slight, while huge fluctuations occurred in 2020. In production-based industries, a current ratio of 2 is usually considered the most reasonable. The reason why Lifan Technology's current ratio averages 0.8 is that the enterprise has a relatively large amount of accounts receivable, inventory turnover days are three times longer than its peers, and the size of current liabilities is larger than current assets. Moreover, since the enterprise's accounts receivable turnover is much lower than the automotive industry average, and the asset impairment loss is higher, the quick ratio is 0.6 on average lower than the average value of 1.

(2) Long-term solvency analysis

Table 5. Lifan Technology long-term solvency indicators

Years	2016	2017	2018	2019	2020
Total liabilities (billions)	225.5	227.3	203.5	165.7	67.29
Total assets (billions)	293.8	300.2	279.0	194.1	179.4
Total profit (billions)	1.059	1.759	3.135	-54.25	0.7441
Interest on debt (billions)	1.495	1.305	1.159	1.774	------
Net operating cash (billions)	-8.935	-3.283	0.5695	-11.31	2.346
Asset-liability ratio	0.7674	0.7572	0.7294	0.8540	0.3750
Equity ratio	3.349	3.161	2.731	6.039	0.688
Number of times interest earned	1.708	2.348	3.705	-29.58	-----
Cash debt coverage ratio	-0.040	-0.014	0.0028	-0.068	0.0348

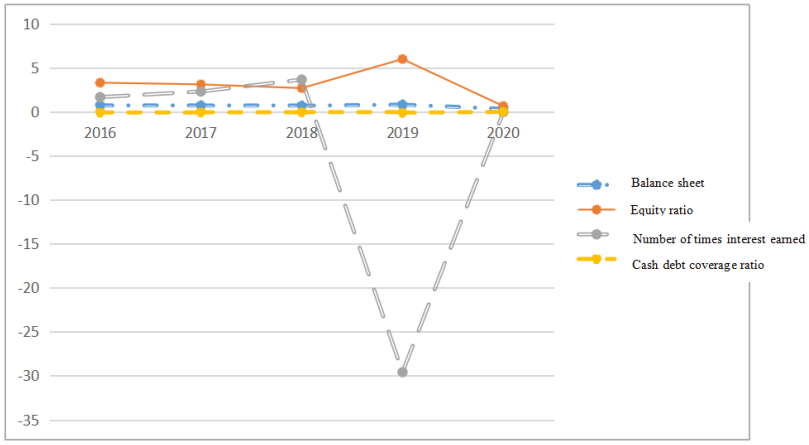

Figure 4. Long-term solvency indicators line graph

As can be seen from the line graph in figure 4, the long-term solvency indicators changed slightly from 2016 to 2018, and the indicators changed drastically in 2019. Lifan Technology's asset-liability ratio remains at 76% on average, and the asset-liability ratio of the automotive manufacturing industry is 59.13% (taking 2018 as an example). The enterprise's debt ratio level is higher than that of its peers, the enterprise's ability to repay debt is decreasing, and the financial risk is relatively high, which may bring the problem of insufficient cash flow and a broken capital chain not being able to repay debt in time.

As far as the number of times interest earned is concerned, the number of times interest earned from 2016 to 2018 basically remained at the level of 2.2, and the data situation for 2019 is not optimistic. Internationally, this indicator is usually considered more appropriate to be 3. Additionally, when the number of times interest earned is negative, it is not very meaningful. Moreover, Lifan Technology does not have sufficient sources of funds to repay the interest on its debt, and its solvency is declining, facing a great risk of bankruptcy.(As shown in table 5)

In summary, Lifan Technology's short-term solvency indicators have not met expectations, and its long-term solvency indicators are even weaker. Lifan Technology inevitably suffers from some financial risks. Furthermore, how to weigh business development and risk avoidance, and how to improve the

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ability of management, is an important issue Lifan Technology should consider at present.

3.3.2 Operating capacity analysis

(1) Inventory turnover ratio and accounts receivable turnover ratio

Table 6. Lifan Technology operating capacity indicators

Years	2016	2017	2018	2019	2020
Sales revenue (billions)	68.73	94.81	80.85	45.75	13.77
Accounts receivable (billions)	24.83	29.48	25.37	15.32	5.299
Inventory (billions)	25.33	29.00	16.80	10.11	26.95
Inventory turnover rate (times)	4.187	4.035	4.372	5.703	1.770
Accounts receivable turnover rate (times)	2.768	3.216	3.187	2.986	2.599

From the various data in table 6, it can be seen that the average inventory turnover rate of Lifan Technology is 4.0134 times, and the average inventory turnover level in the automotive industry in recent years is at 8.26 times. Through the analysis of inventory turnover speed, the enterprise's inventory turnover rate is lower than the average level. The enterprise shows slow inventory turnover, weak sales ability, and poor business performance.

Moreover, Lifan Technology's accounts receivable turnover rate is 2.9512 times on average, and the average level of accounts receivable turnover in the automotive industry is 9.25 (taking 2016 as an example). It is generally believed that a higher level of accounts receivable turnover is better, and Lifan Technology's data is far lower than the average level, which also reflects some extent the weak liquidity of assets and the risk of bad debt provision, which further affects the level of profit and future development of the enterprise.

(2) Current asset turnover ratio and total asset turnover ratio

Table 7. Lifan Technology operating capacity indicators

Years	2016	2017	2018	2019	2020
Current assets (billions)	159.1	159.2	134.3	66.64	73.78
Total assets (billions)	293.8	300.2	279.0	194.1	179.4
Total assets turnover (times)	0.404	0.424	0.380	0.315	0.195
Current asset turnover (times)	0.432	0.596	0.602	0.687	0.187

As shown in table 7, current asset turnover is an essential indicator to evaluate the utilization rate of an enterprise's assets. Generally, the greater the current asset turnover, the better it is. Lifan Technology's current asset turnover is roughly at the level of 0.57, and the average level of current asset turnover in the automotive industry is 1.81 (taking 2016 as an example), which indicates the slow turnover of the enterprise's current assets and low utilization efficiency. The total asset turnover is generally considered to be between 1 and 2 at a normal enterprise operation level. However, Lifan Technology's total asset turnover level is maintained at 0.4. The low total asset turnover indicates that the enterprise's sales capacity is weak and the efficiency of asset investment is poor.

In summary, the four operating capacity indicators of Lifan Technology are not qualified. The problems of Lifan Technology's operation are more prominent, which need to strengthen internal management, make full use of capital, and deal with the problem of inventory backlog and accounts receivable accounting for a relatively large amount.

3.3.3 Profitability analysis

This part evaluates the profitability of Lifan Technology with the help of gross profit margin, net profit margin, return on total assets, return on equity, and other data. (As shown in table 8)

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Table 8. Lifan Technology profitability indicators

Years	2016	2017	2018	2019	2020
Operating income (billions)	110.5	126.0	110.1	74.50	36.37
Operating costs (billions)	98.15	109.6	100.1	76.75	32.79
Net profit (billions)	0.9197	1.556	2.469	-46.92	0.5468
Gross profit margin (%)	11.15	13.00	9.08	-3.02	9.84
Net profit margin (%)	0.83	1.23	2.24	-62.98	1.50
Return on equity (%)	1.22	2.48	3.46	-91.61	1.88
Return on total assets (%)	0.34	0.52	0.85	-19.83	0.29

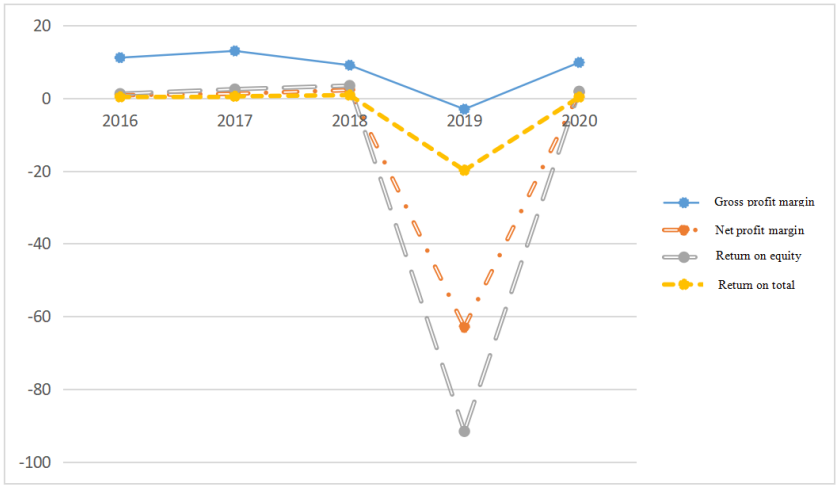

Figure 5. Lifan Technology profitability indicators line graph

As shown in figure 5, Lifan Technology's operating income has been declining in recent years. The average operating income of the automotive industry is 53.71 billion, while Lifan Technology is only 2.559 billion, which is at a lagging level. The operating costs are very close to the operating income, as Lifan Technology's strategy in recent years has been to continuously increase the enterprise's management and financial expenses, and the total costs are huge. The enterprise's net profit is about 150 million, and the net profit for 2019 is even -4.692 billion, while the average net profit of the automotive industry is at 2.025 billion, a very big gap, which sends the message that Lifan Technology's profit is declining.

Under DuPont's comparative analysis[4], the return on equity for the automotive industry is 8.76% on average from 2018 to 2020. However, Lifan's return on equity is -29.16%, and the net profit in 2019 pulls down the return. This indicator also reflects the low level of return on shareholders' equity and the low efficiency of using their own capital, which is a more serious problem. Additionally, the return on total assets is not very good, and the investment rate of assets is low.

3.4 Prospect analysis

Since 2016, Lifan Technology's performance has declined markedly after the enterprise's new energy vehicle subsidies were withdrawn, and it was involved in "subsidy fraud". According to the "Supplementary Announcement on the Company's Accumulated Litigation (Arbitration) Matters" released by Lifan Technology in June 2020, Lifan Technology has been involved in 392 lawsuits (arbitration), involving an amount of RMB 2.906 billion, and undisclosed lawsuits (arbitration) amounting to RMB 268 million in the last 12 months. Moreover, to save the enterprise's declining performance, Lifan Technology has decided to lower the automotive industry segment and refocus its development eyes on the motorcycle business as a way to lead the enterprise out of the current predicament.

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Currently, the state has given a lot of policy support for developing a new energy industry. The domestic market for new energy vehicles is very large, the competition is becoming more and more diversified, the product supply level continues to rise, the infrastructure is also improving, the whole society's consumption enthusiasm is rising, and the irreversible trend of new energy is basically formed. Therefore, Lifan Technology can strengthen the core technology and actively build a green industry chain integrating Internet+, smart cars, and new energy for the new energy development trend. This is in line with the development trend of the times and may become a good opportunity for Lifan Technology's development.

4. Conclusion and suggestions

4.1 Automotive industry companies can increase the research and development of new energy vehicles and continue to promote the development of new energy vehicles

Lifan Technology's development strategy should be in line with the world's development trends, cultivate the ability of independent innovation, and enhance market competitiveness. Moreover, the enterprise can introduce new talents, improve the degree of training and welfare of talents, and motivate their innovation ability.

4.2 Automotive industry companies can change their development ideas and learn from advanced marketing models at home and abroad

Lifan Technology's sales performance is poor, with numerous inventories and falling profits. Therefore, the enterprise should learn the management model and sales model from the industry leader, standardize the accounting policy and increase the objective and fair cases without missing.

4.3 Automotive industry companies can adjust the fund utilization structure and conduct mergers and reorganizations as necessary

The bankruptcy part is prioritized for liquidation and reasonable use. When the development of the enterprise is not good, it is necessary to have a sense of crisis, to unite multiple businesses, and to join together in troubled times to obtain warmth and win-win cooperation. Simultaneously, the internal financial evaluation index should be transparent.

4.4 Automotive industry companies can make reasonable plans to manage their asset allocation

The enterprise can plan the annual planning and prospect setting, reasonably customize the target from small to big, bigger and stronger, clear its own market positioning, and make appropriate transformations when necessary.

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