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Research Article

Innovation and Effect Evaluation Model of Education and Training Outsourcing of State-owned Enterprises under Big Data*

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Abstract

Along with the reform of state enterprises and the progress of science and technology, big data technology has been fully applied in state-owned enterprises. There exists waste of human resource management and the unreasonable service mode both in the education and skill training of state-owned enterprise employees. Based on this, the study takes the problems existing in the education and training of state-owned enterprise employees as the research direction under the background of big data, and innovates upon the management optimization strategy for the managers, technicians and operators in the educational mode. Then, according to the multiple regression analysis method, this study establishes an evaluation model for the effect of employee training. Finally, it analyzes the results of the research data of the state-owned enterprises reasonable and puts forward reasonable suggestions.

Keywords

Big Data • Employee Training • Multiple Regression Analysis • Effect Evaluation Model

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Driven by the big data technology, global enterprises are rapidly developing into an integrated economy. All the large enterprises have invested a lot of human resources and services in the education and training of their employees, which has promoted the enterprises to enter the best brand-new era. In the business of employee training in China, the education and training mode of managers, technicians and operators is still in the traditional way without keeping up with the trend and pace of the times. As a result, although a lot of time, human and financial cost has been invested, the effect of training is unsatisfactory. Therefore, it is possible to analyze the problems existing in the education and training of state-owned enterprise employees according to different groups of people (Fung, Tam, Lo & Lu, 2009).

The first is the training of managers. The administrative staff in the state-owned enterprises always follows the “old-fashioned” training mode, and still takes the laws, regulations and policies as the main training contents, but don’t follow the development of the times and the needs of the society. In addition, they don’t effectively integrate the managers’ business capacities with the rapid development of state-owned enterprises. Consequently, the use of administrative rights, the use of theoretical knowledge and the skills of work management haven’t been substantially improved. In a word, in the education and training mode and method of the managers, the lack of innovative consciousness makes it difficult to finish the administrative management of state-owned enterprise employees efficiently.

The second is the training of technicians. In the training plan of the whole year, state-owned enterprises usually attach importance to the skill training of technicians. Both the time arrangement and the allocation of resources reflect the unavailability of technicians. However, in the actual operation, the training content isn’t targeted and is still about knowledge and skills. There are loopholes in the training plan and assessment of technicians, and the training and use of innovative talents always follow the principle of “neither advocating nor suppressing”. This is a huge loss for state-owned enterprises, so there are multifaceted strategies for technicians in terms of methods, modes and implementation of training (Li, Yan, Wu, Radwan & Zhang, 2016).

The third is the training of operators. In the production tasks of the first-line operators in the state-owned enterprises, the work pressure is high and the work contradiction is much. However, in the arrangement of education and training, the actual difficulties and needs of operators aren’t taken into account. Infusion-based training and task-based learning are often conducted (Zubizarreta, Cuadrado, Iradi, García & Orbe, 2017), leading to a low degree of positive participation in learning training. Besides, the main content of the training and the actual work needs become more disconnected and the first-line production and construction efficiency hasn’t been improved, and it is difficult to stimulate the enthusiasm of the operators.

Optimization of the Strategies for Education and Training of State-owned Enterprise Employees

Optimization of strategies for education and training of managers

Managers in state-owned enterprises are roughly divided into low-level managers, middle and high-level managers according to their levels. The optimization of education and training of these two types of personnel

can be strategically innovated from training contents and methods respectively. The specific optimization of strategies for education and training of managers is shown in Figure 1.

The basic professional management knowledge, the method of human resources administration and the operation of basic skills should be taken as the main contents of learning and training for the low-level managers. At the same time, we should be familiar with the daily work and frequent problems of first-line operators. In the training method, we should follow the method of integrating theory with practice. We should not only learn the theoretical knowledge of management, but learn the daily workflow of the operators at the grass-roots level so as to improve the ability to solve the accidents on site.

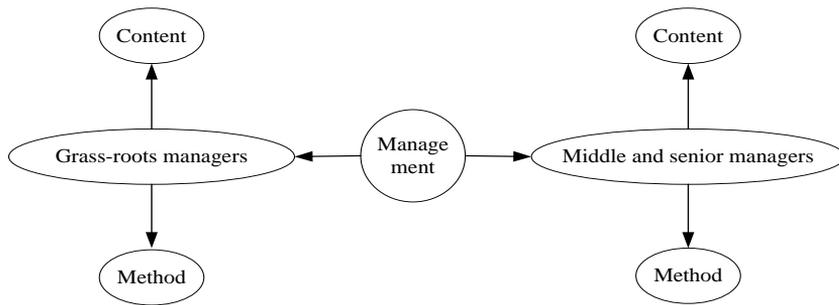


Figure 1. Educational and Training Strategies for Managers.

For middle and high-level managers, the training content should focus on social communication ability, innovation impetus ability and decision-making ability and attach importance to improving the manager’s own strain and decision-making ability and improving the innovation in management work. In the training method, we can stimulate the manager’s innovative consciousness according to the classic cases and brainstorming methods in the market, carry out the timely work communication and written summary among departments. At the same time, we can also arrange young middle-level and above managers to participate in the study of MBA theory in colleges and universities, as well as to exchange and share with more experienced managers so as to improve their own management level (Simpson & Scheer, 2016).

Optimization of strategies for education and training of technicians

The technicians in state-owned enterprises are roughly divided into general technicians, technical backbones and technical experts according to the technical level, all of whom should focus on the improvement of the technical level in education and training. The training mode of the three groups are strategically optimized at different levels in different ways (Wang *et al.*, 2016), and the specific optimization of strategies for education and training of technicians is shown in Figure 2.

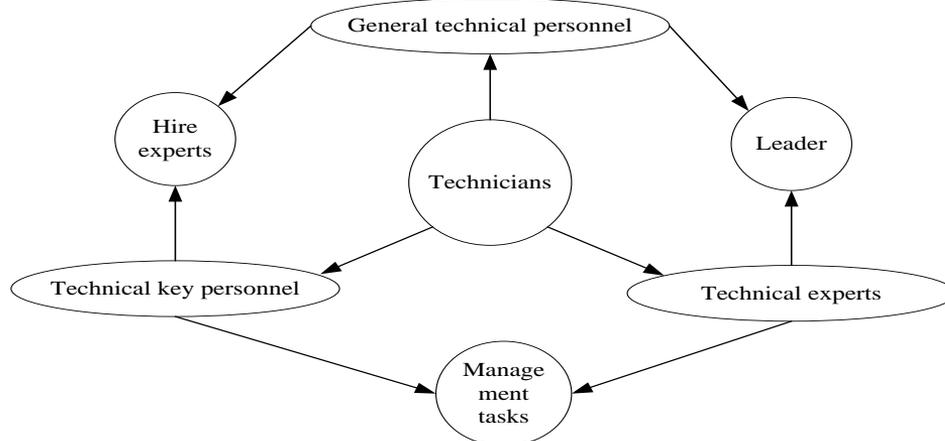


Figure 2. Educational and Training Strategies for Technicians.

In the long-term work of general technical workers, leaders will arrange the corresponding professional technical training, the understanding of frontier products and the evaluation of project quality management. Under appropriate circumstances, competition activities can be held to promote the learning of technical personnel, and innovative technical methods should be greatly encouraged so as to establish a strong desire for knowledge and a sense of honour and responsibility of the grass-roots technical workers.

In the arrangement of education and training of technical backbones, industry experts at home and abroad should be regularly invited to conduct publicity and discussion on frontier products and technologies, and conduct in-depth exchange and discussion so that technical backbones can better understand the technical characteristics of the most frontier products and the development direction of new technologies in the world. For the problems encountered in the work, we should also consult with the hired experts timely in order to achieve breakthrough and innovation (Mori, Washida, Kurosawa & Masui, 2018).

The construction of the technical expert team is inseparable from the high concern of the senior leaders in state-owned enterprises. We should reward the experts who have made outstanding contributions in spiritual and material ways in various ways. What's more, we should regularly arrange academic experts to study in and exchange with well-known industry units at home and abroad (Zhang, Duan, Dan, Shi & Wang, 2018), and to actively participate in the management and guidance of the project in this unit, trying to cultivate more excellent experts.

Optimization of strategies for education and training of operators

The operators in state-owned enterprises should accurately locate the needs of education and training, improve the methods of training and perfect the training mode in the actual production work. The specific optimization of strategies for the operators' education and training is shown in Figure 3.

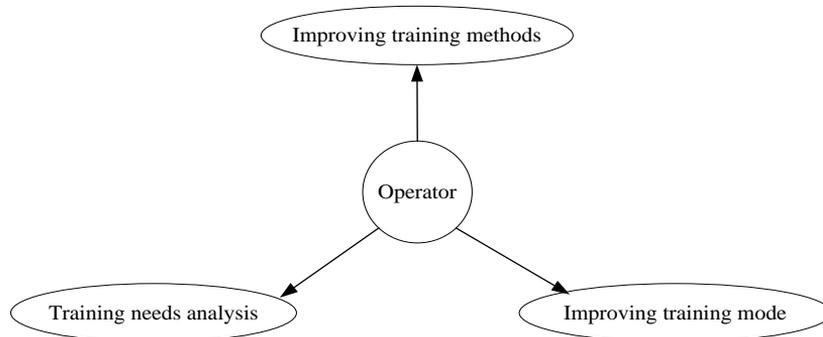


Figure 3. Educational and Training Strategies for Operators.

Before education and training, operators should conduct sufficient investigation and research on the first-line operators, and arrange the education and training tasks for different production work according to the principle of “centralized service and separate training”. Careful investigation and analysis should be made on the level of knowledge mastery of operators, the supporting of hardware facilities, the formulation of training methods and the training conditions so as to make more people get improved from education and training (Rouhani, Ghazanfari & Jafari, 2012).

In the process of education and training, operators should improve the training methods, abandon the inherited method “top-level design and bottom-level implementation”, and carry out various aspects of education and training, such as theory and operation on the operators according to the specific functional departments. In addition, we should make systematic allocation from the supporting of production and operation rooms on the front line, the formulation of daily work plan, the implementation and arrangement of training education plan so as to achieve the training by level and classification according to the professional training methods.

The training model should be perfected based on more innovative models to improve the effectiveness of education and training. In the process of education and training, we should make more experienced staff pass on rich experience to young workers according to the guiding ideology of “the old teach the new, and make more excellent staff participate in the process of paired learning. Furthermore, an appropriate “binding” system should be established to achieve the necessary “joint” rewards and penalties to enable more operators of state-owned enterprises to benefit (Fung, Tam, Lo & Lu, 2010).

Establishment of Evaluation Model

Research methods

Firstly, according to the literature analysis method, this paper summarizes and evaluates the training data of state-owned enterprises in each period, takes the strategy of development of state-owned enterprises as the

starting point, extracts the concrete theoretical basis and relevant variable design, and combines the present situation of domestic state-owned enterprises, Establish the basic structure of the evaluation model.

Then the basic structure of the evaluation model is divided into specific units by means of qualitative analysis elements and quantitative analysis data, and the most realistic data are put forward from the questionnaire according to the index of education and training to get the latest information.

Multiple regression method is used to analyze and calculate the collected data. According to the solution of the regression equation, we design the weight of each index in the evaluation model and establish the optimized evaluation model.

Finally, according to the evaluation model, the education and training results of state-owned enterprises are analyzed and a reasonable proposal is put forward according to the result of the regression equation to give targeted guidance (Feng & Li, 2011).

Theoretical basis

In the process of research, the theories of management, educational psychology, macroeconomics, software engineering design, strategy research, 360-degree performance evaluation and the education and training evaluation model proposed by European management experts are involved. A systematic study is conducted on the evaluation model theory, mainly taking the Kirkpatrick evaluation model as the theoretical structure. Phillips evaluation model is a further revision of the Kirkpatrick evaluation model and the evaluation model of Walburd and Rekham is an important link in establishing the regression equation (Kosugi *et al.*, 2009).

Design of variables

In the establishment of the evaluation model, regression analysis is carried out on four main factors, including the individual attribute variables of employees, the change variables of employee training, the satisfaction variables of training result and the gain variables of training staff.

The individual attribute variables include marital status (M), age (A), education background (E), sex (S), working time (T), and department (D).

The change variables of employee training include number of complaints (C₁), degree of work stress (C₂), sense of work accomplishment (C₃), work initiative (C₄), leave factor (C₅), expectation for the future (C₆), degree of completion of work (C₇), work environment (C₈), interpersonal communication (C₉), enthusiasm of employees to participate in activities (C₁₀), and change status of employees (AC₁).

The satisfaction variables of training result include practical satisfaction (A₁), targeted satisfaction (A₂), systematic satisfaction (A₃), training method arrangement satisfaction (A₄), time setting satisfaction (A₅), training mode satisfaction (A₆), hardware facility satisfaction (A₇), personal demand satisfaction (A₈) and overall satisfaction (A).

The gain variables of training staff include whether it is practical (B₁), objective (B₂), comprehension (B₃), fullness (B₄), applicability (B₅), work requirement (B₆), training material (B₇), time (B₈), expansion (B₉) and harvest of training staff (B).

In accordance with the 360-degree performance evaluation variable, variables are designed, such as evaluation effect of the superior (AC₂), the colleague’s recognition degree (AC₃), the basic level’s recognition degree (AC₄), the service object’s recognition degree (AC₅), training implementer’s recognition degree (AC₆) and weighted recognition degree (AC). Therefore, it is possible to perform a simple evaluation of AC. $AC = (AC_1 + AC_1 + AC_3 + AC_4 + AC_5 + AC_6)/6$.

Evaluation model

Specific variable data are obtained from the actual survey data, and regression analysis is used in line-by-line order to construct a training effect evaluation model (Huang & Chiu, 2015).

First, the data A₁, A₂, A₃, A₄, A₅, A₆, A₇, A₈ of the satisfaction of the training result are input into the EVIEW software, and the calculation result shows that the t value of A₂, A₄, A₅, A₆ is obviously not greater than 2. And the result of the Adjusted R-squared calculation is 0.614508. The least square method is used to further adjust the basic equation to reduce the heteroscedasticity. The corrected Adjusted R-squared value is 0.996891, and then the dimension of the equation is reduced by stepwise regression (p = 0.05). Finally, the equation obtained is as follows:

$$1:A = 13.2816893347 + 4.69046812973 * A_3 + 3.908090771 * A_1 + 3.33163808115 * A_8 + 1.77865344408 * A_7 + 1.56608921242 * A_6 + 1.543843336366 * A_4 + 0.44696092663 * A_5$$

In the regression calculation of the equation, the independent variable A₂ doesn’t accord with the solution range of the equation, so it is directly excluded. The equation variable result of the satisfaction of the variable training result is obtained from the EVIEW software, as shown in Table 1.

Table 1
Variable Table of Equation 1

Independent variable	Coefficient	t - Statistic
A3	4.69	60.56285
A1	3.91	50.82571
A8	3.33	38.15792
A7	1.78	24.99656
A6	1.57	15.52388
A4	1.54	17.17630
A5	0.44	5.310527

Similarly, multivariate regression analysis is carried out on the harvest variables of training staff. We input B₁, B₂, B₃, B₄, B₅, B₆, B₇, B₈ and the calculation result shows that the t value of B₁, B₃, B₅, B₈ is obviously not more than 2. The result of the Adjusted R-squared calculation is 0.699717. The basic equation is further adjusted by the least square method to reduce the heteroscedasticity. The corrected Adjusted R-squared value is

0.997562, and then the dimension of the equation is reduced by stepwise regression ($p = 0.05$). Finally, the equation obtained is as follows:

$$1: B = 13.1464601117 + 3.24513183966 * B_4 + 1.67946471569 * B_2 + 3.9784730137 * B_6 + 1.46424327182 * B_3 + 3.19722792173 * B_7 + 2.82523000468 * B_9 + 0.761645810541 * B_1 + 0.391976925832 * B_2$$

In the EVIEW software, regression calculation is performed on the gains of the equation variable training staff, and the calculation results of the variables are shown in Table 2.

In the EVIEW software, the change variables of employee training are calculated, and then the regression analysis is carried out to get the final equation.

$$AC = 25.970690293 + 2.86639825103 * C_4 + 2.30914726461 * C_8 + 2.75492422867 * C_1 + 2.91520431244 * C_6 + 3.26084956142 * C_2 + 2.21768299807 * C_9 - 0.985853592587 * C_5 - 0.834655779977 * C_3 - 0.354190518703 * C_{10}$$

The specific results of change variables of employee training are shown in Table 3.

Table 2
Variable Table of Equation 2

Independent variable	Coefficient	t - Statistic
B ₄	3.25	27.71582
B ₂	1.68	15.02376
B ₆	3.98	27.66556
B ₃	1.46	10.49765
B ₇	3.20	19.20215
B ₉	2.83	17.23095
B ₁	0.76	5.227736
B ₈	0.39	3.022564

Table 3
Variable Table of Equation 3

Independent variable	Coefficient	t - Statistic
C ₄	2.87	23.22669
C ₈	2.31	8.692238
C ₁	2.75	15.17863
C ₆	2.92	17.64421
C ₂	3.26	19.34795
C ₉	2.22	16.89610
C ₅	-0.99	-6.857881
C ₃	-0.83	-6.102598
C ₁₀	-0.35	-2.157593

Undergraduate colleges and universities have made some achievements in the cultivation of talents, but they still can't keep up with the pace of social development. Therefore, based on the importance of application-oriented teaching model, this study analyzes the main problems and reasons in the practice teaching model of undergraduate colleges and universities.

By reconstructing Coefficient and t-Statistic in Equation 1, Equation 2 and Equation 3 and the individual attribute variables of employees, the change variables of employee training, the satisfaction variables of training result and the gain variables of training staff, we can contain a new effect evaluation model.

Analysis of Model Results

According to the established evaluation model, effect evaluation is conducted on variables A, B and C of the state-owned enterprises in the experimental data, and then strategic recommendations are made for the results of the evaluation. The satisfaction variable of the training result is firstly tested, as shown in Table 4.

As can be seen from Table 4, A₃ has the highest T value, followed by A₁ and A₈, so it is possible to improve the practicality and systematicness of the training content by making constructive comments from the satisfaction of the results. According to the main needs of the training object as the main point of training design and starting from the technical characteristics and needs of employees, we can improve the satisfaction of employees to the training results in a short period of time.

Then, the training staff's harvest variables are calculated by the evaluation model, and the specific calculation results are shown in Table 5.

Table 4
Model Measurement Table 1

Variable	A ₁	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈
Average value	3.16	21.89	3.16	3.11	3.47	3.68	3.32
Coefficient	3.91	4.69	1.54	0.44	1.57	1.78	3.33
Av*Coefficient	12.3556	13.5541	4.8664	1.3684	5.4479	6.5504	11.0556
t-Statistic	50.83	60.56	17.176	5.32	15.52	25.00	38.16

Table 5
Model Measurement Table 2

Variable	B1	B2	B3	B4	B6	B7	B8	B9
Average value	3.58	3.53	3.63	3.74	3.26	3.32	3.26	3.05
Coefficient	0.76	1.68	1.46	3.25	3.98	3.20	0.39	2.83
Av*Coefficient	2.72	5.93	5.30	12.16	12.97	10.62	1.27	8.63
t-Statistic	5.23	15.02	10.50	27.72	27.67	19.20	3.02	17.23

Table 6
Model Measurement Table 3

Variable	C1	C2	C3	C4	C5	C6	C8	C9
Average value	2.68	2.74	2.84	3.68	2.89	3.42	2.79	2.89
Coefficient	2.75	3.26	-0.83	2.87	-0.99	2.92	2.31	2.22
Av*Coefficient	7.37	8.93	-2.36	10.56	-2.86	9.9864	6.4449	6.4158
t-Statistic	15.18	19.35	-6.10	23.23	-6.86	17.64	8.69	16.90

It can be seen from Table 5 that B₄ has the highest T value, followed by B₆ and B₇, so it is possible to enhance the richness and interest of the content by making constructive advice from the gains of training staff. The training content and the actual work can be quickly combined to produce effect as far as possible. At the

same time, human concern should be increased to the personal life, psychology, family and other factors of employees, which can enhance the training staff's harvest in a certain period of time.

Finally, the change variables of employee training are calculated by the evaluation model and the specific calculation results are shown in Table 6.

As shown in Table 6, C₄ has the highest T value, followed by C₂ and C₆, so constructive suggestions can be made from the change of employee training with the main focus being that the educational training activities themselves aren't attractive enough to employees. The rewards and punishments should be increased to improve the work enthusiasm of employees so that employees enhance their sense of self-belonging. In this way, they can recognize that they are both employees and protagonists of the enterprises.

Through the above analysis and the calculation of the evaluation model, the effect of training is analyzed qualitatively and quantitatively from three different aspects. It is found that state-owned enterprises should arrange the training from the practicality, systematic and interest of the training contents. The scientific nature and the integrity of the training methods should be improved. Combined with the people-oriented principle, the personal factors other than the work of employees should be combed and guided to enhance their self-identity and sense of belonging. Through the strategies of the above-mentioned construction opinions, the education and training effect of state-owned enterprises will certainly achieve a better result.

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