The Construction of Evaluation Indicator System on Urban Talent Development Potential

Yanling Cao
Yatai School of Business Management
Jilin University of Finance and Economics
Changchun, China
caoyanling76@163.com

Hongying Li
Yatai School of Business Management
Jilin University of Finance and Economics
Changchun, China
87944255@qq.com

Abstract—**Urban talent development potential can express the dynamic condition and predict the future development of talents. Through quantifying it, we can grasp the development status of talents as well as the sustainable development potential in the realm of a city. By a comprehensive use of literature review, expert consultation, mathematical statistics and other methods, the indicator system of urban talent development potential with six indicators was established. This six-indicator system includes talent stock, talent quality, talent innovativeness, talent mobility, talent environment and talent age. Delphi method and AHP was used to determine the weight of each index. Finally, using urban talent development potential indicator system and the relevant urban data, the evaluation and empirical research of urban talent development potential was conducted.**

Keywords—urban talent development potential, Evaluation indicator system, talent development status, AHP

I. INTRODUCTION

Harbison believes that talent is the ultimate basis of national wealth [1]. Capital and natural resources are passive factors of production, while talent is a major force to accumulate capitals, exploit natural resources, build social, economic and political organizations and promote the whole social forward. Talent also plays a leading role in urban economic development. High-quality talent can not only substitute for natural resource, alleviate the shortage of resource, but also exploit deeply and make use of natural resource effectively, create new original material resource and make up for deficiencies. From the urban development strategic point of view, talent can create a strong urban competitive edge and make the urban competitiveness more sustainable.

Urban talent development potential is a concept that expresses the dynamic of urban talent. It can measure the current and future situation of urban talent, then further forecast the talent's future development comprehensively. China's urban economic development is not balanced, in addition to the factors such as the policy, geographical and climatic, just because of an unbalanced talent development status and future potential [2]. The status and potential of urban talent development lead a direct result of the existing economic

development condition, even economic development potential between two cities. As the gap of different urban talent development condition among cities widens, high-quality talent continue flowing to developed areas, which makes talent development potential in developed cities continue increasing, and promotes faster economic development and stronger economic vitality in these cities, and thus makes the formation of Matthew Effect and the gaps between cities continue widening.

This thesis presented the concept of urban talent development potential. By a comprehensive use of literature review, expert consultation, mathematical statistics and other methods, the factors that influence urban talent development potential was identified. On this basis, urban talent development potential indicator system was established. Finally, using urban talent development potential model and the relevant urban data, the evaluation and empirical research of urban talent development potential was conducted.

II. URBAN TALENT DEVELOPMENT POTENTIAL

Urban talent development potential depends on the urban present and future talent stock, quality, innovation and mobility determines the real changes of the urban value systems and affects urban future status [3]. So the urban talent development potential is an important component of the competitive potential in a city. Therefore, urban talent development potential is determined by many factors such as the level of urban economic development, population structure, reflecting the urban talent innovation ability, growth ability and competitiveness, is the vitality of urban talent. It not only determines the level of vitality of a urban economic and social development, but also links to sustainable development of urban talent, is a capacity that the whole talent in a certain city survive, develop, and seize opportunities for development, is an innovative spirit and motivation, an ability of talent achieving sustainable development, an important indicator of enhancing the strength of the overall development of a city including economic vitality [4]. Therefore, the urban talent development potential is an expression of not only a real development trend of urban talent, but also its prospective development trends; determines not only the real economic and social development status of the region but also the economic and social development trends in the future.

III. URBAN TALENT DEVELOPMENT INDICATOR SYSTEM

Urban talent development potential is an indicator that evaluates the current situation and prospective development of the talent in a city. Establishing urban talent development indicator system and identifying the influence factors plays a core and key role in a comprehensive evaluation of urban talent. Through the establishment of urban talent development potential indicator system, an empirical analysis can be carried on finally.

In order to ensure the composition of the factors of urban talent development potential, this thesis conducted a series of studies. First, through the literature review, based on the understanding of the concept of urban talent development potential and decomposition of relevant indicators, using the brainstorming method, factors of the urban talent development potential were identified as 11 factors. In addition, a questionnaire about talent and urban talent development potential was designed. The questionnaire had 24 questions, including the basic situation of the respondents; the talent and understanding of talent development potential, the possible 11 factors of urban talent development potential - the number of urban talent, talent mobility cost, talent environment, talent age, talent quality, talent structure, talent innovation, talent enterprising, talent education, talent income level, talent employment probabilities were set. 210 questionnaires issued in Changchun, 189 valid questionnaires returned, whose effective rate is 90%. 5-point Likert scale was adopted to design the questionnaire answer. The answers from 1 to 5 represented 'strongly agree', 'agree', 'uncertain', 'disagree', 'strongly disagree' respectively.

In order to find scientific results, this paper selects basic average age of respondents, the number of respondents for each age group is roughly equal, which guarantees the respondents cannot be too prejudice to the option in the questionnaire because of concentrated age. Secondly, the proportion of male respondents and female respondents are equal in terms of gender. In respondents academic qualifications aspects, the respondents who have a higher cultural level and a certain understanding of talent vitality are selected to carry out surveys, which ensures that the investigation has real effects.

According to the results of the questionnaire, 11 factors were further integrated into 6, as follows:

A. Talent Stock

Talent stock is the total quantity of talent employed in the region, possessing certain professional skills and contributing to urban development [5]. The more the talent stock, the development of urban talent has more potential and urban vitality is stronger. A sub-index is the quantity of urban talent.

B. Talent Quality

Urban talent development potential is reflected by the average education level of urban population. The higher the quality of urban talent, the degree of talent development potential is higher [6]. The indicators this paper selects are divided into three parts. One part is the proportion of the senior professional talent; the second part is the proportion of

scientific and technological talents; the third part is the proportion of the talent with a graduate degree.

C. Talent Mobility

From the systematic point of large talent market view, the flow of talent is an important driving force to keep the overall urban talent active [7]. Concentration and surging of a large number of active talents, inspire a great talent activity and strong talent competitiveness in one city. When the flow of talent is active, it's relatively easy to look for senior management and senior technical talent in this city. So the region will attract well-known companies, research institutions located. Talent mobility selects sub-indicators as talent inflow and outflow ratio.

D. Talent Innovation

Reflecting the innovation of talent in a region, talent innovation is the greatest spiritual force of the urban talent development potential and is a key indicator to measure talent development potential. Innovation can ensure talent win the competition and is also a prerequisite to enhance talent activity [8]. Patents can reflect the innovation of urban talent most, while the proportion of key technologies is the most important. In recent years, the proportion of patients in key technologies in China improves year by year, while the number of utility model patents is decreasing, which can also explain our creative talent is increasing. So, sub-indicators of talent innovation selected are the number of patent and the proportion of the key technologies.

E. Talent Environment

Talent environment is an integration of hard environment and soft environment. The hard environment includes urban infrastructure environment, urban quality of life; soft-environment includes urban talent policies, urban talent atmosphere [9]. The urban hard environment selects two categories of sub-indicators. The first category is the sub-indicator of income level - the average earning and per capita disposable income [10]. The second category is the sub-indicator of living conditions, mainly reflecting the urban residents' housing affordability, the maintenance of their existing house, living comfort and so on. Sub-indicators selected are per capita public green area and per capita housing area. The third category is the momentum of urban development. Development momentum indicates the region's current economic strength. One of the most representative indicators is per capita GDP growth rate which shows the entire region's economic growth performance. Considering the inertia of economic growth, the index also represents the potential for future growth. urban soft-environment - the urban talent policy and the urban atmosphere is embodied by the governmental financial support for education and research, which together determine the urban talent activity. The index is the proportion of total expenditure of R&D and education investment in government financial input.

F. Talent Age

The level of the overall age of talent is an important natural factor affecting urban talent activity [11]. The more young

people in the total population of the region, the level of talent vitality is higher. Talent age can reflect the growth of urban talent. The indicators selected for talent age is the proportion of talent under the age of 35 in the total talent.

IV. URBAN TALENT DEVELOPMENT POTENTIAL MODEL

AHP (Analytical Hierarchy Process) is adopted in this paper to determine the index weights of urban talent development potential, as shown in TABLE I:

TABLE I.   LEVELS OF INDICATORS WEIGHTING COEFFICIENT

First level and the weight	Second level and the weight	First level and the weight	Second level and the weight
$\beta_1 = 0.041$	$\partial_{11} = 1$		$\partial_{51} = 0.141$
$\beta_2 = 0.203$	$\partial_{21} = 0.318$		$\partial_{52} = 0.223$
	$\partial_{22} = 0.303$		$\partial_{53} = 0.051$
	$\partial_{23} = 0.379$	$\beta_5 = 0.206$	$\partial_{54} = 0.082$
$\beta_3 = 0.103$	$\partial_{31} = 1$		$\partial_{55} = 0.417$
			$\partial_{56} = 0.045$
			$\partial_{57} = 0.041$
$\beta_4 = 0.285$	$\partial_{41} = 0.75$	$\beta_6 = 0.162$	$\partial_{61} = 1$
	$\partial_{42} = 0.25$		

According to the linear character of the factors of the urban talent development potential, the urban talent development potential indicator is the mathematical expectation of each index growth rate. urban talent development potential indicator system is established as follows:

$$A_t = \sum_{i=1}^{15} \beta_i \sum_{j=1}^{m_i} \partial_{ij} \frac{c_{ijt} - c_{ij(t-1)}}{C_{ij(t-1)}}$$

Among them:

A_t is the comprehensive evaluation of the indicator of the urban talent development potential in the year of No. t.

β_i is an index weights of the first level.

∂_{ij} is the weight of the j-th secondary indicators of the i-th first level subsystem.

c_{ijt} is the actual value of the j-th indicator of the potential urban talent development potential in the year of No.t.

m_i is the number of secondary indicators of the i-th primary subsystem.

V. EMPIRICAL ANALYSIS OF URBAN TALENT DEVELOPMENT POTENTIAL

"China Statistical Yearbook", "Jilin Statistical Yearbook", "China Labor Statistical Yearbook" and other relevant information are referred to in this paper. At last, the talent development potential indicators values of the year 2016-2017 are obtained.

By using these data, talent development potential index of Changchun city in 2016 and 2017 can be drawn:

$$A_{2016} = \sum_{i=1}^{15} \beta_i \sum_{j=1}^{m_i} \partial_{ij} \frac{c_{ijt2016} - c_{ij2015}}{C_{ij2016}} = 0.1315$$

$$A_{2017} = \sum_{i=1}^{15} \beta_i \sum_{j=1}^{m_i} \partial_{ij} \frac{c_{ijt2017} - c_{ij2016}}{C_{ij2017}} = 0.1384$$

As a linear index, the bigger the index of talent development potential, the higher the level of talent development potential. Calculations above conclude that the talent development potential index of Changchun city in 2016 is 0.1382, then promote to 0.1384 in 2017, the talent development potential index of Changchun city has been greatly improved to the enhanced range of 5.25%. In all of the indicators of talent development potential indicator system, in 2017 and 2016, the sub-indicator talent environment contributes the greatest to the urban talent development potential, while talent innovation improved the fastest, which shows that talent innovation spirit and innovation output of Changchun city in 2017, has been greatly improved compared with 2016. But one of the indicators - the proportion of post-graduate academic qualifications in 2016 is 0.30%, the value in 2017 is 0.23%, which shows that this sub-indicator do not rise; another important indicator - the percentage of 35 year-old talent is declining year by year, being 25.8% and 24.78%. These two indicators need to be improved.

VI. TALENT DEVELOPMENT POTENTIAL COMPARATIVE ANALYSIS BETWEEN TWO CITIES

The significant feature of urban talent development potential index is that it can be compared, not only compared vertically and annually but also conduct a horizontal comparison among cities. Only through comparison, the gap of talent development potential among cites can be found. The following is empirical analysis on talent development potential index of Shenyang city, whose objective is the comparison between Shenyang city and Changchun city, in order to find out the gap of talent development potential.

$$A_{2017} = \sum_{i=1}^{15} \beta_i \sum_{j=1}^{m_i} \partial_{ij} \frac{c_{ij2017} - c_{ij2016}}{C_{ij2016}} = 0.1563$$

The talent development potential index of Shenyang city in 2017 is 0.1563. Compared with Shenyang city, the talent development potential index of Changchun city in 2017 is only 0.1384, the gap ratio is 12.93%. Through the comparison of each sub-indicator value, the talent development potential index of Shenyang city increases much more in 2017 than in 2016. The absolute index value of Shenyang city is higher than Changchun city, but only in the aspect of the indicator talent stock, there's a declining trend of Shenyang city in 2011 compared to 2010. Among talent development potential indicators, the indicator which makes the greatest contribution to the talent development potential is the ratio of inflow to outflow, which also proves in another side that there is a lot of talent flowing into Shenyang city, so as to enhance its talent development potential.

Specifically, the gap is due to:

One of the biggest reason is that the talent environment of Shenyang city is better than Changchun city. From all aspects as the overall economic strength, living standards, financial

support, and others, the talent environment of Shenyang city is more favorable to attract more and more talents.

The second is the mobility of talent. Talent maintains the normal flow can ensure this region achieve an important guarantee for fresh blood.

In terms of talent innovation, the number of patents and utility models is much higher than the number of Changchun city. Although in 2016, the number of patents and utility models of Shenyang city substantially increased but is relatively backward in absolute number.

The talent of Changchun city is relatively younger, so the potential and talent development potential would naturally increase.

In talent quality aspect, the proportion of senior professional titles, science-technology talent and talent with a graduate degree are higher than in both absolute and relative number, which indicates that the talent quality of Shenyang city is also far superior than Changchun city.

Finally, the talent stock being researched in this thesis is determined by the stock of talent with the college degree or above. In contrast, talent with the college degree or above in Shenyang city is more than in Changchun city, so the talent stock in Shenyang city also accounted for a greater advantage.

Based on the above aspects, talent development potential in Shenyang city not only on the whole but also in all indicators is significantly better than Changchun city. In order to get out of this backwardness, Changchun city must greatly enhance talent development potential; at least achieve catch-up from the above six aspects.

VII. CONCLUSION

This paper presents the concept of urban talent development potential, point out that urban talent development potential is divided into six factors: talent stock, talent quality, talent mobility, talent innovation, talent environment, talent age; On this basis, urban talent development potential indicator system is designed, urban talent development potential index of Changchun is annually vertically compared; then a horizontal comparison about urban talent development potential index between Changchun and Shenyang has been made. At last, the gap of urban talent development potential between the two cities is pointed out and reasons are analyzed.

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