

## SCIENTIFIC APPROACH FOR DISCOVERING EMPLOYABILITY SKILLS

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### Abstract

The ability to effectively match an employee's skills and personality to a specific job offer is a great advantage for job seekers. Currently, the extraction from a textual dataset through a job advertisement has become an effective way of discovering knowledge from a given collection of vacancies. Thus, this paper attempted to determine the skills required by employers from fresh graduates with bachelor's degree in Statistics. The source of data is from an online job advertisement platform extracted from September 2019 to February 2020. Text Mining analysis and Pearson Chi-square Test were employed for the analysis. The results show that the essential hard skills for graduates are the ability to work with data and equipped with computer skills. Meanwhile, communication skills, cross-functional and the ability of being a multi-tasker are the main soft skills required by employers. In addition, the results showed that soft skills are sought differently in product-based industry and service-based industry. The findings show some understandings regarding skills that are essential for statistics graduates.

**Keyword:** skills analysis, employability skills, text mining

### Introduction

Increases in the supply of graduates have posed a greater challenge in finding a stable and better job after graduating. Anxieties for not being able to decide on a career and being plagued by the career exploration process have also become a concern for the graduates. Career indecision problem is getting worrisome even if the graduates have a strong core of hard skills and soft skills (Talib & Tan, 2009).

Higher educational institutions seek for alternatives to ensure that graduates have sufficient knowledge, skills, attitudes, and values to meet the demands of the industries. Having the ability to gather information from employers provides valuable information about employability skills. Past studies proposed job advertisement analysis as one of the methods. Job advertisement contains a rich source of talent information in the job market. Job advertisement analysis helps researchers to identify the employers' requirements of skills by analyzing the content of job advertisements. It is cost-effective and is able to improve the accuracy of job market forecasts. Currently, the advancement of the World Wide Web has given advantages to the employers about going digital in posting and recruiting for jobs. Therefore, online advertisement is one of the best platforms to uncover the skills and values that employers seek for in their future employees. As an example, JobStreet.com is the earliest job vacancy portal introduced in Malaysia.

One of the challenges when dealing with job advertisement analysis is that most information exist in the text form. Each job advertisement expresses rich information about the occupation at hand, such as the competence needed (i.e. required degrees, field of knowledge, task expertise or technical skills). It is a challenge to extract the word patterns, frequency of

words or association between words. Thus, an intensive process of information extraction is necessary.

### **Employability Skills**

Studies regarding the skills required in the job market have globally increased. Employability skills can be defined as a personal attribute customized by an individual in their field of specialization and helps them to secure gainful employment, sustain them in that job, and let them progress in their career to achieve their maximum ability and contribute towards their aims and organization (Sarfraz et al., 2018). Employability skills are generally categorised into soft skills and hard skills.

Soft skills are personal behaviors and characteristics that shape the way individuals communicate with others, in their own way. For example, effective communication is a key soft skill that many employers are looking for. Some others include reliability, effective teamwork and active listening skills. Soft skills are essential in a career and during career search. However, graduates failed to gauge the main soft skills in the early stage of career development. Lacking in soft skills among graduates are discernable during the prior screening process, interview or selection sessions which are based on candidate's physical appearances, aptitudes, ability, communication, and personal talents (Omar et al., 2012).

The main soft skills are identified in several different ways. Communication skill is a basic skill in applying for a position and will be tested during the job interview (Azmi et al., 2018). Good communication skills can improve the way people operate through life, ensuring a good flow of information transferring process among colleagues, managers or clients. Meanwhile, technology savvy skills acquire graduates to learn how to use modern technology since information and communication technologies, and innovation continue to grow as the time passes, making the workplace more complex and challenging (Alshare & Sewailem, 2018). The importance of tech-savvy is also concurred by Omar et.al, as information and communication technologies (ICT) and technical skills are the second most required soft skills by graduates.

On the other hand, hard skills refer to the technical or administrative procedures related to an organization's core business which are more specific, teachable skills, and are usually related to professional knowledge, tools, or techniques within the profession (Aida et al., 2015). Hard skills are learned abilities which are acquired and enhanced through practice, repetition, and education. Hard skill is important because it increases employee's productivity and efficiency which subsequently improves employee satisfaction. Suleman (2016) revealed that analytical skills and the ability to identify and select information are important to facilitate communication and interaction, even though they are hard to observe. Meanwhile, Arcodia & Barker (2003) stated that computer knowledge is important and repeatedly appears in the job advertisement. A study by Azmi et al. (2018) also agree that the main hard skills required by graduates are information technology (IT) skills. Graduates need to be well equipped with information technology skills since they will be competing with others in this era of technology.

## **Materials and Method**

### **Source of Data**

The data source for this study is from an online job advertisement platform in Malaysia involving positions that can be applied by fresh graduates with bachelor's degree in Statistics. Job advertisements for related positions were extracted starting from September 2019 until February 2020. Throughout the time frame, 81 job offers were obtained. From each job advertisement, fields such as the company name, type of industry, language requirement, company location, job position, advertisement date, required soft skills and hard skills were

recorded.

### Text Mining Analysis

Text Mining is a process of extracting information by using a specialized analysis tool to interact with a collection of data in the document form. Through text mining, knowledge discovery can be done by analyzing several texts involving several stages. Text mining seeks to extract useful information by identifying and exploring interesting patterns from data sources (Espinoza et al., 2015). The following are the procedures in Text Mining:

#### Text Pre-Processing

The text is processed to eliminate redundancies, contradictions, different terms and stemming (Sheela & Bharathi, 2018). This process helps to remove numbers, punctuation, common words, capitalization and otherwise prepares users' texts for analysis. There are four sub-steps in text pre-processing which are tokenization, stop word removal, filtering and stemming process.

#### Text Mining Using Word Cloud

There are several text mining techniques in the text mining process. This includes supervised text categorization technique, pattern matching algorithm and support vector machine technique. In this paper, the word cloud was used to present the analysis. Word cloud serves as graphic presentation to determine visual representations of words that give greater prominence to words that appear more frequently. This type of visualization can highlight the most common answers and present the data in a way that everyone can understand.

#### Pearson Chi-square Test

The Chi-square test of independence (also known as the Pearson Chi-square test, or simply the Chi-square) is one of the most useful statistics for hypotheses testing when the variables are nominal (McHugh, 2013). The Chi-square test is a nonparametric used to test the association between two groups, population or criteria (Rana & Singhal, 2015).

The test statistic Chi-square ( $\chi^2$ ) is defined by the following equation,

$$\chi^2 = \sum_{i=0}^n \frac{(O_i - E_i)^2}{E_i} \quad (1)$$

where  $O_i$  is the observed frequency count and  $E_i$  is the expected frequency count. Approximately follows the Chi-square distribution with  $(r - 1)(c - 1)$  degrees of freedom where  $r$  is the number of rows and  $c$  is the number of columns in the contingency table.

### Results and Discussion

This section reveals the results and analysis of the research. The data is analyzed in R Studio and statistical software.

#### Employability Skills in Job Market

**Figure 1** shows the word cloud of the most frequent words of soft skills in job advertisement. The word with the biggest size shows the most frequent soft skill mentioned above all. "Communication skill", "multi-tasking" and "cross functional" are the most important soft skills required by employers. It is followed by second level size words such as "team detail" and "detail mind". This indicates that job seekers require attention to details when working in a team. Other words that appear on the word cloud are write, support team, project timeline



product-based industry and service-based industry.

**Table 1** Pearson Chi-square Test Result

Variables	Industry		$\chi^2$	p-value
	Product	Service		
Soft skill sets			16.065	0.041
Adaptability	4(2.1)	5(6.9)		
Critical thinking	7(7.4)	24(23.6)		
Dependability	6(7.6)	26(24.4)		
Effective communication	11(10.2)	32(32.8)		
Integrity	6(6.9)	23(22.1)		
Organization	9(9.8)	32(31.2)		
Problem-solving	10(4.8)	10(15.2)		
Teamwork	4(9.5)	36(30.5)		
Willingness to learn	3(1.7)	4(5.3)		
Hard skill sets			11.179	0.083
Microsoft software suite	4(7.8)	23(19.2)		
Bilingual/Multilingual	6(8.1)	22(19.9)		
Data mining	8(9.3)	24(22.7)		
Database/Storage system	9(5.2)	9(12.8)		
Programming languages	10(6.7)	13(16.3)		
Statistical analysis	17(16.0)	38(39.0)		
User interface design	0(0.9)	3(2.1)		

### Conclusion

In this paper, the text mining method and Pearson Chi-square test were successfully applied to identify the employer's requirement of skills for Statistics fresh graduates. The results from the word cloud summarises the main skills required by the employers. Meanwhile, Chi-square test showed that there is an association between soft skill sets and types of industries. The results acquired show some understandings regarding skills that are essential for graduates.

### Acknowledgement

The authors would like to thank Universiti Teknologi MARA Negeri Sembilan for the facilities involved in making this research a success.

### Conflict of interests

Author hereby declares that there is no conflict of interests with any organization or financial body for supporting this research.

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