

Research on AHP-based Entrepreneurial Oriented Evaluation Model Taking Manufacturing Enterprises as an Example

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Abstract—As the foundation of China's real economy, manufacturing industry is an important promoter of China's industrial transformation and upgrading. As market uncertainty increases, how to quickly respond to market changes and maintain a competitive advantage is a concern for manufacturing companies. Entrepreneurship orientation is an important strategy for enterprises to maintain vitality and sustain healthy development, which is of great significance to the development of manufacturing enterprises. This paper sorts out 21 specific factors in 5 categories that affect the entrepreneurial orientation of the manufacturing industry, and constructs an evaluation model of the entrepreneurial orientation of the manufacturing enterprises based on AHP, which provides directions for the transformation and upgrading of the manufacturing industry.

1 INTRODUCTION

Facing an international environment full of competition and challenges, it is imperative for China's manufacturing industry to strengthen the driving force for innovation and realize resource renewal. More research shows that the promotion effect of entrepreneurial orientation on organizational growth performance is more prominent in manufacturing companies. Therefore, the establishment of entrepreneurship-oriented evaluation model is of great significance to the transformation and upgrading of China's manufacturing enterprises. The academic research on entrepreneurial orientation is mainly divided into two aspects: the influence of entrepreneurial orientation and the relationship between entrepreneurial orientation and corporate performance. Miller (1983) divides entrepreneurial orientation into three dimensions: innovation, first mover and risk taking[1]. Covin and Slevin created a three-dimensional nine-term entrepreneurial vector table has been widely used in the research of later scholars[2]. However, most researchers regard entrepreneurial orientation as a holistic concept, but they ignore the special contribution of each dimension of entrepreneurial orientation to the growth performance of the enterprise; and for the measurement of entrepreneurial orientation, the cumulative scale is mostly used, which is difficult to ensure the accuracy of the measurement. In summary, this article takes manufacturing enterprises as an example to deeply study the impact of various dimensions of entrepreneurial orientation on its performance, build an entrepreneurial orientation evaluation model, and provide reference for policy formulation and enterprise transformation and upgrading.

2 AHP-based evaluation model for entrepreneurial orientation of manufacturing enterprises

2.1 Entrepreneurship-oriented five-dimensional reflection model

This model is based on the "Entrepreneurial Orientation Overall Strategy View" proposed by Covin and Slevin (1991), which regards entrepreneurial orientation as a high-level latent variable, which changes through changes in its key dimensions. The use of a five-dimensional reflection model is conducive to improving measurement confidence and making it easier to reveal the mechanism of entrepreneurial orientation on corporate growth performance.

Table1. Entrepreneurial orientation-enterprise growth performance model

<i>Latent variable</i>	<i>Independent variable</i>	<i>Dependent variable</i>
Entrepreneurial orientation	Innovative	Growth performance
	Proactive	
	Risk-taking	
	Competitive	
	Autonomy	

2.2 Construction of evaluation system for entrepreneurial orientation of manufacturing enterprises

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AHP is a decision method combining quantitative and qualitative analysis proposed by T.L. Saaty, an operations research professor, in the 1970s. It uses the 1-9 scale to objectively quantify the subjective evaluation of people, and obtains the weight through the comparison between the indicators, thereby ensuring the accuracy and objectivity of the model. This article decomposes the five dimensions of entrepreneurial orientation into 15 specific impact indicators by consulting a large number of relevant materials, interviewing relevant experts, and combining the characteristics of the manufacturing industry.

Table 2. Evaluation system for entrepreneurial orientation of manufacturing enterprises

Target layer	Criterion layer	Scheme layer
Entrepreneurial orientation A	Innovative B1	R & D input intensity C1
		Number of patents C2
		Proportion of R & D personnel C3
	Proactive B2	Policy grasping ability C4
		Customer satisfaction C5
		Market share C6
	Risk-taking B3	Entrepreneurship C7
		High financial leverage risk taking ability C8
		Management Incentive C9
	Competitive B4	Market share C10
		Willingness to develop high value-added products C11
		Mergers and Acquisitions C12
	Autonomy B5	Organization flatness degree C13
		Incentive internal innovation policy intensity C14
		Whether employees hold shares C15

2.3 Explanation of the Evaluation System of Entrepreneurial Orientation for Manufacturing Enterprises

2.3.1 Innovative:

The demand for market innovation stimulates enterprises to generate innovation consciousness. Under the guidance of innovation consciousness, enterprises create new products and new services by changing innovation methods and increasing innovation investment, so as to meet market demand and obtain innovation profits. In the process of independent innovation of enterprises, innovation consciousness is usually reflected in the enterprise's innovation culture and entrepreneurs' willingness to innovate. Manufacturing companies will strengthen their innovation capabilities by increasing R & D investment and introducing high-level scientific and technological talents. The number of invention patents, the

success rate of R & D conversion, and the market share of new products can measure the innovation output capacity of an enterprise[3].

2.3.2 Proactive:

Proactiveness means that the company has a forward-looking strategic vision and is the first to introduce new products and technologies or enter new markets[4]. Proactive companies often focus on analyzing and predicting customer needs, tapping customers' pain points and itching points, and conducting demand-oriented innovation. On the other hand, by paying close attention to the frontiers of policy and technology, they can grasp the pulse of the times and accumulate scarce resources[5]. Relevant research shows that market share is still an important indicator to measure the initiative of enterprises[6].

2.3.3 Risk-taking:

High-risk commitment means that the company is more inclined to high-risk and high-return business activities, and has a higher tolerance for investment failure. Based on the perspective of internal governance, entrepreneurs' courageousness is an important influencing factor. For the entrusted agent, the agency problem can be alleviated through equity incentives, promotion incentives, and salary incentives to enhance the enterprise's ability to bear risks. The involvement in unknown fields often faces huge uncertainties, requiring companies to have good cash flow management capabilities, so a higher bank credit rating, a higher capital turnover rate and a reasonable asset-liability ratio will reflect the company's higher Risk-taking capacity

2.3.4 Competitive:

In a dynamic and complex market environment, competition among enterprises is becoming increasingly fierce. Enterprises can seize market share through strategic layout such as cost leadership and differentiation, thereby gaining market initiative and high returns. Relevant research shows that companies with high competitive enthusiasm often adopt non-traditional "overwhelming" strategies, giving them an absolute market advantage.

2.3.5 Autonomy:

Within the company, the degree of expression of employees' ideas, the realization space of team goals, and whether the organization adopts flexible management are important measures of company autonomy. In the era of economic globalization and the interconnection of all things, a flat and flexible form of organizational management means the improvement of organizational resilience and flexibility, the improvement of the quality of management personnel and the multiplication of enterprise efficiency.

2.4 Construct the judgment matrix

In this study, a questionnaire was distributed to 15 research experts, using a 1-9 scale scoring table. After multiple rounds of anonymous scoring and discussion, the expert scoring average was used to construct a judgment matrix.

Table3. Seaty1-9 scaling method

Scaling	Meaning
1	It means that the two elements have the same importance
3	The former is slightly more important than the latter
5	The former is obviously more important than the latter
7	The former is strongly more important than the latter
9	The former is extremely more important than the latter
2, 4, 6, 8	Represents the median value of the above adjacent judgment

Table4. Criteria layer-target layer A judgment matrix

A	B1	B2	B3	B4	B5
B1	1	7.9237	5.4820	8.5793	3.5889
B2	0.1262	1	3.1396	2.0547	3.5954
B3	0.1824	0.3185	1	1.0041	0.9436
B4	0.1166	0.4867	0.9960	1	1.9078
B5	0.2786	0.2781	1.0598	0.5242	1

Table5. Scheme layer-criteria layer B2 judgment matrix

B1	C1	C2	C3
C1	1	5	0.3333
C2	0.2	1	0.1429
C3	3	7	1

Table6. Scheme layer-criteria layer B2 judgment matrix

B2	C4	C5	C6
C4	1	3.0138	3.9898
C5	0.3318	1	0.5153
C6	0.2506	1.9405	1

Table7. Scheme layer-criteria layer B3 judgment matrix

B3	C7	C8	C9
C7	1	6.0323	8.5780
C8	0.1658	1	3.5694
C9	0.1166	0.2802	1

Table8. Scheme layer-criteria layer B4 judgment matrix

B4	C10	C11	C12
C10	1	3.7304	6.200
C11	0.2681	1	4.3404

C12	0.1613	0.2304	1
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Table9. Scheme layer-criteria layer B5 judgment matrix

B5	C13	C14	C15
C13	1	4.7890	8.7700
C14	0.2088	1	4.6352
C15	0.1140	0.2157	1

2.5 Hierarchical total ordering and consistency check

The weight vectors of the target layers B1, B2, B3, B4 and B5 are: $W^T=(w_1, w_2, w_3, w_4, w_5)=(0.5529, 0.1694, 0.0837, 0.1136, 0.0840)$. This study calculates the total ranking results of the hierarchy and performs a consistency check: $CR=\frac{CI}{RI} \approx 0.05379 < 0.1$, sample data passed consistency test.

Available evaluation index weights are shown in Table 10.

Table10. Weight of evaluation indicators for entrepreneurial orientation of manufacturing companies

First-level indicators	Weights	Secondary indicators	Global weight	Local weight
Innovative B1	0.5650	C1	0.1598	0.2828
		C2	0.0417	0.0738
		C3	0.3635	0.6434
Proactive B2	0.1850	C4	0.1148	0.6209
		C5	0.0291	0.1571
		C6	0.0411	0.2220
Risk-taking B3	0.0773	C7	0.0581	0.7524
		C8	0.0138	0.1792
		C9	0.0053	0.0684
Competitive B4	0.0902	C10	0.0598	0.6629
		C11	0.0230	0.2551
		C12	0.0074	0.0820
Autonomy B5	0.0825	C13	0.0595	0.7208
		C14	0.0178	0.2154
		C15	0.0053	0.0638

3 Results and analysis

According to Table 9, the weights of the various dimensions of manufacturing enterprise entrepreneurship orientation on growth performance are innovation (0.5650) (denoting the weight, the same below), roactive, (0.1850) competitive (0.0902), autonomy (0.0825), risk-taking (0.0773).

With the integration of a new generation of information technology and manufacturing, technological innovation has become the core driving force for the upgrading of the manufacturing industry, a major technological breakthrough will improve quality and efficiency and expand profitability. Successful

technological innovation comes from solving social needs. Highly proactive companies often focus on analyzing and predicting customer needs, conducting demand-oriented innovation, and accumulating scarce resources on the basis of grasping policies. In a dynamic and complex market environment, the competition between enterprises is becoming increasingly fierce, responding positively to market competition, and seizing market share through strategic layout such as cost leadership and differentiation to obtain market initiative and high returns. Focus on the first three dimensions will help manufacturing companies achieve higher growth performance.

4 Conclusions and recommendations

4.1 The government

First, the government should improve the intellectual property protection system, promote the transformation of achievements, and improve the independent innovation capabilities of enterprises; second, the government should strengthen the construction of a collaborative innovation system, promote the integration of production, education and research, and promote the optimization and integration of innovation resources; third, the government has increased fiscal and taxation support to release the company's endogenous innovation drive.

4.2 The Enterprise

First, manufacturing companies should increase R & D funding, especially in basic innovation, they must introduce high-level innovative talents and master cutting-edge technological resources; second, companies should pay attention to the policies and market demand to seize market share; third, enterprises should pay attention to industry cooperation, promote the in-depth integration of manufacturing and information industries, and promote industry transformation and upgrading.

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