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Creation of Indicator System for Quality Estimation of Safety Management of Personnel and it's Psychological impact on Industrial Enterprises

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Abstract

In the era of knowledge economy, more and more enterprises attach great importance to the importance of human resources, and the psychology they are having towards the safety measures because talents are the irreplaceable core competitive power of enterprises, and the competition between enterprises is the competition of talents. Safety management talents as scarce talents are particularly valued by industrial enterprises. To evaluate the safety management personnel, the personnel quality evaluation indicator system is an important means for enterprises to select, educate, employ and retain personnel. In this paper, the construction of quality evaluation indicator system for safety management personnel in industrial enterprises is mainly studied. Firstly, the relevant theories are reviewed and the competency model is proposed as the theoretical basis of the study. Secondly, through literature and questionnaire survey, an indicator system for quality evaluation of safety management personnel in industrial enterprises is established based on competency model theory, and the weight is determined by analytic hierarchy process. Thirdly, aiming at the effective implementation of the indicator system, its application in recruitment, training, performance and salary is described. Finally, suggestions on the application of recruitment and training in industrial enterprises are put forward. This paper provides a reference for industrial enterprises to achieve high-level human resource management and safety management objectives by constructing an indicator system for evaluating the quality of safety management personnel in industrial enterprises.

Keywords: Industrial Enterprises, Safety Management Personnel, Quality Evaluation, psychological impact.

Introduction

Safety is the most basic and important demand of human beings. In recent years, safety accidents caused by human factors are still common, so industrial enterprises must break through limitations and innovate constantly

in safety management if they want to develop continuously and have competitive advantages. Safety management is an effective means for people to improve their safety awareness and master safety theories, regulations and technical standards [1]. In the industrial enterprises, the safety management personnel have a great responsibility and need to make timely judgment and treatment of many safety accidents. Therefore, they must have excellent work quality and ability to ensure the safety of the industrial enterprises and reduce unsafe factors and losses. Personnel quality evaluation is an important means in human resource management, and the construction of safety management personnel quality assessment indicator system is particularly important.

For the concept of competency, it is generally accepted by scholars at present that the distinguishing features of people with advantages from ordinary people are called competency, which include individual motivation, characteristics, self-concept, knowledge, skills and so on [2,3]. In this paper, two common models of iceberg model and onion model are introduced. In the iceberg model (Fig. 1), there are six levels of competency: knowledge, skills, self- concept, traits, motivation and belief. In addition to the knowledge and skills, other abilities are implicit, and the decisive factor of an individual is the implicit ability [4].

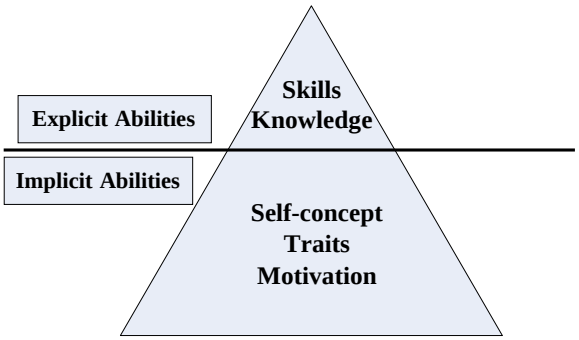

Fig 1: Iceberg model

In the onion model (Fig. 2), competency is divided into three layers, with a stronger sense of hierarchy than the iceberg model. The outermost layer includes knowledge and skills, the middle layer mainly includes values, self-concept, social roles and attitudes, and the innermost layer is the deepest level of individual ability [5].

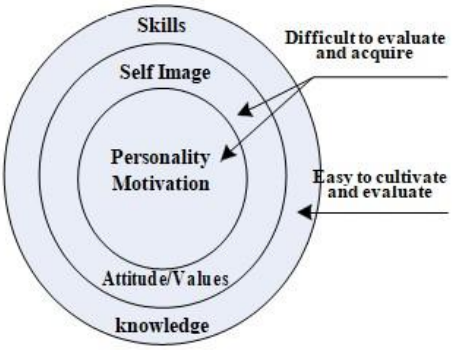

Fig 2: Onion model

In this paper, the two models lay a foundation for literature analysis and questionnaire survey methods in subsequent articles, and provide a strong theoretical basis for screening indicators, playing an indispensable role in the text [6,7].

Process And Method

Document analysis method is used to preliminarily screen the competency characteristics of safety management personnel in industrial enterprises [8-10]. Just as the name implied, the method of literature analysis is to search relevant documents, sum up the relevant terms related to the qualifications, and find out relevant factors [11]. In this paper, in the literature database, three first-level indicators and twenty second-level indicators of

competencyare preliminarily selected from the following figure (Table 1) by inputting related keywords such as "industrial enterprise", "safety management", "quality" and sorting out the collected competency characteristics. After 3 first-level and 20 second-level indicators are preliminarily determined, they are screened again by means of questionnaire survey in order to construct a more accurate indicator system for quality evaluation. The Likert scale method is used in the evaluation of the questionnaire, i.e. the questionnaire has a maximum of five points for an evaluation indicator and a minimum of one point. The greater the number, the greater the importance.

Table 1. Competency Indicators

First-levelindicators	**Second-levelindicators**	**Definition of Indicators**
Knowledge level	Specializedknowledge, English proficiency, OA proficiency	Relevant expertise required CET Band Six, Proficiency in office knowledge used in work
Comprehensivecapacity	Communication skills, Innovation ability, Strain capacity, Insight Strategic thinking, Learning ability, Ability to summarize, Ability to analyze problems, Teamwork, Customer service ability	Ability to communicate effectively with others Open mind, unique insights into events, Strong thinking and adaptability, Ability to discover deeper problems through presentations A general outlook on thinking Ability to quickly learn new things in the industry Ability to summarize information and collect effective information Ability to find major problems and make judgments from all kinds of things Ability to work more efficiently with others Service awareness and ability to serve others well
Personal traits	AmbitionInitiativeIntegrity Self-confidence Job interest Independence Hardwork	Progressive spirit for continuous progress Initiative to work within components Integrity in interactions with others Having a high self-evaluation, believe in ones' ability Keeping a keen interest in work Ability to handle work independently and efficientlyWorking seriously

Table 2. Importance of Universal Competency Indicators

Ranking	**Ability characteristics**	**Mean**
1	Integrity	4.467
2	Initiative	4.316
2	Hardwork	4.316
4	Teamworking	4.183
4	Ambition	4.183
6	Communication skills	4.150
6	Customer service ability	4.150
8	Job interest	4.017
9	Independence	3.983

10	Self-confidence	3.933
11	Innovation ability	3.917
12	Ability to analysis problems	3.833
13	Strain capacity	3.800
13	Learning ability	3.800
15	Specialized knowledge	3.767
15	Ability to summarize	3.767
17	Strategic thinking	3.650
18	OA proficiency	3.633
19	Insight	3.617
20	English proficiency	2.567

This questionnaire is conducted online with the target group of 160 safety managers in industrial enterprises, including 48.3% of men and 51.7% of women; 83.3% of undergraduate students, 5% of graduate students and 11.7% of other students. The average importance of the general competency characteristics of safety managers in industrial enterprises is obtained by statistical analysis of the information from the survey results using software as shown in Table 2 above.

According to the statistical analysis of the results of the questionnaire, the competency characteristics above 3.5 points are regarded as the core competency characteristics, that is,more than 70% of the people think this feature is very important; those with a score between 3 and 3.5 are defined as an important competency characteristic, that is, more than 60% of people think that this feature is very important. According to the classification criteria, there are 19core competency characteristics, and a competency feature model is built, as shown in Table 3 below.

Table 3. Competency Characteristics Model

First-levelindicators	Second-level indicators	Definition of Indicators
A1 Knowledge level of safety management	B1 Safety expertise B2 OA proficiency	Relevant expertise in safety management required Proficiency in office knowledge used in work
A2 Comprehensiveability of safetymanagement	C1 Communication skills C2 Innovation ability C3 Strain capacity C4 Insight C5 Strategic thinkingC6 Learning ability C7 Ability to summarize C8Ability to analyzeproblems C9 Teamwork C10 Customer serviceability	Ability to communicate effectively with others Open mind, unique insights into events Strong thinking and adaptability Ability to discover deeper problems through presentations A general outlook on thinking Ability to quickly learn new things in the industry Ability to summarize information and collect effective information Ability to find major problems and make judgmentsfrom all kinds of things Ability to work more efficiently with others Service awareness and ability to serve others well
A3 Behavior characteristics of individual safetymanagement	D1 Ambition D2 Initiative D3 Integrity D4 Self-confidence D5 Job interest D6 Independence	Progressive spirit for continuous progress Initiative to work within components Integrity in interactions with others Having a high self-evaluation, believe in ones' abilityKeeping a keen interest in work Ability to handle work independently and

	D7 Hardwork	efficientlyWorking seriously

In order to better determine the quality evaluation indicator system, the AHP method is used to determine its weight. Firstly, the lower analytic hierarchy process is briefly introduced.

The characteristic of AHP method is to use less quantitative information to mathematicize the thought process of decision-making, thus providing a simple decision-making method for complex decision-making problems with multi-objective, multi-criteria or no structural characteristics, especially in situations where it is difficult to directly and accurately measure the decision results. Because comparison between any two is conducive to the determination of scientific weights, and some interfering factors are excluded by the test, so as to impartially evaluate the quality of human resources to arrive at a more reasonable conclusion [5].

Step I: To determine the respective weights of the indicators, the indicators should be compared in two according to the rating of scale 1-9, and written into a matrix (Table 4).

Table 4. Scaling Criteria 1-9

Importance comparison	Scale
Factor i is as important as factor j	1
Factor i is as important as factor j	3
Factor i is as important as factor j	5
Factor i is as important as factor j	7
Factor i is as important as factor j	9
Between the above levels of importance	2,4,6,8

Step II: n indicators A1, A2...An(n=1,2,3...) are compared according to the above figure to get the following judgment matrix A:

a11 a12 …a1n
a21 a22 …a2n
… … … …
an1 an2 …ann

Step III: Calculate the weight. First sum the columns to obtain ∑aij, then by $Wi = \frac{1}{n} * \sum_{j=1}^{n} (aij / \sum_{j=1}^{n} aij)$ to get the weights of each indicator.

Table 5. Judgment matrix of primary index

Judgment Matrix	A1	A2	A3
A1	1	1/4	1/2
A2	4	1	3
A3	2	1/3	1

Experts are invited to judge the scale value of the three first-level indicators, and the results are shown in Table 5 above. Based on the calculation above, W=(0.14,0.63,0.24). Sort by weight to get the following table:

Table 6. Ranking of first-level indicators

Ranking	First-level indicators	Weight
1	Comprehensive capacity	0.63
2	Personal traits	0.24
3	Knowledge level	0.14

The same method is used to calculate the second-level indicators, and the judgment matrices of the second-level indicators under knowledge level, comprehensive ability and personal traits are obtained as follows:

Table 7. Judgment matrix of knowledge level

Judgment Matrix	B1	B2
B1	1	1/2
B2	2	1

Based on the calculation above,W=(0.33,0.67). Sort by weight to get the following table:

Table 8. Ranking of knowledge level

Ranking	Second-level indicators (Knowledge level)	Weight
1	OA proficiency	0.67
2	Specialized knowledge	0.33

Table 9. Judgment matrix of comprehensive abilities

C1	1	4	1	2	3	1/2	3	2	1	1/2
C2	1/4	1	1/3	1	1/3	2	1/2	1/2	1/3	1/2
C3	1	3	1	1	1/2	2	1	1	1	1/2
C4	1/2	1	1	1	1	2	2	2	2	3
C5	1/3	3	2	1	1	3	3	3	3	2
C6	2	1/2	1/2	1/2	1/3	1	1/2	1/2	1/2	1/3
C7	1/3	2	1	1/2	1/3	2	1	1	1	1/2
C8	1/2	2	1	1/2	1/3	2	1	1	1	1/2
C9	1	3	1	1/2	1/3	2	1	1	1	1/2
C10	2	2	2	1/3	1/2	3	2	2	2	1

Based on the calculation above, W=(0.1523, 0.0519,0.0902,0.1302,0.1628, 0.0592,0.0698, 0.0717,0.0820,0.1300).
Sort by weight to get the following table:

Table 10. Ranking of weights of comprehensive abilities

Ranking	Second-level indicators (Comprehensivecapacity)	Weight
1	Strategic thinking	0.1628
2	Communication skills	0.1523
3	Insight	0.1302
4	Customer service ability	0.1300
5	Strain capacity	0.0902
6	Teamworking	0.0820
7	Ability to analysis problems	0.0717
8	Ability to summarize	0.0698
9	Learning ability	0.0592
10	Communication skills	0.0519

Table 11. Judgment matrix of personal traits

Judgment Matrix	D1	D2	D3	D4	D5	D6	D7
D1	1	1	1	4	1	1/2	1/2
D2	1	1	2	4	1	1/2	1
D3	1	1/2	1	5	3	1/2	1/2

D4	1/4	1/4	1/5	1	1/3	1/3	3
D5	1	1	1/3	3	1	1	2
D6	2	2	2	3	1	1	1
D7	2	1	2	1/3	1/2	1	1

Based on the calculation above, W=(0.1243, 0.1490,0.1572,0.0834,0.1447,0.1952,0.1462).
Sort by weight to get the following table:

Table 12. Weight ranking of personal traits

Ranking	Second-level (personal traits)	Weight
1	Independence	0.1952
2	Integrity	0.1572
3	Initiative	0.1490
4	Hardwork	0.1462
5	Job interest	0.1447
6	Ambition	0.1243
7	Self-confidence	0.0834

According to the ranking of the weights of first-level indicators, the weight ofcomprehensive abilities is 0.63, that of personal traits is 0.24, and that of knowledge level is 0.14, indicating that among the first-level indicators, the most important is the comprehensive abilities, followed by the personal traits, and finally the knowledge level [30-33].
Among the second-level indicators (comprehensive abilities): the weight of strategic thinking is 0.1628, that of communication skills is 0.1523, that of insight is 0.1302, that of customer service ability is 0.13, that of strain ability is 0.0902, that of teamwork is 0.082, that of ability to analyze problems is 0.0717, that of ability to summarize is 0.0698, that of learning ability is 0.0592, that of innovation ability is 0.0519, indicating that the most important in the comprehensive abilities is strategic thinking, followed by communication ability, insight, customer service ability, strain ability, teamwork, ability to analyze problems, ability to summarize, learning ability and finally innovation ability.
Among the second-level indicators (personal traits): the weight of independence is 0.1952, that of integrity is 0.1572, that of initiative is 0.149, that of hard work is 0.1462, that of job interest is 0.1447, that of ambition is 0.1243, and that of self-confidence is 0.0834, indicating that the most important in personal traits is independence, followed by integrity, initiative, hard work, job interest, ambition and finally self-confidence.
Among the second-level indicators (knowledge level): OA proficiency (0.67) is more important than knowledge level (0.33).

Conclusion

In this paper, through the research on the construction of the indicator system for the quality evaluation of safety management personnel in industrial enterprises, the following conclusions are drawn: First, among the first-level indicators, the comprehensive ability is the most important, followed by personal traits, and finally the knowledge level. Second, among the second-level indicators (comprehensive abilities), the most important is strategic thinking, followed by communication ability, insight, customer service ability, strain ability, teamwork, ability to analyze problems, ability to summarize, learning ability, and finally innovation ability; among the second-level indicators (personal traits), the most important is independence, followed by integrity, initiative, hard work, job interest, ambition and finally self-confidence; among the second-level indicators (knowledge level): OA proficiency is more important than knowledge level.

Based on the above results, corresponding application suggestions on recruitment and training are put forward. Recruitment: The evaluation indicator system of the security management personnel should be used in selecting the most suitable employees instead of the most outstanding ones according to the ranking of weights and

importance of indicators in order to achieve the purpose of post matching. Training: Based on the quality evaluation indicator system of safety management personnel, the training needs of employees should be analyzed to find out the shortcomings of their quality, conduct targeted training, and evaluate the training effect, so as to facilitate the development of future staff training.

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