



# The features and marketability of certificates for occupational safety and health management in Taiwan



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## ABSTRACT

This study first features 334,781 job openings required certificate from Taiwan's two largest human source agencies and then evaluates the market value of certificates for occupational safety and health management. We utilize demand, supply and an intermediary unit as the three main criteria while ten sub-criteria and five alternatives are chosen as well. The study utilizes multi-criteria decision making (MCDM) methods, such as Fuzzy AHP, Fuzzy ANP and VIKOR as the tools for evaluating and analyzing the market value of the certificates. The qualitative analysis results suggest that the demand aspect is more important than the supply and intermediary unit aspects, that "fit between certificates and industries" in relation to supply is the most important sub-criterion, and that "government and regulations" for the intermediary unit has the second highest weight. Finally, "level A technician for occupational safety management", "level A technician for occupational health management" and "higher examination for industrial safety" have significant market value in occupational safety and health management.

We use the hybrid FMCDM model in this study to provide help to industries, the government, examinees and other interested parties to find out the factors affecting the supply of and demand for certificates.

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## 1. Introduction

Skill tests are one of the motivating powers behind the development of modern commerce and industries. Most of countries in the world have already established a certification system, despite there being problems in the system (Hung, 2009). But there is a mismatch between skill tests and industries' manpower needs and a disequilibrium between supply and demand in some of the categories of skill tests in Taiwan. In particular, the certification for the occupational safety and health management group is one of them.

The number of participants was 3.95 million, and the number of certificates issued was 2.04 million from 2008 to 2012 in Taiwan. Skill tests cover 154 categories, with an acceptance rate of 51.68%. Occupational safety and the health protection of workers form the basis of the work environment, personal safety and the right to work. The government formulated the laws in 1974. The Act was enacted to promote workers' safety and health and prevent occupa-

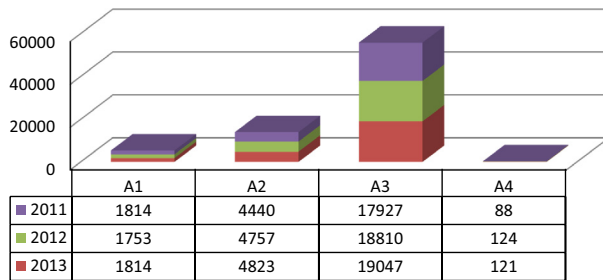
tional accidents. The companies were required to employ the same proportion of managerial staff whose possessed certificates of occupational safety and health according to their business scope.

From the supply aspect of these certificates of occupational safety and health management, the legal methods used to obtain these certificates can be divided into three kinds: higher-level examinations, skill tests and training courses. Fig. 1 presents the number of the above certificates' attendees from 2011 to 2013. Skill tests are held three times every year while the higher examination is held once a year. In Fig. 1, we know that the Level B technician for occupational safety and health management has the highest number of those attending the certification while the number taking the higher examination on industrial safety is the smallest. Fig. 2 shows the number of people who successfully obtained the certification from 2011 to 2013. In Fig. 2, we see that the highest number of people who obtained the certification was that for the Level B technician for occupational safety and health management while the number of those taking the higher examination on industrial safety was the smallest.

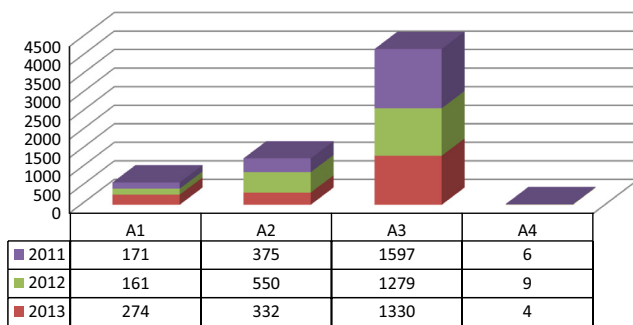
According to the "Occupational Safety and Health Act", companies have to setup occupational safety and health department depend on their size. The Level B technician for occupational safety and health management is basic requirement for enterprises. If the

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**Fig. 1.** The number of attendees from 2011 to 2013. *Source:* Skill Evaluation Center and Ministry of Examination (2015) (each certificate corresponds to the following codes: A1: Level A technician for occupational health management. A2: Level A technician for occupational safety management. A3: Level B technician for occupational safety and health management. A4: Higher examination on industrial safety).



**Fig. 2.** The number of people passing the certification from 2011 to 2013. *Source:* Skill Evaluation Center and Ministry of Examination (2015).

number of employees is higher than 300, companies need to hiring a Level A technician for occupational safety management. Figs. 1 and 2 show the state of market.

From the perspective of the labor market, we collected data from the two largest human resource agencies, 104 Job Bank and 1111 Job Bank. There are 334,781 items of data to analyze the market for certificates until August, 31, 2013. Table 1 shows the top six job openings for which the certificate was required. As shown in Table 2, the number of job seekers who need to have the certificate for occupational safety and health management.

According to the statistical data regarding the supply aspect and demand aspect, we summarize two findings as follows:

1. In terms of the supply aspect, the average acceptance ratios from 2011 to 2013 of A1–A4 were 11.3%, 9%, 7.5% and 5.4%, respectively.
2. The differences of the number of people who obtained the certification with the number of job openings requiring the certificates from 2011 to 2013 are shown in Table 3. According to Table 3, we find the presence of an imbalance in the

**Table 1**

The top six job openings for which the certificate was required. *Source:* 104 Job Bank, 1111 Job Bank and arranged by this study.

Ranking	104 Job Bank		1111 Job Bank	
	Item	Number	Item	Number
1	Restaurant Service	790	Restaurant Service	1416
2	Electrical Engineering	619	Commercial Service	908
3	Beauty Therapy and Hair-dressing	389	Occupational Safety and Health Operating	813
4	<b>Occupational Safety and Health Management</b>	<b>356</b>	Beauty Therapy and Hair-dressing	802
5	Commercial Service	211	Electrical Engineering	730
6	Machinery and Equipment Maintenance	146	<b>Occupational Safety and Health Management</b>	<b>655</b>

**Table 2**

The number of job seekers who need to have the certificate. *Source:* Arranged by this study.

Certificate's Name/Human Resource Agency	104 Job Bank	1111 Job Bank	Total
Level A technician for occupational health management	45	59	104
Level A technician for occupational safety management	76	80	156
Level B technician for occupational safety and health management	233	379	612
Higher examination on industrial safety	2	2	4

**Table 3**

The differences between supply and demand. *Source:* Arranged by this study.

Certificate's Name/Human Resource Agency	Supply	Demand	Difference
Level A technician for occupational health management	606	104	+502
Level A technician for occupational safety management	1257	156	+1101
Level B technician for occupational safety and health management	4206	612	+3594
Higher examination on industrial safety	18	4	+14

occupational safety and health management group. For example, the total number of people who obtained the certificate for the Level B technician for occupational safety and health management was far greater than the demand for the certificate.

In sum, there are certain phenomena that characterize certification in occupational safety and health management. First, business owners have difficulties recruiting suitable personnel. Second, the number of certificates that people have is unable to fit the market demand. Third, there are few other relevant certificates of professional competence in the field of occupational safety and health management. For these reasons, we focus on the certificates for occupational safety and health management in Taiwan.

The study further aims to develop an evaluation model for the certification market. We first extract the relevant factors affecting the supply and demand analysis of the skill tests and explore the indicators of supply and demand through expert-based questionnaires. Furthermore, we utilize the fuzzy analytic network process (FANP) approach to obtain causalities among the main criteria and to calculate the weights of the evaluation indicators. In addition, we use sensitivity analysis of the ANP to confirm whether the ranking of alternatives changes as weights are adjusted. Finally, the VIKOR (Vlsekriterijumska Optimizacija I Kompromisno Resenje) method is introduced to rank alternatives and select the best certificates for occupational safety and health management in Taiwan.

The framework of this study is as follows. Section 1 describes the study background and introduces the market for certificates in occupational safety and health management. Section 2 reviews the literature. In Section 3, we provide the methods and the evaluation model. Section 4 shows the empirical results. Section 5 includes conclusions.

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