

Research on Demand Forecasting Model of Human Resources Labor Demand in Large-scale SOE Group Under Cost Constraint Circumstances

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Abstract—Human resource demand forecasting is an important part of human resource planning. It is of great significance to construct a human resource demand forecasting model that matches the organizational development. According to the characteristics of personnel and human resource management practice of large-scale SOE group, this paper constructs a forecasting model of total human resource demand under cost constraint circumstances, and takes domestic large-scale power grid enterprises as an example to carry out an empirical study. The results show that the model can achieve the expected management goal of "downsizing the total amount of labor by reducing labor costs", and it plays an important role in optimizing the scientificity and accuracy of labor management in large enterprises under the constraints of labor costs.

Keywords—human resource; total amount of labor; demand forecasting; labor cost.

I. INTRODUCTION

Labor demand forecasting is an important part of human resource planning. Constructing a labor demand forecasting model matching with the organizational development can support the enterprise development strategy. For large-scale SOEs (State-Owned-Enterprises) in China, traditional labor plan management is not closely related to the operation of enterprises. The surplus or shortage of staff is widespread. On the other hand, the rigid growth of labor costs has brought tremendous pressure to enterprises, and labor productivity needs to be improved.

As China enters a new stage of economy development, the economy environment has significantly changed. Improving quality, reducing cost and increasing productivity will become an important goal of SOE management in the future. Among all the ways and means, downsizing the total amount of labor cost by reducing the amount of total labor, and allocating human resources to match the performance growth are the key means to fulfill the above goals.

Based on these considerations, under the circumstances of labor cost constraints, this paper constructs a forecasting model of labor demand. Moreover, according to the forecasting model, this paper takes a large power grid enterprise as an example to carry out empirical research. The results have important value for further improving the scientificity and accuracy of

enterprise labor demand forecast, and for improving the management level of human resource. Meanwhile, the results has application value for other large SOEs in China.

II. CONSTRUCTING MODEL

At present, large SOEs are facing increasing operating pressure, and the pressure of labor cost rigid growth must be effectively alleviated. (Taking a large power grid enterprise as an example, the total labor cost of the company increased by 10.4% annually during the 12th Five-Year Plan. Affected by the reduction of operating income, the personnel cost rate reached 9.13% in 2015, which was the highest in the five-year period. The labor cost will further aggravate the operating pressure of the 13th Five-Year Plan.) Therefore, in this paper, we use labor cost to calculate the total amount of employment. That is to say, under the consideration of fixed per capita pay level and personnel cost level, the total labor cost has a constraint effect on the amount of labors. The labor forecasting model under cost constraint is showed as follows:

$$Y_{t+1} = \frac{S_{t+1}}{V_{S_{t+1}}} \quad (1)$$

Y_{t+1} is the estimation of the amount of labor demand of a enterprise in t+1 period, S_{t+1} is the labor cost budget in t+1 period, $V_{S_{t+1}}$ is the benchmark per capita labor cost in t+1 period.

Per capita labor cost in future periods is,

$$V_{S_{t+1}} = V_{S_t} \times \left(\frac{\eta_t}{\frac{1}{y_{S_{t+1}}} + \frac{1}{l_{r_{t+1}}}} + 1 \right) \times (1 + x_t / 2) \quad (2)$$

V_{S_t} is per capita labor cost in t period, η_t is the comprehensive elastic ratio of labor cost, $y_{S_{t+1}}$ is planned per capita sales growth rate, $l_{r_{t+1}}$ is planned per capita profit growth rate, x_t is the benchmark enterprise. Planned benchmark enterprises per capita labor cost deviation ratio is gap between the target enterprise and its benchmark enterprise. Comprehensive elastic ratio of labor cost determines the

percent of annual income and profit growth that can be used as labor cost growth.

Industrial per capita labor cost deviation ratio= (per capita income of the benchmark enterprise -per capita income of the target enterprise) / per capita income of the target enterprise+ (per capita profit of the benchmark enterprise-per capita profit of the target enterprise) / per capita profit of the target enterprise. The definition of the ratios are showed in table 1.

TABLE I. THE DEFINITION OF THE RATIOS IN THE FORECASTING MODEL

NO.	Index	Explanation	Calculation Formula
1	Per capita income growth rate (ys_{t+1})	The growth of income as the target company growth situation	(per capita income in t period - per capita income in t-1 period)/per capita income in t-1 period
2	per capita profit growth rate (lr_{t+1})	The growth of profit as the target company growth situation	(per capita profit in t period - per capita profit in t-1 period)/per capita profit in t-1 period
3	Per capita labor cost growth rate	The growth of labor cost of the target company	(per capita labor cost in t period - per capita labor cost in t-1 period)/per capita labor cost in t-1 period)
4	Per capita labor cost deviation ratio of benchmark enterprises	The relative situation of labor cost to benchmark company in the industry	(per capita income of the benchmark enterprise -per capita income of the target enterprise)/per capita income of the target enterprise+(per capita profit of the benchmark enterprise-per capita profit of the target enterprise)/per capita profit of the target enterprise
5	elastic ratio of labor cost to income	The relative growth of labor cost to the growth of budget income	Per capita labor cost growth rate in t period / per capita income growth rate in t period
6	elastic ratio of labor cost to profit	The relative growth of labor cost to the growth of budget profit	Per capita labor cost growth rate in t period / per capita profit growth rate in t period
7	comprehensive elastic ratio of labor cost	the percent of annul income and profit growth that can be used as labor cost growth	elastic ratio of labor cost to income + elastic ratio of labor cost to profit

In this part, we choose a large power grid enterprise whose core business is the construction and operation of the power grid to carry out the empirical analysis.

Considering the enterprise size and the international level, the domestic benchmark enterprises chosed is SINOPEC, and the international counterpart is France Electric Power Company and Tokyo Electric Power Company. The sample period is 2016.

A. Data Collection

TABLE II. BENCHMARK ENTERPRISES DATA

Benchmark	labor amount (full aperture)	Per capita income	Per capita profit
SINOPEC	90.87	289.85	5.66
France Electric Power Company	15.85	63.33	2.95
Tokyo Electric Power Company	4.57	144.71	9.57

Notes: 1.SINOPEC use CNY as measure currency. France Electric Power Company and Tokyo Electric Power Company use USD as measure currency. 2. The average exchange rate between CHY and USD in 2015 is 6.2285.

B. Calculating the Growth Rate

- (1) Per capita income growth rate()= 5.96%
- (2) rofit growth rate() = 21.95%
- (3) Per capita labor cost growth rate = 14.12%

C. Calculating the Per Capita Labor Cost Deviation Ratio of Target Enterprises

TABLE III. PER CAPITA LABOR COST DEVIATION RATIO OF BENCHMARK ENTERPRISES

Benchmark	Per capita labor cost deviation ratio (full aperture)
SINOPEC	0.901969531
France Electric Power Company	3.13315014
Tokyo Electric Power Company	6.839066337

D. Calculating the Comprehensive ElasticRatio of Labor Cost

$$\eta_t = \eta_{1t} + \eta_{2t} = \frac{(Vs_t - Vs_{t-1}) / Vs_{t-1} + (Vs_t - Vs_{t-1}) / Vs_{t-1}}{(ys_t - ys_{t-1}) / ys_{t-1} + (lr_t - lr_{t-1}) / lr_{t-1}}$$

=elastic ratio of labor cost to income + elastic ratio of labor cost to profit

$$=2.370372236+0.643247735$$

$$=3.013619971$$

E. Calculating Per Capita Labor Cost in the Future

$$Vs_{t+1} = Vs_t \times \left(\frac{\eta_t}{\frac{1}{ys_{t+1}} + \frac{1}{lr_{t+1}}} + 1 \right) \times (1 + x_t / 2)$$

$$=270.6529$$

The definition of equation above remains the same in equation(2). Assumably, ys_{t+1} is set to 6%, lr_{t+1} is set to 6%.

F. Calculating the Amount of Labor Demand

Bring the budget of total labor cost and the per capita labor cost into the formula.

$$Y_{t+1} = \frac{S_{t+1}}{V_{S_{t+1}}} = 13815$$

Which is the amount of labor demand of the target enterprise.

In the same process, I can get the amount of labor demand of benchmark enterprises.

When benchmark is SINOPEC: 1096464.

When benchmark is France Electric Power Company: 619874.

When benchmark is Tokyo Electric Power Company: 359983.

Based on the current development situation of target company, referring to the opinion of HR expert in the target enterprise. This paper give 3 benchmarks different weight. The weight are 0.6, 0.2, 0.2 for SINOPEC, France Electric Power Company, Tokyo Electric Power Company respectively. Thus, the final forecasting result is 853849.

TABLE IV. WEIGHED AVERAGE RESULT OF THE MODEL

When benchmark is	Forecasting results	Weights	Weighed average result
SINOPEC	1096464	0.6	853850
France Electric Power Company	619874	0.2	
Tokyo Electric Power Company	359983	0.2	

III. CONCLUSIONS

This paper constructs a human resource demand forecasting model based on cost constraints for group enterprises, and takes a large power grid enterprise as an example for empirical study. The model shows the planning of labor management under cost constraints, and the external competitiveness of the improving of enterprise labor productivity. From the modeling results, the model can achieve the expected goals. From the empirical results, the grid enterprise's cost pressure of labor growth is greater. Labor efficiency needs to be improved. It needs to be pointed out that, the model is only from the perspective of cost constraints. In further application, it should be combined with the context of business and the strategies of enterprises.

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