

# Enterprise Internal Training and Performance Evaluation of Network learning based on Online System

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## **Abstract**

*The development of small and medium-sized enterprises is greatly affected by the entrepreneurs. In recent years; network learning becomes an important way to achieve the advanced competitiveness, which provides rich information and resources for entrepreneurs and staffs. Network learning refers to a study activity through online system; it mainly uses the autonomous learning and consultation learning methods. In comparison with the traditional learning activities, online learning has the following three characteristics: the first is to share the rich network learning resources; the second is the individual learning and collaborative learning; the third is it can break space and time limit. With the universal of building the learning websites, learning resources become more and more abundant in content, quantity, type, distribution, dissemination way and the propagation velocity, etc. It creates a more complicated space of information. Therefore, it is an important problem to establish a scientific, systematic and operable evaluation system, in order to provide support for organization, development and utilization of online learning resources.*

**Keywords:** *Internal Training; Network Learning; Performance Evaluation; Principal Component Analysis; Small and Medium-Sized Enterprises*

## **1. Introduction**

Network learning refers to a study activity through online system; it mainly uses the autonomous learning and consultation learning methods. In comparison with the traditional learning activities, online learning has the following three characteristics: the first is to share the rich network learning resources; the second is the individual learning and collaborative learning; the third is it can break space and time limit[1]. Education informatization is the main mark and important content of social informatization. The network is the lifeblood of the information society and the foundation of knowledge economy. Online learning is the transmission of information carrier, which has changed the learning methods of learners. It narrows the differences in education, expands the education space and time dimension, and creates a broader and free learning space, which becomes an important mean in lifelong education[2]. With the universal of building the learning websites, learning resources become more and more abundant in content, quantity, type, distribution, dissemination way and the propagation velocity, etc. It creates a more complicated space of information. Therefore, it is an important problem to establish a scientific, systematic and operable evaluation system, in order to provide support for organization, development and utilization of online learning resources.

A.M. Payne & J.E. Stephenson (2009) made an investigation about whether an e-learning approach can be successfully applied to train employees in a highly specialized skill thought to require expert individuals and extensive prolonged training.

The results demonstrated the e-learning can be applied outside the traditional learning environment to train unskilled employees to undertake complex practical tasks which traditionally would involve prohibitively expensive instruction [3]. Sevgi Ozkan (2009) proposed a conceptual e-learning assessment model, named hexagonal e-learning assessment model (HELAM) [4]. The analytical results strongly support the appropriateness of the proposed model in evaluating LMSs through learners' satisfaction. Daniel Y. Shee (2008) pointed that the web-based e-learning system (WELS) has emerged as a new means of skill training and knowledge acquisition, encouraging both academia and industry to invest resources in the adoption of this system[5]. Maja Wrzesien (2010) presented and evaluated the E-Junior application; E-Junior is a serious virtual world (SVW) for teaching children natural science and ecology[6]. The result showed that the serious virtual world does not present statistically significant differences with the traditional type of class. However, students from the virtual group reported enjoying the class more, being more engaged. Mofreh A. Hogo(2010) introduced a hybridization approach of AI techniques and statistical tools to evaluate and adapt the e-learning systems including e-learners[7].

There are also many researchers complex model and statistic method to analyze the application of E-learning. Abbas Keramati(2011) proposed a conceptual model to determine the role of readiness factors in the relationship between E-Learning factors and E-Learning outcomes[8]. Results show that organizational readiness factors have the most important effect on E-Learning outcomes. Ilker Yengin (2011) investigated factors that related to instructors' satisfaction in e-learning systems and pointed that "E-Learning Success Model for Instructors' Satisfaction" could be a basic guide for e-learning designers[9]. In this paper, we use principal component method to analyze the main factors that can improve the quality of E-learning system, and give some suggestions to the E-learning system. As the development of information technology, using E-learning system is necessary for the course study in school and other work place, and network learning will provide a powerful resource with a low cost. However, we should not neglect the assessment of network learning resources in organizing and using network information. According to the management of E-learning resources and the present situation, we build a value evaluation system and use principal component analysis to analyze the factors which can improve the quality of E-learning system, the evaluation model includes four main indicators and eighteen secondary indicators.

## 2. Model Design

Factor analysis decomposes each of the original variables into two parts; one part is composed of all variables shared with a few elements, and the so-called is public factor; the other part is alone with each variable factor, which is the so-called special factors part. If  $n$  original observed data samples are  $x_1=(x_{11},x_{21},\dots,x_{p1})'$ , the  $x_2=(x_{12},x_{22},\dots,x_{p2})'$ ,.....,  $x_n=(x_{1n},x_{2n},\dots,x_{pn})'$  can be written in the form of the original data matrix.

$$X = (x_1, x_2, \dots, x_p) = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ x_{p1} & x_{p2} & \dots & x_{pn} \end{bmatrix} \quad (1)$$

For the sake of convenience, assume that the standardization of treatment received data matrix is denoted by  $X$ . Its correlation matrix  $R$  and the covariance matrix  $S$  is exactly the same. Then the correlation matrix can be expressed as:

$$R = X \cdot X' \quad (2)$$

R characteristic equation of a matrix is  $|R-\lambda|$ , assuming that their p eigenvalues satisfy the following relations:  $\lambda_1 > \lambda_2 > \dots > \lambda_p \geq 0$ , the eigenvectors corresponding is  $U_1, U_2, \dots, U_p$ , and each feature vector as a column vector of matrix:

$$U = [U_1, U_2, \dots, U_p] = \begin{bmatrix} U_{11} & U_{12} & \dots & U_{1n} \\ U_{21} & U_{22} & \dots & U_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ U_{p1} & U_{p2} & \dots & U_{pn} \end{bmatrix} \quad (3)$$

Let  $F=U'X$ , then the above formula becomes:

$$FF' = \Lambda = \begin{bmatrix} \lambda_{11} & & & 0 \\ & \lambda_{22} & & \\ & & \ddots & \\ 0 & & & \lambda_{pn} \end{bmatrix} \quad (4)$$

After the simplification, we obtain:

$$F = [U'x_1, U'x_2, \dots, U'x_n] \quad (5)$$

The  $F_\alpha = U'X_\alpha$  ( $\alpha = 1, 2, \dots, n$ ), and every  $F_\alpha$  can be considered as sample observation value of main factor, which can be written as:

$$F_\alpha = [f_{1\alpha}, f_{2\alpha}, \dots, f_{p\alpha}]' \quad (6)$$

In the factor analysis, we usually only use the m ( $m < P$ ) as main factor, namely according to variables that are associated with the selected first factor  $f_1$ . After selected M, we divide U matrix into two parts. Because  $F_\alpha = U'X_\alpha$ , then we can get  $X_\alpha = UF_\alpha$ .

$$X_\alpha = [U_1, \dots, U_m, U_{m+1}, \dots, U_p]' \cdot \begin{bmatrix} f_{1\alpha} \\ \vdots \\ f_{p\alpha} \end{bmatrix} \quad (7)$$

One of the coefficient matrix of main factors is  $U(1)$ , which is called the loading matrix of factors. Due to the characteristics of vector  $U_i$ , it is typically representation by unit vector, so it needs to be normalized, i.e.

$$a_{ij} = U_{ij} \sqrt{\lambda_i} \quad (8)$$

Therefore, the factor loading matrix can be shown as:

$$A = (a_{ij}) = \begin{bmatrix} U_{11} \sqrt{\lambda_1} & U_{12} \sqrt{\lambda_2} & \dots & U_{1m} \sqrt{\lambda_m} \\ U_{21} \sqrt{\lambda_1} & U_{22} \sqrt{\lambda_2} & \dots & U_{2m} \sqrt{\lambda_m} \\ \vdots & \vdots & \ddots & \vdots \\ U_{p1} \sqrt{\lambda_1} & U_{p2} \sqrt{\lambda_2} & \dots & U_{pm} \sqrt{\lambda_m} \end{bmatrix} \quad (9)$$

From the above analysis, factor analysis and principal component analysis are very different. Principal component analysis of main component is expressed as linear combinations of original variable, but factor analysis is the original observation variables, which are expressed as a linear combination of the public factor. Principal component analysis number m and the original P are equal. It is a set of related

variables, which are transformed into a set of independent variables. The purpose of factor analysis is to make the public factor number.  $m$  is smaller than the original variables  $p$ , so as to construct a simple model. In the principal component analysis, effect of the original observation variables on a principal component is determined by the main constituents of the corresponding feature vectors, and the original observation variables in a main factor of the load in the factor analysis are determined by the corresponding feature vectors.

### 3. Empirical Analysis

#### 3.1. The Design of Evaluation Index

In this paper, we determine the dimensions of evaluation index according to the literature research, which refers to perceived quality dimensions of network learning resources. There are four one class indexes as “Organizational structure”, “The quality of content”, “Technical means” and “Educational function. The organizational structure includes four two level indexed as the integrity of resource, rationality of design, nonlinear structure, and searchable convenience. Organizational structure of network learning mainly refers to the organization of resources, such as whether the proper use of multimedia resources in different ways to present, resources organization structure is reasonable. For learners, good resources can improve the learning interest and learning efficiency of learners, and improve their satisfaction of resources. Mention of education resource construction technical specification, evaluation of educational resources should be considered in the artistic resources, this is mainly targeted at multimedia material, the technique of expression of the diversity, vivid plots, and the composition of the rationality and flexibility of the picture. Evaluation of other relevant cyber source form basically requires a beauty, clarity. According to the above evaluation on resources, according to the evaluation from four aspects of network learning resources in this study: aesthetics, namely resources show good effect, such as color, font design appropriate; diversity, namely resources forms, the use of text, graphics, images, audio, video, animation and other forms of media; rationality, resource structure, interface layout is reasonable; the degree of recognition, namely resource format used properly, to achieve a good visual effect.

The quality of content has five two level indexes as “targeted”, “objectivity”, “accuracy”, “scientific”, “timeliness” and “systemic”. The network learning resources is to distance learners and its content, the level of quality will directly influence the learners' satisfaction. Education resource evaluation should consider the education and science resources. The integration of educational resources of education, whether it's physical and mental development of students play a positive role in promoting, is in accordance with the syllabus and curriculum standards, whether it is conducive to stimulate students' learning motivation, improve the learning interest of the students; science refers to the integration of resources are objective, scientific, intellectual resources provided is relatively strong, can provide reference for the daily teaching activities, if there are typos and scientific ambiguity errors. Evaluation on the network education resources both at home and abroad mainly in the following points: resources are in line with the actual needs of learners, the main object is who, utility; the scope of resource is a comprehensive and extensive; resources correctly and objectively, is reliable and credible; resources are frequently updated.

Technical means has five two level indexes as “navigation intelligence”, “advanced technology”, “maintainability of learning”, “access to high-speed” and “educational function”. The security and stability of network learning resources for learners to create a good online learning environment, improve the learning efficiency, to meet the needs

of distance learners. Educational function has four two level indexes as “meet the training needs of degree”, “consistent with the discipline”, “academic reference value” and “easy acceptance of knowledge”. All variables can be shown in table 1.

**Table 1: The Main Variables**

Variables	Secondary variables	Code
Organizational structure $\alpha_1$	Rationality of design	X1
	The integrity of resource	X2
	Searchable convenience	X3
	Nonlinear structure	X4
The quality of content $\alpha_2$	Accuracy	X5
	Targeted	X6
	Objectivity	X7
	Timeliness	X8
	Systemic	X9
	Scientific	X10
Technical means $\alpha_3$	Intelligent navigation	X11
	Advanced technology	X12
	Maintainability of learning	X13
	Access to high-speed	X14
Educational function $\alpha_4$	Meet the training needs of degree	X16
	Consistent with the discipline	X15
	Academic reference value	X17
	Easy acceptance of knowledge	X18

### 3.2. Reliability Analysis

The reliability of the questionnaire is the reliability of the questionnaire; the reliability analysis is analyzed by using the same method on the same object of investigation results when measuring the degree of consistency. This study used a clone of Bach the most common Cronbach's alpha internal consistency reliability coefficient of the questionnaire. Using SPSS statistical software for reliability analysis, we can get the coefficient alpha coefficient of the questionnaire and the overall evaluation of each level index, as shown in Table 2. The following table control evaluation criteria, the display mode fit of belonging to a good level, therefore, the evaluation model is a consistent with empirical data models, the overall construct validity is high, can carry on the factor analysis.

**Table 2: Reliability Analysis**

Factor	Secondary index	corrected item-total correlation	Cronbach's Alpha if item deleted	Cronbach 's Alpha
$\alpha_1$	X1	0.8721	0.8769	0.8951
	X2	0.7491	0.8242	
	X3	0.7046	0.7894	
	X4	0.6583	0.7216	
$\alpha_2$	X5	0.7963	0.8452	0.8235
	X6	0.7802	0.8457	
	X7	0.6278	0.6832	
	X8	0.6726	0.7153	

	X9	0.7423	0.8242	
	X10	0.7138	0.7560	
$\alpha_3$	X11	0.7642	0.8101	0.8028
	X12	0.7856	0.8483	
	X13	0.6652	0.7013	
	X14	0.6863	0.7382	
$\alpha_4$	X15	0.7842	0.8528	0.7945
	X16	0.6763	0.7583	
	X17	0.7542	0.7369	
	X18	0.6214	0.6833	

### 3.3. Validity Analysis

It is a complex system to build the assessment of network learning resources. According to the mode of operation and management tools, we conclude four indicators which affect the valuation of network learning resources. The four indicators are organizational structure, the quality of content, technology, teaching functions. According to these four indicators, we analyze 18 secondary indicators which are consistent with the main four indicators. In order to analyze and process the data of questionnaire, we use factor analysis. Index data of the processing methods of questionnaire contain extraction, rotating, and simplify the analysis, so we can find index system to reflect the value of network learning resources. The statistical tool for data processing is the software of SPSS19.0. We distribute 600 copies of the questionnaires, and there are 564 valid questionnaires, which has reached 94%. First, we using KMO test and Bartlett test to determine whether the data is suitable for factor analysis or not, as showed in table 3. The result shows that the test value of KMO is 0.737, and p value of Bartlett test is less than 0.05, which illustrates that the data of the network learning resources is suitable for factor analysis.

In order to ensure the effectiveness of the model evaluation and hypothesis test, it is necessary to test reliability of variables. First of all, we use the whole measurement identifies to examine whether the measurement identity in load factor is less than 0.4. If it is less than 0.4, we need to remove it. The result of load parameter was shown as table 4. After the standardized processing of factor loading, we find the load is between 0.609 and 0.871; which means credibility of measurement scale is relatively high. So the index system has good internal consistency and reliability, and it is suitable to divide valuation system of network learning resources into organizational structure, the quality of content, technical means, educational function. According to the result, we find that the integrity of resource is the most important factor in organizational structure; also the rationality of design should be taken in to consideration as well. And we can find that the targeted and objective content is more important for most people, so that E-learning system should pay more attention to the content targeting, the keywords and search queries maybe the most useful method to solve this problem. Also, the most important thing to E-learning function is to help consumer meeting the training needs. So that, E-learning system should add more training process about actual operation.

**Table 3: The Result of KMO Statistical Test and Bartlett Test**

Kaiser-Meyer-Olkin		0.737
Bartlett test	Approximate chi-square	151.304
	df	23
	Sig.	0.000

**Table 4: Estimation Results of Load Parameter on Measurement System Factors**

Level indicators	Secondary indicators	Factor loadings	Symbol
Organizational structure	The integrity of resource	0.871	X2
	Rationality of design	0.833	X1
	Nonlinear structure	0.792	X4
	Searchable convenience	0.785	X3
The quality of content	Targeted	0.822	X6
	Objectivity	0.813	X7
	Accuracy	0.789	X5
	Scientific	0.771	X10
	Timeliness	0.687	X8
	Systemic	0.651	X9
Technical means	Navigation intelligence	0.811	X11
	Advanced technology	0.717	X12
	Maintainability of learning	0.633	X13
	Access to high-speed	0.621	X14
Educational function	Meet the training needs	0.773	X16
	Consistent with discipline	0.697	X15
	Academic reference value	0.631	X17
	Easy accept	0.609	X18

### 3.4. Result and Discussion

In this paper, we analyze the influencing factors of the evaluation model by combining with related literature, then make customer satisfaction evaluation index based on the network learning resources. And test the reliability, validity of the evaluation index through the learning satisfaction questionnaire, and make further changes, and finally get the final evaluation index based on the revised index weight calculation. According to the result, we find that the integrity of resource is the most important factor in organizational structure; also the rationality of design should be taken in to consideration as well. And we can find that the targeted and objective content is more important for most people, so that E-learning system should pay more attention to the content targeting, the keywords and search queries maybe the most useful method to solve this problem. Also, the most important thing to E-learning

function is to help consumer meeting the training needs. So that, E-learning system should add more training process about actual operation.

However, this research also has many deficiencies, mainly in the following two aspects: One limitation is the sample selection. Due to the large number of distance learning, distributed in all walks of life, sampling investigation is very difficult to do. Using the survey method in this study is the network questionnaire survey, the sample is restricted to a certain extent, the representative of the sample is not ideal, and the data obtained from the test of reliability and validity of the results did not reach the ideal level. Another is the index system is not perfect, the evaluation model established in this study is mainly considered the learners' expectation and perceived quality on two dimensions, but there are many factors affecting the learning satisfaction of network resources, such as learning style, learning motivation. In addition, due to the author's own level and the limited research time, evaluation index model refinement remains to be perfect.

#### **4. Conclusion and Suggestion**

In conclusions, the value of E-learning resources is mainly affected by organizational structure, the quality of content, technical means and educational functions. Therefore, in order to increase the value and utilization of the network learning resources, it is necessary to cover the wide range of disciplines, covering the professional quality of core courses, and tend to improve the quality management of online learning resources. In addition, we need to enhance the education function of learning resources, enhance its richness, adaptability, innovation and application, in order to meet the learners' needs about knowledge construction, and meet the needs of personnel training in enterprises. Meanwhile, in order to optimize the organizational structure of the learning resources, we need to use the advanced information technology and modern means of educational technology, achieve the sharing of knowledge, and improve the status of the network learning platform in the system of lifelong education, and provide support and services for universities and learners in enterprises.

Depending on analysis, we find that online learning has some advantages. It can provide the best teaching methods of education resources; staffs can really enjoy the most excellent teachers' service, and provide the completed teaching team. In network classes, whenever and wherever possible, staffs can attend the network classrooms. But there are still some problems, for example, many staffs find it difficult to operate resources on line, and cannot choose the suitable curriculum schedules; some teachers find if there are too many people online, they cannot answer questions in time. Also courseware quality is greatly affected by the network environment; staffs mainly rely on text to communicate and lack of interaction. These imperfections need to be considered, and should be solved in the future. Based on the analysis and summary, we put forward the following suggestions on the construction and development of network learning from three aspects as resource operation, technology and content,

##### **4.1. Constructing Efficient Resource, Improve the Operation Quality of Resources**

Survey results show that the network learning although made great efforts in resource operation, also has obtained the certain result, but the network learning resources did not get effective use of resources, their ease of use and convenience of the satisfaction degree is low, the construction of resource operation need to be further strengthened. In order to improve the learning satisfaction, it is necessary to improve the operation quality resources, on the basis of the construction of truly meet the needs of staff's resources. First of all, the network learning to provide rich resources, which is



an important prerequisite for the exchange of staffs and the feedback of resources? There are abundant resources, staffs will use the center of learning resources, will produce the evaluation of resources, then the communication and feedback; secondly, the network learning to provide navigation links and convenient for staffs, let the staffs learn simple and efficient use of resources; third, to improve the construction of network learning feedback, timely reply to staff feedback, put forward a topic, to improve the v to participate in the exchange of interests, which not only helps to promote staffs' learning, but also to improve resources are of great help.

#### **4.2. Strengthen the Construction Technology, Improve Resource Quality**

Network learning has been improved in the construction of resources, and set up technical support. But the survey data shows, staffs of the resources quality satisfaction is not very high, therefore, the network learning also needs to make further efforts in resource technology. Has a great influence on the safety, stability and compatibility of the satisfaction of resources for staffs learning needs, the network from the three aspects strengthens the construction of resources. First of all, the technical staff on a regular basis to participate in the resources construction of training and assessment improves the resource construction of related personnel and maintenance skills, at the same time on a regular basis of existing resources for testing, to ensure security and stability in resources. Secondly, in strict accordance with the development and construction of various types of resources, technical specifications, improve resource compatibility, and continue to solve the staffs through the digital TV or other handheld terminal access to resources, so that staffs can be able to properly use the resources in different network environments.

#### **4.3. Augment Innovation Advantage, Improve Effectiveness and Satisfaction**

According to the results of the survey, staffs of the content of the resource quality of most concern, relatively high satisfaction of resources quality in general, but specific to the content quality of each index satisfaction degree is high, the staffs' effectiveness of resources and the low satisfaction, sample test also showed that the staffs of these two indicators of the actual experience and use of resources to the expectations gap. The quality of staff resource content are most concerned about, is the impact of staff satisfaction is the most important dimension. Network learning needs of staffs from the lower satisfaction to improve the timeliness and resources two aspects, improve resource content quality, to improve the staffs' satisfaction. First, the network learning need to understand the characteristics and needs of the staffs, according to the characteristics of staffs and the needs of different scientific classification of resources, and provide a rich and unique learning resources in each category of resources, to meet the individual needs of staffs. Second, the network learning should continue to explore the resources integration strategy, methods and sources, the content has been continuously enriched and updated in a timely manner.

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