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Research on the Influencing Factors of Enterprise Quality Culture System Construction

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ABSTRACT
Enterprise quality culture is increasingly regarded as the necessary "soft" equipment for enterprises to succeed. This paper uses a questionnaire survey, factor analysis, analysis of variance, and other methods. We take 304 enterprises in Jiangsu Province as the research object to analyze the influencing factors of enterprise quality culture construction and explore their significance on different enterprises-sizes. The results show that the main factors affecting the enterprise quality culture construction are behavior, institutional, and material. According to the analysis results, this paper gives suggestions from communication and publicity, education and training, institution and material on the enterprise quality culture construction.
Keywords: *Quality culture system, Factor analysis, Influence factor, Variance analysis*

1. INTRODUCTION

Enterprise quality culture is the key to the continuous operation of enterprises. Daming, Zhulan, and other quality management masters of quality management theory in Japan promoted the formation of Japan's quality culture system after the 1940s, fundamentally improving the quality management level of Japanese enterprises, to win the global market in less than 20 years. It is feasible to help enterprises achieve sustainable development by actively building the quality culture system from the academic.

China's quality culture construction started late. The enterprise quality culture construction is still in the exploration stage. The four-hierarchy theory is the current trend of quality culture system research. Many scholars build quality culture concept from many directions, such as cultural gene theory, excellent performance-oriented, people-oriented management thought-oriented, brand-building-oriented, put forward the proposals of enterprise quality culture construction. However, these researches are lack practical significance of the quality culture construction and can't guide to build the quality culture.

Based on the basic factors that affect the quality culture construction, this paper explores the core factors affecting the quality culture construction with factor analysis and variance analysis and the significance of these core factors of the quality culture in the construction of different sizes enterprises. From these core factors, the proposal of building quality culture provides a theoretical basis for helping enterprises to build quality culture and has more practical guiding significance.

2. INDEX CONSTRUCTION

2.1. Construction of Survey Indicators

China Aviation Integrated Technology Research Institute (2008) [1] divides quality culture into the spiritual, institutional, and material levels. Hongzhi Liu [2] classified quality culture construction into quality values, leadership, organizational structure, quality management system, communication, quality culture and education, quality methods and tools, quality system, and rules. Hong Cheng [3] (2017) evaluated quality culture by dividing it into five aspects: creativity, professionalism, demand satisfaction, employee participation, and quality control. Ye Lin (2019) [4] divided the assessment of quality culture maturity into quality cultural awareness and practice maturity.

In this paper, the framework of enterprise quality culture is constructed by the pyramid structure of quality culture [5], namely, quality spiritual culture, quality institutional culture, quality behavioral culture, and quality material culture, from the main content and evaluation indicators. **Table 1** presents specific evaluation indicators.

Table 1. Evaluation index table of the effectiveness of enterprise quality culture construction

Evaluation level	Evaluation indicators
Quality spiritual culture level	C1 Enterprise quality concept
	C2 Enterprise quality policy
	C3 Enterprise quality target
Quality institutional culture level	C4 Organizational structure
	C5 Quality rewards and punishment institution

Evaluation level	Evaluation indicators
	C6 Product quality standards
	C7 Work quality standards
Quality behavioral cultural level	C8 Communication and Publicity
	C9 Education and Training
Quality material cultural level	C10 Quality management system
	C11 Quality management tools

2.2. Effectiveness Analysis of Survey Indicators

After determining the survey index, we set 2-5 items under each indicator to construct a questionnaire to achieve a more comprehensive survey of the survey index. Import the questionnaire data into SPSS to test the reliability and validity of the questionnaire at first. The validity analysis of the questionnaire in this paper refers to the questionnaire structure validity. We use the KMO index in factor analysis to measure and verify the rationality of each question item construction. **Table 2** and **Table 3** present the reliability and validity analyses of the questionnaire.

Table 2. Cronbach reliability analysis

number	Sample size	Cronbach α
11	304	0.881

Table 3. KMO and Bartlett tests

KMO	Bartlett sphericity test		
	Approximate Chi-Square	*df*	*p*
0.852	1821.093	55	0

Using KMO and Bartlett tests for validity verification. As shown in **Table 2**, the Cronbach. α coefficient is 0.881, more than 0.8, indicating the high-reliability quality of research data. From **Table 3**, the KMO value was 0.852, indicating good structural validity of the questionnaire.

3. EVALUATION AND ANALYSIS OF THE CONSTRUCTION OF ENTERPRISE QUALITY CULTURE SYSTEM

There may be a correlation between the 11 survey indicators. Given those indicators were selected randomly according to the literature and actual. This paper uses the factor analysis method to simplify the 11 survey indicators into a few common factors and determines the core factors that affect the construction of enterprise quality culture by combining the score of those common factors.

3.1. Common Factor Number

As shown in **Table 3**, KMO is 0.852, and the survey index is suitable for factor analysis. It means rejecting the null hypothesis of the unit matrix when the significance value of the Bartlett test is less than 0.05 and means there is a correlation between each survey index, and the factor analysis is valid. Then use SPSS for factor analysis, and **Table 4** presents the total variance explained.

Table 4. Variance interpretation rate table

Component	Initial Eigenvalues			Variance interpretation rate before Rotation			Variance interpretation rate after Rotation		
	Root	*% of Var*	*Cumulative %*	*Root*	*% of Var*	*Cumulative %*	*Root*	*% of Var*	*Cumulative %*
1	5.369	48.812	48.812	5.369	48.812	48.812	2.821	25.641	25.641
2	1.333	12.122	60.934	1.333	12.122	60.934	1.939	17.630	43.272
3	0.978	8.894	69.828	0.978	8.894	69.828	1.898	17.254	60.526
4	0.824	7.488	77.316	0.824	7.488	77.316	1.847	16.791	77.316
5	0.609	5.536	82.852	-	-	-	-	-	-
6	0.476	4.332	87.184	-	-	-	-	-	-
7	0.425	3.864	91.048	-	-	-	-	-	-
8	0.340	3.089	94.138	-	-	-	-	-	-
9	0.281	2.558	96.695	-	-	-	-	-	-
10	0.192	1.742	98.437	-	-	-	-	-	-
11	0.172	1.563	100.000	-	-	-	-	-	-

Table 4 shows that: The factor analysis extracted four factors. The variance explanation rate of these four factors after rotation was respectively 25.641%,17.630%,17.254%, and 16.791%. The cumulative variance explanation rate was

77.316% after rotation, a high level, covered most of the information affecting indicators. Therefore, we determined the number of common factors to be 4, namely F1, F2, F3, and F4.

3.2. Common Factors Identify

To have a high concentration load on the four common factors for the 11 survey indicators, we use the maximum variance rotation method (VARI max) to rota the date to find the corresponding relationship between the factors and the study items. **Table 5** displays the load coefficients of factors after rotation.

Table 5. Load factors after rotation

Name	Factor load factor			
	F1	*F2*	*F3*	*F4*
C9	**0.817**	0.266	0.159	0.168
C8	**0.856**	0.250	0.173	0.113
C4	**0.734**	0.244	0.145	0.272
C1	0.607	-0.051	0.069	**0.491**
C7	0.493	**0.547**	0.187	0.275
C6	0.124	**0.769**	0.243	0.298
C5	0.273	**0.812**	0.039	0.111
C11	0.217	0.098	**0.916**	0.126
C10	0.124	0.175	**0.914**	0.131
C3	0.219	0.322	0.107	**0.797**
C2	0.263	0.224	0.186	**0.804**

Table 5 demonstrates the corresponding degree value of all research items, which is higher than 0.4 and means a strong correlation between research items and factors that can effectively extract information. Among those indicates, education and training, communication and publicity, organizational structure, and quality concept have a high load in F1. The work quality standard, product quality standard, and quality reward and punishment institution in F2. Quality management tools and quality management systems in F3, quality target, and quality policies have a high load in F4, and we attribute the quality concept to F4 according to the actual situation. According to the distribution of survey indicators on common factors, common factors F1, F2, F3, and F4 were named respectively as behavioral factor, institutional factor, material factor, and spiritual factor.

3.3. Common Factor Score

Factor score coefficient matrix can more intuitively analyze the influence significance of the four common factors, as shown in **Table 6**.

Table 6. Factor scoring coefficient matrix

Name	F1	F2	F3	F4
Root (Rotation)	2.821	1.939	1.898	1.847
Variance interpretation rate	25.64%	17.63%	17.25%	16.79%
C1	0.3616	-0.0364	0.0498	**0.3612**
C2	0.1564	0.1606	0.1349	**0.5913**
C3	0.1303	0.2315	0.0774	**0.5867**
C4	**0.4368**	0.1755	0.1053	0.2004
C5	0.1627	**0.5828**	0.0284	0.0816
C6	0.0739	**0.5523**	0.1766	0.2189
C7	0.2937	**0.3930**	0.1359	0.2023
C8	**0.5100**	0.1794	0.1254	0.0831
C9	**0.4864**	0.1910	0.1154	0.1234
C10	0.0740	0.1256	**0.6635**	0.0966
C11	0.1291	0.0700	**0.6652**	0.0926

From **Table 6**, respectively, the variance explanation rate of the four factors for quality culture construction is 25.64%, 17.63%, 17.25%, and 16.79%. Normalized the variance explanation rate according to Formula (1). **Table 7** provides the influence weight of the factor score.

$$\partial_i = \frac{\sigma_i}{\sum \sigma_j}, j = 1,2,3,4 \quad (1)$$

Table 7. Influence weights of common factor scores

Factor	Behavioral	Institutional	Material	Spiritual
score weight	33.16%	22.80%	22.32%	21.72%

From **Table 7**, the influence weights of the four common factors on the enterprise quality culture construction are 33.16%, 22.80%, 22.32%, and 21.72% in turn and decrease successively. However, we need further analysis of the common factor for the significance of each specific indicator is uncertain.

3.4. Common Factor Analysis

3.4.1. Significance analysis of common factors

Big companies often pay more attention to the construction of enterprise quality culture than small and medium-sized. This paper takes the enterprise-scale factors as the control variable, when behavioral factors, institutional factors, material factors, and spiritual factors for the observation variable, to carry on the single factor analysis of variance, to explore the significance of the enterprise-scale concrete

index system for enterprise quality culture construction, the results as shown in **Table 8**.

Table 8. One-way ANOVA of common factor

Enterprise-scale	Spiritual Factor	Material Factor	Institutional Factor	Behavioral Factor
F	0.971	3.115	5.048	5.124
p	0.445	0.006**	0.000**	0.000**

* $p<0.05$ ** $p<0.01$

From **Table 8**, when the significance level is 0.01, the P values of behavioral, institutional, and material factors are respectively 0.000, 0.000, and 0.006. It indicates the differences in the quality culture system construction of different-scale enterprises are mainly reflected in behavioral, institutional, and material factors.

3.4.2. Behavioral factor analysis

As can be seen from **Table 5**, behavioral factors mainly include communication and publicity(C8), education and training(C9), and organizational structure(C4). We conducted one-way ANOVA for these three indicators (**Table 9**), with enterprise-scale as the control variable. **Table 9** displays different sizes Enterprises had significant differences in communication and publicity, education and training when the significance level was 0.01.

Table 9. One-way ANOVA of behavior factors

Enterprise-scale	C9	C8	C4
F	5.062	6.067	1.303
p	0.000**	0.000**	0.255

* $p<0.05$ ** $p<0.01$

3.4.3. Institutional factor analysis

Table 5 shows that institutional factors mainly include quality rewards and punishment institution(C5), product quality standards(C6), and work quality standards(C7). We conducted one-way ANOVA for these three indicators with enterprise-size as the control variable (**Table 10**). The work quality standards and product quality standards exist significant differences when the significance level of 0.01 under the condition of different enterprises-scale. When the significance level is 0.05, there are appreciable differences in the quality reward and punishment systems of different scale enterprises.

Table 10. One-way ANOVA of institutional factor

Enterprise-scale	C7	C6	C5
F	6.200	2.955	2.221
p	0.000**	0.008**	0.041*

* $p<0.05$ ** $p<0.01$

3.4.4. Material factors analysis

From **Table 5**, the material factors mainly include the quality management system(C10) and quality management tools(C11). We conducted one-way ANOVA for these two indicators with enterprise-size as the control variable (**Table 11**). When the significance level was 0.01, there were significant differences in the quality management tools application in enterprises of different sizes.

Table 11. One-way ANOVA of material factors

Enterprise-scale	C11	C10
F	3.908	1.933
p	0.001**	0.075

* $p<0.05$ ** $p<0.01$

4. SUGGESTIONS

Based on literature review, expert consultation, and empirical analysis, this paper puts forward the following suggestions:

4.1. Strengthen Communication and Publicity of Quality Cultural

Most managers focus on the production and business activities of the enterprise, ignoring the construction of quality culture. Quality problems often occur in enterprises for lacking quality awareness among employees. The key to improving quality awareness is to do well in quality communication and publicity. At the macro level, governments at all levels and industries can hold relevant activities, formulate industry or government quality incentive measures to guide enterprises to focus on quality management. At the micro, managers can develop internal quality incentive measures, regularly hold quality culture publicity activities, invite industry majors to open quality lectures, to publicity quality awareness education through numerous carriers in the enterprise. To create an atmosphere for all employees to participate in quality culture construction and continuously improve quality.

4.2. Increase Quality Professional Knowledge Education and Training Activities

The improvement of quality awareness and advanced quality management knowledge complement each other. On the one hand, the improvement of quality awareness increases the demand for advanced quality management methods; on the other hand, the study of advanced quality management methods, in turn, promotes the improvement of quality awareness. It is self-evident that the education and training of quality management tools and approaches are of great importance to the quality culture system construction.

At present, most domestic enterprises still ensure product quality in the form of post-check. It is necessary to improve the quality management level of all staff to ensure product quality more comprehensively. Outside the enterprise, the government, industry, and universities can provide a general quality method learning platform and a training and education institution for professional quality management personnel. In the enterprise, we should provide training on different tools and methods, increase the introduction of professional quality talents, drive all employees to participate in the construction of quality culture, and actively learn and use advanced quality management tools for employees at different levels.

4.3. Improve the Quality of Enterprise Culture Construction System Material Conditions

We should institutionalize the quality culture construction, establish the corresponding appraisal and evaluation system, set up rationalization proposals, QC groups, and other quality activities after communication, publicity, and education training. Strengthen the quality management methods, the application of technology and tools, etc. Improve the enterprise's institutional and material conditions of quality culture construction.

5. CONCLUSION

This paper uses some statistical methods to make an empirical analysis of 304 enterprises in Jiangsu province, such as questionnaire survey, factor and variance analysis, to find the core factors that influence the enterprise quality culture system construction.

Results display that three core factors have a significant influence. Behavioral factors have the greatest influence, mainly reflected in communication, publicity, education, and training, etc. The impact of institutional factors is in the quality standard of work and product; The influence of material factors is mainly embodied in the application of quality tools; the spiritual factors have relatively little effect on the construction of enterprise quality culture system.

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