

Analyzing Factors Accountable for Success in Completing University Studies

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Abstract

The analysis of success in completing university studies and implicitly of student dropout rates have recently become topics of great interest for researchers and policy-makers. This may be explained by the fact that completion rates play an important role in assessing the quality of teaching which further influences potential students in choosing the higher education institution. A large number of publications investigating the success rates and dropout rates focus on institutional policies, measuring the effectiveness of specific institutional measures to improve graduation success and reduce student dropout.

In this paper we analyze several factors accountable for success in higher education. We perform an exploratory factor analysis on a dataset consisting of 61 items, by using the method of extraction of principal components and subsequent Varimax rotation. The results obtained enable identifying several relevant factors accountable for success in higher education and assessing their impact on reducing the dropout rate.

Keywords: Factor analysis, principal components, higher education, student dropout.

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1. Introduction

The growing interest in investigating the drivers of success in completing higher education studies as well as the reasons of dropping out is confirmed by an

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increasing number of scientific papers that attempt to analyze the factors responsible for students' choices and routes in this respect.

The literature highlights a series of essential characteristics that have to be considered, like personal characteristics of the student, motivation, skills, socio-economic and ethnic background as well as institutional characteristics that need to be explored. The main policy areas are oriented towards funding, the organization of higher education institution, teaching and learning and student support. However, not many scientific papers have examined the impact of national practices and policies on success in university studies.

Dropout is not considered a problem *per se*, but rather the compound result of a complex of phenomena that higher education has to deal with. Quinn et al. (2005) and Quinn (2013) argue that rising dropout rates should not be considered an effect of broader access to higher education, but rather an alarming sign of the carelessness of decision-makers with respect to the needs of an increasingly diverse student body as well as a lack of focused strategy per student. In this perspective, one may conclude that higher education institutions are losing their ability to attract students, to provide them with quality education and to stimulate their interests and talents. This perception is similar to what Tinto (1993) calls integration as the main mechanism of the university student experience. In this regard, not only students who drop out or are vulnerable to dropout are affected, but also the quality of education of those completing their studies may be jeopardized. Regardless of the perspective, the constant increase in dropout rates makes the issue difficult to ignore. So far, there are no internationally comparable data sources regarding the success in completing studies in Europe. Consequently, various definitions and methodologies for calculating the dropout rate lead often to results that are difficult to interpret or even impossible to compare (Vossensteyn et al., 2015). Although not much can be said for the moment about the effective development and progress in this direction at international level, trends can still be illustrated at least at national level.

In a recent review of empirical literature on student dropout, Kehm et al. (2019) point out that research studies are currently trying to refine Tinto's approach, considering also as factors with impact on dropout, preuniversity and intrauniversity factors, external factors related to student's characteristics, as for example financial situation, family support, counseling opportunities. The review includes 44 studies which attempt to investigate the factors responsible for dropout from university as well as interventions with potential impact on preventing or reducing dropout phenomenon.

Kehm et al. (2019) enumerate the nine factors below, with impact on dropout and transfer decision:

1. *Study conditions at university*
2. *Academic integration at university*
3. *Social integration at university*
4. *Personal efforts and motivations for studying*
5. *Information and admission requirements*

6. *Prior academic achievement in school*
7. *Personal characteristics of the student*
8. *Sociodemographic background of the student*
9. *External conditions*

For a detailed description, comments and recommendations, see Kehm et al. (2019) and the references therein.

In this paper, we present a preliminary empirical study that attempts to analyze several factors with potential impact on academic performance of students through exploratory factor analysis. The paper is organized as follows. Section 2 describes the data and the methodology, in Section 3 we present and comment the numerical results and the paper ends with a section of conclusions.

2. Data and Methodology

We conducted a survey on a sample of first year students from Faculty of Cybernetics, Statistics and Economic Informatics (Bucharest University of Economic Studies), based on a five point Likert scale questionnaire. The factors analyzed were grouped in three categories (Disciplines, including 8 items denoted by Q1 – Q8, Difficulties, consisting of items Q9 – Q16, Counseling and support opportunities, including items Q17 – Q21), according to three types of questions, as follows:

Disciplines

What are the disciplines in which you encountered difficulties?

- Q1 *Economics*
- Q2 *Algebra*
- Q3 *Basics of Statistics*
- Q4 *Information Technology Basics*
- Q5 *Basics of Computer Programming*
- Q6 *Basics of Operational Research*
- Q7 *English / French language and Specialized Communication*
- Q8 *Physical Education and Sport*

Difficulties

What are the reasons for the difficulties encountered?

- Q9 *Too much information to assimilate in a short time*
- Q10 *Different requirements from those in high-school*
- Q11 *Difficult communication with instructors*
- Q12 *Insufficient pre-university training*
- Q13 *Too busy schedule*
- Q14 *I integrated with difficulty among my colleagues*
- Q15 *I had a hard time adapting to the conditions in the campus*
- Q16 *I had a hard time adapting to city life*

Counseling and support opportunities

What type of support do you think would be appropriate to receive from the faculty in order to reduce the difficulties you face and increase your level of performance in exams?

Q17 *Additional consultations on first year subjects*

Q18 *Group remedial activities*

Q19 *Counseling on the specifics of university life*

Q20 *Counseling on effective study methods and techniques*

Q21 *Counseling on exam stress*

Additional information for assessing the individual performance of the students have been taken into consideration, by recording the average score obtained at the exams, denoted by M and the numbers of failed exams, denoted by R. We have collected and processed the responses of 61 subjects using modus imputation for the missing data. Table 1 displays the descriptive statistics of the dataset.

Table 1: Descriptive statistics

	Minumum	Maximum	Mean	Std. Deviation	Variance
M	0	10	7.59	1.434	2.056
R	0	4	.35	.840	.706
Q1	1	5	2.60	1.078	1.163
Q2	1	5	3.60	1.221	1.490
Q3	1	5	2.40	1.166	1.359
Q4	1	5	2.82	1.337	1.788
Q5	1	5	3.42	1.625	2.641
Q6	1	4	1.89	.851	.725
Q7	1	3	1.32	.566	.320
Q8	1	4	1.15	.539	.290
Q9	1	5	3.97	1.116	1.245
Q10	1	5	2.85	1.278	1.634
Q11	1	5	2.60	.966	.933
Q12	1	5	2.16	1.257	1.580
Q13	1	5	2.48	1.036	1.074
Q14	1	4	1.61	.947	.897
Q15	1	5	1.44	1.065	1.135
Q16	1	5	1.45	.953	.907
Q17	1	5	4.18	1.167	1.361
Q18	1	5	3.66	1.173	1.375
Q19	1	5	2.35	1.332	1.774
Q20	1	5	3.18	1.208	1.460
Q21	1	5	2.71	1.206	1.455

Source: Authors' own computations

3. Results and discussion

The results obtained by performing Factor Analysis are presented and discussed according to the three categories of factors considered for designing the analysis: Disciplines, Difficulties and Counseling and support opportunities, respectively.

The correlation matrix depicted in Figure 1 presents the Pearson correlations between several factors: Q2, Q9, Q10, Q12, Q13, Q14, Q15, Q19, Q20 and Q21, displaying in red the significant values at a 5% level. The bin charts of the responses for each considered factor are displayed on the first diagonal of the matrix. We note, for example, that difficulties encountered in *Algebra* have the highest correlations with *Too much information to assimilate in a short time* and *Insufficient pre-university training*.

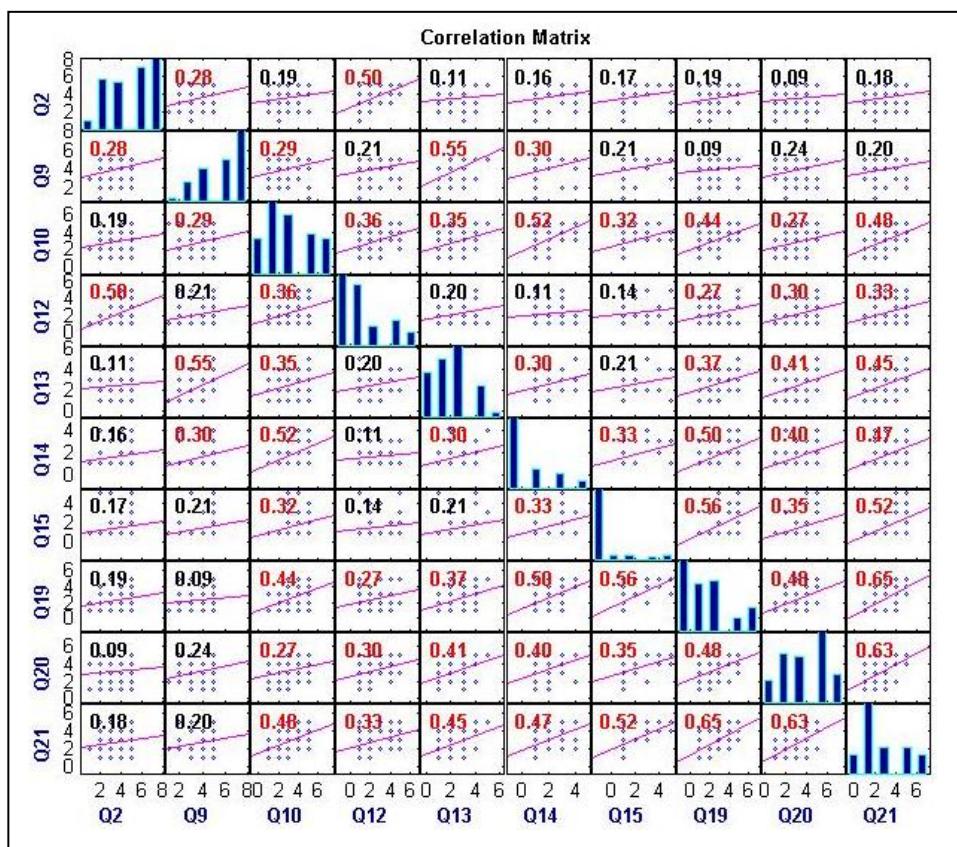


Figure 1: Correlation Matrix for selected factors

Source: Authors' own computations.

3.1 Factor Analysis for Disciplines group

By using an extraction method based on Principal Component Analysis, several relevant factors are revealed. The eigenvalues, variability and cumulated variability corresponding to each principal component are displayed in Table 2. The first three factors cumulated which correspond to eigenvalues greater than 1 explain almost 55% of the information contained in the 8 variables corresponding to the Disciplines group.

Table 2: Total variance explained, corresponding to the Disciplines group

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	1.795	22.441	22.441	1.795	22.441
2	1.465	18.314	40.755	1.465	18.314
3	1.097	13.714	54.468	1.097	13.714
4	.994	12.427	66.895		
5	.876	10.946	77.841		
6	.665	8.308	86.150		
7	.585	7.307	93.456		
8	.523	6.544	100.000		

Source: Authors' own computations.

By further performing the Rotation Method based on Varimax with Kaiser Normalization, the Component Score Coefficient Matrix regarding to the Disciplines group is obtained and displayed in Table 3. The first principal component is moderately positive correlated with the factors Q1, Q2, Q5 and Q6. The second principal component is moderately positive correlated with the factors Q3, Q4 and Q5, whereas the third principal component is strongly positive correlated with the factor Q7.

Table 3: Component Score Coefficient Matrix for the Disciplines group

	Component		
	1	2	3
Q1	.365	-.057	-.198
Q2	.426	-.028	-.005
Q3	-.029	.506	-.104
Q4	-.033	.551	.294
Q5	.295	.309	-.102
Q6	.352	-.038	.247
Q7	-.088	.087	.769
Q8	.185	-.245	.230

Source: Authors' own computations.

3.2 Factor Analysis for Difficulties group

The relevant factors are identified by using an extraction method based on Principal Component Analysis. The eigenvalues, variability and cumulated variability corresponding to each principal component are displayed in Table 4. The first three factors cumulated which correspond to eigenvalues greater than 1 explain almost 61% of the information contained in the 8 variables related to Difficulties group.

Table 4: Total variance explained, corresponding to the Difficulties group

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	2.950	36.871	36.871	2.950	36.871
2	1.225	15.315	52.186	1.225	15.315
3	1.054	13.176	65.361	1.054	13.176
4	.874	10.926	76.287		
5	.776	9.696	85.983		
6	.455	5.687	91.671		
7	.394	4.920	96.591		
8	.273	3.409	100.000		

Source: Authors' own computations

By further performing the Rotation Method based on Varimax with Kaiser Normalization, the Component Score Coefficient Matrix regarding to the Difficulties group is obtained and presented in Table 5. The first principal component is moderately positive correlated with the factors Q15 and Q16. The second principal component is moderately positive correlated with the factors Q11 and Q12, whereas the third principal component is moderately positive correlated with the factors Q9 and Q13.

Table 5: Component Score Coefficient Matrix for the Difficulties group

	Component		
	1	2	3
Q9	-.090	-.088	.526
Q10	.132	.211	.121
Q11	.003	.674	-.239
Q12	-.139	.502	.113
Q13	-.120	-.104	.569
Q14	.268	.108	.009
Q15	.468	-.183	-.108
Q16	.469	-.044	-.142

Source: Authors' own computations

3.3 Factor Analysis for Counseling and support opportunities group

By applying an extraction method based on Principal Component Analysis, several relevant factors are revealed. The eigenvalues, variability and cumulated variability corresponding to each principal component are displayed in Table 6. The first two factors cumulated which correspond to eigenvalues greater than 1 explain more than 72% of the information contained in the 5 variables corresponding to the Counseling and support opportunities group.

Table 6: Total variance explained for Counseling and support opportunities group

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	2.618	52.356	52.356	2.618	52.356
2	1.001	20.011	72.366	1.001	20.011
3	.605	12.092	84.458		
4	.481	9.610	94.068		
5	.297	5.932	100.000		

Source: Authors' own computations

By further performing the Rotation Method based on Varimax with Kaiser Normalization, the Component Score Coefficient Matrix regarding to the Counseling and support opportunities group is obtained and displayed in Table 7. We note that the first principal component is moderately positive correlated with the factors Q19, Q20 and Q21, whereas the second principal component is moderately positive correlated with the factors Q17 and Q18.

Table 7: Component Score Coefficient Matrix for Counseling and support opportunities group

	Component	
	1	2
Q17	-.206	.682
Q18	-.061	.527
Q19	.322	.079
Q20	.495	-.244
Q21	.420	-.041

Source: Authors' own computations

4. Conclusions

In this paper several factors accountable for success in higher education have been proposed and discussed by performing an exploratory factor analysis on a dataset consisting of 61 items and by using the method of extraction of principal

components. The results obtained enable identifying the relevant factors accountable for success in higher education and assess their impact for achieving success in completing university studies and implicitly in decreasing the student dropout rates.

Further research includes analysis of public higher education policies and corresponding accompanying measures at national and European level, involving also institutional policies for reducing dropout rates and improving the success in completing higher education studies.

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References

1. Kehm, B. M., Larsen, M. R., & Sommersel, H. B. (2019). Student dropout from universities in Europe: A review of empirical literature. Hungarian Educational Research Journal, 9(2), 147-164. DOI:10.1556/063.9.2019.1.18.
2. Quinn, J. (2013). *Drop-out and completion in higher education and Europe among students from under-represented groups*. NESET-report, October 2013. European Commission.
3. Quinn, J., Thomas, L., Slack, K., Casey, L., Thexton, W., Noble, J. (2005). *From life crisis to lifelong learning - Rethinking working-class „drop out” from higher education*. York: Joseph Rowntree Foundation.
4. Tinto, V. (1993). *Leaving College: Rethinking the Causes and Cures of Student Attrition*. (2nd ed.). Chicago: University of Chicago Press.
5. Vossensteyn, H., Kottman, A., Jongbloed, B., Kaiser, F., Cremonini, L., Stensaker, B., Hovdhaugen, E., Wollscheid, S. (2015). *Dropout and Completion in Higher Education in Europe (HEDOCE)*. Luxembourg: Publications Office of the European Union.