

Planning of educational training courses by data mining: Using China Motor Corporation as an example

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ABSTRACT

In Taiwan, most industries are of small and medium scale, and there are limited resources for educational training. Increasing the quality of personnel by cultivating talents for the future becomes an extremely important issue. With the growth of firms and the increase in their needs, the database is also growing. We should therefore determine how to recognize and extract the useful information contained in this database in order to apply it in such a way that assists companies in meeting their increasing and changing needs. This research collects data of personnel educational training in China Motor Corporation by cluster analysis, decision tree algorithm and back-propagation neural networks for mining analysis and classification. Based on the algorithm classification result, we finally propose the demand model suitable for educational training in other related industries. The research is expected to explore how to maximize results through planning the courses and the personnel's participation in the training. We try to determine the key factors essential to the success of educational training. Once identified, this information can then serve as the basis for other firms' future planning of educational training strategies with regard to innovation and breakthrough.

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1. Introduction

Georgenson (1982) noted that although the funds of corporate educational training continued growing, only 10% of the training was effective. For innovation and breakthrough, this paper conducted a random sampling of 38,000 pieces of data in the personnel educational training database of China Motor Corporation according to employees' positions and departments. This was done through the decision tree algorithm developed upon the principle of Data Mining for study, mining and analysis in order to find the relation between the classification of educational training courses and the classification of the employees' occupation, the courses favored by the employees of different occupations and their accomplishment probability. However, in the educational training, the employees' characteristics or positions will influence the time spent on providing employee education and the funds invested in education. Thus, the educational training should be precise. Since educational training tends to be conducted by the human resources department, the cognitive difference between the employees' characteristics and the human resources department might lead to insufficient funds or the waste of the investment.

It will take more time to adjust the administration's strategies when there is an imbalance of manpower supply and demand. Thus, manpower planning and the precision of prediction will influence corporate efficiency and quality. Excess manpower supply will lead to idleness and inefficient use of personnel and indirectly result in the increase of the cost and the waste of resources; on the contrary, insufficient manpower will lead to imbalanced distribution of resources and reduce the corporate quality. Thus, with complicated training courses and plenty of employees, we should determine how to classify educational training precisely and meet the manpower demand to increase educational training quality and reduce excess expenses. This research expects to effectively analyze and evaluate by database in order to modify the original educational training model, and to construct an educational training system through manpower forecasting. It will also construct an evaluation model to formulate the most accurate forecasting models as the basis for designing employee educational training and to increase the precision of employee classification and reduce the waste of human resources.

More than 95% of the industries in Taiwan are of small and medium scale, and the firms have limited resources for educational training (Farh, 1995). Nonetheless, the funds for corporate educational training continue growing, and in order to improve human resources quality, we should cultivate employees' talents for the future. This research follows the "Input-Process-Output" (IPO)

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proposed by Bushnell (1990) as the basic framework of the educational training model, as shown in Fig. 1.

The research purposes are reorganized below:

- (1) We construct a “training input, practice training process and training effect” assessment model to explore an overview of the training effect.
- (2) We explore the possible mediating effect between training input and effect during the practice.
- (3) We validate the feasibility of “training input, practice training process and training effect” assessment model in small- and medium-sized enterprises within the manufacturing industry in Taiwan.
- (4) The educational training fund invested in the firm is one of the critical indexes for assessing “training input”. We try to find the key indexes of training funds invested in the firms to explore the relationship among training funds, the training process and the training effect.
- (5) We plan educational training strategies specially adapted to meet the specific needs of employees in different positions.

2. Literature review

With the advancement of Internet and database techniques, data saving in different industries becomes diverse yet simple. In order to combine the applications of the Internet, the firms promote e-data. Plenty of data collection techniques, high-efficacy, multiple-function computers and the maturity of the Data Mining algorithm are the most critical factors with respect to the rise of Data Mining, and they are generally applied in varied industries. This research therefore applies Data Mining to the analysis of educational training data. The firms should try to extract the key information from sufficient data and effectively use this information to increase the efficacy of management, improve the quality of personnel and control costs of human resources in addition to determining the employees’ needs in order to design proper service strategies. So far most of the enterprises have been unable to achieve these goals and, even if they have tried, they are hindered by having improperly related activities.

This research intends to treat cluster analysis, classification technique and neural algorithm as the initial analytical tools of educational training and human resources, and designs the process by Six Sigma to continue improving the management cycle. We also analyze and predict educational training. Finally, we compare the consistency and precision of the conclusions by performance matrix. The literature reviews the available literatures related to

human resources, educational training, the management of Six Sigma and data mining.

2.1. Human resources

In knowledge economy time, knowledge becomes the main component essential to increased productivity and economic growth. Of most significant value to corporate operations are the employees’ wisdom and knowledge. Manpower capital is the most unique of invisible assets having core value (Cascio, 1991). Some scholars call employees “the heart, wisdom and soul of the organization” and “the only drive for the actions in the organization” (Edvinsson and Malone, 1997).

Most scholars regard educational training as the most direct investment tool for human resources. In order to avoid the waste of the resources and to improve the organizational performance of these resources by investment in training and increased productivity, the construction of effective “educational training” becomes the critical issue concerning many firms (Carlson et al., 2000).

2.2. Educational training

This research combines “education” and “training” into “educational training” and defines it as the training to cultivate the employees’ knowledge, skills, habits and problem-solving capacities and to stimulate the employees’ maximum potential to meet the demands of their present or future position (Charles, 1998). In terms of practicability, when the results of training or advanced studies cannot be transformed into a certain degree of performance in the related work, they will represent a kind of waste. Thus, the training should match the related stimulation measures to lead to the real outcome.

Coffey et al., (2003) describe a unique approach to the creation of an expert system to provide performance support and training for electronics technicians. The starting point for development of the system was the creation of a semantically rich knowledge model comprising Concept Maps and other digital media. The knowledge model was used to create the inference part of the system, and then retained to furnish an explanation of the inference component’s behaviors, and to provide content for training. The findings of Ng, (2005) are based on a survey conducted in China; the present job characteristics and firm background were found to play key roles in determining training provisions. Workers who received off-the-job training were less likely to receive on-the-job training, while those who received on-the-job training were neither more nor less likely to have received off-the-job training. Unlike in developed countries, training in China was

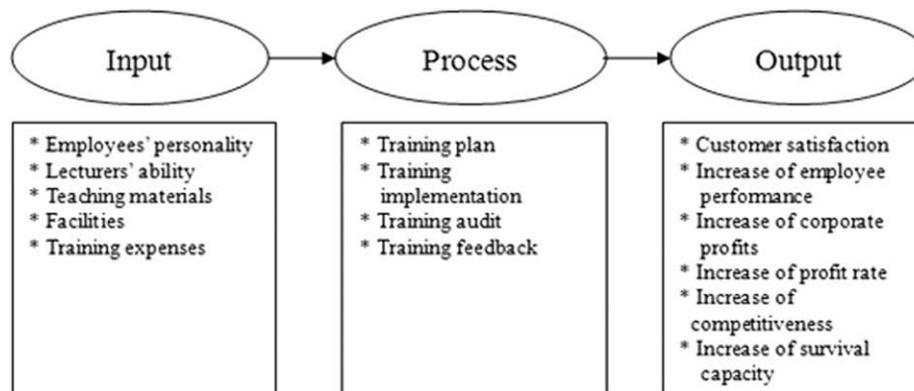


Fig. 1. Basic framework of the educational training system model source: this research.

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