

[Field Research]

Empirical Analysis of the Influence of Incentive Factors on University Teachers based on Grey Theory: The Case of LinYi University

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Abstract

Purpose - The objective of this paper is to identify how different incentive factors influence teachers with different ages and professional titles at LinYi University, China.

Research design, data, and methodology - A total of 435 university teachers participated in the study, and the Grey Correlation Degree Analysis method was used to analyze the sample data.

Results - The results indicated that teachers with different professional titles and ages have different levels of preference on various incentive factors. Young and assistant-level teachers seem to place more importance on incentives than associate and senior-level teachers.

Conclusions - This study has some practical implications. First, the principal and school administrators should pay more attention to young and middle-aged teachers and to how these teachers are motivated through monetary incentives as compared to associate or senior-level teachers. Second, school administrators should pay more attention to teachers' opportunities for career growth and should provide more opportunity for academic promotion. In order to stimulate positivity in teachers, school administrators should adopt various incentive systems.

Keywords : College Teachers, Incentives Factors, Grey Correlation Degree.

JEL Classifications : I21, I23, J21, J30.

1. Introduction

With the development of higher education popularization, the number of Chinese colleges and universities increased sharply, and, at present, the total number of universities and colleges is about 2,358 (universities are 1112, and non-University Tertiary are 1246) (Chinese Ministry of Education, 2010). But now university teachers' initiative

and stability is still a big problem because of difficulties in motivational patterns and the incentive system. Due to the lack of young teachers training, attention, meanwhile low pay, this causes a large number of young teachers leaving, which could be damaging the talent structure of universities, so how to retain and employ high quality teachers will affect the long-term development of school. The lag behind of human resources management has become a serious problem of universities in many developing countries including China.

Higher education is the foundation for developing human resource, the key factor in increasing national quality, and the important way to upgrade a nation's competitive status (Fairweather, 2000; Meek, 2000). Nowadays schools are more dependent on teachers who are willing to contribute to successful change, so the enthusiasm of the university teachers plays a key role in stimulating the development and improving teaching quality and efficiency.

The factors influencing the enthusiasm of higher education teachers are various, such as salary level, working environment, value concept, etc. Among of these, the incentive system would be the most powerful and influential factor (Noe et al., 2010; Stajkovic & Luthans, 2001). The incentive mechanism is essential in human resource management in universities and colleges. (Guan, 2009). However, incentives for schools and teachers in the public education system are frequently weak due to ineffective incentives and sanctions. Poor human resource management also seriously de-motivates employees (Bennell, 2004). In a narrow sense speaking, a positive effect of incentive can make an extra stimulation to internalize appropriate behaviors to accomplishing intended goals (Romer, 1994).

It is widely argued that the status of teachers in most countries both developed and developing countries, has declined appreciably during recent decades (Bennell, 2004). The occupational status depends on the 'public valuing' of the competence, role and overall contribution on individuals and societal welfare. The professional status shares a common set of characteristics including a higher level of education and training, a strong ideal of public service with an enforced professional code of conduct, and high levels of respect from the public. However, teachers in most Low-Income Developing countries (LICs) are 'semi-professionals' mainly because of their relatively low levels of education vis-à-vis professional occupations such as doctors, engineers and lawyers in China, many universities require only master's degree to become university teachers. In general, Chinese university needs more high level teachers, but many teachers still remain in primary and middle level teachers. Generally, it requires great amount of enthusiasm and efforts to elevate to upper levels.

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Therefore, it is critically important to motivate lower level teachers to upgrade themselves, but how to motivate them is still unknown.

From the above, there are various incentive factors which influence teachers' work enthusiasm, such as salary, promotion, performance evaluation, honor, working environment, remuneration, etc. The importance degree to incentive factors of university teachers with different characteristics are different, that is to say, the same kind of incentive factors has different incentive effect upon teachers with different characteristics. Therefore, in order to establish scientific and reasonable incentive mechanism of university teachers, there must be answer the following questions.

Question 1: Which kind of incentive factors has the biggest effect on university teachers' work enthusiasm?

Question 2: What kind of factors (e.g. teacher position and age) do mostly effect on university teacher to be more vulnerable to incentive?

For further exploring the differences of the university teachers' incentive factors, as namely positional title and age, analyzing incentive factors preference of teachers with different individual characteristics, and accurately grasping university teachers' incentive factors, so as to provide the theory basis and the empirical support for attracting, retaining and inspiring teachers. The purpose of this study is to investigate the attention degree for different incentive factors of university teachers with different ages and professional positions, applying grey theory to analyze sample data. The grey correlation analysis method to explore university teachers' motivation factors, and make further investigation about university teachers incentive factors in the light of different positional titles and different age, and hope that this will provide some enlightenment and reference for university human resources management.

2. Literature Review

2.1. Incentives

The general definition of incentives is something which could motivate an individual to perform a specific action (Shields, 2007). When incentives are used properly, the desirable actions of individuals can be expected, which could induce the future organizational outcomes. Mondy & Mondy (2012) mentioned that the well-designed incentive system can help an organization to meet its goals. There are mainly two types of incentives: financial and non-financial incentives. Financial incentives are usually in the form of wages, salaries, commissions, and bonuses. Otherwise, non-financial incentives are more related to psychological fulfillment such as satisfaction, reputation, and work appraisal. How to balance out between two types of incentives can be the most difficult and challenging issue for human resource management practitioners because individual satisfaction toward two types of incentives might be different depending on persons and situations (Mondy & Mondy, 2012).

In particular, the age profile of teachers has become younger in many countries, including China, due to the higher cultivating rate for young teachers, and teacher attrition (Bennell, 2004). In the past, the monetary incentives were much more common as rewards for teachers, but, recently, incentives have been gradually changed from monetary to non-monetary incentives, which could refer that only using monetary incentives are not enough to motivate younger teachers. Also, many studies identified only material incentives are not always positively correlated with teacher's satisfaction (Canrinus et al., 2012; Johnson, 1986).

According to Alderfe's "ERG" (Existence, Relatedness Growth) theory, material incentives could only satisfy the lower level needs of employees (Noe et al., 2010). Only depending on material incentives ignoring teachers' various needs might cause them to lose enthusiasm to work and motivation, which could prevent organizations from achieving their objectives successfully. According to Herzberg's two-factor theory, an employee's satisfaction depends primarily on two factors: on the one hand is the hygiene factors, such as salary and benefits, and the motivation factors, such as leadership management, training promotion and the job itself, etc. Huang (2003) thought, in the application of Chinese university teachers incentive, the two-factors theory mainly indicated in three aspects: The first was that the external incentive was to create a good living environment for college teachers; the second was that the managers needed to effectively integrate monetary and non-monetary incentives to motivate their employees; the third was that the internal motivation was mainly to promote career development of university teachers.

2.2. The Conception of Grey System Theory

Grey system theory was developed in 1980's by Deng (1982) in P.R. China. During the past decades, researches related to the Grey system theory were mainly conducted in the Chinese speaking areas (Lu & Wevers, 2006). In recent years, as a kind of unique new theory, the grey system theory has had a huge effect on the development of science, and increasingly being recognized for the domestic and foreign academic circles.

Grey system provides multidisciplinary approaches for analysis and abstract model of systems for which the information is limited, incomplete and characteristic by random uncertainty. The term grey stands for poor, incomplete and uncertain, and is especially used in relation to the concept of information. In the view of Grey Theory, a system is composed of many factors. If a system for which the relevant information is completely known is sometimes called a white system, while a system for which the relevant information is completely unknown is termed a black system. Any system with partial information already known and partial information unknown, then may be called a grey system.

2.3. Grey Correlation Analysis

In general, people often want to know that which are major factors and which are secondary factors among many factors in a system. The general abstract systems, such as social system, economic

system and agricultural system, ecological system, farm machinery system, education system and etc. contain many kinds of factors, the results of joint action of various factors determine the system development trend. The main concerns are: which are the main factors; which are the secondary factors; what factors have big effect and what factors have small effect; what factors promoting system development need to be strengthened; what factors impeding system development ought to be curbed. All these are widespread concerned matters in the system analysis. For example, the analysis of college and university teacher incentive factors can be as a system. It is necessary to promote cooperation between teaching faculties and researchers to enhance flexibility and competitiveness of universities. Since the factors influencing the enthusiasm of teachers are various, salary level, job position, working environment, and value concept, it is important to identify the most influential factor in the viewpoint of system analysis.

The existing system quantitative analysis methods mainly include: regression analysis (including linear regression, multiple factors regression, single factor regression, etc.), variance analysis, principal component analysis and so on, and most of the empirical studies using regression analysis method. But regression analysis can only be applied to the situation of less factors and linear case, but it is difficult to deal with in the case of multi-factors, nonlinear. In summary regression analysis has the following shortages: (1) needs large quantities of data, if the data is small it is difficult to find statistical regular pattern; (2) the data distribution should be linear, or exponential, or logarithmic. Due to the easier calculation of linear regression, people often wish the data distribution be linear or be exponential and logarithmic in the case of single factor or less factors. But on the whole, the requirement of data distribution is typical rather than chaotic; (3) abnormal situation may appear. This is because the regression analysis calculation is mainly the data of power and arithmetic, that is the sum of squares, sum of full, etc., it is easy to appear the phenomenon of Xmax-Xmin in the operation process of error calculation, make positive correlation into negative correlation, so that the correct phenomenon is distorted and upside down. However, the grey correlation analysis method makes up for the shortage of the regression analysis. No matter how the sample size is bigger or whether there is typical distribution, this method can be applied anyway, and have small amount calculation and is very simple calculated, generally won't appear the situation that quantitative and qualitative analysis results are not in conformity with each other. In analysis process, we often meet statistical data limited, data gray scale bigger, data fluctuating, and no typical distribution situation, that adopt regression analysis are afraid to receive due effect.

2.4. Grey Correlation Analysis Model

2.4.1. Definition and Description of Correlation analysis factors

For correlation analysis, the first is to specify reference sequence. Generally, the dependent variable constitute a reference sequence: $Y_i = \{Y_i(k), k=1,2,\dots,n\}$, the independent variable compose comparative sequence: $X_i = \{X_i(k), k=1,2, \dots, n \}$.

2.4.2. The calculation of Correlation coefficient and Correlation degree

After get data of comparative sequence and reference sequence, and then calculating the correlation coefficient and the correlation degree between comparative sequence and reference sequence through the following methods and steps, and then proceed to the next step to analyze the influence degree of each comparative sequence upon reference sequence.

Calculation method and procedure is as follows:

(1) The original data transform (immeasurable dimension processing)

Due to the dimension (or unit) of every factors in the system are not necessarily alike, sometimes the numerical order of magnitude are differ greatly and such data is difficult to compare directly. So the original data should be eliminated dimension (or unit), converted to comparable data sequence. The following several kinds of commonly used method:

a) Mean change transformation

First to calculate the mean value of each sequence separately, and use the average value to divide by each original number of corresponding sequence, then get new data column, i.e., the average sequence.

b) Initial value conversion

With the first datum data of the same sequence to divide back raw data respectively and get a new multiple sequence, that is namely initial value change sequence.

c) Standardized transformation

First to calculate the mean and standard deviation of each sequence separately and after all the original data minus the average value then be divided by standard deviation, so get the standardized sequence.

(2) For correlation coefficient

① For the difference sequence Δ between the comparison sequence X_i and reference sequence Y_0 .

From the formula: $\Delta(k) = |Y_0(k) - X_i(k)|$

② From the sequence difference $\Delta(k)$ to find out the minimum and maximum value, namely:

$$\min_k |Y_0(k) - X_i(k)| ; \max_k |Y_0(k) - X_i(k)|;$$

And then from different comparative column (i) minimum value and maximum value to take out the minimum and maximum respectively, get:

$$\min_i \min_k |X_0(k) - X_i(k)| ; \max_i \max_k |X_0(k) - X_i(k)|$$

③ Calculating correlation coefficient the formula:

$$\sigma_i(k) = \frac{\min_k \min_i |Y_0(k) - X_i(k)| + \rho \max_k \max_i |Y_0(k) - X_i(k)|}{|\min_k \min_i |Y_0(k) - X_i(k)| + \rho \max_k \max_i |Y_0(k) - X_i(k)|}$$

Amongst, the resolution ratio ρ range between 0 ~ 1, generally take $\rho = 0.5$.

Correlation coefficient reflects close (near) degree between two compared sequence at one point (indicator or observation object).

If: $|Y_0(k) - X_i(k)| = \min_k |Y_0(k) - X_i(k)|$; Then: $\sigma_i(k) = 1$

If: $|Y_0(k) - X_i(k)| = \max_k |Y_0(k) - X_i(k)|$; Then correlation coefficient $\sigma_i(k)$ is the minimum. Therefore, correlation coefficient $\sigma_i(k)$ ranges $0 < \sigma_i(k) \leq 1$

(3) For correlation degree

From the above, it is known that the correlation degree analysis is essentially the comparison of geometrical relationship for sequence data, if two sequences are coincidence together in each time point, namely correlation coefficient is equal to 1.

On the other hand, the two comparison sequence will never be vertical at any moment, so correlation coefficient are always greater than zero, the correlation degree are greater than zero too. Therefore, the correlation degree of two sequences is calculated from the average correlation coefficient with two comparison sequence at each time. Correlation degree calculation formula is commonly:

$$Y_{oi} = \sum_{k=1}^N \frac{\sigma_i(k)}{n}$$

Amongst, N is the sequence's length, namely the number of data. And Y_{oi} be the correlation degree of comparative sequence X_i for reference sequence Y_0 .

2.4.3 Row correlation order

To arrange the correlation degree in size order of n series subsequence for same mother sequence, that composes the correlation order sequence. It directly reflects the "strengths and weaknesses" relationship of each subsequence for mother sequence.

If $Y_{oi} > Y_{oj}$, it says X_i was superior to X_j for the same mother sequence Y_0 .

3. Research Method

3.1. Sample

Linyi University is a new local comprehensive university, located in Linyi city, Shandong province, China, and nearly 35,000 students are registered. Recently, in order to adapt to the rapid development of the school scale and to enrich and strengthen the construction of teachers' team, the school authority hired a large number of highly

educated young and middle-aged teachers. By January 2012, the faculty was more than 2,700 people, including 1,900 full-time teaching and scientific research personnel, accounting for 70.4%, the professors and associate professors are 701 persons, accounting for 37%. The teachers with doctoral degree and master's degree are of 1375, accounting for 72.4 %; Master tutor and doctor tutor are of 60 people. The young teachers under the age of 45 are of 1456 person, accounting for 76% (LinYi University, n.d.).

The present research mainly chose two personal characteristics, as namely, age and professional title, as comparison factors to analyze the sample. The main reason to choose age as one of personal characteristics was that age is one of the most important factors for determining people's demands. Different ages have different needs, and different focuses on incentive factors. Generally, Chinese university teachers retire when he or she is sixty years old. Therefore, this study categorized the university teacher's age into below 30 years old, 30-39 years old, 40 - 49 years old and over fifty years old by ten years interval for the aim of study and analysis.

Moreover, the professional title is another important personal characteristic of university teachers. In China, universities teacher's titles are divided into three levels: primary, intermediate and advanced. In general, the primary level teacher could refer as the assistant professor. Whereas, the intermediate level teacher could refer as the lectural, and the advanced level teacher could be as the professor.

The professional title is another important personal characteristic of university teachers. In LinYi University, there are three levels of teachers: assistant professor (primary level), lecturer (intermediate level), and associate professor and professor (advanced level).

3.2. Instrument

The factors that influence university teacher enthusiasm have extensive gray character, namely, the incomplete information and uncertainty, so that the encouragement system can be regarded as gray system, and using gray relational analysis to bleach the relationship between the incentive factors and get comprehensive analysis model, thus to determine the correlation degree between the teachers enthusiasm and motivation.

This study took into account university teachers' professional characteristics, the selection of incentive factors include: Reputation, Promotion, compensation and benefits, working environment, performance evaluation, and devise questionnaire (see the appendix). Using five-point scales of a Likert Scale to evaluate, in which "5" extremely important, "4" very important, "3" important, "2" doesn't matter, "1" not important.

3.3. Data Collection

The study subjects were teachers randomly selected from Linyi University, a total of 500 questionnaires were distributed, but 435 subjects could be used for further analysis, which came up with 87% response rate.

According to the age, 21.6% of the participants were below 30 years; 24.6% were between 30-39 years; 28.2% were between 40-49

years; 25.6% were above 50 years old. As far as the professional title is concerned, 25.9% of them had primary professional title; 43.2% had intermediate professional title and 30.9% had advanced professional title. The original data collection is weighted average in table 1 and table 2.

<Table 1> Sample Basic Condition List

Personality Characteristics	Number of People	Proportion	Total
Primary	113	25.9%	435
Intermediate	188	43.2%	
Advanced	134	30.9%	
below 30 years	94	21.6%	435
30 - 39 years	107	24.6%	
40 - 49 years	123	28.2%	
above 50years	111	25.6%	

<Table 2> The Raw Score of Incentive Factors Influence on Teachers

Personality Characteristics	Rep	Prom	Env	Compen	Eva
Primary	1.98	4.99	3.85	4.89	2.56
Intermediate	2.84	4.15	2.93	4.85	3.01
Advanced	4.88	1.92	4.27	2.96	2.97
-30	1.88	4.79	2.67	4.31	3.11
30 - 39	3.03	4.21	3.88	4.63	2.96
40 - 49	4.12	3.72	4.67	3.97	3.07
50 -	4.92	1.62	3.34	2.95	2.99

Note: Rep = Reputation, Prom = Promotion, Env = Working Environment, Compen = Compensation, Eva = Performance Evaluation

4. Results

4.1. Horizontal analyses

Horizontal analysis refers to the incentive factors as independent variables and composes a comparative sequence, while the teachers' personality traits are as dependent variable and determine the reference sequence.

Make comparative series

$$X_i = (X_i(1), X_i(2), \dots, X_i(7)), \quad i = 1, 2, \dots, 5$$

Among: X_1 for reputation stimulation; X_2 for promotion stimulation; X_3 for working environment incentives; X_4 for compensation and benefits incentives; X_5 for performance evaluation incentive, and take the maximum of every personality characteristics university teachers as reference sequence, that is :

$$x_0 = (4.99, 4.65, 4.88, 4.79, 4.63, 4.67, 4.92)$$

Reference sequence and comparing sequence will be normalized separately and transformed into percentage, take the maximum value of every personality characteristics of university teachers as reference sequence, and get reference sequence:

$$X_0 = (100, 100, 100, 100, 100, 100, 100)$$

Transformation result is such as table 4.

<Table 3> Horizontal Reference Sequence

Personality Characteristics	Rep	Prom	Env	Compen	Eva	Ref
Primary	1.98	4.99	3.85	4.89	2.56	4.99
Intermediate	2.84	4.15	2.93	4.85	3.01	4.85
Advanced	4.88	1.92	4.27	2.96	2.97	4.88
-30	1.88	4.79	2.67	4.31	3.11	4.79
30 - 39	3.03	4.21	3.88	4.63	2.96	4.63
40 - 49	4.12	3.72	4.67	3.97	3.07	4.67
50 -	4.92	1.62	3.34	2.95	2.99	4.92

Note: Rep = Reputation, Prom = Promotion, Env = Working Environment, Compen = Compensation, Eva = Performance Evaluation, Ref = reference sequence

<Table 4> Horizontal Reference Sequence Transformation

Personality Characteristics	Rep	Prom	Env	Compen	Eva	Ref
Primary	39.7	100	77.1	97.9	51.3	100
Intermediate	58.5	85.6	60.4	100	62.1	100
Advanced	100	39.3	87.5	60.6	60.9	100
-30	39.2	100	55.7	89.9	64.9	100
30 - 39	65.5	90.9	83.8	100	63.9	100
40 - 49	88.2	79.7	100	85.0	65.7	100
50 -	100	32.9	67.9	59.9	60.8	100

Note: Rep = Reputation, Prom = Promotion, Env = Working Environment, Compen = Compensation, Eva = Performance Evaluation, Ref = reference sequence

For the difference sequence Δ_i between the comparison sequence X_i and reference sequence X_0 .

From the formula:

$$\Delta_i(k) = |X_0(k) - X_i(k)|, \quad k=1, 2, \dots, 7$$

$$\Delta_1 = (60.3, 41.5, 0.00, 60.8, 34.5, 11.8, 0);$$

$$\Delta_2 = (0.0, 14.4, 60.7, 0.0, 9.1, 20.3, 67.1);$$

$$\Delta_3 = (22.9, 39.6, 12.5, 44.3, 16.2, 0.0, 32.1);$$

$$\Delta_4 = (2.1, 0.0, 39.4, 10.1, 0.0, 15, 40.1);$$

$$\Delta_5 = (48.7, 37.9, 39.1, 35.1, 36.1, 34.3, 39.2);$$

Grey correlation coefficient calculation.

Take distinguish coefficient $\rho = 0.5$, from the correlation coefficient calculation formula:

$$\sigma_i(k) = \frac{\min_i \min_k |X_0(k) - X_i(k)| + \rho \max_i \max_k |X_0(k) - X_i(k)|}{|X_0(k) - X_i(k)| + \rho \max_i \max_k |X_0(k) - X_i(k)|}$$

$$\sigma_1 = (0.36, 0.44, 1.00, 0.35, 0.49, 0.74, 1.00)$$

$$\sigma_2 = (1.00, 0.69, 0.35, 1.00, 0.79, 0.62, 0.33)$$

$$\sigma_3 = (0.59, 0.45, 0.74, 0.43, 0.67, 1.00, 0.51)$$

$$\sigma_4 = (0.94, 1.00, 0.46, 0.77, 1.00, 0.69, 0.45)$$

$$\sigma_5 = (0.40, 0.46, 0.46, 0.49, 0.48, 0.49, 0.46)$$

Grey correlation degree calculation

From the correlation degree formula:

$$Y_i = Y_{0i} = \sum_{k=1}^N \frac{\sigma_i(k)}{n}, \text{ and get:}$$

$$\gamma_1 = 0.6257; \gamma_2 = 0.6828; \gamma_3 = 0.6271; \gamma_4 = 0.7585; \gamma_5 = 0.4628$$

Sorting by size, namely : $\gamma_4 > \gamma_2 > \gamma_3 > \gamma_1 > \gamma_5$

This result shows that Compensation and benefit is the most important factor which motivates university teachers working hard, followed by promotion stimulation, reputation and working environment has nearly the same importance for college teachers, performance evaluation stimulation has the smallest importance to university teachers.

4.2. Vertical analysis

Vertical comparative analysis refers to the teachers' personality traits as independent variables and composes a comparative sequence, while the incentive factors are as dependent variable and determine the reference sequence.

Make comparative sequence

$$Y_i = (Y_i(1), Y_i(2), \dots, Y_i(5)), i = 1, 2, \dots, 7$$

Among: Y_1 for Primary professional title teachers; Y_2 for middle professional title teachers; Y_3 for high professional title teachers; Y_4 for below 30 years teachers; Y_5 for 30 - 39 years teachers; Y_6 for 40 - 49 years teachers; Y_7 for above 50 years teachers; Then, determine the reference number Y_0 , take the maximum value of every incentive factors as reference sequence:

$$Y_0 = (4.92, 4.99, 4.67, 4.89, 3.11)$$

<Table 5> Vertical Reference Sequence

Personality Characteristics	Rep	Prom	Env	Compen	Eva
Primary	1.98	4.99	3.85	4.89	2.56
Intermediate	2.84	4.15	2.93	4.85	3.01
Advanced	4.88	1.92	4.27	2.96	2.97
-30	1.88	4.79	2.67	4.31	3.11
30 - 39	3.03	4.21	3.88	4.63	2.96
40 - 49	4.12	3.72	4.67	3.97	3.07
50 -	4.92	1.62	3.34	2.95	2.99
Reference	2.92	4.99	4.67	4.89	3.11

Note: Rep = Reputation, Prom = Promotion, Env = Working Environment, Compen = Compensation, Eva = Performance Evaluation

Reference sequence and comparing sequence will be normalized separately and transformed into percentage, take the maximum value of every personality characteristics of university teachers as reference sequence, and get reference sequence:

$$Y_1 = (100, 100, 100, 100, 100)$$

Transformation result is such as table 6.

<Table 6> VerticalReference Sequence Transformation

Personality Characteristics	Rep	Prom	Env	Compen	Eva
Primary	40.2	100	82.4	100	82.3
Intermediate	57.7	83.1	62.7	99.2	96.8
Advanced	99.2	38.5	91.4	60.5	95.5
-30	38.2	95.9	57.2	88.1	100
30 - 39	61.6	85.5	83.1	94.7	95.1
40 - 49	83.7	74.3	100	81.2	98.7
50 -	100	32.5	71.5	60.3	96.1
reference	100	100	100	100	100

Note: Rep = Reputation, Prom = Promotion, Env = Working Environment, Compen = Compensation, Eva = Performance Evaluation, Ref = reference sequence

From the formula:

$$\Delta_i = (\Delta_i(k) | k=1, 2, \dots, 5) = (Y_{0(k)} - Y_{i(k)} | k=1, 2, \dots, 5),$$

$$\text{get : } \Delta_1 = (59.8, 0.0, 17.6, 0.0, 17.7)$$

$$\Delta_2 = (42.3, 16.9, 37.3, 0.8, 3.2)$$

$$\Delta_3 = (0.8, 61.5, 8.6, 39.5, 4.5)$$

$$\Delta_4 = (61.8, 4.1, 42.8, 11.9, 0.0)$$

$$\Delta_5 = (38.4, 14.5, 16.9, 5.3, 4.9)$$

$$\Delta_6 = (16.3, 25.7, 0, 18.8, 1.3)$$

$$\Delta_7 = (0.0, 67.5, 28.5, 39.7, 3.9)$$

Grey correlation coefficient calculation

Take distinguish coefficient $\rho = 0.5$, from the correlation coefficient calculation formula:

$$\sigma_i(k) = \frac{\min_i \min_k |X_0(k) - X_i(k)| + \rho \max_i \max_k |X_0(k) - X_i(k)|}{|X_0(k) - X_i(k)| + \rho \max_i \max_k |X_0(k) - X_i(k)|}$$

$$\sigma_1 = (0.36, 1.00, 0.65, 1.00, 0.65)$$

$$\sigma_2 = (0.45, 0.67, 0.48, 0.97, 0.92)$$

$$\sigma_3 = (0.97, 0.35, 0.79, 0.45, 0.87)$$

$$\sigma_4 = (0.35, 0.89, 0.44, 0.74, 1.00)$$

$$\sigma_5 = (0.46, 0.69, 0.66, 0.85, 0.87)$$

$$\sigma_6 = (0.66, 0.56, 1.00, 0.64, 0.94)$$

$$\sigma_7 = (1.00, 0.33, 0.53, 0.45, 0.89)$$

Grey correlation degree calculation

From the correlation degree formula:

$$Y_j = Y_{0j} = \sum_{k=1}^N \frac{\sigma_j(k)}{n},$$

$$\text{get : } \gamma_1 = 0.732; \gamma_2 = 0.698; \gamma_3 = 0.686; \gamma_4 = 0.684; \gamma_5 = 0.706; \gamma_6 = 0.760; \gamma_7 = 0.640;$$

Sort by size, namely : $\gamma_1 > \gamma_2 > \gamma_3; \gamma_6 > \gamma_5 > \gamma_4 > \gamma_7$

This results show that primary title teachers attach more importance to incentives than intermediate and senior title teachers; meanwhile, different age paragraph teachers pay different attention to the incentive factors (need), 40 -49 years of age teachers attach more importance to stimulation, followed by 30- 39 years old, once again is below 30 years old teachers, above 50 years old teachers do not take care of incentive.

5. Conclusion

From horizontal and vertical analysis results could conclude that teachers with different age and positional titles showed different levels of attention on every incentive factors.

This study found that compensations and benefit were basically the most important factors to motivate LinYi University teachers to work harder, followed by promotion stimulation, reputation stimulation and working environment, and performance evaluation stimulation had the least important to LinYi University teachers. From the vertical analysis results, this study could conclude that primary title teachers were attaching more importance to incentives than intermediate and senior title teachers, which could refer that the higher title of teachers had the lower effect of incentive factors. Meanwhile, different age paragraph teachers paid different attention to the incentive factors, 40 -49 years of age teachers put more importance on stimulation, followed by 30- 39 years old. However, below 30 years old teachers and above 50 years old teachers seemed not to take care of incentive too much.

There are some practical implications for the top management of school and further researchers. First, college and university in china, the principal and authorized managers should pay more attention on compensation and benefits to the young and middle-aged teachers' motivation whom with primary-middle professional titles. Probably, this study is carefully assuming that China is still the developing and low-income country, and economic factors are still critical to people, so the compensation and benefits are the most important motivation factors to college and university teachers. Second, the top management of school should pay more attention to teachers' growth, and create more academic promotion opportunities, especially for younger and middle-aged teachers. The promotion opportunities have become the more important incentive factor for young and middle-aged teachers. In addition, improving the working environment for teachers also has certain incentive effect. The reputation stimulation incentives seemed to be more important to higher professional titles teachers that younger and lower professional titles teachers.

Although LinYi University has own performance evaluation mechanism system, it seems to be too focused on monetary incentives which could not attract all types of teachers to motivate, so that in order to motivate teachers positively, school administrators should adopt various incentive systems for different teachers with different professional title and different age.

This research is also not free from limitations. This study has the sample selection bias because the participants only come from Linyi University. Moreover, the demographic data of teachers only include age and professional title. Maybe the marital status, gender, experience and so on can influence the result of the study, so further research is needed.

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