Training Appraisal Value Evaluation Model of Power Grid Enterprises Based on Value Creation

Youfeng Xu and Jingxian Gao*
Yunnan Power Grid Co. LTD, Kunming, China

*Corresponding author e-mail: yngjx8410@yn.csg.cn

Abstract. In order to improve the value of training evaluation of power grid enterprises, we combed the value creation process of training management and designed the integrator model of training value chain through theoretical research on mature training evaluation with the help of enterprise operation analysis process. Taking the training evaluation project of Yunnan Power Grid Company as an example and based on the value-creation process of training management, we sorted out the evaluation index systems respectively for individual training project, training project, assessment project and resource development project, and verified their feasibility according to the previous data of the company.

Keywords: Value Chain, Evaluation Model, Learning Effect, Behaviour Transformation, Performance Improvement

1. Introduction
In recent years, with the further deepening of the reform of state-owned enterprises and the increase in commercial competition of the society, enterprises are paying more and more attention to personnel training. They take training as an important measure of human capital investment, optimize the structure of human capital as well as that of staff knowledge and improve the production and service skills, thus enhancing their core competitiveness. As an important means of measuring the success of training projects, training value evaluation is an indispensable link in the overall training work [1]. And training management departments should employ scientific, systematic and purposeful means and methods to carry out training value evaluation, giving full play to the important role of training in enterprise management as well as in maintenance and appreciation of human capital.

2. Theoretical Research on Training Evaluation Models
As early as in the 1950s, foreign scholars began to conduct exploratory and empirical studies on employee training evaluation. Since the 1960s and 1970s, with the development of practice and research, there have emerged various training evaluation models, which can be primarily divided into two types: hierarchical evaluation based on the Four-level Model and process evaluation represented by CIRO and CIPP [2]. Among them, the hierarchical evaluation training evaluation models mainly include Koch Four-level Training Evaluation Model [3-5], Phillips Five-level Return on Investment (RIO) Model [6] and Kaufman Five-level Evaluation Model [7]; and the process evaluation training
evaluation models mainly include CIRO Training Evaluation Model [8] and CIPP Training Evaluation Model [9-10]. Through analyses of the above models, it is found that the value evaluation of training projects lies not only in the evaluation of the effectiveness of organization and implementation for constant improvement but also in the evaluation of the promotion effect of the training project on trainees to grasp the diversified training needs more accurately as well as to make the courses more consistent with the needs of enterprise development and employee growth. Finally, the cost and output of the training project should be analyzed in an effective way. The input and output of training should be clarified through accurate analysis of the cost and benefit of training, so that enterprises can realize the significance of investment in training and obtain greater support and development.

Table 1. Comparative Analysis of Training Evaluation Models

| Types of hierarchical evaluation | Evaluation Models               | Dimensions of Evaluation                                                                 | Characteristics of Models                                                                 |
|---------------------------------|---------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Koch Four-level Training Model  | Response evaluation layer,      | The implementation is from easy to difficult and the cost is from low to high.           |
|                                 | learning evaluation layer,      |                                                                                        |                                                                                        |
|                                 | behaviour evaluation layer,     |                                                                                        |                                                                                        |
|                                 | and effect evaluation layer.    |                                                                                        |                                                                                        |
| Phillips Five-level RIO Model   | Response evaluation layer,      | The monetary profit generated by the training project is compared with its cost to     |
|                                 | learning evaluation layer,      | measure the relevant ROI indicators.                                                   |
|                                 | behaviour evaluation layer,     |                                                                                        |                                                                                        |
|                                 | effectiveness evaluation layer, |                                                                                        |                                                                                        |
|                                 | and financial evaluation (ROI)layer. |                                                                                      |                                                                                        |
| Kaufman Five-level Evaluation   | Possibility and response       | It is believed that the effect of training will also affect the environment of enterprises, so as to bring benefits to enterprises. |
| Model                           | evaluation, mastery evaluation, |                                                                                        |                                                                                        |
|                                 | application evaluation,         |                                                                                        |                                                                                        |
|                                 | enterprise benefit evaluation,  |                                                                                        |                                                                                        |
|                                 | and social benefit output.      |                                                                                        |                                                                                        |
| CIRO Evaluation Model           | Background evaluation,          | The evaluation of training effect runs through the whole training process and should be  |
|                                 | investment evaluation,          | carried out simultaneously with the training work.                                     |
|                                 | response evaluation, and output |                                                                                        |                                                                                        |
| CIPP Evaluation Model           | Background evaluation, input    | The evaluation is carried out throughout the training process and the evaluation      |
|                                 | evaluation, process evaluation, | outcomes can be used to implement the training activities.                             |
|                                 | and outcome evaluation.         |                                                                                        |                                                                                        |

3. Training Value Chain Creation Process

3.1. Business Operation Analysis Process
First of all, with the goal of improving the business performance of the enterprise, the core value of training management in the enterprise management analysis process (Figure 1) is identified to clarify that training management generates core value. The business department will discuss and determine the training project together with the company's training department according to the training needs that come from the enterprise operation analysis, including training planning projects for different abilities. Training solves the problem of "knowing and being able to do", while "doing well" requires continuous improvement through practice in work. When employees return to work after having
acquired theoretical knowledge or practical operation methods and skills, their practical operation ability cannot improve immediately, but will improve after repeated practice for a period of time, especially when they are given the help and correction by superior managers or senior staff as well as some conducive tools to improving their business. Only after the indicators of each business (sales/R&D/production/procurement, etc.) are effectively refined, will the company's overall business performance be greatly improved.

Figure 1. Business analysis process

3.2. End-to-end Value Creation Process of Training Management

Based on the analysis of enterprise management process and taking the promotion of enterprise operating performance as the goal, we identified the core value of training management in enterprise management, referred to some forefront theoretical research in the field of training management, such as 6 ds rule learning development projects, created the end-to-end value creation process of training management and specified the main duties and responsibilities as well as the work requirements of training department and business department in each link.

Figure 2. End-to-end value creation process for training management

3.3. Integrator Model of Training Value Chain
According to the duty division between the training department and the business department, with the goal of improving the training management value, the integrator model of the training value chain was creatively proposed based on the end-to-end value creation process. The model clarified the value of the training project and the evaluation factors of the business value, as shown in Figure 3.

Based on the integrator model of training value chain, according to the theoretical research results of mature training evaluation in the field of training, and combined with the "requirements" in the process of value creation, a whole-cycle training value evaluation index system of "from input to output" was constructed based on Koch Four-level Evaluation. In addition, in line with the project classification standard, the value evaluation index systems are designed respectively for training project, assessment project and resource development project.

For a single training project, the value can be evaluated in four dimensions of operation and implementation, learning effect, learning transformation as well as performance improvement. At the same time, the value of a kind of project can be evaluated by the ratio of input to output.

4. Training Value Evaluation Model

Table 2. Evaluation Index System for Individual Training Project

| Dimensions of value | Types of indicator | Indicators of judgement | Explanation of indicators |
|---------------------|-------------------|-------------------------|---------------------------|
| Operation and implementation Value | Verification of requirements | Validity of project requirements | Evaluate the completeness of the contents in the training requirement specification submitted by the hosting department of training, the clarity of the source/background of the requirements, and the clarity of the expected results/objectives. |
|                      | Project planning   | Effectiveness of project planning | Evaluate the scientificity and feasibility of the training project plan (or training demand statement) submitted by the training undertaking department |
| Dimensions of value | Types of indicator | Indicators of judgement | Explanation of indicators |
|---------------------|---------------------|-------------------------|--------------------------|
| Involvement of business department | Evaluate whether the hosting department of training can respond positively, give feedback and cooperate with the undertaking department to complete the follow-up work of project planning in the training demand link. |
| Cooperation degree of the undertaking department | Evaluate whether the undertaking department of training shall cooperate with the hosting department to complete the project planning and provide professional and reasonable suggestions for the hosting department's reference |
| Satisfaction of logistics service | Evaluate the hospitality and service awareness of the undertaking department of training in preparing accommodation, meals for trainees and lecturers |
| Operation and implementation value | Effectiveness of trainee management | Evaluate the serious and rigorous work attitude of the undertaking department of training in the work of trainee sign-in and attendance. |
| Effectiveness of site-based management | Evaluate whether the undertaking department of training handle emergencies in a timely and reasonable manner. |
| Training resources | Rationality of training site | Evaluate whether the undertaking department of training tries its best to ensure that the training site and equipment are consistent with the actual operating environment, and that the classrooms, lighting, equipment, sound effects are comfortable |

| Training resources | Effectiveness of training courseware | Evaluate whether the courseware contents of this training project are consistent with the teaching contents on site, and whether the courseware is produced beautifully and reasonably. |
| Training instructors | Effectiveness of curriculum design | Evaluate whether the courses of this training project are targeted, whether they can solve practical problems in the work and make employees more confident to complete the work. |
| Professionalism of training instructors | Evaluate the professional level of the instructors in teaching methods, classroom atmosphere, teaching rhythm, etc. |
| Trainees | Clarity of learning target | Evaluate whether the trainees have a clear understanding of the significance of the training project and what the individuals expect to achieve through the training |
| Dimensions of value | Types of indicator | Indicators of judgement | Explanation of indicators |
|--------------------|-------------------|-------------------------|--------------------------|
| Learning effect value | Pass rate of examination | The proportion of the number of participants who pass the written or practical examination after the completion of a single training project. |
| | Pass rate of post evaluation | The proportion of qualified personnel in post competency evaluation after participating in this training. |
| | Pass rate of general or investigation examination | The proportion of trainees who pass the general or investigation examination to the total number of participants. |
| Behavior change value | Clarity of learning objectives | Evaluate whether the line manager has clearly defined the learning objectives with the trainees prior to the training. |
| | Coverage of action plan | Evaluate whether the line manager has developed a detailed and systematic action plan for learning transformation after training. |
| | Efficiency of performance support | Evaluate whether the business department has provided effective performance support tools and methods for trainees to improve their business ability. |
| Performance Improvement | Abundance of practice opportunities | Evaluate whether trainees are properly given learning transformation and work practice opportunities in line with the requirements of the learning transformation action plan in their daily work. |
| | Achievement rate of problem improvement | Evaluate whether the line manager can provide guidance and reasonable improvement suggestions to the trainees when they face problems in their daily work. |
| | Coverage of reward and punishment measures | Evaluate whether the business department or line manager has established a reward and punishment mechanism for the performance of the learning transformation. |
| | Efficiency of learning transformation | Evaluate whether the practical operation ability of the trainees has reached the expected requirements of the business department or line manager after the practical training. |
improvement value rate of target performance rate of target performance requirements in the training plan, extract the target value of the corresponding business indicators for this year. The achievement rate = the number of trainees whose performance has reached the standards ÷ the total number of trainees.

(Outcome indicators) Improvement rate of target performance According to the training objectives and evaluation requirements, extract the completed values of the previous year and this year for comparative analysis. The improvement rate = \(\frac{\sum[(completed \ value \ of \ this \ year - completed \ value \ of \ the \ previous \ year)]}{completed \ value \ of \ the \ previous \ year}\) ÷ the total number of trainees.

4.2. Evaluation Index System for Training Project

Table 3. Evaluation Index System for Training Project

| Dimensions of value | Types of indicator | Indicators of evaluation | Explanation of indicators |
|---------------------|-------------------|--------------------------|---------------------------|
| Input value Funds    |                   | Annual teaching and training funds | The actual expenditure of annual teaching and training funds for a certain type of training project. |
|                     |                   | Increase rate of annual teaching and training funds | The actual increase in the annual teaching and training funds for a certain type of training project compared to the year before. |
|                     |                   | Per capita teaching and training funds | The ratio of the actual annual expenditure of a training project to the number of participants in the project. |
|                     |                   | Increase rate of per capita teaching and training funds | The increase in the ratio of the actual annual expenditure for a certain type of training project to the number of participants in the project. |
|                     | Funds             | Base construction cost | The actual annual funds of base construction for a certain type of training project. |
|                     |                   | Increase rate of base construction cost | The increase rate of actual annual base construction funds for a certain type of training project. |
|                     | Time              | Number of per capita class hours | The number of per capita class hours this year for a certain type of training project. |
|                     |                   | Increase rate of per capita class hours | The increase in the number of per capita class hours this year for a certain type of training project. |
|                     | Human resources   | Per capita participation rate | The ratio of the total number of trainees in a certain type of training project to the number of professionals included in the project. |
|                     |                   | Number of annual trainees | The total number of trainees included in a certain type of training project in a year. |
|                     |                   | Increase in the total number of trainees | The annual increase rate of the total number of trainees included in a certain type of training project. |
|                     | Process Plan execution | Completion rate of | The organization and implementation of a |
| Dimensions of value | Types of indicator | Indicators of evaluation                                                                 | Explanation of indicators                                                                 |
|-------------------|-------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Output value      | Learning transformation | Efficiency of performance support | Evaluate whether the business department has provided effective performance support tools and methods for trainees to improve their business ability. |
|                   |                    | Abundance of practice opportunities | Evaluate whether trainees are properly given opportunities for learning transformation and work practice in line with the requirements of the learning transformation action plan in their daily work. |
|                   |                    | Achievement rate of problem | Evaluate whether the line manager can provide guidance and reasonable |
| Resource allocation | Number of training instructors available | Increase rate of training instructors available | The increase in the number of training instructors employed. |
|                   | Number of training materials available | Increase rate of the number of training materials available | The increase in the number of training materials available |
| Operational implementation | Control effectiveness of training project |                        | The average score of the operation and implementation value of the projects belonging to this category. |
| Output value      |                       | Pass rate after training | The proportion of the number of participants who pass the test after training to the total number of trainees. |
|                   |                       | Pass rate of post evaluation | The proportion of qualified personnel to the total number of participants in post competency evaluation |
|                   |                       | Pass rate of general or investigation examination | The proportion of trainees who pass general or investigation examination to the total number of participants. |
improvement suggestions to the trainees when they face problems in their daily work.

Coverage of reward and punishment measures
Evaluate whether the business department or line manager has established a reward and punishment mechanism for the performance of the learning transformation.

Efficiency of learning transformation
Evaluate whether the practical operation ability of the trainees has reached the expected requirements of the business department or line manager after the practical training.

### Improvement of performance

| Score of individual performance | Annual score of performance indicators related to the training contents. |
|---------------------------------|--------------------------------------------------------------------------------|
| Score of organizational performance | The score of indicators of the organization's performance related to the training contents. |

### Human capita

| Increase in staffing | The increase in staffing of all relevant professional departments participating in this training project. |
|----------------------|--------------------------------------------------------------------------------------------------|
| Proportion of highly skilled people | The proportion of highly skilled workers and above to the total number of skilled workers. |

### 4.3. Evaluation Index System for Assessment Projects

**Table 4. Evaluation Index System for Assessment Projects**

| Dimensions of Value | Types of Indicators | Indicators of Evaluation |
|---------------------|---------------------|--------------------------|
| Input Value         | Expenditure         | Per capita teaching and training expenditure. |
|                     | Human resources     | The number of participants in the evaluation. |
| Output value        | Human capital       | The number of people who have passed the assessment project. |
|                     | Input-output        | The pass rate of assessment project. |
|                     |                     | Per capita input-output ratio. |

### 4.4. Evaluation Index System for Resource Development Project

**Table 5. Evaluation Index System for Resource Development Project**

| Dimensions of Value | Types of Indicators | Indicators of Evaluation |
|---------------------|---------------------|--------------------------|
| Input Value         | Expenditure         | Total annual funds of course courseware |
|                     |                     | Total annual funds of training venue |
|                     | Coverage of training courses |
| Process value       | Resource allocation | Coverage of training courseware |
|                     |                      | Coverage of teacher training |
|                     |                      | Coverage of training site |
| Output value        | Validity            | Average times of courseware usage |
Effectiveness of training courseware

5. Evaluation Analysis of Input-Output Value of Project -- Taking Training Project as an Example
We collected the monitoring data of the 2017-2019 annual training project of Yunnan Power Grid Company and the information data of employees of the same period, sorted the plan type, the project type and the project sequence statistically, and compared the plan cost, the number of trainees and the training class hours with the staff number as well as the per capita quality equivalent of each skill and professional category in Yunnan Power Grid Company.

Table 6. Results of Input-Output Comparative Analysis of Training Projects of Yunnan Power Grid Company from 2017 to 2019

| Professional sequence   | Average increase rate of per capita training costs (planned) | Increase rate of per capita training hours | Average increase rate of staffing | Average increase rate of average per capita quality equivalent |
|-------------------------|-------------------------------------------------------------|--------------------------------------------|----------------------------------|---------------------------------------------------------------|
| Substation skills       | 32.86%                                                      | 35.92%                                     | -15.19%                          | 0.87%                                                         |
| Distribution skills     | 3.87%                                                       | 2.44%                                      | 34.56%                           | 0.61%                                                         |
| Transmission skills     | 56.91%                                                      | 31.39%                                     | -14.31%                          | 1.37%                                                         |
| Communication skills    | 566.55%                                                     | 12.11%                                     | -7.72%                           | 1.11%                                                         |
| Logistics skills        | -23.84%                                                     | -20.88%                                    | -2.42%                           | 0.98%                                                         |
| Information skills      | -19.85%                                                     | -18.56%                                    | -1.77%                           | -0.31%                                                        |
| Marketing skills        | 235.76%                                                     | 33.69%                                     | -1.29%                           | 1.06%                                                         |

As can be seen from Table 6:
(1) Except for specialties such as logistics, information and power distribution, the number of staff decreases with the increase of per capita training cost (plan) input, indicating that per capita efficiency increases with the increase of per capita training cost (plan) input, that is, output increases with the increase of input.

(2) Except for the specialty of logistics, the per capita quality equivalent increases with the increase of per capita training cost (planning) investment, indicating that the quality of personnel increases with the increase of per capita training cost (plan) input, that is, the output increases with the increase of input.

(3) For the specialty of logistics, with the decrease of per capita training cost (planning) and training hours, per capita efficiency is improved and per capita quality equivalent is increased, indicating that the allocation of training resources is more reasonable than before and the input-output efficiency is improved.

(4) For the specialty of information, with the decrease of per capita training cost (plan) and training class hours, per capita efficiency increases while per capita quality equivalent decreases slightly, indicating that the decrease of training resource investment weakens the quality of talent team. Therefore, it is necessary to increase training resources.

For the specialty of power distribution, with the increase of per capita training cost (planning) input, per capita efficiency decreases while per capita quality equivalent increases slightly, indicating that the input of training resources has played a certain role in output. However, the rationality of resource allocation and use still needs to be improved.

6. Conclusion
By identifying the core value of training management in the enterprise management analysis process and aiming at the promotion of enterprise operating performance, we ordered the end-to-end value creation process of training management and innovatively proposed the "training" value chain integration model. This model specified the evaluation factors of project value and business value of training, and designed index evaluation systems respectively for individual training project, training project, assessment project and resources development project, providing reference for the direction of value evaluation of single project and category I project of enterprises.

Taking the training monitoring data and employment data of Yunnan Power Grid Company as an example, the average growth rate of each index of input and output in recent three years was calculated. Both input and output are positive, indicating that input has a positive effect on output. Input is positive and output is negative or close to 0, indicating that the implementation of the training project does not have a positive effect. Therefore, it is necessary to evaluate whether the training process control links, such as training demand analysis, project planning, project implementation and effect evaluation, are fully implemented.

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