

Analysis of Satisfaction with Social Training Based on Multiple Linear Regression

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Abstract. With the rapid development of the information age and the change of employment the concept of vocational training conducted by higher vocational institutions for the society is not only beneficial to the employment in entrepreneur, but also conducive to the school's ability to improve the quality of talent training and the competence of school running. However, there are still a series of problems in conducting vocational and technical training for the society, such as insufficient analysis of students' satisfaction, low initiative of schools and teachers, insufficient curriculum and resources, insufficient applicability of training methods and weak practical teaching ability of teachers. In recent years, theories and methods of machine learning have been widely used in various engineering and disciplines to solve complex problems. Therefore, this paper first analyses the factors influencing social training satisfaction using Pearson's correlation coefficient; then, it constructs a decision model of social training methods based on multiple linear regression to solve the problem of insufficient applicability of training methods, and verifies the effectiveness of the proposed model and method through experiments.

Keywords: multiple linear regression, social training, satisfaction analysis, impact analysis

1 Introduction

It is the statutory duty of vocational colleges to implement both academic education and training. It is not only the need of the society for higher vocational institutions to carry out social training, but also the necessity for higher vocational institutions themselves to play their social functions and improve quality and efficiency in serving economic and social development. However, there are still some problems in the process of social training. Firstly, the quality of social training implementation is poor. In the process of implementing social training, many rich and diverse tutorials have been added into it, including but not limited to "youth quality development courses", "policy-based skills training programmes", "re-employment programmes for the unemployed", and "training for the unemployed". The training programmes include, but are not limited to, "youth development courses", "policy skills training programmes", "re-employment training for the unemployed", etc., but they do not achieve the corresponding results in the process of implementation. The main reason for this situation is the lack of involvement of residents in the implementation of social training and the uneven quality of the training, causing the results that do not meet expectations. Secondly, there is a lack of attention to vocational training. Some of the leaders of the faculties (departments) have a misunderstanding of vocational training work, simply they equate social training services with

income generating work and the don't attention to the synergy of training work with the professional development of the faculties and the construction of the teaching staff, lacking the pursuit of quality and innovation of social training, pursuit of social training work, which in turn leads to lower satisfaction of the trainees. Finally, the existing training model is outdated, with the school arranging for the School of Continuing Education to be responsible for co-ordinating the development of external social training, and the faculty specifically undertaking the development of the teaching task model. The school leadership has insufficient understanding of the social training work and limited resources invested in it, believing that social training work is only the business of the School of Continuing Education and that social training work lacks quality management awareness. The lack of long-term planning for the development of social training at the school level has led to a greater degree of arbitrariness in the development of training programmes, curriculum setting and training management. Although there is a wide variety of social training methods available, it is also a difficult problem to choose a combination of training methods that will satisfy the trainees.

In response to the above questions, we investigated the potential factors that might affect satisfaction with social training. We first analysed the relevant potential factors using Pearson's correlation coefficient, and then obtained the influence factors of each factor on the satisfaction of social training. In order to make the social training modality more suitable for the trainees, we used a multiple linear regression model to model the satisfaction with the social training modality and also obtained the regression coefficients for the importance of each training modality. Through the above modelling analysis, appropriate adjustments can be made to social training and its modalities to provide guidance for the survival and development of social training under the new competitive situation, and also to provide reference and reference for the strategic choice of social training development in higher education institutions in China.

2 Training satisfaction analysis and training approach decision model

Social training in higher education institutions is complex and diverse, and students' satisfaction is easily influenced by the uneven quality teaching. In order to enhance students' satisfaction with social training more effectively, we analyse model social training satisfaction and training methods basing on Pearson correlation coefficient and multiple linear regression.

2.1 Analysis of factors related to satisfaction with social training

There are a number of possible influences on students' satisfaction with social training, for example, the number of times they attend the training, the importance the company places on the training, the focus of the training, etc. In order to analyse the influence of these factors on satisfaction, a Pearson correlation coefficient has been introduced for calculation purposes. Pearson's correlation coefficient is widely used to measure the degree of correlation between two variables and is defined by the standard deviation and covariance between the two variables, formalised as:

$$\rho_{X,Y} = \frac{\text{cov}(X,Y)}{\sigma_X\sigma_Y} = \frac{E((X-\mu_X)(Y-\mu_Y))}{\sigma_X\sigma_Y} = \frac{E(XY)-E(X)E(Y)}{\sqrt{E(X^2)-E^2(X)}\sqrt{E(Y^2)-E^2(Y)}}, \quad (1)$$

where $\text{cov}(X, Y)$ is the covariance of X and Y , and σ_X, σ_Y are the standard deviations of X and Y , respectively. We used n influencing factors x (the magnitude of n is given in the experimental section) as a sample to calculate their correlation with satisfaction y . The sample Pearson correlation coefficient r_{xy} can be obtained by transforming equation (1):

$$r_{xy} = \frac{\sum x_i y_i - n \bar{x} \bar{y}}{(n-1) s_x s_y} = \frac{n \sum x_i y_i - \sum x_i \sum y_i}{\sqrt{n \sum x_i^2 - (\sum x_i)^2} \sqrt{n \sum y_i^2 - (\sum y_i)^2}}, \quad (2)$$

where r_{xy} the value range of $[-1, 1]$. After the calculation of the above equation, the correlation between each influencing factor and the satisfaction of social training can be obtained, which in turn can guide the higher vocational institutions to adjust the focus of social training accordingly in order to achieve the goal of improving students' satisfaction.

2.2 A multiple linear regression-based decision model for training methods

With the development of teaching models and teaching philosophies, training methods are constantly changing. The choice of training method is an important factor influencing satisfaction of social training. Correlation analysis of training methods and satisfaction is not sufficient to support the development of training methods because social training is often delivered using a combination of training methods and correlation analysis of a single variable cannot satisfy this need. The principle of multiple linear regression is accomplished by the optimal combination of multiple independent variables Forecast or Estimation Dependent variable, this method is more effective and realistic than the prediction or estimation of a single independent variable. We therefore constructed a multiple linear regression based satisfaction analysis model and used model training to obtain regression coefficients indicating the importance of training methods to provide a basis for the development of social training.

Hypothetical training approach There are a total of d types, a linear regression is used to predict social training satisfaction y , calculated as:

$$\hat{y} = w_1 x_1 + \dots + w_d x_d + b, \quad (3)$$

where w is the regression coefficient and b is the bias. To facilitate model training, all training methods are put as features into the vector $\mathbf{x} \in \mathbb{R}^d$ in the model, then all samples are represented by the matrix $\mathbf{X} \in \mathbb{R}^{n \times d}$ (n is the number of samples) is represented. So the predicted value $\hat{\mathbf{y}} \in \mathbb{R}^n$ are calculated from the original equation (3) as follows:

$$\hat{\mathbf{y}} = \mathbf{X}\mathbf{w} + b, \quad (4)$$

where $\mathbf{w} \in \mathbb{R}^d$ is the bias vector. We use the squared error function most commonly used in regression problems as the loss function, which is calculated as:

$$L(\mathbf{w}, b) = \frac{1}{2n} \sum_{i=1}^n (\hat{y}^{(i)} - y^{(i)})^2, \quad (5)$$

In order to minimise losses $L(\mathbf{w}, b)$, we use gradient descent for optimization. The final model is trained to obtain \mathbf{w} is the vector of regression coefficients for each training method, which is then used as the basis for developing the training programme.

3 Experimental and Strategic Approach Study

We tested the validity of the proposed social training satisfaction analysis model and proposed a new competitive strategy for social training in Guangzhou Huashang Vocational College by applying SWOT analysis.

3.1 Data sets

In 2020, Guangzhou Huashang Vocational College enrolled more than 4,000 students in the special expansion of higher vocational education, with flexible forms of study such as alternate work and "on-the-job" teaching, where students study on the job during the week and attend classes in the evening on weekdays or on holidays. The majority of these students are in-service workers from different companies, and the questionnaires were distributed to them by means of a questionnaire star. The questionnaires received were analysed in depth in an attempt to understand the characteristics of the training needs of workers in various industries. A total of 600 questionnaires were distributed and 573 were recaved. The following findings were obtained from the statistics and analysis of the questionnaire data.

The company's training should focus on professional skills (75.74%) and corporate culture (60.03%); the factors that affect the effectiveness of training are the time arrangement (23.65%) and the choice of content (21.8%). As for the suggestions for schools to carry out training for students, they need to learn with results and see the difference before and after the training; the content needs to be learner-centred and it is more important to learn than to learn more; the follow-up survey after the training, the practical application of the knowledge learnt, the survey feedback and improvement of the digestion and absorption situation.

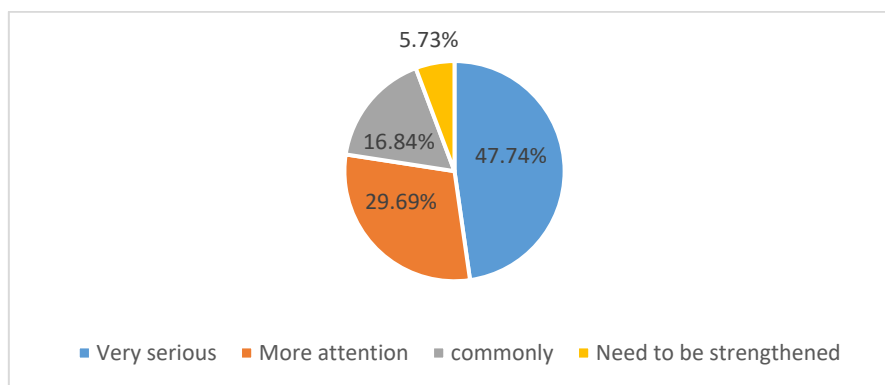


Fig. 1. Current emphasis of the company on training (count)

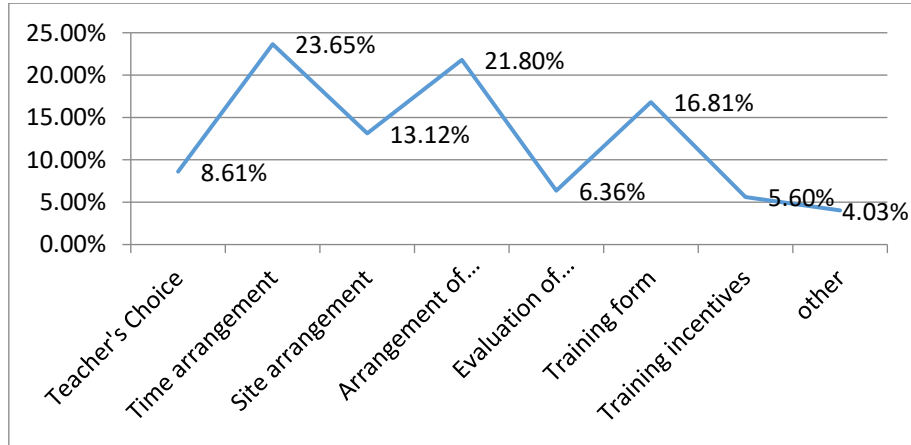


Fig. 2. Statistical Table of Factors Affecting Training Effect

3.2 Analysis of factors related to satisfaction with social training

We calculated Pearson's correlation coefficients between the four factors of number of training courses attended, frequency of desired attendance, importance of the company, and confusion of the students and satisfaction, with the degree of student satisfaction ranging from 1 to 5 (from satisfied to unsatisfied), as Table 1 shown. We can draw the following conclusions.

The greatest correlation with satisfaction with social training is the importance companies place on social training, with a Pearson correlation coefficient of 0.673, which intuitively shows the importance of the companies place on social training, The higher levels of importance, the more can increase the students' satisfaction. This is because only by giving some importance to social training can some higher quality training courses and training strategies be produced.

In addition, the number of training courses attended has a negative relationship with satisfaction, suggesting that students who attend fewer training courses may have a lower level of satisfaction, which may due to a lack of attention of the company and result in poor quality courses and fewer training courses, thus triggering dissatisfaction among students.

Table 1. Pearson's correlation coefficients for each factor and satisfaction

Related factors	Numerical range	Pearson's correlation coefficient
Number of training courses attended	1-6 (from less to more)	-0.429
Desired frequency of participation	1-5 (from more to less)	-0.053
The importance of the company	1-4 (from highest to lowest)	0.673
Confusion among students	0 - 7 (from less to more)	0.004

3.3 A multiple linear regression-based decision model for training methods

We used Python as well as the PyTorch machine learning library for our experiments, setting the model learning rate to 0.005 and the number of epochs to 100.

There are seven social training methods involved in this experiment: classroom lectures, case study, simulation, audio-visual multimedia, games competitions, seminars and others. After the training, we obtained regression coefficients for each training method and satisfaction, as shown in the graph. The largest regression coefficient was obtained for the case study training method, followed by simulation, which indicates that students are more satisfied with the practical type of training. Therefore, in order to develop better training courses, a mixture of training methods with a focus based on the regression coefficients should be adopted for delivery.

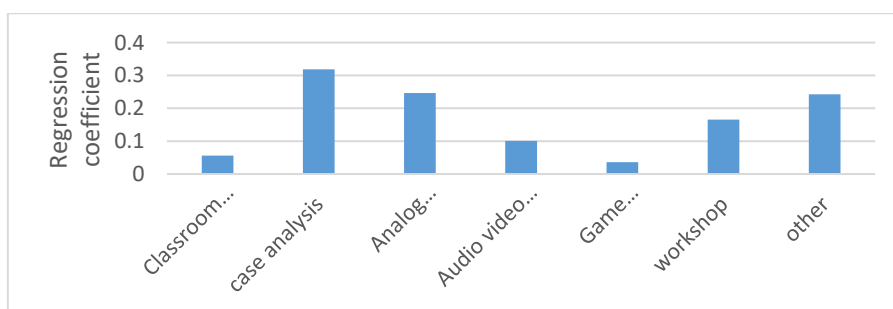


Fig. 3. Regression coefficients by training method

4 Conclusions.

In this paper, the current problems in social training are analysed, the factors affecting the satisfaction of social training are investigated and modelling is carried out by learning the usage of machine. Through experiments on the real data collected, the importance of different factors and different training methods on social satisfaction is obtained, providing guidance for the survival and development of social training in the new competitive situation, as well as providing reference and reference for the strategic choice of social training development in China's higher education institutions. However, there are still limitations in this study in terms of market research and the study of improving training quality. Future research directions can be further highlighted how social training in higher education institution can cope with the competition on Internet training by strengthening research in these two aspects.

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