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Research on the Impact of R&D and Innovation Capability of "Specialized, Specialized and New" Enterprises on Enterprise Performance in Liaoning Province—A Case Study of Demax

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Abstract: This paper focuses on the "specialized, special and new" enterprises in Liaoning Province, and takes Demax as a typical case to carry out an in-depth analysis, focusing on the impact of R&D and innovation capabilities on enterprise performance. In the research process, we collected a wide range of relevant data from Demax, and comprehensively used quantitative and qualitative analysis methods to analyze the internal relationship between key innovation elements such as R&D investment, R&D scale, R&D results, and the financial performance of the enterprise. The study finds that the R&D and innovation capabilities of Demax have a significant positive effect on enterprise performance in the long run. Specifically, the continuous increase in R&D investment has effectively promoted product upgrading, expanded market space, and improved the profitability and market competitiveness of enterprises. This research conclusion provides a valuable practical reference and a solid theoretical basis for "specialized, special and new" enterprises in Liaoning Province to improve their R&D and innovation capabilities and optimize innovation strategies to achieve performance growth.

1. Introduction

Independent R&D and innovation of enterprises is the key path for enterprises to break through technical barriers and build core competitiveness under the background of the current scientific and technological revolution. our country From 2021 to 2025, the central government will arrange a total of more than 10 billion yuan of rewards and subsidies, focusing on supporting more than 1,000 national-level specialized and new "little giant" enterprises in three batches, and promoting the upgrading of small and medium-sized enterprises to specialization, refinement, characteristics and novelty through measures such as gradient cultivation, fiscal and tax incentives, and industry-university-research collaboration[1]. As an old industrial base in Northeast China, Liaoning Province actively responds to the national strategy, cultivates a number of provincial-level "specialized, refined, and new" enterprises and national-level "little giant" enterprises, forming a

gradient cultivation system of "innovative small and medium-sized enterprises-provincial-level specialized, specialized, and new-national-level little giant-individual champions", injecting new momentum into the high-quality development of the regional economy[2].

2. Theoretical basis

2.1. Definition of R&D innovation

R&D and innovation are systematic research and development activities carried out by enterprises to obtain new technologies, new products or new processes. It covers the process from exploratory investment in the research stage to the transformation of results into applicable assets in the development stage, and the relevant expenditures need to be reasonably recognized, measured and disclosed in accordance with accounting standards[4].

2.2. The impact path of R&D innovation on performance

Through R&D and innovation, enterprises can develop new technologies and products, enhance product competitiveness, meet the diversified needs of the market, directly drive sales growth, and improve market performance. Secondly, innovation can optimize production processes, reduce production costs, improve production efficiency, and enhance cost performance. Furthermore, continuous innovation helps to establish a good image of the enterprise, attract talents and investment, enhance brand value, and indirectly promote the overall performance of the enterprise. In short, R&D innovation exerts efforts in products, costs, brands and other aspects to form a strong driving force for enterprise performance[7].

3. Case studies

3.1. Enterprise introduction

Dalian Demax Precision Technology Co., Ltd. was established in November 2001 and is headquartered in Lushun Economic and Technological Development Zone, Dalian City, Liaoning Province, and was listed on the Shenzhen Stock Exchange in June 2021. The company focuses on the research and development, production and sales of precision shafts and precision cutting parts, and its products are widely used in automotive power systems, body chassis systems, window systems and other fields, and are exported to North America, Europe, Japan and other countries and regions. As a national specialized and new "little giant" enterprise, Demax has outstanding technical strength and has won the titles of "National Service-oriented Manufacturing Demonstration Enterprise", "National Intellectual Property Demonstration Enterprise" and "Liaoning Intelligent Factory".

The company takes R&D innovation as the core driving force, masters a number of core process technologies, and introduces the "amoeba business model" to optimize management efficiency. In terms of digital transformation, Demax accelerates the construction of smart factories, realizes the digitalization of production processes and transparent management through the integration of ERP, MES, WMS and other systems, and uses Internet of Things technology to improve the level of equipment automation, significantly improving production efficiency, and fully complying with the national "intelligent manufacturing" strategic orientation.

3.2. Analysis of R&D and innovation capabilities

Table 1 R&D innovation evaluation indicators

project year	2020	2021	2022	2023	2024
Research and Development Expenses (10,000)	2005	2712	2855	2977	2969
Development Expenditures (10,000)	—	202	369	369	—
Intangible Assets (10,000)	1502	1550	1500	1450	1850
Number of Patents (count)	15	25	27	13	8

Data source: Company annual report

According to the data in Table 1, it can be known from 2020 to 2024, Demax has shown a positive and steady trend in R&D investment. R&D expenses in 2020 were 20.05 million yuan, and then increased year by year, increasing to 29.77 million yuan in 2023, and although R&D expenses fell slightly to 29.69 million yuan in 2024, the overall level remained high. This shows that the company attaches great importance to R&D and innovation, continues to inject impetus into technology upgrading and product iteration, and is committed to maintaining an advantageous position in market competition through R&D investment. In terms of development expenditure, it was 2.02 million yuan in 2021, increased to 3.69 million yuan in 2022, and maintained this level in 2023, and the phased growth of development expenditure showed that the company focused on the development of new products and technologies in a specific period, and concentrated R&D resources in potential projects to promote the transformation of technological achievements into actual productivity[3].

Intangible assets fell from 15.02 million yuan in 2020 to 15 million yuan in 2021, fell back to 15 million yuan in 2022, further declined in 2023, and jumped sharply to 18.5 million yuan in 2024. This fluctuation reflects the company's accumulation of R&D investment into intangible assets in the process of technology research and development, as well as changes in asset value caused by factors such as technology updates and asset amortization. The significant growth of intangible assets in 2024 may be due to the concentrated manifestation of R&D achievements, such as the successful acquisition or appreciation of patented technologies and proprietary technologies. The early growth of the number of patents reflects the company's positive achievements in R&D innovation, and the innovation ability of the R&D team has been effectively released. However, the decrease in the number of patents in the later stage does not necessarily mean a decline in R&D capabilities, which may be due to the adjustment of the company's R&D focus, from the pursuit of the number of patents to the focus on patent quality and practical application value, and more energy is invested in the in-depth research and development of core technologies and the transformation of achievements, so as to enhance the market competitiveness of products and the long-term benefits of enterprises[5].

3.3. Impact analysis on financial performance

(1) Profitability analysis

Table 2 Profitability analysis indicators

project year	2020	2021	2022	2023	2024
Net profit margin on sales	11.43%	9.65%	8.14%	9.65%	11.43%
Net profit margin on total assets	7.59%	6.52%	5.36%	5.53%	5.30%
Gross margin on sales	28.31%	23.37%	21.53%	21.98%	20.77%

Data source: Company annual report

According to the data in Table 2, the trend of net profit margin falling first and then rising is highly consistent with the transformation rhythm of R&D investment. From 2020 to 2022, as R&D expenses increased from 20.05 million yuan to 28.55 million yuan and the net profit margin of sales decreased from 11.43% to 8.14%, the short-term cost pressure of R&D investment at this stage may not have been fully converted into income, and the impact of the increase in R&D expenditure has led to a contraction of profit margins. After 2023, R&D expenses will remain high, patented technologies will be gradually implemented, improving production efficiency and promoting the net profit margin of sales to 11.43% in 2024, confirming the lagged return effect of R&D investment.

The overall net asset profit margin shows a downward trend, reflecting the balance between R&D investment and asset utilization efficiency. Although intangible assets will increase to 18.5 million yuan in 2024, the capitalization of early development expenditures may push up the scale of assets, and the intensified market competition has led to a continuous decline in gross profit margin, making asset turnover efficiency not improved simultaneously. However, the net profit margin on total assets in 2023 increased slightly by 0.17 percentage points compared with 2022, indicating that the application of core technologies has begun to hedge the pressure of some asset expansion.

The continuous decline in gross profit margin exposes the limitations of R&D innovation in dealing with industry competition. Although the R&D team has overcome a number of technical problems, the dual pressure of price competition and rising raw material costs in the auto parts industry has led to an average annual decline of 1.5 percentage points in gross profit margin. However, it is worth noting that the gross profit margin in 2023 stopped falling slightly in the peak year of R&D expenses, indicating that technology iteration is still slowing down the deterioration of profitability and gaining room for adjustment for enterprises[6].

(2) Operational capability analysis

Table 3 Operational capacity analysis indicators

project year	2020	2021	2022	2023	2024
Total Asset Turnover	0.66	0.68	0.66	0.67	0.68
Accounts receivable turnover ratio	3.54	3.81	3.68	3.33	3.51
Inventory turnover	4.39	4.19	4.09	4.39	4.51

Data source: Company annual report

It can be seen from the data in Table 3, from 2020 to 2024, the total asset turnover ratio will be stable in the range of 0.66-0.68, echoing the transformation rhythm of R&D investment. Although the cumulative development expenditure from 2021 to 2023 is 9.4 million yuan, the automated production line built by the R&D team has improved the capacity utilization rate, and the product competitiveness brought by patented technology has enhanced market penetration, so that the asset expansion has not dragged down the overall turnover efficiency. This stability is positively linked to the continuous improvement of inventory turnover, which proves that R&D innovation has simultaneously improved asset utilization efficiency and inventory turnover speed by optimizing production processes.

The fluctuation in the receivables turnover ratio reflects the R&D-driven adjustment of market strategies. In 2021, when the R&D results were first revealed, high value-added products quickly occupied the market, and the efficiency of capital recovery was improved; Subsequently, in order to promote new technology products, the appropriate relaxation of customer account period led to a short-term decline in the turnover rate; In 2024, as intangible assets increase to 18.5 million yuan, the customer stickiness formed by technical barriers will be enhanced, and the turnover efficiency of accounts receivable will gradually recover. This fluctuation is matched with the stability of the total asset turnover rate and the increase of the inventory turnover rate, which shows the regulating role of R&D innovation in balancing market expansion and operational efficiency, which not only

guarantees the basic disk of asset turnover through technical advantages, but also promotes the optimization of inventory turnover with the help of product iteration, and at the same time forms a flexible space in customer relationship management, and finally realizes the overall coordinated development of operational capabilities[8].

(3) Development ability analysis

Table 4 Analysis indicators of development capacity

project year	2020	2021	2022	2023	2024
Growth rate of operating income	8.48%	15.38%	12.49%	12.24%	6.77%
Net profit growth rate	45.78%	-2.64%	-5.05%	13.71%	1.18%

Data source: Company annual report

It can be seen from the data in Table 4, in 2021, the growth rate of operating income reached a peak of 15.38%, which is closely related to the technological achievements transformed by R&D investment in the early stage, and the new development expenditure of 2.02 million yuan in that year promoted product iteration, the number of patents increased from 15 to 25, and high value-added products helped market expansion. However, the slowdown in revenue growth after 2022 reflects the weakening of the short-term pull effect of R&D and innovation under the intensification of competition in the industry, and the need to continue to break through technical bottlenecks.

The fluctuation of net profit growth highlights the pace of efficiency transformation of R&D investment. The high net profit growth of 45.78% in 2020 depends on the accumulation of technology in the early stage, and the negative growth of net profit in 2021-2022 is directly related to the cost pressure caused by the continuous increase in R&D expenses. In 2023, the net profit growth rate will rebound to 13.71%, thanks to the implementation of core technologies conquered by the R&D team. The growth rate will drop to 1.18% in 2024, indicating that the market increment space for current R&D achievements is narrowing, and a new growth path needs to be opened through higher-quality innovation[9].

(4) Solvency analysis

Table 5 Solvency analysis indicators

project year	2020	2021	2022	2023	2024
Liquidity ratio	0.88	1.56	1.48	1.44	1.47
Debt-to-asset ratio	46.34%	27.96%	33.35%	34.51%	35.64%

Data source: Company annual report

It can be seen from the data in Table 5, in 2021, the current ratio jumped from 0.88 to 1.56, the asset-liability ratio decreased from 46.34% to 27.96%, and the solvency was significantly improved, which was related to the improvement of the operation brought about by the transformation of R&D achievements in that year, while the development expenditure of 2.02 million yuan did not excessively occupy the working capital, providing a buffer for short-term debt repayment.

After 2022, the asset-liability ratio has rebounded year by year, and the current ratio has remained in the range of 1.44-1.48, reflecting the pressure on debt repayment ability due to the capital demand for R&D investment. R&D expenses continue to remain above 28 million yuan, and the total development expenditure from 2022 to 2023 will be 7.38 million yuan, which may be supported by debt financing, resulting in a slight increase in long-term debt repayment pressure. However, the intangible assets and technical barriers formed by R&D have enhanced the asset quality, and the current ratio has not declined sharply with the increase in the asset-liability ratio, indicating that R&D innovation has partially hedged the debt repayment pressure by improving the

liquidity of assets[10].

4. Conclusions

On the whole, R&D and innovation, as the core driving factor of Demax's performance fluctuations, has a significant multi-dimensional and phased impact. In terms of profitability, the short-term cost pressure of R&D investment is hedged in the long term through the transformation of technological achievements; At the operational level, R&D-driven automation significantly improved inventory turnover efficiency and offset the negative impact of asset expansion on turnover ratio. In terms of development capabilities, the phased release of R&D results will drive revenue growth, but the speed of technology iteration needs to match market demand to solve the sluggish growth in the later stage; Solvency is reflected in the balance between the positive improvement of asset quality by R&D investment and the increase of liabilities caused by capital occupation.

In the future, R&D and innovation should focus on three directions: first, strengthen the quality orientation of patents and concentrate resources to break through the technical barriers of core components; The second is to build a "R&D-market" synergy mechanism to promote the precise docking of innovation achievements and customer needs; The third is to optimize the investment structure, balance short-term cost control and long-term technology precipitation, and improve performance stability.

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