Competitiveness of Graduates on the Job Market

András Farkas

Budapest Tech, Faculty of Economics
1084 Budapest, Tavaszmező út 17., Hungary
e-mail: farkas.andras@kgk.bmf.hu

Summary: In this paper the employment of university/college graduates is examined. Based on international standards a competency profile of these graduates is developed. A survey is conducted to measure employer expectations versus student performance with respect to 26 attributes. The research is supported by analytical and graphical statistical methods.

1 Introduction

The purpose of this study is to compare perceptions of economics and engineering students to those of employers regarding the value of specific skills necessary for employment. In today's job market the employers want people who can rapidly fit in to the workplace culture, can work in teams, exhibit good interpersonal skills, communicate well, take on responsibility for an area of work, and perform efficiently and effectively to add value to the organization. Therefore, universities and colleges need to be aware of the changing nature of the workplace and of the requirements of employing organizations. They should respond to these challenges and demands.

Section 2 discusses the methodology of the research, Section 3 presents an analysis of the competency profiles of graduates both from the employers and from the potential employees (students) viewpoints and finally the paper summarizes the major findings.

2 Research Methodology

The study relies on empirical research. The survey method is used which utilizes questionnaires and interviews to discover descriptive characteristics of competencies. Categorical data are given by cross-tabulation. To give insight into the characteristics of our data sets descriptive statistical measures and graphical displays are applied. Levels of measurement are ordinal and interval.

To analyze the relationships between the variables in a subtle way a multivariate statistical method called correspondence analysis is used. It is a descriptive technique of factoring categorical variables and displaying them in a property space which maps

their association in two or more dimensions. The goal is to represent the entries in the cross-tabulation table of relative frequencies in terms of the distances between rows or columns in usually two dimensions. The table of frequencies is then standardized, so that the relative frequencies across all cells sum to unity. This is achieved by factoring the basic structure (through singular value decomposition) of the chi-square distance matrix, resulting in a set of row vectors, column vectors and singular values.

The computed scores are plotted in a visual display, by showing which category values are close together. The interpretive strength of the method lies with its representation of low-dimensional solutions in these graphical displays, which permit the researcher to make comparisons between row variables and/or between column variables (after principal normalization), and between row and column variables (after symmetrical normalization) in their relative placement in a space. The graphical display is called a biplot which represents an optimal fit to the original data set. The interested reader may find details of this method in the classic texts of Benzecri [1] and Greenacre [3].

3 Analysis of the Expected Competencies of Graduates

In the literature numerous surveys have been published for suggesting attributes, skills and motivation that are sought nowadays in the workforce market. A comprehensive list of these attributes appeared in Farkas [2] which was based on mainly international sources [4], [5], [6]. We call this list a competency profile of graduates. This set of 26 attributes is suggested to be divided into four groups:

Group 1		**Proficiency and Knowledge**
	A	Adequacy of Knowledge in Appropriate Field
	B	Ability to Apply Knowledge in Practice
	C	Multi-disciplinary Perspective
	D	Desire to Continue Learning
	E	Capacity to Learn New Skills and Procedures
	F	Capacity to Work with Minimum Supervision
Group 2		**Skills**
	G	Communication Skills
	H	Presentation Skills
	I	Writing/Report Writing Skills
	J	Capability to Present Well Reasoned Arguments
	K	Analytical/Problem Solving Skills
	L	Capacity for Co-operation and Teamwork
	M	Capacity to Make Decisions
	N	Managerial/Supervisory Skills
	O	IT/Computing Skills

Group 3		**Abilities**
	P	Ability to Access and Use Information
	Q	Ability to Think Creatively
	R	Adaptability/Resourcefulness
	S	Capacity to Cope with/Manage Change
Group 4		**Global Thinking**
	T	Sensitivity to Different Viewpoints/Cultural Perspectives
	U	International Awareness
	V	International Experience
	W	Capacity to Function in Multicultural/Global Context
	X	Capacity to Act Ethically
	Y	Capacity to Act with Social Responsibility
	Z	Capacity to Communicate in at least one Foreign Language

3.1 Employer assessment on the expectations of graduate attributes

Employers who have economics and engineering graduates were asked about the type and size of their business or organization and its location of operation. Then a sample of employers was taken from international and local companies. Data sources included surveys from Europe [5] and overseas countries [6]. In addition, personal interviews have been conducted by the author with several local employers. **Table 1** presents the list of the business type categories and the distribution of responses in each category.

Table 1 Business type of employing organization

Type of Business/organization	No.	Percent
Public Sector and Social Services	85	23.3
Consulting Services, Education, Training	70	19.2
Banking Finance, Insurance	49	13.4
Governmental, Administration	35	9.6
Mining, Electricity, Gas, Water, Utilities	34	9.3
Manufacture, Building, Construction	32	8.8
Tourism, Hospitality	18	4.9
Trade, Wholesale & Retail (Trade)	15	4.1
Communications & Media	11	3.0
Other (e.g. Agriculture)	16	4.4
Total:	365	100.0

The size of the organization is usually measured by the number of employees. In this respect, there was a wide spread of company sizes from 16.7% who employ less then 9 employees to the 26% who employ more than 200. The proportion of the SMEs was approx. 2/3 of the total, which is in an excess when compared to the world average.

Employers were asked to rate from 1 to 7 on a seven point ascending scale the 26 competencies which they expect graduates on entering employment. The use of such Likert-scales is common in applied research. They simply gauge the degree to which there is agreement or disagreement with statements to reflect clear positions on an issue and represent a desirable goal, a transition from ordinal scales to interval scales. **Figure 1** shows the size of the weighted averages assessed for importance for the 26 competencies expected by employers in an ascending order. The figure demonstrates clearly that all the listed attributes except those labeled V,W,U,N,O,C,T are rated consistently highly by these employers. It is perhaps surprising that employers rank International Experience (V), Capacity to Function in Multicultural and Global Contexts (W), International Awareness (U), and Managerial and Supervisory Skills (N) as not very important for graduate employees joining their business or organization. Latter items are unexpected findings. This apparent lack of interest by employers in broader international, multicultural, and multidisciplinary awareness and/or experience of graduates, or at least an allocation of low priority, is puzzling, and is perhaps due to the relatively large proportion of the very small-sized SMEs (especially in Hungary) as opposed to the multinationals in our sample. From **Figure 1** it can be seen that Communication Skills (G), Capacity to Act Ethically (X), Capacity to Learn New Skills and Procedures (E), Capacity for Co-operation and Teamwork (L) and Ability to Apply Knowledge in Practice (B) are at the top of the list.

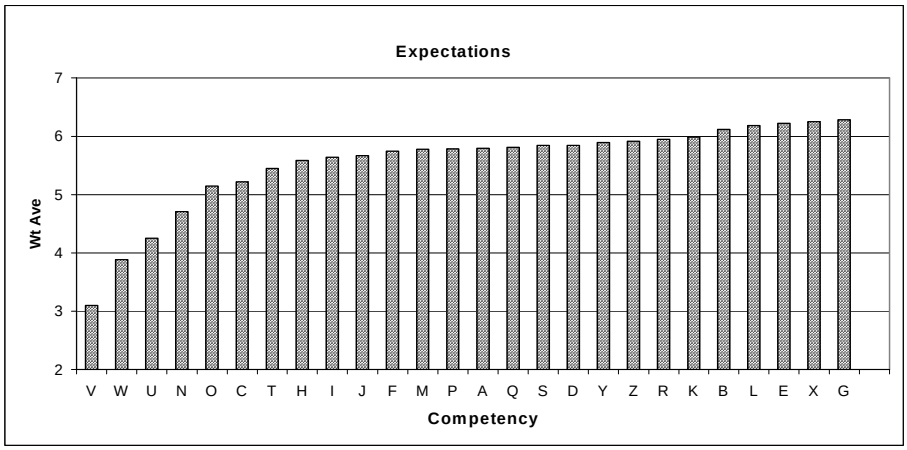

Figure 1 Weighted averages of employers' ranking of importance of attributes

3.2 Student self assessment of their performance on the attributes expected by the employers

Graduate students of the Budapest Tech (BMF) were asked to rate from 1 to 7 on a seven point ascending scale the degree to which the school's educational/teaching activities has contributed to their competency achievements in these attributes. The verbal interpretation of the scale is given below (the level of contribution to his/her development, i.e., a measure of efficacy of the school how it prepares students for the present and future challenges of the workplace):

1	Not at all
2	Very slight, on an unsatisfactory level
3	Less than my expected minimum
4	Minimum level I expected
5	A little more than the minimum level I expected
6	On a highly expected level
7	Maximum level that can be expected

The survey was done for the students of each faculty of the Budapest Tech (BMF), i.e. Faculty of Mechanical Engineering = BGK, Faculty of Electrical Engineering = KVK, Faculty of Light Engineering = RKK, Faculty of Informatics = NIK and Faculty of Economics = KGK. The size of the aggregated total sample and the sizes of the component samples were:

TOTAL (403) = BGK (66) + KVK (100) + RKK (54) + NIK (93) + KGK (90).

Both in terms of the number of full-time students who are recently completing their studies at the BMF (approx. 1,500) and of their distributions at the different faculties, the samples (both the overall and the component samples) are representative samples (stratified random sampling).

Figure 2 shows the size of the weighted averages estimated by economics graduates (KGK) of the BMF as competency scores expected by employers for the 26 attributes. As with the employer expectations, the attributes can be grouped according to similar weighted averages. Thus, the largest contributions of the BMF to the development of student competencies have been made in the Ability to Think Creatively (Q), Adaptability/Resourcefulness (R) and Co-operation and Teamwork (L). Attribute Q received the highest score (weighted average) with a magnitude of 5.00. Nevertheless, each competency deserves special attention from the Board of the Economics Faculty (as well as from other faculties of the BMF), since the maximum of the scores just exceeds the minimum expectations of the students! The attributes received the lowest scores are: Ability to Apply Knowledge in Practice (B), Capacity to Communicate in at least one Foreign Language (Z) and Capacity to Function in Multicultural/Global Context (W). These issues also demand special interests of the faculties.

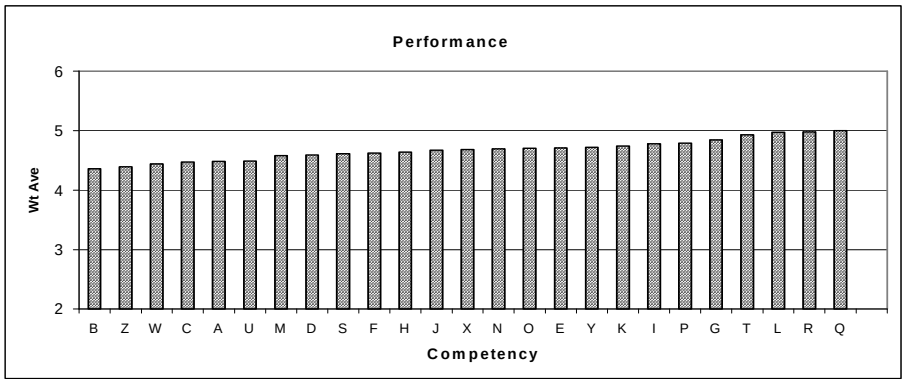

Figure 2 Weighted averages of economic student evaluation of the attributes

3.3 Comparison of the rankings

A simple way of comparing the rankings for expectations and performance is shown in the graph below. **Figure 3** exhibits the differences of the attribute scores in weighted averages (score deviations) for employer importance (EMP) and student assessment (STU) with the order of the questions being sorted by increasing values for EMP.

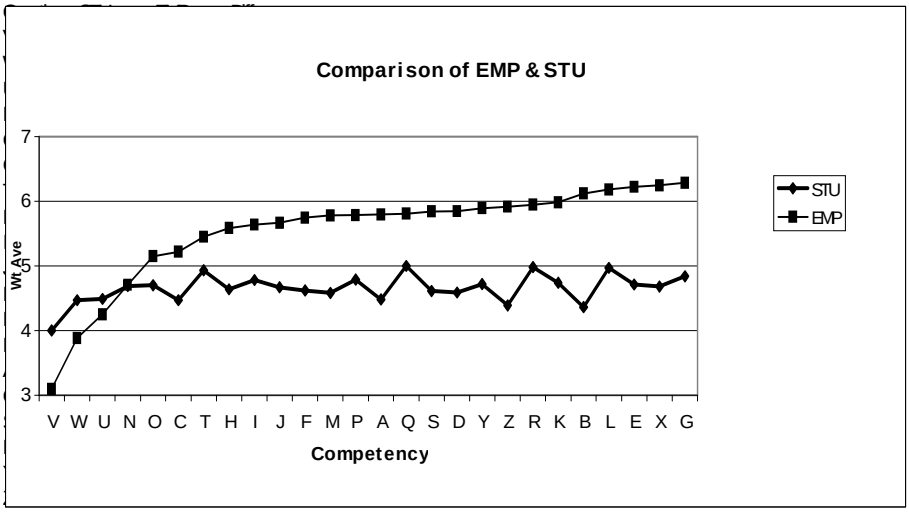

Figure 3 Employers' ranked expectations compared with student performance

There are some clearly large differences between expectations and performance. We remark that these differences are even higher between the scores of the employer expectations and the BMF weighted average. This fact becomes to be apparent when one is studying the relationships given in the biplot (see Figure 5)

Figure 4 shows the plot of these differences (competency deficiencies = Expectations minus Performance), sorted by the actual values of the difference. It is interesting to note that not all the differences are negative (slacks). There are three competencies in which the KGK graduates have some surpluses: International Experience (V), Capacity to Function in Multicultural/Global Context (W) and International Awareness (U). One of the possible explanations to this strange result can be that many SMEs do not consider these competencies to be, in fact, so important for their young employees.

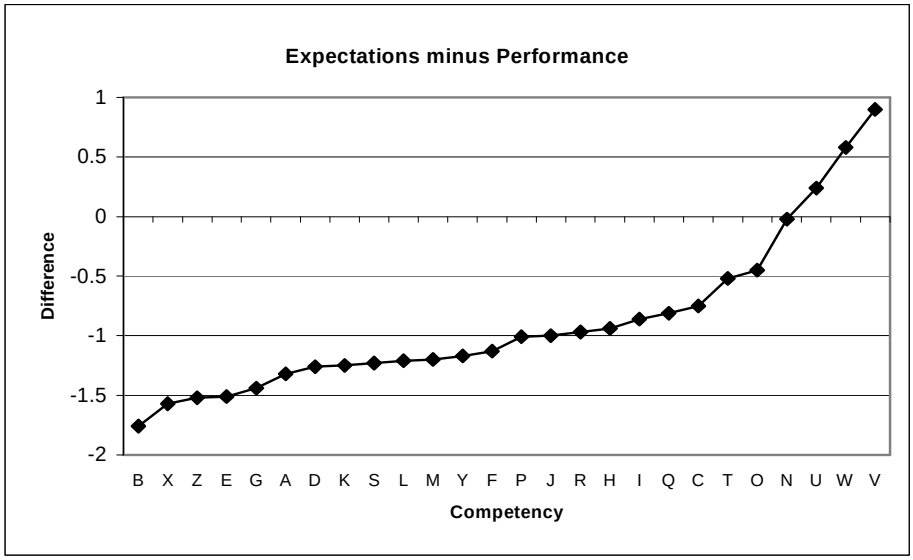

Figure 4 Scores for expectations minus performance

Largest differences are found with regard to Ability to Apply Knowledge in Practice (B), Capacity to Act Ethically (X) and Capacity to Communicate in at least one Foreign Language (Z), Capacity to Learn New Skills and Procedures (E) and the rest decreasing steadily. The low assessment by employers of B and E should be a matter of some concern to the Budapest Tech in reviewing the preparation of graduates for employment.

By studying the student self evaluations in terms of the weighted mean scores it turns out that the KGK performance outperforms that of the BMF average. Also, its student body is rather homogenous as it is reflected by the much smaller dispersion (variances in the responses) of the scores. The overall weighted mean score for the KGK is: $\hat{w}_{..}$=4.65, while for the whole BMF: $\hat{w}_{..}$=4.10. The weighted standard deviations are: $\hat{s}_{..}$=0.22, and $\hat{s}_{..}$=0.29, respectively. The range of the weighted averages for the KGK is: R=5.0–4.0=1.0, whereas for the BMF: R=4.61–3.29=1.32. The rankings that are generated from the ratings coincide fairly well between the KGK and the whole BMF, since the Spearman's coefficient of rank correlation is: ρ=0.798. On a higher level of measurement (interval scale), considering now the magnitudes of the weighted mean scores, the Pearson's product moment sample coefficient of correlation is: r=0.777.

There are large differences, however, between the employer expectations and the BMF data. The overall weighted average score for the EMP is: $\hat{w}_{..}$=5.54. The weighted standard deviation is: $\hat{s}_{..}$=0.77. The range of the weighted averages is: R=6.28–3.10=3.18 (very large!). Even more remarkable is to observe the considerable differences in the rankings. The Spearman's coefficients of rank correlation yield between EMP & BMF and EPM & KGF: ρ=0.551 and ρ=0.350, respectively. The Pearson's coefficients of correlation are: r=0.592 and r=0.582, respectively.

Now we will execute a statistical analysis by applying the correspondence analysis method. Here, we may think of the 7-column values (the seven points on the Likert-scale) in each row of the contingency table as coordinates in a 7-dimensional space. A step-by-step analysis of this problem follows.

In terms of the *significance of dependencies* the value of the chi-square statistic yields χ^2= 640.466 which is at α=0.05 indicates a significant dependency between the rows (attributes) and the columns (performance) [p=0.000]. The next step deals with the *dimensionality of the solution*, i.e. determining the appropriate number of dimensions to use in the solution. The dimensions are extracted so as to maximize the distances between the row or column points. The successive dimensions (which are orthogonal to each other) will explain less and less of the overall chi-square value. In our problem the first and the second axes account for 62 % and 15.1 % of the inertia, respectively, i.e. a cumulative total of 77.1 %. This retention of the solution is high enough, as if the data were purely random with no significant dependencies, then the average axis should account for 100/(7–1)=16.7% of the columns and 100/(26–1)=4% for the rows. Since the third axis accounts for only 12.8% of the inertia, a 2-dimensional solution can be used. It may well occur that not all of the rows or columns are equally well represented. The assessment of the *quality of representation* of a particular row or column may provide additional richness to the interpretation of the relationships in the contingency table. This measure of association between a particular column and a particular axis is evaluated by the sum of the squared correlations over the n dimensions. Here, all categories and all competencies are well represented in the two dimensions, except Presentation Skills (H; 0.047) and Arguing well (J; 0.106).

The major result of this analysis is displayed in **Figure 5**. This biplot (perceptual map) includes almost 80% of the original information in two dimensions. We plotted the faculty averages (KGK, BGK, NIK, KVK, RKK) and the employer expectations (EMP) onto the same exhibit as supplementary points to be capable of making a subtle analysis of the results. Thus, it is possible to make a comprehensive evaluation of the relationships that exist between the employer expectations and the efficacy of the educational/teaching process at the BMF with respect to each competency, as well as an analysis based on the comparisons of BMF's five faculties.

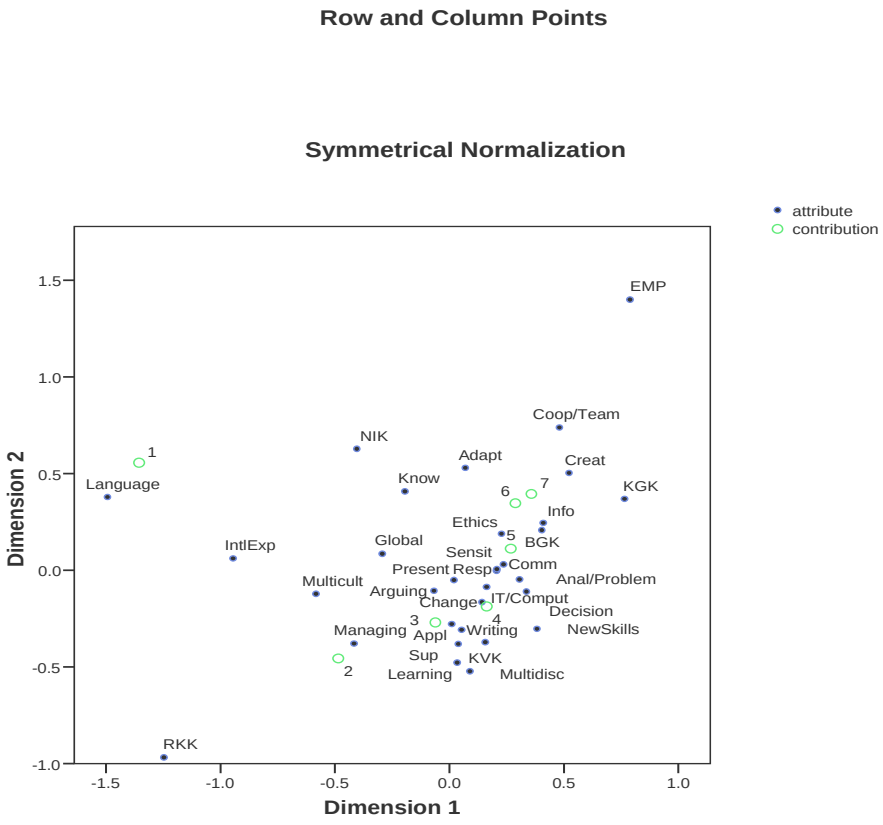

Figure 5 Biplot for analyzing the relationships between the variables

From this chart it is apparent that the KGK is being judged currently to best conforms to student expectations (its overall rating point is closest to the highest levels of performance) and the RKK operates as to be the least efficient faculty (its overall rating point locates farthest from the highest levels of performance). Similarly, the actual performance of KGK graduates is closest to the employer expectations (EMP), however, this distance seems to be fairly large.

Conclusions

The intent of our study was to survey our students and their employers to determine whether BMF's student perceptions of marketable skills matched actual employer expectations. It is possible that our sample may not represent the views of all possible employers. Nonetheless, our method is likely to be broadly applicable to carry out similar surveys. In this paper a competency profile of university (college) graduates has been developed. The performance of the Budapest Tech has been evaluated with respect to the achieved improvements in these competencies by our students. The research has shed a light to the fact that the level of satisfaction of the graduates is just a little bit above their minimum level of expectations. The correspondence analysis has shown that there are quite a bit large gaps between employer expectations and the performance of our students. Therefore, the school should make efforts to diminish the existing deficiencies in the appropriate groups of the competencies.

Acknowledgements

The author expresses his thanks for the members of the HÖOK (Youth Association of the Budapest Tech), namely for Barnabás Jezsek, KGK; Barbara Bodnár, RKK; János Kuti, BGK; György Dominák, KVK and Károly Wenhardt, NIK, for their valuable help in gathering and preparing the data for the analyses.

References

[1] Benzecri,J.P. (1992), Correspondence analysis handbook. New York: Marcel Dekker.

[2] Farkas,A. (2007), On the Competency Profiles of Graduates. Proceedings of the 5th International Conference on Management, Enterprise and Benchmarking, Budapest, Hungary, June 1-2, 2007, Budapest Tech, Hungary, 153-166.

[3] Greenacre,M.J. (1984), Theory and applications of Correspondence Analysis. Academic Press. London.

[4] http://www.erak.hu/szemelvenyek/kompetenciafogalom.pdf

[5] http://www.om.hu/doc/upload/200509/consultation_eqf_en.pdf

[6] http://www.utas.edu.au/tl/docs/Graduate Employer survey report for printing.doc