

# Research on Competency Assessment of Auditing Graduates Dispatched Overseas

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## ABSTRACT

To evaluate the competency of auditing graduates and facilitate the determination of the best candidates dispatched overseas for enterprises, an assessment system is established in this study. Firstly, an assessment indicator system including professional knowledge, professional skills, professional characteristics, professional experience and cross-cultural competence is established. Setting valued iteration is used to calculate the weight of each indicator, and the multiple attribute group decision making (MAGDM) method with Pythagorean 2-tuple linguistic weighted averaging (P2TLWA) operators are adopted for evaluation. Finally, a case using the proposed method is given. The result shows that the proposed assessment system can be used to evaluate the auditing graduates' ability to adapt to overseas dispatch, and select graduates for enterprises.

**Keywords:** *overseas dispatch, auditing education, auditing graduates, competency assessment*

## 1. INTRODUCTION

At present, higher education in China is in the process of popularization, and most of the application-oriented colleges implement the talent training mode guided by the demands of industry and employment. With the vigorous development of "the Belt and Road" initiative and the implementation of globalization strategies by some enterprises, more and more enterprises need to dispatch employees overseas, including internal auditors, and many colleges majoring in auditing have developed the training of auditing talents dispatched overseas. How to evaluate the competency of auditing graduates in the overseas assignment has become the focus of both schools and enterprises. The existing research mainly focuses on building the internal auditor competency framework. Following are the shortcomings that exist in them: (1) For overseas dispatched employees, in addition to the knowledge and skills related to the business they are engaged in, they also need to have cross-cultural competence. (2) The weight of the indicators was not considered in the previous evaluation, and the weight of all indicators were the same by default. Due to the differences of evaluation objects, purposes, factors, and different decision makers, the personal cognition of valuator and other reasons, the weight of each indicator is often inconsistent, even subtle [1]. (3) Due to the uncertainties, the incompleteness, the hesitancy of the experts, and the lack of clear connotation and extension, etc., the accuracy and reliability of evaluation results will be affected, even a similar situation will appear in self-evaluation. To avoid the above shortcomings, an assessment indicator system including cross-cultural competence is established. Set valued iteration [2], which is convenient for selection, is

used to calculate the weight of each indicator, and MAGDM with P2TLWA operators [3], which considers the hesitation of evaluators, are adopted for evaluation.

## 2. ESTABLISHMENT OF ASSESSMENT INDICATORS

The importance of internal auditing in overseas projects has been highlighted in accounting error detection and fraud prevention, the effective operation of internal control, and the improvement of economic benefits. The demand for the internal auditing of overseas projects is increasing, which raises requirements for schools to train qualified internal auditors to adapt to overseas environments. However, as an important means to guarantee the quality of training, the corresponding assessment system is still lacking.

For a long time, a great deal of research has been carried out on the competency of internal auditors, which provides a reference for the internal auditors' competency research and assessment. These articles have reflected that the connotations of internal auditor competency are the ability of the professional internal auditing individuals to perform their internal auditing duties and ensure they meet established standards. To be specific, the professional knowledge (IA(1999), AICPA(2005), Zhang(2013)[6]), skills (IA(1999), AICPA(2005)), attitudes, thinking, and values [6] of internal auditors are significantly different from those of other practitioners in a specific job and organizational environment; however, this varies slightly according to the field of study.

Far away from the company's headquarters, the large cultural differences and numerous needs for independent judgment make the cross-cultural ability and experience of

employees particularly important. Besides, attitude, thinking, and values are merged into professional characteristics. This dimension is implicit, difficult to evaluate, but important [4]. Based on previous studies, the evaluation indicators of this study include five dimensions, which are professional knowledge, professional skills, professional characteristics, professional experience and cross-cultural competence.

### **2.1. Professional Knowledge**

The knowledge structure of auditing graduates is relatively singular, but a qualified internal auditor should have a pluralistic knowledge system, such as basic and applied professional knowledge, environmental knowledge, anti-fraud knowledge and transaction process knowledge. In addition, there is also a need for participation in various training programs to acquire the additional knowledge needed to implement the business[4].

### **2.2. Professional Skills**

According to the CBOK questionnaire(2008), in order of importance, the skills for an internal auditor are to understand business operations, risk analysis, interview and communication skills. Seol et al. [5]found that the main skills of entry-level auditors include technical skills, analytical skills, comprehension skills, and personal and interpersonal skills. With the development and application of information technology, information technology has a greater impact on accuracy than general auditing experience in risk assessment. Auditors must begin auditing using applications such as auditing software [6]. Therefore, internal auditors should have IT skills as well as general business skills.

### **2.3. Professional Characteristics**

Professional characteristics refer to the unique and intrinsic personal characteristics of employees related to professional behavior. For internal auditors, these include independence, objectivity and professional skepticism [4]. Specifically, distance from any transaction or action that may have a conflict of interest, professional judgment without prejudice [4], and an attitude of prudent evaluation of auditing evidence.

### **2.4. Professional Experience**

Professional experience refers to the various knowledge and skills acquired by auditors through the accumulation of

rich experience in auditing work and experience in specific industry areas. Auditors with industry experience show more professional skepticism than the novice [7]. They have a better ability for knowledge structure aggregation, information classification, data analysis, trade-off decisions, and problem-solving.

### **2.5. Cross-cultural Competence**

Individuals with strong cross-cultural competence can effectively manage themselves, relationships and business in an unfamiliar cultural context. At present, “the Belt and Road” initiative has involved 65 countries and regions, covering numerous cultural clusters, which have different values. Particularly, in some Islamic countries Islamic law has been integrated into auditing activities [8]. For internal auditors dispatched overseas, the difference in the environment at home and abroad is the first challenge they face in their work. A good cross-cultural ability can help them adapt to the unfamiliar cultural environment as soon as possible.

Based on the study of Bird et al. [9], this study evaluates cross-cultural competence in terms of perception management, relationship management and self-management. Reflecting how people perceive and deal with cultural differences, perception management evaluates people's psychological flexibility for cultural differences, their tendency to make quick judgments about these differences, their ability to manage their perceptions, and their intrinsic interest and curiosity in other culture [9].Relation management reflects people's understanding of others, ways of interaction, and the self-awareness which is the understanding of one's strengths, weaknesses and values in interpersonal communication [9]. As a form of social support, positive interpersonal relationships are a source of information for understanding unfamiliar cultures. Employees dispatched overseas are vulnerable to cultural shocks and role conflicts in a new cultural environment, which result in anxiety, confusion and other negative emotions[10]. Self-management considers people's strength of identity and ability to manage emotions and stress effectively, which can reflect whether people working abroad can maintain mental and emotional health [9].

According to previous studies, an indicator system is formed to train and evaluate competent internal auditors dispatched overseas, including the above five elements. After considering the operability and convenience of the actual evaluation and soliciting the opinions of the enterprise auditing department, human resources department, overseas projects department and senior auditors, the indicators for the evaluation formed are shown in Table 1.

**Table 1.** Competency indicators of auditing graduates dispatched overseas

Competency	u <sub>i</sub>	Specific assessment indicators
Professional Knowledge	u1	Master the professional knowledge to deal with auditing business
	u2	Actively participate in training to obtain the knowledge updates needed to implement the business
Professional Skills	u3	Ability to perform auditing work independently and use relevant auditing software
	u4	Ability to properly use analytical procedures in risk assessment, detailed testing, general review, etc
	u5	Avoid resistance feelings of the audited unit in the process of auditing. Even if conflicts arise, be good at communication, coordination and resolution
Professional Characteristics	u6	No interference from conflict of interest, self-evaluation and external pressure during the auditing process, and auditing conclusions based on auditing evidence only
	u7	Maintain a professional skepticism to obtain adequate auditing evidence
Professional Experience	u8	Internship experience related to assigned auditing projects
	u9	Faced with complex auditing problems, be good at finding important information to find a solution
Cross-cultural Competence	u10	Accept the uncertainty caused by the lack of correct interpretation methods in new or complex overseas environments
	u11	Willing to find deep-seated reasons for cultural differences
	u12	Interest and curiosity in different countries and cultures
	u13	Willing to build and maintain relationships with people from different cultures
	u14	Ability to easily feel the emotions of others
	u15	Ability to communicate with host countries
	u16	Having proper expectations of overseas dispatch work and living standards, such as diet and living environment, can calmly cope with the pressure of expatriate work

**3. RESEARCH METHOD**

Taking into account that it is generally easier for people to rank evaluation indicators than grade to a certain indicator, and the differences in level, specialty and personal preferences of evaluation experts, the set valued iteration method is used to calculate the weights of indicators. This method is based on "function-driven", which reflects the relative importance of the indicator and excludes the subjective factors of the experts. In terms of the evaluation method [2], the Pythagorean 2-tuple linguistic MAGDM [3] method is used, which can overcome the indecision of evaluators with many uncertainties, and expand the scope of fuzzy evaluation. Therefore, it can be applied to the evaluation of the competency of the overseas dispatched internal auditors trained by the auditing major.

**3.1. Calculate Indicators' Weights**

Assuming the indicator set  $\Xi = \{e_1, e_2, \dots, e_m\}$ , and  $L (\geq 2)$  experts, and  $k (1 \leq k < m)$  as a positive integer. The expert strictly follows the following steps to select indicators. Taking the  $p$  expert as an example, firstly, select the indicators which he thinks are the most important

$k$  indicators of all indicators to get the index set  $\Xi_{1,p} = \{e_{1,p,1}, e_{1,p,2}, \dots, e_{1,p,k}\}$ ; then select the most important  $k$  indicators from the remaining indicators in turn. If the indicators are selected by  $s$  times, the set of indicators can be obtained  $\Xi_{i,p} = \{e_{i,p,1}, e_{i,p,2}, \dots, e_{i,p,k}\} (1 \leq i \leq s)$ . Until  $r (1 \leq r < k)$  indicators are left, if  $s, r \in N$ , such that  $s \cdot k + r = m$ .  $s_k$  sets of indicators are acquired.

The function  $u_{ik}(e_j)$  [2] is used to calculate times of each indicator selected by all experts in the indicator set:

$$u_{ip}(e_j) = \begin{cases} 1, & e_j \in \Xi_{i,p} \\ 0, & e_j \notin \Xi_{i,p} \end{cases} \quad (1)$$

$$(i = 1, 2, \dots, s; p = 1, 2, \dots, L)$$

Assume:

$$\xi(e_j) = \sum_{p=1}^L \sum_{i=1}^s u_{ip}(e_j), j = 1, 2, \dots, m \quad (2)$$

The weight of the indicators  $e_j$  is acquired after normalized:

$$w_j = \xi(e_j) / \sum_{p=1}^m \xi(e_p), j = 1, 2, \dots, m \quad (3)$$

If there is an indicator that no expert selects, it shows that the indicator is not important and its weight coefficient is adjusted to:

$$w_j = \frac{\xi(e_j) + \frac{1}{2m}}{\sum_{p=1}^m \left( \xi(e_p) + \frac{1}{2m} \right)}, j = 1, 2, \dots, m \quad (4)$$

### 3.2. Pythagorean 2-tuple Linguistic MAGDM method

In this part, the Pythagorean 2-tuple Linguistic MAGDM method is constructed based on compositional operations [3].

If there is the set of indicators  $\Xi = \{e_1, e_2, \dots, e_m\}$ , in which the corresponding weight is  $(w_1, w_2, \dots, w_m)^T$ ,

and  $w_j \in [0, 1], \sum_{j=1}^m w_j = 1$ . And there are L experts,

whose weight is  $(\varpi_1, \varpi_2, \dots, \varpi_L)^T$ , where  $\varpi_i \in [0, 1]$ ,

$$\sum_{i=1}^L \varpi_i = 1.$$

**Step 1:** Constructing the Pythagorean 2-tuple linguistic decision matrix

According to the experts scores, constructing the following Pythagorean 2-tuple linguistic decision matrix

$$M = (\tilde{p}_{ip})_{m \times L}, \text{ where } \tilde{p}_{ip} = \left\langle (s_{ip}, \rho_{ip}), (\mu_{ip}, v_{ip}) \right\rangle,$$

$(s_{ip}, \rho_{ip})$  is used to show the specific score of a certain indicator in a certain scheme. Then Pythagorean membership  $\mu_{\tilde{p}}(e)$  is used to express the support extent

for the score and non-membership  $v_{\tilde{p}}(e)$  is used to express the opposition extent.

**Step 2:** Calculating each expert's assessment results  
Calculating each expert's assessment score according to Eq. (5) [3]

$$t_p = P2TLWA(u_{p1}, u_{p2}, \dots, u_{pm}) = \bigoplus_{i=1}^m (\omega_i u_{pi}) = \left\langle \Delta \left( \sum_{i=1}^m \omega_i \Delta^{-1}(s_{pi}, \rho_{pi}) \right), \right. \quad (5)$$

$$\left. \left( \sqrt{1 - \prod_{i=1}^m (1 - (\mu_{pi})^2)^{\omega_i}}, \prod_{i=1}^m (v_{pi})^{\omega_i} \right) \right\rangle$$

$$p = 1, 2, \dots, L$$

where  $u_{pi}$  is the expert  $p$ , score for indicator  $i$ .  $\omega_i$  is the

weight of indicator  $i$ ,  $\omega_i \in [0, 1], \sum_{i=1}^m \omega_i = 1$ .

**Step 3:** Calculating the score

For a P2TLN, according to the results of Step 2, the score is [3]

$$S(t) = \Delta \left( \Delta^{-1}(s_{\theta(e)}, \rho) \frac{1 + (\mu_t)^2 - (v_t)^2}{2} \right) \quad (6)$$

**Step 4:** Calculating the assessment result

According to the results of Step 3, the assessment result is Q [3]

$$Q = \Delta \left( \sum_{i=1}^L \varpi_i \Delta^{-1}(S(t)) \right) \quad (7)$$

**Step 5:** Ranking the results

Assess the competency of auditing graduates and rank the results calculated by the above methods.

## 4. CASE STUDY

In this part, the competency of 5 auditing graduates is ranked to verify the assessment system established by this research and provides reference for selection.

### 4.1. Calculation of Indicators' Weights

Firstly, a project manager, a human resources manager, a human resources staff member, an auditing manager and a senior auditor with overseas experience were invited to select the evaluation index as experts. According to the requirements of the set value iteration method, each time the most important five indicators in the indicators are selected, after 7 selections, until 3 indicators remained. The indicator set for the five experts is shown in Table 2. The set value iteration method is used to calculate the scores of each index in Table 2 according to formulas (3) and (4). The results are shown in Table 3. The weight of each indicator is calculated and the results are as follows:  $\omega = (0.1081, 0.0856, 0.0856, 0.1036, 0.0946, 0.0946, 0.0590, 0.0630, 0.0770, 0.0410, 0.0500, 0.0540, 0.0320, 0.0180, 0.0140, 0.0230)$

**Table 2.** The indicator set of five experts

Expert	Subset					
	k	2k	3k	4k	5k	6k
1	u1,u3,u4	u12,u5,u6	u2,u7,u9	u8,u16,u10	u11,u13,u14	u15
2	u1,u5,u6	u4,u9,u16,	u3,u7,u11	u8,u10,u12	u13,u15,u2	u14
3	u1,u6,u4	u9,u2,u3	u5,u8,u10	u7,u11,u12	u13,u16,u14	u15
4	u4,u5,u6	u1,u8,u16	u9,u2,u13	u3,u12,u11	u15,u14,u7	u10
5	u1,u2,u3,	u4,u7,u5	u8,u9,u11	u6,u10,u12	u15,u13,u14	u16

**Table 3.** Set value iteration scores

j	u1	u2	u3	u4	u5	u6	u7	u8	u9	u10	u11	u12	u13	u14	u15	u16
$\xi(e)$	24	19	19	23	21	21	13	14	17	9	11	12	7	4	3	5

**4.2. Information Integration**

**Step 1:** Establishing the Pythagorean 2-tuple linguistic decision matrix  
 Five auditing graduates were asked to self-evaluate the indicators established in this study, and three experts were invited to evaluate the five graduates. According to the requirements of Pythagorean binary semantic information,

indicator score will be matched with each graduate's actual situation. First, grade according to (1 = very poor, 2 = poor, 3 = general, 4 = good, 5 = very good); then grade according to the hesitation ambiguity of the indicator, which is in the form of (pros, cons). The scores for the pros and cons are following the scope of Pythagorean membership and non-affiliation. Their quadratic sum is less than 1. The obtained data are organized into the Pythagorean 2-tuple linguistic decision matrix.

**Table 4.** P2TLWA of graduates

Candidate	Self-evaluation	Expert1	Expert2	Expert3
A	((S4,0.2838),(1,0))	((S4,0.0045),(0.8116,0.1620))	((S4,0.3999),(0.7427,0.2631))	((S4,-0.3064),(0.7426,0.2455))
B	((S3,-0.3064),(0.6577,0.3532))	((S4,-0.0404),(0.8557,0.1687))	((S5,-0.4469),(0.7636,0.2528))	((S3,0.3378),(0.5861,0.4128))
C	((S4,-0.3289),(0.7726,0.2297))	((S3,0.3739),(0.8089,0.1472))	((S5,-0.2618),(0.7676,0))	((S4,-0.3243),(0.7402,0.2153))
D	((S4,0.1038),(0.8280,0.1487))	((S3,0.4956),(1,0))	((S4,0.0917),(1,0))	((S4,-0.0808),(0.7339,0.1515))
E	((S4,0.2613),(0.8698,0.1330))	((S4,0.2567),(0.8203,0.1510))	((S5,0.2606),(0.8747,0.1244))	((S3,0.1850),(1,0))

**Table 5.** Score functions of graduates

Candidate	Self-evaluation	Expert1	Expert2	Expert3
A	(S4,0.2838)	(S3,0.2686)	(S3,0.2612)	(S3,-0.2460)
B	(S2,-0.2387)	(S3,0.3731)	(S3,0.4586)	(S2,-0.0421)
C	(S3,-0.1658)	(S3,-0.2457)	(S4,-0.2351)	(S3,-0.2404)
D	(S3,0.4132)	(S3,0.4956)	(S4,0.0917)	(S3,-0.0300)
E	(S4,-0.2953)	(S4,-0.4880)	(S5,-0.3978)	(S3,0.1850)

**Table 6.** The score for each graduate

	A	B	C	D	E
Q	(S3,0.3919)	(S3,-0.3623)	(S3,0.0282)	(S3,0.4926)	(S4,-0.2490)

**Step 2:** Calculating P2TLWA

Based on the Pythagorean 2-tuple linguistic and formula (5), P2TLWA was calculated according to the evaluation of the five graduates by experts, as shown in Table 4.

**Step 3:** Calculating score function  $S(t)$ 

According to formula (6), the scoring function of five graduates is calculated, as shown in Table 5

**STEP 4:** Calculating the score value of the assessment result

In the competency assessment, candidates know more about their abilities than experts, so experts may not be able to evaluate objectively. However, the candidates may show a different willingness according to understanding of the destination. Therefore, to solve this problem and minimize the evaluation error, the weights of experts and participants are set the same. According to the calculated values of Formula (7) and Table 5, the results are shown in Table 6.

**Step 5:** Ranking the evaluation results

According to the results in Table 6, we can assess the level of competency of the auditing major graduates and the ranking of the graduates. In this case, the competency ranking of the five graduates is  $E > D > A > C > B$ .

## 5. CONCLUSION

This paper constructs a competency assessment system for internal auditors dispatched overseas. The assessment system includes three aspects: evaluation indicator, calculation of index weight and evaluation score. Assessment indicators include five dimensions, compared with previous research, adding cross-cultural competence. In order to objectively calculate the weights and consider the evaluator's hesitation, the set value iteration method and the Pythagorean 2-tuple linguistic MAGDM method are used. Finally, a case is given to evaluate the method. The result shows that the assessment method is feasible, and can provide reference for the training and evaluation of auditors.

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