Evaluating Talent Competitiveness of China's Automotive Industry

Zhao Shijia[1,2], Hao Han[1,2], Liu Zongwei[1,2], Zhao Fuquan[1,2]

1. *Automotive Strategy Research Institute, Tsinghua University*
2. *State Key Laboratory of Automotive Safety and Energy, Tsinghua University*

Abstract: Talent plays an essential part in the automotive industry. It is an urgent need to figure out the status quo of talent competitiveness in China's automotive industry. In this study, an evaluation model with subjective and objective combined weights approach is developed to provide more reasonable estimations. An empirical analysis indicates that although China's automotive industry has witnessed remarkable progress of talent competitiveness in the past ten years, there are still huge gaps between China and countries with strong automotive industries. It is recommended that China should further improve talent competitiveness through joint efforts from the government, enterprises, universities and individuals.

Key words: automobile industry, talent competitiveness, combined weights, contrastive analysis, time-dependent analysis

Introduction

With the implementation of the "Made in China 2025" strategy alongside the "Internet Plus" plan, more efforts will be made to boost the integrated growth and improve the levels and core competition of the automotive industry sector. Talent is not only the main body of implementing such innovation but also the most kernel elements of realizing innovation for the automotive industry[1].

In the automotive industry of China, R&D, manufacturing and follow-up service talents are in short supply throughout the whole industrial chain[2]. Chinese automotive enterprises, service companies, marketing enterprises, universities and technical schools were researched by using the method of questionnaire survey[3,4], furthermore, they analyzed the current situation of talent development in the industry and put forward suggestions in terms of talent growth. A multi-dimensional evaluation model of scientific researcher evaluation was formed in[5]. Though Europe can still be a source of inspiration, companies that are competent to create their own talent management culture would most likely play a leading role in the industry in China[6].

Professor Zhao Fuquan's team at Tsinghua automotive strategy research institute put forward a system of ten evaluation indexes of automotive industry where talent competiveness was listed as an important indicator[7,8]. Based on this, the research is intended to conduct a further systematic research on the quantitative evaluation of talent competitiveness of the automotive industry.

1 Evaluation Model

1.1 Principles of Evaluation Index Selection

Establishing a scientific and reasonable evaluation model for talent competitiveness of the automotive industry is the precondition of objective and fair conclusion. The choice of indicators for analyzing problems plays a pivotal role. On the basis of careful deliberation, the establishment of the evaluation model should follow three principles: representativeness, independence and feasibility.

Principle 1: Representativeness

Evaluation index should be fully able to represent the key elements of talent competitiveness of the automotive industry. Simultaneously, the correlation between indices should be better reduced under the condition of ensuring the comprehensiveness of the index system.

Principle 2: Independence

Index of the evaluation model must be able to clearly express the connotation and relative independence. Various indices in the same level do not contain each other as much as possible, however, different levels of indices should have clear relations of hierarchy.

Principle 3: Feasibility

Evaluation index need to have a stable source of data, and uniform data caliber. The indices that are hard to quantify need to be replaced or transformed to appropriate amendments in the evaluation model.

1.2 Evaluation Model Establishment

After thorough discussion and with the aid of experts and scholars' opinions, talent competitiveness of the automotive industry were integrated and summarized. Finally, three potential evaluation dimensions are determined through the focus group process. The hierarchical structure is shown in Fig-1.

1.3 Subjective and Objective Fusion Evaluation Method

It is often difficult for a decision maker to assign a precise weight to an alternative for the criteria under consideration. The merit of using a combined weights is to assign the relative importance of the criteria by using subjective and objective fusion method instead of only one kind of weight computation method. The
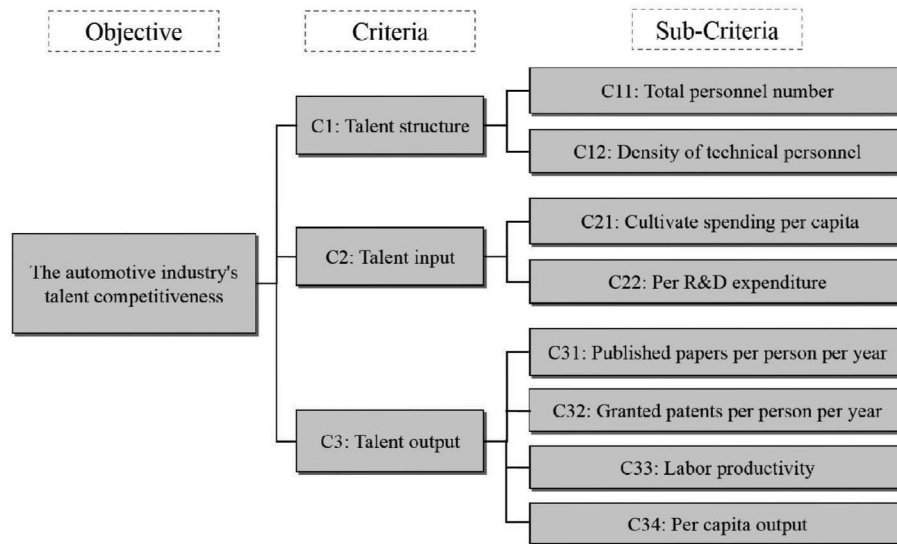
Fig-1   Hierarchical structure of automotive industry talent competitiveness

algorithm procedure for the proposed evaluation approach is organized sequentially into five steps, displayed and explained as follows:

Assume that there are n criteria $C = \{C_j \mid j = 1,2,\cdots,n\}$, m alternative $A = \{A_i \mid i = 1,2,\cdots,m\}$, n weights $W = \{w_j \mid j = 1,2,\cdots,n\}$ and performance ratings $X = \{X_{ij} \mid i = 1,2,\cdots, m, j = 1,2,\cdots,n\}$ in an evaluation framework.

Step 1: Normalize the performance matrix.

$$r_{ij} = x_{ij} \Big/ \sum_{j=1}^{n} x_{ij}, \ \forall i \in [1, m]. \tag{1}$$

Step 2: Determine the subjective and objective combined weights. Suppose the weights obtained by the AHP method and entropy method are w_1^j, w_2^j, $j = 1, 2, \cdots, n$, respectively. Let w_j, $j = 1, 2, \cdots, n$ are the combined weights, according to the Lagrange multiplier method, then

$$w_j = \sqrt{w_1^j w_2^j} \Big/ \sum_{i=1}^{m} \sqrt{w_1^j w_2^j}, j = 1,2,\cdots,n. \tag{2}$$

The weight normalized value is calculated as

$$v_{ij} = w_j r_{ij}, i = 1, 2, \cdots, m, j = 1, 2, \cdots, n. \tag{3}$$

Step 3: Calculate the positive-ideal solution (PIS) and negative-ideal solution (NIS).

$$PIS = A^+ = \{(\max_i v_{ij}(x) \mid j \in J_1), (\min_i v_{ij}(x) \mid j \in J_2) \mid i = 1,2,\cdots,m\}, \tag{4}$$

$$NIS = A^- = \{(\min_i v_{ij}(x) \mid j \in J_1), (\max_i v_{ij}(x) \mid j \in J_2) \mid i = 1,2,\cdots,m\}. \tag{5}$$

Step 4: Determine the distance of each alternative from PIS and NIS.

$$D_i^{\pm} = \sqrt{\sum_{j=1}^{n} [v_{ij}(x) - v_j^{\pm}(x)]^2}, i = 1,2,\cdots,m. \tag{6}$$

Step 5: Obtain the closeness coefficients (relative gap-degree).

$$C_i^+ = D_i^- / (D_i^+ + D_i^-), i = 1, 2, \cdots, m. \tag{7}$$

2   Empirical Analysis

In order to fully reflect the current level of talent competi-

tiveness of China's automotive industry, this research will focus on China's comparison with other countries and its own development through the contrastive analysis (horizontal analysis) and time-dependent analysis (vertical analysis), respectively.

2.1   Contrastive Analysis

To examine talent competitiveness in terms of major automotive countries worldwide and provide better guidance for China's automotive industry, the research sample should be selected with a certain degree of differentiation. After the literature review and expert consultation, evaluation objects are determined as follows: the United States (USA), Germany (G), Japan (J), Korea (K), Italy (I), France (F) and China (C), the United Kingdom (UK). The closeness coefficients of the world's talent competitiveness of the automotive industry are shown in Fig-2 while the relative strengths of different indices for each country are portrayed in Fig-3.

2.2   Time-dependent Analysis

In the dynamic analysis perspective, selecting the time span of 10 years (from 2004 to 2013) to study the development of China's automotive industry from the time dimension. The closeness coefficients of China's talent competitiveness of the automotive industry are displayed in Fig-4 meanwhile the changes of China's indices are depicted in Fig-3.

Concerning China's automotive talent competitiveness, on the one hand, there is an evident gap between China and some foreign countries, especially in the criteria of talent input. Only in the aspect of total personal number does China have great advantage. On the other hand, the ongoing development and improvement of China is dramatic and furthermore, all indices are showing a rising trend.
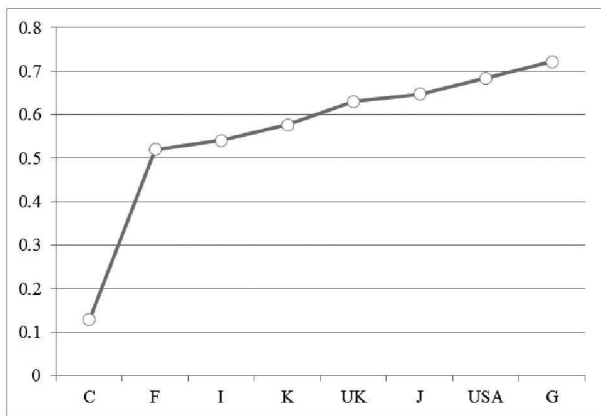
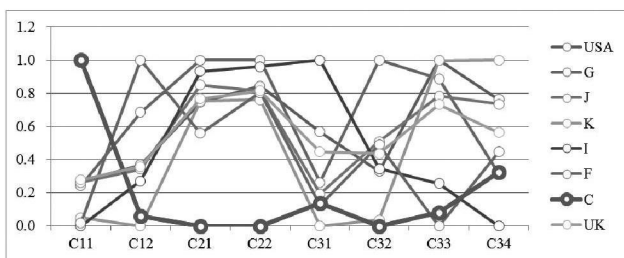**Fig-2   Closeness coefficients of world's automotive industry talent competitiveness**

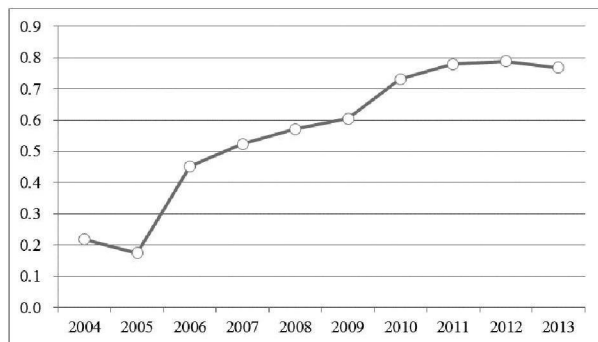**Fig-3   Relative strength of different indices**

Fig-4   Closeness coefficients of China's automotive industry talent competitiveness
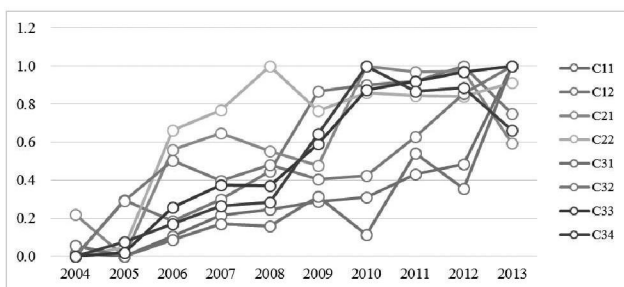

Fig-5   The change of China's indices

3   Policy Implications

China's automotive industry continues to grow stronger, how-ever, it is difficult to achieve synchronization between ascension of the current level of staff and the improvement of competitiveness. For instance, the total personal number of China's automotive industry was 3. 4 million, which increased about 36% to last year. Nevertheless, there were no significant improvements in the talent input and output. In this sense, the per capita indices presented the downward trend. The future competition of automotive industry is the rivalry of talent. Furthermore, the training and development of automotive industry talent will require the concerted efforts of the government, enterprises, universities and technical schools as well as individuals.

3. 1   National Level

With the purpose of avoiding foreign-invested and joint-invested companies excessively occupy for excellent talents, our country should make vigorously develop an automotive talent incentive mechanism that suits for Chinese the reality, and try to guide and comb the disorder competition of talent market systematically and effectively. Under the premise of the proper flow of industrial talent is permitted, helping independent brands to attract, cultivate and retain talent. Advocate to follow the record of formal schooling and professional double-track development, and gradually strengthen vocational education influence under the strategic framework of future high-end manufacturing. Moreover, talent will benefit from large increases input in cultivation and utilization that will bring good innovation environment.

3. 2   Enterprise Level

Enterprise as the main body of management and utilization of talent directly is playing a significant role in the development of talent. Enterprise should combine with China's medium and long-term talent development plan in terms of talent orientation, professional development, motivation mechanism and training system to support talent making great progress[9]. In the aspect of intake, companies should broaden the recruitment way to avoid tend to talent homogeneity by large-scale recruitment of colleges and universities.

3. 3   University and Technical School Level

When universities cultivate talent, they must strengthen the engineering education, weaken scientists' education and pay much more attention to improve students' comprehensive quality. Through the establishment of strategic cooperation project between universities and enterprises to make the second class for the students, so that to shorten the adjustment period for students' first entry. Technical schools should attach great importance to skills and vocational training but also ensure overall level of technical talent output and avoid phenomenon of certification examination.

3. 4   Individual Level

Young staff should moment with a modest inquiring mind and

endeavor to improve the professional skills. On the contrary, qualified staff should have a high degree of team consciousness to guide others and share experience with them. Talents' most important issue is to increase the output while improving the strength. Only the talents who can effective and stable create value for the enterprise and society is the real talent.

4   Conclusion

The aim of this research is to analyze China's automotive industry talent competitiveness through establishing evaluation model. In the performance evaluation for the talent competitiveness include talent structure, talent input, talent output and other eight sub-criteria that generate a final index system. The importance of the dimensions is decided by the proposed subjective and objective combined weights approach. The combined weights reflect both the experience of experts and information of data, hence averting the message loss effectively. Moreover, the contrast analysis demonstrate China has an obvious gap with other countries, especially in the criteria of talent input though China has made remarkable progress through ten years' time-dependent analysis. Particularly the related policy implications for enhancing China automotive industry competitiveness are presented from national, enterprise, university and technical school and individual four levels.

5   Acknowledgment

References

[1]   Zhao F. Q. , Liu Z. W. Strategic judgment on building strong automotive industry in China [J]. Chinese Journal of Automotive Engineering, 2014, 4 (5): 313-318.

[2]   You J. X. Automotive talent present situation and countermeasure research of China [J]. Automotive Industry Research, 2011 (1): 2-8.

[3]   Society of Automotive Engineers of China. Report on the development of Chinese automotive science and technology talents [M]. Beijing Institute of Technology Press, 2012.

[4]   Fu Y. W. Survey of Chinese automotive science and technology talents [J]. Auto Business Review, 2013 (11): 191-200.

[5]   Wu X. Research on the multi-dimensional evaluation model of scientific researcher evaluation [D]. Tsinghua University, 2014.

[6]   Fan T. Corporate talent management in China: A comparative study with Europe [D]. Tsinghua University, 2013.

[7]   Zhao F. Q. Firm strategy is the key to the construction of powerful automotive country [J]. Auto & Safety, 2014 (2): 94-99.

[8]   Zhao F. Q. , Liu Z. W. The direction of construction of powerful automotive country in our nation [J]. Automotive Industry Research, 2014 (10): 4-7.

[9]   Automotive Talents of China [M]. China Auto Talents Society, 2013.