ISSN 2616-5902 Vol. 4, Issue 10: 26-31, DOI: 10.25236/AJBM.2022.041005

Review of Suitable Assessment and Evaluation System for Long-Term Development of Enterprises

Ruihui Dong, Xianghong Ren

Rocket Force University of Engineering, Xi'an, Shaanxi, China

Abstract: *Assessment is often regarded as one of the signs of "new managerialism" in human resource management in the public sector. With the intensification of market competition, Chinese enterprises need to actively respond to domestic and foreign competition, in order to improve their own adaptability and competitiveness, many enterprises began to explore effective ways to improve and improve performance. At present, how to establish a set of assessment and evaluation system suitable for the long-term development of enterprises has become a problem explored by most enterprises. This paper introduces the historical context and current popular assessment methods from multiple perspectives, and puts forward some current development trends and prospects of assessment based on recent literature materials, hoping to give readers some research ideas.*

Keywords: *Examination and evaluation; Assessment method; Development trend*

1. Survey of assessment research

1.1. The presentation of assessment

The concept of assessment comes from the emergence of management. Since the great Industrial Age, people payed attention to the benefits brought by management, and the transition from individual workshop and collective workshop to steam age and machine age, the management concept of individual and collective restricts the improvement of life ability. Later, Frederick Winslow Taylor, a famous American management scientist and economist, known as the "father of Scientific Management", proposed the Principles of Scientific Management. Taylor divides management into four functions: planning function, organization function, leadership function and control function. The core of his theory was that management should be scientific and standardized. Want to advocate spirit revolution, both sides of labor and capital benefit are consistent. Some people think that assessment is a specific performance of post-management, the most prominent performance was performance assessment. The idea of performance appraisal originates from performance management, and the shadow of performance appraisal can be traced back to before Shang and Zhou dynasties. In The Book of Shang Shu Yao Dian, "Taking part in the dalu, torrential rain fu Fan" refers to the performance assessment of Yao before he abdicated his throne to yao. In the late 1970s, Aubrey Daniels, an American management scientist, put forward the concept of "performance management", which was followed by systematic and comprehensive research. It can be seen that performance appraisal has long been attached importance to by rulers or managers in practice. In 1813, the US military gradually adopted performance appraisal, and in 1842, the US federal government also gradually carried out performance appraisal for public servants. In 1950, China's military quantitative analysis was just starting. In 1958, academicians led by Qian Xuesen gradually realized the importance of management and began to translate foreign analytical monographs. In 1979, the Military Management Operation Research Society was established, which vigorously promoted the construction and development of national key projects.

1.2. The historical development of assessment

With the emergence and development of management theory, the form of assessment has changed. In 1895, Taylor, the father of scientific management, introduced the "differential piece rate system", which was designed to increase productivity by paying workers different wages for their efficiency. In 1916, Fayol, in his book Industrial Management and General Management, listed the skills of rewarding and punishing employees and the regular inspection of the organization as the responsibilities of managers. After the 1930s, with the maturity of employee incentive theory, the needs, psychology and personality of employees were brought into the category of performance appraisal, and quantitative analysis method

ISSN 2616-5902 Vol. 4, Issue 10: 26-31, DOI: 10.25236/AJBM.2022.041005

was adopted to implement performance appraisal. Management master Drucker and 1954 put forward the management by objectives, the goal was broken down layer by layer, each layer has a manager, and the main task of the manager and corresponding level of goals. In particular, focus on work output and results rather than work behavior. In the 1960s, liability accounting came into being. On the premise of management by objectives, the management was further refined through responsibility accounting, and several responsible units was established inside the enterprise, and the management activities they was responsible for are divided into four parts: planning, control, assessment and performance evaluation. In the 1980s, 360-degree performance appraisal was widely used in Europe and the United States. After the 1990s, KPI, BSC, OKR and other assessment methods became popular.

1.3. Assessment assessment of the three components

The assessment can be divided into three parts: the selection of assessment system, the determination of index weight and the selection of assessment method. In current assessment, assessment of a person or enterprise often involves multiple factors or indicators, and assessment is a comprehensive judgment under the interaction of multiple factors.

1.3.1. The selection of index system

It is the basis to carry on the assessment and determine the assessment index system. The selection of indicators often plays an important role in analyzing objects. The selection of indicators is a systematic project, because too few indicators can not lead to the lack of rationality of assessment, too few indicators should not be too many, which will make the assessment process too long, easy to distort the information, affect the results of assessment. The assessment system is an organic whole composed of many levels, which reflects the components of the assessment object and the specific grasp of the assessment work. The evaluation index system is the link between evaluation experts and evaluation objects as well as the bridge between evaluation methods and evaluation objects. Only by designing the evaluation index system scientifically and reasonably can we get the real results that managers want.

1.3.2. Determination of index weight

When several indicators are used for assessment, their effect on the assessment object is not equally important from the point of view of the assessment objective. Therefore, the assignment of index weight can be divided into subjective weight assignment and objective weight assignment. Subjective weight assignment mainly depends on the subjective judgment of experts in all walks of life and the degree of preference of managers. Objective weight assignment mainly depends on the past data and scientific algorithms. Weight is a kind of quantitative value that compares and balances the relative importance of factors in the whole thing being evaluated. Reasonable weight determination is of great significance to evaluation or decision making. The same set of index values and different weight coefficients will lead to completely different or even opposite evaluation conclusions. Therefore, the determination of weight is a very difficult problem in assessment.

1.3.3. Selection of evaluation methods

The evaluation methods with their own characteristics provide reference for us to choose evaluation methods for a specific evaluation work. In the selection of evaluation methods, we should adapt to the requirements of the comprehensive evaluation object and the comprehensive evaluation task, and make a scientific choice according to the existing data. In other words, the selection of evaluation methods mainly depends on the purpose of the evaluator and the characteristics of the evaluated things. In addition, each evaluation method has its characteristics and limitations. Different evaluation methods should be integrated to deal with different evaluation objects and evaluation contents. Therefore, to a certain extent, the comprehensive evaluation method is not only a science, but also an art to the application of the method.

2. Several mainstream assessment methods

2.1. AHP

AHP was created by Saaty(1980) to deal with decision-making in complex and multi-criteria evaluation problems. It is a kind of research method to solve the multi - level multi - objective combination of qualitative and quantitative effective weight assignment. The method combines quantitative analysis and qualitative analysis, uses the experience of experts or decision-makers to judge the relative importance of each index, and combines the algorithm to give the weight of each index, and

ISSN 2616-5902 Vol. 4, Issue 10: 26-31, DOI: 10.25236/AJBM.2022.041005

then uses the weight to get the order of the pros and disadvantages of each solution. AHP to help people object to the assessment to make reasonable judgment, the judgment is composed of several interconnected and often competing standards, in order to effectively distinguish between various indicators of priority or importance of quantitative indicators, the key aspect is to construct judgment matrix, using expert system to the assessment of cognitive to determine index weight, in order to compare between them. AHP consists of three steps :(1) in the form of hierarchical structure, the first level of the hierarchy contains decision objectives, and the subsequent lower level represents the gradual decomposition of decision criteria; (2) Pairwise comparison, usually the domain expert is required to complete the comparison of elements at each level of the hierarchical system, assuming that the elements are independent of each other. (3) Consistency of inspection -- sometimes there will be major errors in expert judgment, because AHP allows decision makers to make subjective judgments, and the consistency of judgment cannot be effectively guaranteed. Therefore, consistency verification is critical to ensure the best results. AHP has been applied in many aspects. Shuangshuang Liu [1] integrated BALANCED Scorecard into the performance assessment of enterprises, and transformed the original performance assessment system that only relied on financial indicators into four dimensions (financial level, customer level, internal management level and learning and growth level). Then combine AHP and fuzzy comprehensive evaluation method to evaluate the performance of a company, summarize the specific measures to improve performance. Tutumlu etc. [2] According to employees performance appraisal problem, a mathematical model is put forward, and through the Delphi method and effective indicators, to streamline, examination evaluation system with simplified examination evaluation system finally compared with the initial assessment evaluation system, it is concluded that the performance evaluation scores of deviation is only 4%, to get the data of work fell by 26%, Beneficial to improve management efficiency.

2.2. FCE

Fuzzy comprehensive evaluation method was a comprehensive evaluation method developed based on fuzzy mathematics. In 1965, control scientist L.A. Professor Zadeh proposed the concept of fuzzy set theory, which uses mathematical tools to describe fuzzy things. In today's society, many things have vague concepts or phenomena. Things that are opposite to each other will also have an intermediate state, that is, the uncertainty manifested as the state of things themselves. Its basic original is to determine the index set evaluation set of the evaluated object, and then determine its membership degree and weight respectively, get the discriminant matrix, and finally use the fuzzy operation and normalization, get the evaluation results. At present, fuzzy comprehensive evaluation method is widely used. Zhou Lixin [3] introduced the method of fuzzy algorithm model into the examination and evaluation of higher mathematics course in the design and research of the examination and evaluation system of higher mathematics course, and put forward an improvement plan for the traditional examination and evaluation system of higher mathematics course in colleges and universities. The application prospect and methodological value of this model are proved on the basis of practical evaluation cases.

2.3. TOPSIS

TOPSIS method was a commonly used intra-group comprehensive evaluation method, which can make full use of the information of original data, and its results can accurately reflect the gap between evaluation schemes. The basic process was based on the normalization of the original data matrix, the cosine method was used to find the best and the worst scheme in the finite scheme, and then calculate the distance between each evaluation object and the best scheme and the worst scheme respectively, to obtain the relative proximity of each evaluation object and the optimal scheme, which is used as the basis for evaluation. This method has no strict limitation on data distribution and sample size, and data calculation is simple and easy. In their analysis of cruise port performance, Lorencic et al. [4] found that any performance indicators used by port authorities were rough and could only provide an approximation of terminal operation performance. Therefore, a multi-standard evaluation model is proposed to assist port Authority to evaluate cruise port performance from a multi-disciplinary perspective. This model combines the compatibility and practicability of AHP and TOPSIS to evaluate cruise port performance. AHP method is used to provide the weight of port performance index, TOPSIS method is used to evaluate port performance and create a port ranking list, which effectively solves the situation that port performance is difficult to evaluate. Erdemir, Nazli et al. [5] introduced an integrated personnel performance evaluation model and discussed the potential value of multi-criteria decision making (MCDM) method in supporting personnel performance evaluation. The multi-objective decision making model (MCDM) was used to evaluate employee performance. The comprehensive decision model

ISSN 2616-5902 Vol. 4, Issue 10: 26-31, DOI: 10.25236/AJBM.2022.041005

combining AHP and TOPSIS is adopted, and the model is verified by an example.

2.4. DEA

Data envelopment analysis (DEA) was a systematic analysis method to evaluate the efficiency of the same sector in terms of inputs and outputs. This method was generally used to measure the productivity of some decision-making departments. By explicitly considering the use of multiple inputs (i.e., resources) and the production of multiple outputs (i.e., services), it can be used to compare the efficiency of multiple service units providing similar services. This technique was called data packet Complex analysis (DEA). Pejman Peykani et al. [6] proposed fuzzy window data Envelopment analysis (CFWDEA) based on credibility as a new method for dynamic performance evaluation of hospitals in different periods under data ambiguity and language variables. In order to achieve this goal, data envelopment analysis (DEA) method, window analysis technique, probability programming method, credibility theory and opportunity constrained programming (CCP) are adopted. In addition, the applicability and effectiveness of the proposed CFWDEA approach was illustrated by using real data sets to evaluate hospital performance in the United States. Gao, Bing et al. [7] Based on the efficient work system and human resource management effectiveness hypothesis, through case studies, field interviews, questionnaire survey method, set up with large enterprise human resources management as the core, order and the customer as the output indexes of evaluation index system, puts forward the performance evaluation of enterprise human resources management of DEA model, The validity of the model is verified.

2.5. PSO

Particle Swarm Optimization (PSO), also known as Particle Swarm Optimization, and 1995, developed by R. C. Eberhart and J. Kennedy et al., an evolutionary computing technology for simplified social models. "Swarm" was derived from the five basic principles of swarm intelligence proposed by M. M. Millonas in the development of the model applied to artificial Life. Mu Yuanhong [8] applied fusion particle swarm optimization (FPSA) to teacher performance evaluation. Firstly, on the basis of comprehensive analysis of performance appraisal, the paper discusses the advantages and disadvantages of performance appraisal in colleges and universities. Secondly, particle swarm optimization and fuzzy comprehensive evaluation are applied to the study of teacher performance evaluation.

2.6. ANN

Table 1: Compare the advantages and disadvantages of assessment methods

Assessment method	advantages	disadvantages
AHP	1. Able to refer to expert opinions effectively; 2. Less data is required.	1. Fail to provide new methods for decision making; 2. Less quantitative data and more qualitative components; 3. Too many indicators may cause problems.
FCE	1. Able to evaluate objects with fuzzy factors; 2. The combination of qualitative and quantitative factors expands the amount of information and improves the degree of evaluation.	1. It is difficult to solve the problem of repetition related to evaluation indicators; 2. Subjective opinions have a great influence on the evaluation results.
TOPSIS	1. There is no strict limit on sample size, and data calculation is simple and easy without data verification; 2. The original data information can be fully utilized, and the results can fully reflect the proximity of each evaluation scheme to the optimal scheme.	1. When the gauge matrix is complex, it is difficult to find positive and negative ideal solutions; 2. Weight assignment depends on other algorithms.
DEA	1. Evaluate based on objective information of index data, and eliminate the interference of human factors; 2. There is no need to give the weight coefficient in advance.	1. Most of the weights of simple DEA models need to be artificially corrected; 2. The diversity of input/output index system should be considered; 3. Weight changes with DMU, making DMU lack comparability.
PSO	1. The system is initialized as a set of random solutions, and the optimal value is searched through iteration. Compared with genetic algorithm, PSO has the advantage of being simple and easy to implement without many parameters needing to be adjusted. 2. Fast search speed, high efficiency, simple algorithm, suitable for real-value processing.	It is easy to fall into local optimum when the discrete optimization problem is not well handled.
ANN	1. With self-learning function; 2. Capable of finding optimal solutions at high speed.	1. It is difficult to explain the reasoning process; 2. When the data is insufficient, the neural network

ISSN 2616-5902 Vol. 4, Issue 10: 26-31, DOI: 10.25236/AJBM.2022.041005

		cannot work; 3. Data may be lost.

Artificial Neural Network (ANN) was a model that imitates biological Neural Network. As the artificial neural network has self-learning and self-adaptability, it feels to have a certain fault tolerance rate. Trained neural network can take the place of experts in evaluation, and can avoid human-caused errors in the evaluation process. Alsariera et al. [9] evaluate the performance of students in colleges and universities. In this study, the author found that the evaluation method mainly used six ML models: decision tree (DT), artificial neural network (ANN), Support vector machine (SVM), K-nearest Neighbor (KNN), linear regression (LinR) and Naive Bayes (NB). Through the later one by one comparison, found that ANN has obvious advantages; Yujie et al. [10] proposed a performance evaluation method based on the fusion of decision tree and BP neural network for the performance evaluation of university laboratories. The decision tree model is used to select the performance evaluation index with high weight. BP neural network was used to reduce the influence of non-core factors on classification evaluation and prediction. This method overcomes the deficiency of separation model, eliminates the interference of human factors and improves the accuracy of evaluation.

The advantages and disadvantages of several comprehensive evaluation methods are compared as follows, as shown in Table 1.

3. Development trend and prospect

3.1. Diversified assessment methods

Assessment method from the past "simplification" to "systematic", from the past "hard to quantify" to the "combination of quantitative and qualitative change", from "event management" to "process management", "pay attention to the difference between different objects assessment", choose the corresponding performance evaluation methods, the pursuit of the direction of performance appraisal results. Assessment indicators should be set according to the nature of different posts, combined with the characteristics of the post, avoid setting indicators "one size fits all". This is conducive to improve the overall performance assessment of the scientific, but also conducive to staff acceptance.

3.2. The assessment method is intelligent and real-time

As the object and carrier of assessment continue to deepen and develop, it will lead to the continuous improvement and improvement of assessment methods, but one point is very clear, that is, assessment results should be real-time, which brings new challenges to assessment. At the same time, the current work needs more and more complex, the complexity of the evaluation object is more and more big, only rely on individual or group for the inspection to the inspection work bring certain limitations, we can through the era of big data, reasonable use of software platform, combining with the comprehensive evaluation algorithm, faster and better to provide the assessment results, promote the virtuous cycle of the inspection work.

3.3. The content of assessment tends to be multi-dimensional

In order to reflect all aspects involved in the assessment work in a more comprehensive and detailed way, the assessment content tends to be multi-dimensional and multi-tiered, and a single level or Angle is difficult to meet the needs of current social development. In addition to the assessment of output results, different requirements should also be put forward for different groups, and individual development and enterprise development will be integrated to further improve the significance of assessment.

4. Conclusion

With the continuous progress and development of the current society, assessment and evaluation will be further widely used in all aspects of life and work to promote the continuous development and growth of enterprises or groups. In view of the content of assessment methods, individual objects will have more profound changes, will be more humanized, strategic, at this time to accurately grasp the status of development, it is necessary to constantly improve assessment methods. In this paper, the general situation of assessment research, assessment work, historical context and components, combined with several commonly used assessment methods for a brief introduction and comparison of advantages and disadvantages, and finally elaborated the development trend of assessment.

ISSN 2616-5902 Vol. 4, Issue 10: 26-31, DOI: 10.25236/AJBM.2022.041005

References

[1] Liu, Shuangshuang. Internal Economic Management and Performance Evaluation Method of Enterprise Based on Balanced Scorecard [J]. DISCRETE DYNAMICS IN NATURE AND SOCIETY,2022
[2] Tutumlu, Busra, Sarac, Tugba, Sagir, Mujgan. An AHP based mathematical model to determine the criteria used in the worker performance evaluation [J]. PAMUKKALE UNIVERSITY JOURNAL OF ENGINEERING SCIENCES-PAMUKKALE UNIVERSITESI MUHENDISLIK BILIMLERI DERGISI, 2022(28): 173-182
[3] Zhou Lixin. Research on the Design of Advanced Mathematics Course Examination and Evaluation System Based on Fuzzy Algorithm [C]. International Conference on Measuring Technology and Mechatronics Automation, 2017: 544-547
[4] Lorencic, Vivien, Twrdy, Elen, Lep, Marjan. Cruise Port Performance Evaluation in the Context of Port Authority: An MCDA Approach[J]. SUSTAINABILITY, 2022 (14)
[5] Erdemir, Nazli, Ozturk, Fatih, Kaya, Gulsum Kubra. Integrated decision support model for performance evaluation of public staff: using AHP and fuzzy TOPSIS [J]. JOURNAL OF THE FACULTY OF ENGINEERING AND ARCHITECTURE OF GAZI UNIVERSITY, 2022(37): 1809-1821
[6] Peykani, Pejman, Memar-Masjed, Elaheh, Arabjazi, Nasim, Mirmozaffari, Mirpouya. Dynamic Performance Assessment of Hospitals by Applying Credibility-Based Fuzzy Window Data Envelopment Analysis [J]. HEALTHCARE, 2022(10)
[7] Gao, Bing, Zhang XiMeng. Analysis of an Enterprise Human Resource Management Performance Evaluation Model Based on the DEA Method [J]. JOURNAL OF SENSORS, 2022
[8] Mu Yuanhong. An Improved Particle Swarm Optimisation Method for Performance Evaluation of Instructors [J]. SECURITY AND COMMUNICATION NETWORKS, 2022
[9] Alsariera, Yazan A, Baashar, Yahia, Alkawsi, Gamal, Mustafa, Abdulsalam, Alkahtani, Ammar Ahmed, Ali, Nor'ashikin. Assessment and Evaluation of Different Machine Learning Algorithms for Predicting Student Performance [J]. COMPUTATIONAL INTELLIGENCE AND NEUROSCIENCE, 2022
[10] Yujie, Weimin, Chelli, Karim, Muttar, Ahmed K. H. Performance evaluation of college laboratories based on fusion of decision tree and BP neural network [J]. APPLIED MATHEMATICS AND NONLINEAR SCIENCES, 2022