

FACTOR ANALYSIS OF SUCCESSFUL JOB SEARCH FOR ENGINEERING COLLEGE GRADUATES

SANG-MYUNG KIM, YOUNG-SEOK SIM, HYOU-WON SEO AND JAE-DONG SON*

Department of Industrial and Information Systems Engineering
Soongsil University

No. 369, Sangdo-Ro, Dongjak-Gu, Seoul 06978, Korea

*Corresponding author: son88@ssu.ac.kr

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ABSTRACT. *Recently Korea's job market has become narrower and the required career level has been getting higher. As a result, the number of college graduates who fail in finding job has been increasing. Although there are lots of prior researches that are associated with current job circumstance, most of them did not consider college graduates' specialties. In this research, in order to take into account the job seekers' specialty, especially of engineering major, we use the data of engineering college graduates, from which we derive the important factors for them to successfully get a job and analyze the relationship among the job seekers' qualifications.*

Keywords: Factor analysis, Job search, Engineering college graduates, GPA

1. Introduction. In Korea, the university graduation has been regarded as a guarantee for getting a job. In fact, until 90's the university graduates have usually gotten a better job easily than those who did not have bachelor degree. As a result, the number of university graduates has been rapidly increased. However, because of the limited number of job positions that need university graduates, the competition among them to get a job has been intensifying.

Research results have reported that many factors are required to get a job such as GPA, the number of certificates, the score of TOEIC, internship experience, and experience of studying abroad, which make job seekers find their job easily [1,2]. Especially Seo [2] showed that the job seekers' specialty, the number of certificates, experience of studying abroad, and attending job career programs have a positive effect on employment. As a research on relationship among job seeker's qualifications, Kong et al. [3] clarified that there exists significant difference in successful job search according to gender, specialty, and even region of birth. Byeon [4] insisted that if job seekers want to find job earlier point in time, they should lower their goal and have a strong will to get a job.

Those studies mentioned above, however, have not considered the specialty of engineering college graduates as well as the relationship among the job seekers' qualifications. Hence, the research results have not provided sufficient information to those who are finding job position, especially to the engineering college graduates. In the paper, we survey the employment data of the engineering college graduates in order to take into account the job seekers' specialty, especially of engineering major. Based on those data, we analyze the relationship among the job seeker's qualifications as well as derive the significant qualifications for engineering college graduates to successfully get a job.

The remainder of this paper is organized as follows. Section 2 represents the descriptive statistics based on the collected data. Section 3 describes the results obtained by the following five statistical analyses: homogeneity test, correlation analysis, independence test, ANOVA (analysis of variance), and logistic regression analysis. Finally, Section 4 summarizes the conclusions of this study.

2. Descriptive Statistics. This study gathers the data from the students who entered the college of engineering in a certain university of Korea from 1998 to 2011. The total number of data is 123. The questionnaire used in our research contains 16 questions such as GPA, GPA of major, internship experience, score of TOEIC, the number of certificates, the status of employment, and companies where they are working for. This study excludes gender because there are usually few female students in engineering colleges in Korea. Collected data are classified into two dependent variables and eight independent variables.

To begin, dependent variables consist of two issues: the point of time and quality of successful employment. The point of time of successful employment is divided into two categories whether the graduates have found their job positions before their graduations or not, whereas quality of employment is made up of the following five categories: large company, medium-sized/small company, public company, foreign company, and unemployed state (*during 2 years after graduation*). Figure 1 summarizes the data with respect to the two dependent variables mentioned above. The left side of the figure shows that 46% of graduates found their job positions before graduation, while 54% after graduation. In the right side of figure, we see that 73% of graduates have succeeded in finding their job positions within 2 years after their graduations, among which 36% joined large size companies, whereas 27% have failed in job search.

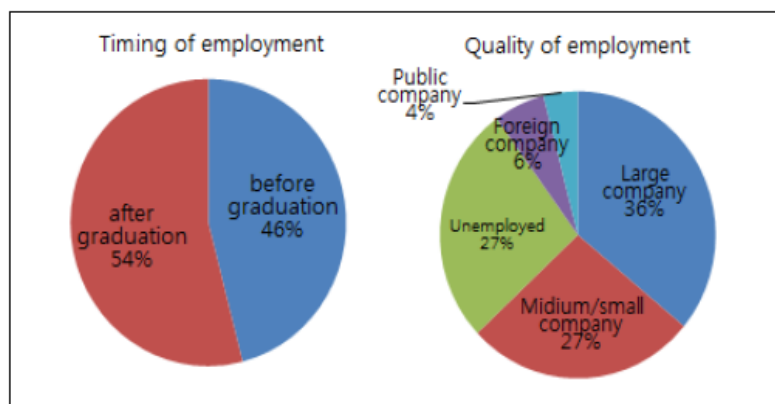


FIGURE 1. Data summary of the independence variables

Next, independent variables are each factor of job seekers' qualifications required to get a job. In this paper, we consider the following eight factors: the number of certificates, TOEIC score, internship experience, volunteer activity, GPA of major, GPA, English speaking score, and prize in the contest.

Table 1 represents the summary of the data with respect to the 8 independent variables stated above. From the table, it can be said that more than 50% of graduates have got at least one certificate related to their major field, more than 800 scores of TOEIC, no internship experience, less than 50 hours of volunteer activity, more than 3.5 of GPA and GPA of major, less proficient English speaking skill, and no prize in the contests.

3. Statistical Analysis. In this section, in order to not only clarify the relationship among job qualifications considered in the paper but also derive the important factors that significantly affect the successful job search, we implement the following five types of statistical analysis: homogeneity test, correlation analysis, independence test, ANOVA, and logistic regression analysis. The purpose of homogeneity test is to find the successful employment factors, and both correlation analysis and independence test are to clarify the relationship between factors. In addition, ANOVA is to confirm the difference in GPA of major with respect to the quality of employment. Finally, logistics regression analysis is

TABLE 1. Results of independence test

Qualifications		Frequency (Ratio: %)
certificate	Yes	106 (86.2)
	No	17 (13.8)
TOEIC	under 700	24 (19.5)
	700-800	38 (30.9)
	800-900	54 (43.9)
	over 900	7 (5.7)
internship experience	Yes	41 (33.3)
	No	82 (66.7)
volunteer activity (over 50 hours)	Yes	35 (28.5)
	No	88 (71.5)
GPA of major	under 3.3	29 (27.1)
	3.3-3.6	25 (23.4)
	3.6-3.9	33 (30.8)
	over 3.9	20 (18.7)
GPA	under 3.3	26 (21.1)
	3.3-3.6	37 (30.1)
	3.6-3.9	42 (34.1)
	over 3.9	18 (14.7)
English speaking score	Yes	39 (44.4)
	No	49 (55.6)
prize in the contest	Yes	21 (17.1)
	No	102 (82.9)

TABLE 2. p-value of homogeneity test

Qualifications	Timing of employment	Quality of employment
certificate	0.891	0.100*
TOEIC	0.298	0.695
internship experience	0.096*	0.194
volunteer activity	0.708	0.454
GPA of major	0.197	0.009*
GPA	0.474	0.077*
English speaking	0.543	0.715
contest	0.787	0.229

(*p-value is lower than significance level 0.1)

to develop a new mathematical model to predict the quality of employment for any given student's GPA.

3.1. Homogeneity test. We conduct Chi-square test to examine the homogeneity among factors of job seeker's qualifications with respect to not only the quality of employment but also the point in time of successful employment. With the test we have succeeded in finding out the following important factors that affect both the quality and the point in time of employment. Table 2 summarizes the p-values of homogeneity test. The following three points are main results obtained from the test.

First, only internship experience affects the timing of successful employment. This may come from the reason that most of companies usually want to employ new workers of outstanding capability that might be pre-tested or revealed in some degrees by internship

program. Thus, it can be said that the students need to have internship experience first if they want to find job position earlier point in time before graduation.

Next, the number of certificate, GPA, and GPA of major have significant influence on the quality of employment. This result is similar to Choi and Kim's [1] in the point that high score of GPA operates positively in job search. In our research, this inclination is more outstanding in both large size company and public corporation than other types of companies. In addition, job seekers should put their efforts into getting certificates related to their specialty. As to the quality of employment, it is cleared by our research that the specialty, evaluated by the certificate and GPA, is required in company's recruiting.

Finally, it is remarkable that TOEIC does not affect employment, which is contrary to our general belief that the higher TOEIC score is, the earlier they can find job position or the better company they can be employed. However, although most students got over 800 points in TOEIC in our survey, they do not have any special benefit on their job search. Therefore, students should keep in mind that high TOEIC score never guarantees their employment, and do not need to spend too much time in getting high TOEIC. Of course, it is needless to say that the business area where English skill is needed is an exception.

3.2. Correlation analysis. In order to clarify the relationship among the job seekers' qualifications, we implement correlation analysis. We confirmed that a very high correlation coefficient as 0.95 between GPA and GPA of major exists. This implies that students who have high GPA of major are also high score of GPA. In addition, the regression model of GPA with respect to GPA with major is given by $y = 0.730 + 0.803x$.

3.3. Independence test. In Section 3.1, we have already shown that both GPA and GPA of major have important influence on the quality of employment. Hence, we investigate in this section the relationship between the GPA and other categorical factors of job seekers' qualifications. To do so, we implement independent test, the result of which is summarized in Table 3. In Table 3 we see that only the TOEIC is dependent relationship with GPA, whereas the number of certificates is not. This implies that students with high score of GPA tend to have also high score of TOEIC, but not much of certificates. Hence, it can be said that students with high score of GPA is well-prepared for job qualifications including TOEIC, and they do not make any effort to obtain certificates. Therefore, thinking of many students spend their time getting certificates to prepare job search, there may be a high possibility that the GPA of most of them are not so high; seen in Table 1, their GPA may not be so high. This might come from the misunderstanding of students preparing for employment because of overheated employment competition in Korea.

TABLE 3. Results of independence test

Qualifications	p-value
TOEIC	0.017*
English speaking skill	0.810
certificate	0.153
internship experience	0.277
contest	0.150
volunteer activity	0.347

(*p-value is lower than significance level 0.1)

3.4. ANOVA. In this section, we perform a single factor ANOVA to examine whether GPA of major has a significant influence on the quality of employment, i.e., the type (size) of company. The average and variation of GPA of major in relation to size of companies are summarized in Table 4. From the results of ANOVA, performed as T-test

TABLE 4. Average and variation of GPA of major

	Frequency	Average	Variation
foreign company	6	3.37	0.16
public enterprise	4	3.57	0.05
large company	38	3.71	0.11
small company	26	3.41	0.13
unemployed	33	3.45	0.19

with significance level 0.1, we clarified that large-sized company has the highest average GPA of major, while foreign company has the lowest average GPA of major. Hence, students should manage their GPA of major while in college to find job position in large-sized company where most graduates eager to join.

3.5. Logistic regression analysis. In this section, we develop logistic regression model to predict the quality of employment according to the job seekers' GPA and GPA of major. The dependent variable Y denotes the quality of employment, which is divided into the following two groups: group1: public corporation and large company; group2: small company, foreign company and the unemployment. The analysis results are summarized in Table 5.

TABLE 5. Results of logistic regression analysis

	Y-intercept (p-value)	Coefficient (p-value)	Determination coefficient
GPA	-0.726 (0.161)	0.327 (0.077)	0.850
GPA of major	-1.264 (0.062)	0.486 (0.037)	0.928

As shown in Table 5, p-values of both Y -intercept and coefficient for GPA of major are lower than the significance level 0.1, whereas only the coefficient for the GPA is higher than the significant level. The coefficients of determination for both models above are as high as 0.850 and 0.928. Hence, the model for GPA of major has stronger explanation and is more suitable for the prediction of the type of company to be employed according to GPA of major than that of GPA. The equations of logistic regression model are obtained as follows.

$$Y = 0.327 \times GPA - 0.726$$

$$Y = 0.486 \times GPA\ of\ major - 1.264$$

4. Conclusion. We have found out the significant factors from the job seeker's qualifications for successful employment, especially for engineering college graduates, by use of the data of engineering college graduates. According to the results, engineering college graduates need to have an internship experience to find jobs as soon as they graduate from the university. In addition, they should take high GPA or GPA of major and take as many certificates as possible in order to enter the large size companies regardless of the timing of his graduation. TOEIC, known as an important factor in job search, does not have direct influence on the successful employment but is dependent on the GPA or GPA of major. That is to say, although TOEIC score is generally known as an important component to get a job, it is not necessarily required in successful job search as long as the job seeker has GPA of major higher than or equal to the average.

The results obtained in this study are based on only 123 data, which are too small size of sample group to represent the huge size of engineering college graduates in Korea. To make those results of this research more practical one providing useful information to the undergraduate students who are preparing for job search, larger number of data should

be collected and comparison analysis with other area of specialty should be conducted in the future.

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