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Study on the Performance Evaluation of Expatriate Technician in Multinational Corporations

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Abstract Performance evaluation of expatriate technicians is an important way for multinational corporations to effectively manage their expatriate technicians, which is crucial to the technological innovation of multinational corporations. This paper designs the performance evaluation index system of expatriate technicians, which includes work efficiency, professional competence, work attitude, and personal traits. Then, based on the C-POWA operator, the evaluation method of expatriate technicians is put forward. Lastly, using the index and method of evaluation of expatriate technician, four expatriate technicians' performance are evaluated, and the results reveal that the index and method we put forward are scientific and practical.

Keywords performance evaluation; indicator; C-POWA operator; expatriate technician

1 Introduction

Under the advocating of the global strategy and "One Belt and One Road", the Chinese government opened its doors to foreign enterprises, and Chinese enterprises are gradually entering the international market. There has been a big interest in the expatriate assignment[1], many Chinese enterprises have sent technical personnel to overseas, which can successfully facilitate the strategy implementation, enhance enterprises' technological innovation capabilities and acquire core competitiveness[2]. However, some expatriates are unable to achieve the desired effect assigned by enterprise[1]. Extant study shows that there are about 25% expatriates leaving when they returned home in first two years, which not only result in repatriates losing, but also decrease firm's competitive advantage with losing knowledge[3]. That is to say, unsuccessful expatriates may harm the company's operations[1], and resignation of expatriate technician will seriously affect the company's technology innovation.

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The expatriate technicians are professional technicians who are selected and sent to overseas to participate in professional technical learning and guidance by Multinational Corporation headquarters, and they are the core talents of Multinational Corporations in technological innovation. There are two reasons explaining the importance of expatriate technicians. One is, although Multinational Corporations have conducted to share internal information and technology, the learning abilities of employees in various subsidiaries are not the same. Another is, considering with the practicality of technical knowledge and the complexity of the regional environment, it is difficult to ensure the feasibility and reliability of technology. So, it is very necessary for the headquarters of Multinational Corporations to assign technical personnel to their subsidiaries and provide guidance on their technology. Through communicating and learning with expatriate technicians, employees can better understand the core of their technology, and they are possible to improve existing technology. Therefore, how to rationally assess expatriate technicians' performances is the important issue for the technological development of Multinational Corporation.

Previous studies have emphasized the importance of expatriates' work performance and put forward the evaluation index system[4,5], but there are few studies about the issue of performance appraisal of expatriate technicians of Multinational Corporations in China. Therefore, in order to scientifically and reasonably evaluate the performance of expatriate technicians in Multinational Corporations, this study takes the expatriate technicians of Multinational Corporations as the research object, and establishes an index system evaluating their work performance, then analyzes the evaluation methods.

2 Building the Evaluation Index System

The expatriate technicians are different from the general technicians and the expatriate managers. The evaluation index system of their work performance cannot completely use the traditional performance evaluation indicators of technicians. The purpose of dispatching technicians by Multinational Corporations is to encourage the technical staffs of the parent company and the subsidiary companies to communicate and learn each other, and the professional expatriate technicians can learn more updated and advanced technological knowledge from oversea, finally achieve the goal of technical improvement or innovation. Therefore, the performance evaluation of expatriate technicians should focus on the technical staff's professional competences and achievements.

Regarding expatriate performance evaluation indicators, domestic and foreign scholars have made some research. For example, Caligiuri & Santo[6] pointed out that the core skills of expatriates include: knowledge reserve, R&D ability, personality traits, and posed that personality traits are innate and other can be trained; Varma, et al.[7] put forward a number of factors that affect self-efficacy and work enthusiasm of expatriate from the perspective of performance theory; Woods, et al.[8] proposed that personality, experience, attitudes, knowledge and skills of expatriate affect her or his performance. Chen, et al.[4] highlighted that employee personal factors, employee competencies, job characteristics, family factors, environmental factors and organization support can affect work of expatriates. Similarly, Martin & Bartol[9] analyzed the factors influencing expatriate performance appraisal systems, such as performance expectations,

consideration of local environment, frequency of performance evaluations, fairness, development of career. It can be seen that different scholars have studied the expatriate performance indicators from different perspectives, but no agreement has been reached, and there are fewer studies on the performance indicators of expatriate technicians. Hence, based on conclusions of previous studies, this study, combining the characteristics and the changed work environment of the expatriate technicians, establishes a work performance evaluation index system for the expatriate technicians, which includes work efficiency, professional competence, work attitude, and personal traits.

2.1 Work Efficiency

Work efficiency refers to the situation where an employee actually completes task under the condition of guaranteeing work quality and reliability according to his or her personal ability. It is generally measured by the quality, the quantity and working hours. For technical staffs, the time, the quality and the quantity of completing task are the core contents of measuring their work performance. Thus, those should be designed as the standards and the inevitable requirements of the assessment expatriate technicians. Multinational Corporations invest a large amount of funds sending technical personnel to overseas to conduct technical instruction and study, in order to improve existing technology of expatriate technicians and spur technical innovations for the company. Therefore, the human resources department of a Multinational Corporation needs to pay attention to work efficiency of expatriate technicians.

Regarding the research on the work efficiency on performance, many researchers study from the perspective of organizational behavior and psychology, and they believe that the work efficiency of employees has a positive effect on the work performance. For example, Bandura[10] demonstrated that the work effectiveness is crucial to the work performance of employees through empirical research; Rotundo[11] studied the performance of employees that five different types of managers evaluated, and found that they almost pay attention to the accomplish amounts of work. So this study suggests that work efficiency is one of the indicators to measure the performance of expatriate technicians, and it should be measured using the achievement, quality, and speed of the expatriate technicians' assignment.

2.2 Professional Competence

Professional competence refers to the knowledge and skills that technicians possess are advantage to successfully complete task[12]. Different companies have different requirements of employees' professional capabilities. Especially for technical personnel, if they have no relevant professional knowledge and corresponding capabilities, it is difficult for them to perform technical work. Professional competence is a concentrated expression of the professional development of an expatriate technician in the work practices. It affects the individual's development in the company and the improvement of the company's technological innovation capabilities.

With the development of economic globalization, many companies are increasingly demanding those employees who have professional competence. As an expatriate technician, he/she not only needs professional technical knowledge in specific field, but also masters professional skills in different cultural backgrounds. Subramaniam & Venkatraman[13] found that expatriates possess professional competence in related fields can successfully complete assignments,

they can combine their own expertise with their work tasks, such as R&D, manufacturing of new products, and use or maintenance of new products and technologies, and those all require professional knowledge and skills in related fields. Qiu, et al.[14] put forward that professional technical employees are the core personnel of the organization to maintain normal operation and develop technology of company. Besides, Rezaei, et al.[15] pointed out that it is important for individuals to believe that they are capable of mobilizing motivation and resources to complete a particular task. Especially, the professional competence of technical employees not only affects the performance of individuals, but also has an important impact on the technological innovation of company. Therefore, this study applies professional competence to measure job performance of expatriate technicians.

2.3 Work Attitude

Work attitude refers to the evaluation and behavior tendency of employees that they show in the process of handling their work. The theory of planned behavior indicates that personal attitude has a significant influence on his or her behavior. Rezaei, et al.[15] also showed that the more favorable attitude towards the behavior, the stronger individual's intention to perform it. In order to achieve the maximize outcomes of expatriate assignments, many Multinational Corporations try to enhance and maintain the satisfaction of expatriate[16]. A satisfying job can improve expatriates' enthusiasm, and they have a positive attitude to do it. It can facilitate expatriates to take more responsibility to explore new knowledge, create more learning opportunities within the organization[17], thus affecting their performance[18].

Besides, current research has emphasized that attitude is important for the performance of expatriates. For example, Saint-Criq, et al.[19] studied the enthusiasm of Polish expatriates, and found that positive attitudes help them to adapt the cross-cultural surroundings and improve personal development; Tsai, et al.[20] investigated the Taiwanese employees in the mainland through questionnaires to analyze their performance, and indicated that employees' attitudes positively affect their work performance. Huff, et al.[1] pointed out that expatriates often need to adjust their attitudes to adopt the new cultural contexts, so that they can successfully fulfill their foreign assignment. Expatriate technicians face some work and life changes of cross-cultural adjustment, so they may have a negative attitude towards their works. Therefore, this study puts forward that work attitude should be one of the indicators of expatriate technicians' work performance evaluation.

2.4 Personal Traits

Personal traits are the stable psychological behavior cultivated by individuals under the comprehensive influence of family, school and social environment based on genetic genes, and can be clearly expressed in his/her words and behaviors[21]. It is one latent propensity that one behaves a particular manner on a particular condition[22]. If the company's expatriates can quickly adapt to the overseas work environment, get along well with others, obtain enough trust in the company, and possess strong learning ability, he will easily carry out assignments. As Huff, et al.[1] said, an expatriate that adjusts well feels little stress associated with expatriate assignment in the host country. Meanwhile, they will be able to transfer the knowledge and skills to the domestic colleagues after returning home, which will help promote the company's

development.

Prior literatures proposed that personal trait has a significant impact on the job performance[1,23] and incomes of employees[24], and it includes individual responsibility and interpersonal communication skills of employees[25]. In terms of expatriates, emotional stability, openness, extraversion, conscientiousness, and agreeableness can exert a noteworthy impact on expatriate adjustment[22]. Similarity, Shaffer, et al.[26] and Bhatti, et al.[27] argued that personal traits of expatriates play an important role in their work performance. Besides, Rezaei, et al.[15] suggested that the effort and persistence of individuals have effects on their outcome of perform activities form self-efficacy perspective. Therefore, this study uses personal traits as an assessment indicator for the work performance of expatriate technicians.

3 Performance Evaluation Model Based on C-POWA Operator

3.1 Performance Evaluation Method of Expatriate of Multinational Corporations

Previous studies used the multiple levels fuzzy comprehensive evaluation method to evaluate the performance of expatriate[4,5]. However, the multi-level fuzzy comprehensive evaluation method is relatively complicated when the evaluation index is multiple. And the Delphi is no clear standard for the experts, using it to measure the weights is risky. When the data volume of the index is large, the weighted gap of the indexes is relatively small, and the degree of membership is not easy to distinguish, and the evaluation is easy to fail. Based on the above analysis, in order to overcome these shortcomings, combined with the characteristics of expatriate technician, we apply C-POWA operator to evaluate the work performance of expatriate technicians.

3.2 Applicability of C-POWA Operators for Performance Evaluation Methods

For the performance evaluation method of expatriate technician, we not only need to consider the fairness, comprehensiveness and rationality of method, but also must consider the uncertainties of the individual judgments of the manager. Different managers possess different characters, knowledge, experiences and ability, which make it very ambiguous to properly assess the performance of employees. The C-POWA operator uses interval value to determine the assessment result[28], which can avoid the above problems and ensure the accuracy of the results.

In fact, employees work either in a large organization or in a small team, and they influence each other. Similarly, expatriate technicians could face with similar problems in the process of working overseas and also learn from each other. In other words, their work performance is also inevitably related, and those results that different managers evaluate an employee's using same indicator also have links. The multi-criteria decision-making method of C-POWA operator can solve these problems. At the same time, since different decision-makers have different attitudes toward employees, there set the decision-maker's risk attitude parameters, and different attitude of decision-makers are represented by different values of risk attitude parameters. Based on the above analysis, this paper uses the C-POWA operator evaluation method put forward by Lu, et al. to evaluate the performance of the expatriate technicians.

3.3 Performance Evaluation Model of C-POWA Operators

(i) Standardization of evaluation indicator data

The work performance evaluation of expatriate technicians can be equated with the multi-criteria decision problem. The study supposes that the evaluated employee set is X, and $X = \{x_1, x_2, \cdots, x_m\}$, m is the number of employees, C represents the evaluation indicator set, $C = \{c_1, c_2, \cdots, c_n\}$, n is the number of evaluation indicators, K represents the decision-maker set, $K = \{k_1, k_2, \cdots, k_t\}$, t is the number of decision-maker. $\widetilde{A}^{(k)}$represents the evaluation matrix that the kth decision-maker evaluates the different expatriate technicians, $\widetilde{A}^{(k)} = \left(\widetilde{a}_{ij}^{(k)}\right)_{m\times n}$. And $\widetilde{a}_{ij}^{(k)} = \left[\widetilde{a}_{ij}^{(k)L}, \widetilde{a}_{ij}^{(k)U}\right]$is the interval value that the kth decision-maker evaluates the score of the ith employee in the jth index. $\widetilde{a} = \left[\widetilde{a}^L, \widetilde{a}^U\right]$, it is non-negative interval number, $\widetilde{a}^L$ is the upper bound of $\widetilde{a}$, $\widetilde{a}^U$ is the lower bound of $\widetilde{a}$, and $\left\{0 \leqslant \widetilde{a}^L \leqslant \widetilde{a}^U\right\}$. Because indicators of different magnitudes cannot be directly integrated, they need to be standardized, this study takes into account the inconsistencies in the standardization methods of the efficiency indicators and the cost indicators, so that I_1 represents the subscript set of the efficiency indicators, I_2 represents the subscript set of the cost indicators. $\widetilde{A}^{(k)}$ gets normalized to $\widetilde{R}^{(k)} = \left(\widetilde{r}_{ij}^{(k)}\right)_{m\times n}$, which is the indicators standardization process:

$$r_{ij}^{(k)-} = \frac{a_{ij}^{(k)-}}{\sqrt{\sum_{i=1}^{n}(a_{ij}^{(k)+})^2}}, \quad r_{ij}^{(k)+} = \frac{a_{ij}^{(k)+}}{\sqrt{\sum_{i=1}^{n}(a_{ij}^{(k)-})^2}}, \quad i \in \{1, 2, \cdots, n\}, \quad j \in I_1, \tag{1}$$

$$r_{ij}^{(k)-} = \frac{(a_{ij}^{(k)+})^{-1}}{\sqrt{\sum_{i=1}^{n}(a_{ij}^{(k)-})^{-2}}}, \quad r_{ij}^{(k)+} = \frac{(a_{ij}^{(k)-})^{-1}}{\sqrt{\sum_{i=1}^{n}(a_{ij}^{(k)+})^{-2}}}, \quad i \in \{1, 2, \cdots, n\}, \quad j \in I_2. \tag{2}$$

(ii) Caluclation of the support degree and distance between interval numbers:

The C-OWA operator:

$$F_Q([a, b]) = \int_0^1 \frac{\mathrm{d}Q(y)}{\mathrm{d}y}(b - y(b - a))\,\mathrm{d}y \tag{3}$$

and $[a, b] \in \Omega$, Q is the basic unit-interval monotonic function, it effects F, $Q : [0, 1] \to [0, 1]$, and $Q(0) = 0$, $Q(1) = 1$. For the sake of calculation, if $\mu = \int_0^1 Q(y)\mathrm{d}y$, then $F_Q([a, b]) = \mu b + (1 - \mu)a$, and μ is the attitude parameter of Q.

We calculate the distance and support of interval numbers using C-OWA operator. If $\widetilde{a} = \left[\widetilde{a}^L, \widetilde{a}^U\right] \in \Omega$, and $\widetilde{b} = \left[\widetilde{b}^L, \widetilde{b}^U\right] \in \Omega$, $\widetilde{a}$ and $\widetilde{b}$ both are the interval numbers, and

$$d\left(\widetilde{a}, \widetilde{b}\right) = \left|F_Q(\widetilde{a}) - F_Q\left(\widetilde{b}\right)\right|, \tag{4}$$

it is the distance of $\widetilde{a}$ and $\widetilde{b}$ based on the C-OWA operator. And

$$d\left(\widetilde{a}, \widetilde{b}\right) = \left|\mu\left(\widetilde{a}^U - \widetilde{b}^U\right) + (1 - \mu)\left(\widetilde{a}^L - \widetilde{b}^L\right)\right|. \tag{5}$$

$\sup(a_i, a_j)$ as the support degree of a_i and a_j, it needs to meet below requirements:

(a) $\sup(a_i, a_j) \in [0, 1]$;

(b) $\sup(a_i, a_j) = \sup(a_j, a_i)$;

(c) If $|a_i - a_j| < |a_s - a_p|$, then $\sup(a_i, a_j) \geq \sup(a_s, a_p), i, j, s, p = 1, 2, \cdots, n.$ and

$$\sup(a_i, a_j) = 1 - \frac{|a_i - a_j|}{\sum_{i=1, i\neq j}^{n} |a_i - a_j|}. \tag{6}$$

$\sup(\widetilde{a}_i, \widetilde{a}_j)$ as the support degree of $\widetilde{a}_i$ and $\widetilde{a}_j$, it also meets the below conditions:

1) $\sup(\widetilde{a}_i, \widetilde{a}_j) \in [0, 1]$;

2) $\sup(\widetilde{a}_i, \widetilde{a}_j) = \sup(\widetilde{a}_j, \widetilde{a}_i)$;

3) if $d(\widetilde{a}_i, \widetilde{a}_j) < d(\widetilde{a}_s, \widetilde{a}_p)$, then $\sup(\widetilde{a}_i, \widetilde{a}_j) \geq \sup(\widetilde{a}_s, \widetilde{a}_p), i, j, s, p = 1, 2, \cdots, n.$

The support degree of $\widetilde{a}_{ij}^{(k)}$ and $\widetilde{a}_{ij}^{(l)}$:

$$\sup\left(\widetilde{a}_{ij}^{(k)}, \widetilde{a}_{ij}^{(l)}\right) = 1 - \frac{d\left(\widetilde{a}_{ij}^{(k)}, \widetilde{a}_{ij}^{(l)}\right)}{\sum_{l=1, l\neq k}^{t} d\left(\widetilde{a}_{ij}^{(k)}, \widetilde{a}_{ij}^{(l)}\right)}, \quad l = 1, 2, \cdots, t, \tag{7}$$

and $d\left(\widetilde{a}_{ij}^{(k)}, \widetilde{a}_{ij}^{(l)}\right) = \left|\mu\left(\widetilde{a}_{ij}^{(k)U} - \widetilde{a}_{ij}^{(l)U}\right) + (1-\mu)\left(\widetilde{a}_{ij}^{(k)L} - \widetilde{a}_{ij}^{(l)L}\right)\right|$;

Similarly, the support degree and distance of $\widetilde{a}_{is}$ and $\widetilde{a}_{ip}$:

$$\sup(\widetilde{a}_{is}, \widetilde{a}_{ip}) = 1 - \frac{d(\widetilde{a}_{is}, \widetilde{a}_{ip})}{\sum_{p=1, p\neq s}^{n} d(\widetilde{a}_{is}, \widetilde{a}_{ip})}. \tag{8}$$

And $d(\widetilde{a}_{is}, \widetilde{a}_{ip}) = \left|\mu\left(\widetilde{a}_{is}^{U} - \widetilde{a}_{ip}^{U}\right) + (1-\mu)\left(\widetilde{a}_{is}^{L} - \widetilde{a}_{ip}^{L}\right)\right|, i = 1, 2, \cdots, m; s, p = 1, 2, \cdots, n.$

(iii) Aggregation of evaluation matrix using C-POWA operator

We use the C-POWA operator to integrate all evaluation matrix to become a comprehensive evaluation matrix, that is, $\widetilde{R}^{(k)} = \left(\widetilde{r}_{ij}^{(k)}\right)_{m\times n}$ are massed into $\widetilde{R} = (\widetilde{r}_{ij})_{m\times n}$.

And the C-POWA operator: $\Omega^n \to R^+$ meet

$$\text{C-POWA}(\widetilde{a}_1, \widetilde{a}_2, \cdots, \widetilde{a}_n) = \sum_{i=1}^{n} \mu_i F_Q\left(\widetilde{a}_{index(i)}\right). \tag{9}$$

And $\mu_i = h\left(\frac{R_i}{TV}\right) - h\left(\frac{R_{i-1}}{TV}\right)$, $R_i = \sum_{j=1}^{i} V_{index(j)}$, $TV = \sum_{i=1}^{n} V_{index(i)}$, $V_{index(i)} = 1 + T\left(\widetilde{a}_{index(i)}\right)$, $T\left(\widetilde{a}_{index(i)}\right) = \sum_{j=1, j\neq i}^{n} \sup\left(\widetilde{a}_{index(i)}, \widetilde{a}_{index(j)}\right)$. $F_Q\left(\widetilde{a}_{index(i)}\right)$ is the ith largest number in the descending order in the $F_Q(\widetilde{a}_j)$, h is a monotonically increasing function between 0 and 1, and it is called BUM. In particular, if $h(x) = x$, then

$$\text{C-POWA}(\widetilde{a}_1, \widetilde{a}_2, \cdots, \widetilde{a}_n) = \frac{\sum_{i=1}^{n} (1 + T(\widetilde{a}_i)) F_Q(\widetilde{a}_i)}{\sum_{i=1}^{n} (1 + T(\widetilde{a}_i))}. \tag{10}$$

And when $\widetilde{a}_{ij}$ is real number, we can use the following formula:

$$\widetilde{r}_i = \text{C-POWA}(\widetilde{a}_{i1}, \widetilde{a}_{i2}, \cdots, \widetilde{a}_{in}) = \frac{\sum_{j=1}^{n} (1 + T(\widetilde{a}_{ij})) \widetilde{a}_{ij}}{\sum_{j=1}^{n} (1 + T(\widetilde{a}_{ij}))}, \quad i = 1, 2 \cdots, m. \tag{11}$$

4 Case Analysis

We investigated four expatriate technicians of the multinational corporation, and evaluated their work performance. The evaluation index mainly includes work efficiency (c_1), professional competence (c_2), work attitude (c_3), and personal characteristics (c_4). As shown in Table 1, it is the assessment level and reference content. The heads of subsidiaries, team leaders, and deputy team leaders respectively assess four aspects of four expatriate technicians. Each assessment result is expressed in the form of interval numbers. The evaluation scores are shown in Table 2, Table 3, and Table 4. If we take $h(x) = Q(x) = x$ then $\mu = 0.5$.

Table 1 Assessment level and reference content

Work efficiency	90–100	High speed and high quality of work to accomplish the mission
	80–90	High work speed, general quality of work, the mission can be completed well
	70–80	Work speed is normal, work quality is normal, and the mission is barely accomplished
	60–70	General working speed, poor quality of work, barely complete the mission
	Less than 60	Cannot complete the prescribed goals and tasks on time, and the quality of work is general
Professional competence	90–100	Multi-tasking ability, rich reserve of professional knowledge, and ability to deal with crisis
	80–90	Multi-tasking capabilities, rich expertise, and general crisis management skills
	70–80	Multi-tasking capabilities, general professional knowledge storage, coping with dangerour emergencies
	60–70	With simplex ability, general knowledge storage capacity, coping with part of dangerous emergencies
	Less than 60	With simplex ability, insufficient reserve of expertise, unable to cope with dangerous emergencies
Work attitude	90–100	Active overtime, high attendance, strict compliance with company rules and regulations
	80–90	Active overtime, normal attendance, and better compliance with regulations
	70–80	Occasional overtime, general attendance, compliance with company rules and regulations
	60–70	No overtime, low attendance, compliance with company rules and regulations
	Less than 60	Violation of company-set rules and regulations, low attendance rate
Personal traits	90–100	Strong sense of responsibility, self-learning ability, and getting along well with other people
	80–90	Common responsible and self-study ability, and getting along well with other company personnel
	70–80	Responsibility is normal, self-learning ability is normal, and getting along with other employees
	60–70	Responsibility, self-learning ability, and getting along general relationship with colleagues
	Less than 60	Irresponsibility, poor self-learning, and bad work relationship

Table 2 The evaluation matrix $\widetilde{A}^{(1)}$

	c_1	c_2	c_3	c_4
x_1	[65, 70]	[70, 75]	[78, 83]	[45, 50]
x_2	[65, 74]	[60, 67]	[80, 87]	[68, 75]
x_3	[60, 68]	[70, 78]	[85, 90]	[65, 75]
x_4	[60, 64]	[63, 72]	[80, 87]	[60, 69]

Table 3 The evaluation matrix $\widetilde{A}^{(2)}$

	c_1	c_2	c_3	c_4
x_1	[60, 73]	[68, 78]	[75, 85]	[40, 53]
x_2	[68, 75]	[65, 75]	[84, 90]	[65, 78]
x_3	[65, 74]	[73, 80]	[83, 88]	[70, 80]
x_4	[63, 70]	[65, 75]	[75, 83]	[58, 65]

Table 4 The evaluation matrix$\widetilde{A}^{(3)}$

	c_1	c_2	c_3	c_4
x_1	[60, 75]	[65, 73]	[70, 85]	[40, 55]
x_2	[65, 75]	[65, 80]	[80, 90]	[63, 80]
x_3	[65, 70]	[75, 80]	[80, 85]	[70, 75]
x_4	[55, 68]	[60, 75]	[73, 90]	[55, 70]

Since the evaluation results are given in the form of scores, there is no need to normalize the interval data and the calculation can be done directly. First, we calculate the support of different decision-makers on the interval value of the same indicator for the same employee:

$$\sup\left(\widetilde{r}_{ij}^{(k)}, \widetilde{r}_{ij}^{(l)}\right) = 1 - \frac{d\left(\widetilde{r}_{ij}^{(k)}, \widetilde{r}_{ij}^{(l)}\right)}{\sum_{l=1, l\neq k}^{t} d\left(\widetilde{r}_{ij}^{(k)}, \widetilde{r}_{ij}^{(l)}\right)}, \quad k, l = 1, 2, 3. \tag{12}$$

And $d\left(\widetilde{r}_{ij}^{(k)}, \widetilde{r}_{ij}^{(l)}\right) = \left|\mu\left(\widetilde{r}_{ij}^{(k)U} - \widetilde{r}_{ij}^{(l)U}\right) + (1-\mu)\left(\widetilde{r}_{ij}^{(k)L} - \widetilde{r}_{ij}^{(l)L}\right)\right|, i, j = 1, 2, 3, 4.$

Next, we use the C-POWA operator to calculate the evaluation matrix that three decision-makers given, and combine a comprehensive evaluation matrix.

$$\widetilde{r}_{ij} = \text{C-POWA}\left(\widetilde{r}_{ij}^{(1)}, \widetilde{r}_{ij}^{(2)}, \widetilde{r}_{ij}^{(3)}\right), \quad i, j = 1, 2, 3, 4. \tag{13}$$

$$\widetilde{R} = (\widetilde{r}_{ij})_{4\times 4} = \begin{bmatrix} 67.167 & 71.500 & 79.333 & 47.167 \\ 70.333 & 68.667 & 85.167 & 71.500 \\ 67.000 & 76.000 & 85.167 & 72.500 \\ 63.333 & 68.333 & 81.333 & 62.833 \end{bmatrix}. \tag{14}$$

Then, we calculate the support degree of an expatriate technician' the four evaluation indicators value, $\widetilde{r}_{is}$ and $\widetilde{r}_{ip}$ are real number at this point:

$$\sup\left(\widetilde{r}_{is}, \widetilde{r}_{ip}\right) = 1 - \frac{|\widetilde{r}_{is} - \widetilde{r}_{ip}|}{\sum_{p=1, p\neq s}^{n} |\widetilde{r}_{is} - \widetilde{r}_{ip}|}, \quad s, p = 1, 2, 3, 4. \tag{15}$$

And, we calculate the comprehensive evaluation value $\widetilde{r}_i$:

$$\widetilde{r}_i = \text{C-POWA}\left(\widetilde{r}_{i1}, \widetilde{r}_{i2}, \widetilde{r}_{i3}, \widetilde{r}_{i4}\right), \quad i = 1, 2, 3, 4. \tag{16}$$

The result is, $\widetilde{r}_1 = 66.292, \widetilde{r}_2 = 73.917, \widetilde{r}_3 = 75.167, \widetilde{r}_4 = 68.958$. We can sort them by the result, $\widetilde{r}_3 > \widetilde{r}_2 > \widetilde{r}_4 > \widetilde{r}_1$, in other words $x_3 > x_2 > x_4 > x_1$.

Finally, the study takes into account the impact of different decision makers' risk attitude parameter μ on the assessment results, describes the line drawing that μ takes different values to represent different risk preferences on the horizontal axis, and the comprehensive evaluation value of expatriate technician on the vertical axis. The results are shown in Figure 1.

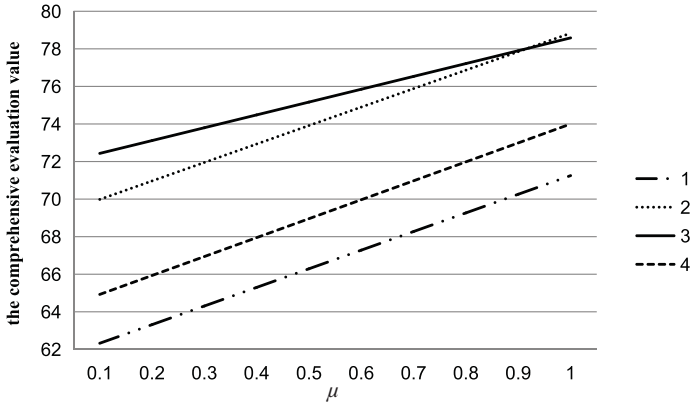

Figure 1 The impact of decision-maker risk attitude parameter μ on the performance appraisal results

As can be seen from Figure 1, the size of the decision-maker risk parameter μ has slightly effect on the performance evaluation result of expatriates. When $\mu > 0.9$, the assessment result is more favorable for x_2, and when $\mu \leq 0.9$, the assessment result is more favorable for x_3. That is to say, for negative decision makers, smaller μ can be selected, and the evaluation result is favorable for x_3; at the same time, for positive decision makers, larger μ can be selected, and the evaluation result is favorable for x_2, but the gap between the two is not significant. And the evaluation results of the other two employees are far behind.

5 Conclusion

This paper analyzes the literature on the performance of expatriates at home and abroad, conducts research on the expatriate technicians of Multinational Corporations, and divides the performance appraisal indicators of expatriate technicians into four dimensions: work efficiency, professional competence, work attitude, and personal traits. At the same time, the paper used the latest C-POWA operator performance evaluation method to assess the performance of expatriate technicians. This method, compared with fuzzy comprehensive evaluation method and other assignment performance evaluation methods, not only considers the correlation that different decision-makers evaluates the same employee and the correlation of the employee's different indicators, but also analyzes the different values of attitude parameters, which is a good solution to the problem of different decision makers' influence on the evaluation results. Finally, through an example analysis, the evaluation model was tasted and verified.

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