Characterisation of structure and trends in the higher education

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Abstract

Romanian education system faces structural failures due to increased labour market instability and the proliferation of austere economic policies in adjusting the value of GDP. Open competition on the labour market, both in the EU and countries outside the European Union also stresses the need to adapt the education system to meet current and future needs of society by contributing to the development of information technology research and eco-awareness. The education system in Romania will have to take into account the need to give people the skills and abilities needed to adapt quickly to a changing labour market.

Keywords: High education system, study programs, macro economical indicators, linear trend, labour market.

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1. Introduction. Fundamental concepts regarding the coordinates of the higher education in Romania

The educational reform in Romania has gone through the several stages and took into account, mainly, the restructuring of education system and the content of the educational programs, given the economic realities, the social trends, but also the European policies and guidelines (The National Institute of Statistics, 2012). Currently, these programs of study are finished with a certificate.

As well, all over the world, the education system is confronting the impact of the new technologies of knowing and communication, and also the consequences of a globalised society, of growing interdependencies between countries and cultures (Serban, Cristache & Ţigu, 2012).

As a consequence, by adopting a new legislation regarding the education system followed by the modification and completion of it, for example, Teaching Staff or the Education Law, enhanced new strategies in the alignment with the updated European standards regarding the education system (National Institute of Statistics, 2012).

According to the education law in force, the higher education in state universities is free in Romania, for the schooling approved annually by the government. The reorganisation, starting with 2005–2006, of the higher education on the three successive study cycles recommended by the Bologna Process, the liberalisation of the first cycle of study and the transformation of this into a mass higher education, and also the opening to the internationalisation of the study programs for young people is an indisputable reality in Romania (Korka, 2009).

In the European Environment of the higher education, there is a growing awareness of the fact that the preoccupation for quality has to be in the centre of the system, said the European University Association that promoted this approach from the beginning of 1990, but only at the Ministerial Conference from Berlin 2003, the impulse for a new development regarding a better understanding of the purpose of universities in assuring the quality in the higher education according to the conform *Communiqué of the Ministerial Bologna Follow-up Conference*, Berlin, 2003, was triggered.

Due to the decentralisation of the education system in Romania, the local educational players have to be involved in the quality management and, as a consequence, there will be, close to the national system, indicators systems and procedures regarding the quality of the developed education at a local levy.

2. Literature review

To be able to speak about the coordinates of the higher education, one must define it and the institutions involved. The higher education is defined as that type of education that is organised in the universities. These are defined as institutions that organise the higher education programs.

The purpose of education in the knowing society is recognised both at the level of the European Union and the member states. From this level of education, an important contribution in achieving the objectives from the Lisbon. Treaty, regarding the growth, prosperity and social cohesion. The working program of the European Union "Education and training for 2010" underlines the importance of modernising the education institutions and the reforms encourages by the Bologna Process, that have as purpose the creation of an European Area for the Higher Education. The quality level of the higher education must pass the comparison test, on an international scale, to improve the management and responsibility, to increase financing and diversify the financing sources (Bergen, 2005).

The main European directions regarding the financing of the higher education institutions are tied to the purpose that the system has in implementing the strategy Europa 2020, the main action directions enhancing the following elements: the necessity of growing public financing for the higher education, growing autonomy in managing the own financial resources, focus on results by establishing a direct connection among the results of the education process and the public funds

assigned to these, encouraging the diversification of financing resources as well as closing strategic partnerships with research institutions, enterprises and regional authorities. (Popescu, Brătianu, et al., 2004).

Regarding the financing of the activities that take place in the education institutions is assured by public funds, as well as private funds, at the level of the European Union by using a diversity of methods and models through which the public funds assigned to these institutions are split to each university, their performance representing a criteria in the assignment process (Romanian Agency for Quality Assurance in Higher Education, 2006)

3. Research methodology

This study is based on analysing and comparing the statistical correlations in education. The research analysis will be based on secondary data, counting on the information provided by the Romanian Statistical Yearbook published by the National Institute of Statistics and other publications of public institutions Romania. The main research methods used in the case of time series are total research for macroeconomic variables that characterise the education system, such as: average gross nominal earning in the education field, school population represented by the number of students, university institutions.

The analysis and modelling (multiple regression and correlation method, statistical analysis of descriptive indicators and testing the validity of regression models) will be achieved with the help of management programs and database analysis (Cristache, Vuta, Gruiescu, et al., 2011).

The intensity of the macroeconomic indicators correlations that characterise the education system from Romania was realised by using the correlation reports calculated with the formula as follows:

$$R_{y/x} = \sqrt{\frac{\sum_{i=1}^{n}(\hat{y}_t - \overline{y})^2}{\sum_{i=1}^{n}(y_t - \overline{y})^2}} = \sqrt{1 - \frac{\sum_{i=1}^{n}(y_t - \hat{y}_t)^2}{\sum_{i=1}^{n}(y_t - \overline{y})^2}}$$

The choice of these methods was motivated by the following objectives: the accurate quantification of the effects produced by all the factors, selecting the main factors, measuring the intensity and direction of links existing between indicators characterising higher university educational system.

4. Analysis of the structure and the dependencies between variables that characterise the high-university educational system in Romanian

The results of the national education system are measured using indicators that express the capacity of the system to create potential qualified labour force, adapted to the requests of economic and social development. Also, the National Institute of Statistics in the official publications, such as The Year-Book of Statistics of Romania, The State the Education System in Romania alongside to the Higher Education 2001–2010 prove the fact that the higher education showed an increasing trend of the average period of frequenting of the systems and an increase in the indicators showing the population of all the ages.

The number of the institutions of higher education increased continually until 2002/2003 when there were 70 private institutions of higher education. After this period, the indicator shows a decreasing trend. In 2013/2014, the indicator reached the value of 47 private institutions.

At the present moment, inside the institutions, 775 faculties functioned, 590 of them being in public universities. Studying the evolution of the higher education institutions assume an examination

of the structure mutations, as well as a dynamic analysis of these mutations. It can be appreciated an increasing share of 51% in 2005/2006 up to 64% in 2013/2014 (See Tables 1 and 2).

As a consequence of the demographic evolution in the latest years and due to the phenomena of migrations, the population decreased dramatically. The slow process, but continuous, of aging population lead to a decrease in the schooling population (3–23 years old). In 2012–2013, 12.4% from the total schooling population were students.
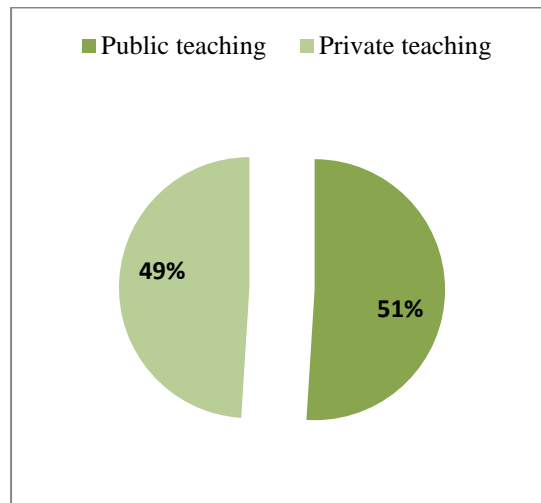

Figure 1. Share of institutions in high education 2005/2006. Note: the value of 2014 is estimated
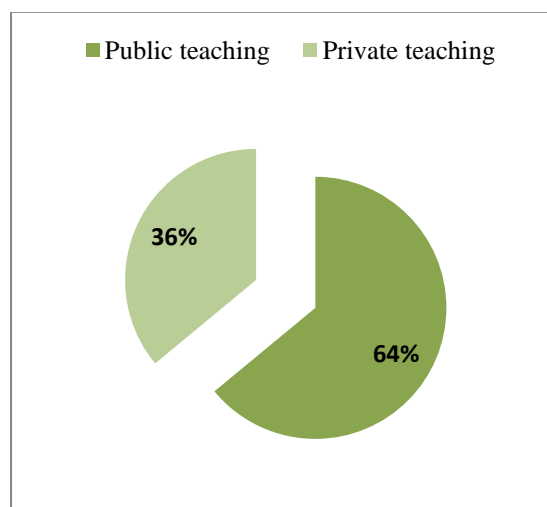

Figure 2. Share of institutions in high education 2013/2014

At the same time, comparing to 2000/2001, the number of students that follow a professor career in 2012/2013 decreased from 21 to 15 students. The structure on genders of the population does not show significant changes, the female population being almost equal to the male one (The National Institute of Statistics Social Trends, 2012–2013). The number of students registered for faculty increased successively in 2001–2007 from 582.000 people in 2001 to 907.000 people in 2007 (See Figure 3).
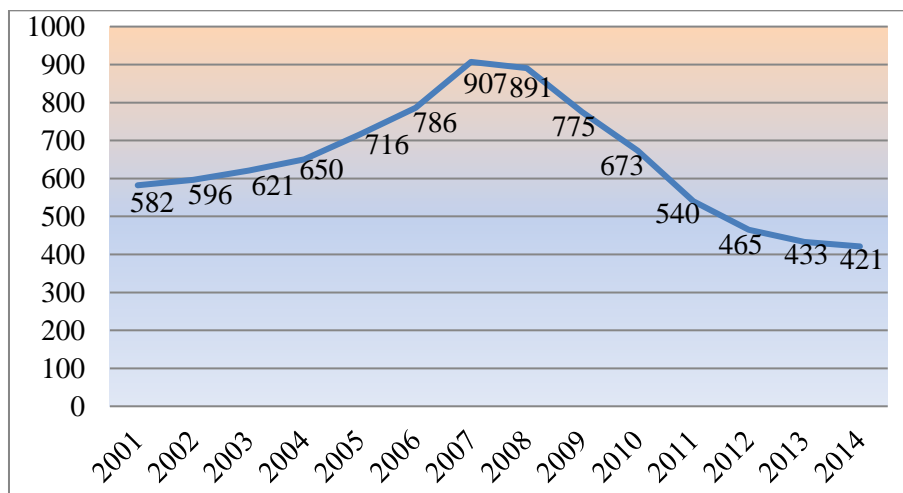
Figure 3. Evolution of the number of people registered for faculty. Note: the value of 2014 is estimated

After 2007, this indicator had a decreasing evolution, registering a minimum value in 2014 of 421.000 people. The average rate of decreasing students registered for faculty during 2001–2014 was of 2.46% representing an average number of 12 students/ year. The evolution of the gross earning/ month from the education system had an increasing trend from 2001 to 2009 with values in between 397 RON and 2206 RON. After 2009, as a consequence of the economic crisis, the gross earning has encountered successive increases and decreases.

This situation can be explained by the low level of expenses for education as a percentage of GDP that was assigned for our country comparing to other European Union member states, but also because of the insufficient financial resources from the private sector. In Romania and also at European level, the education is financed, mainly, from public funds (See Figure 4).

Following, the evolution of the gross real investments from the education system had the same trend with an average gain 5.61 million Euro/year and an annual rate of 10.37% (See Figure 4).

During 2001–2014, a significant increase in the number of students registered for distance faculty was recorded. The study programs are organised in six groups of specialisations, for all the fields of study: technical, pharmaceutical, economic science, juridical science, teaching and arts. The structure of the graduates, on groups of specialisation at the end of 2011/2012, is as follows: from the total, significant shares were registered inside the faculties with specialisations in the universities (30.4%). economic (25.2%), technical (21.7%) (The National Institute of Statistics Social Trends, 2012). At the current moment, similar trends are registered regarding the share of graduates from universities.
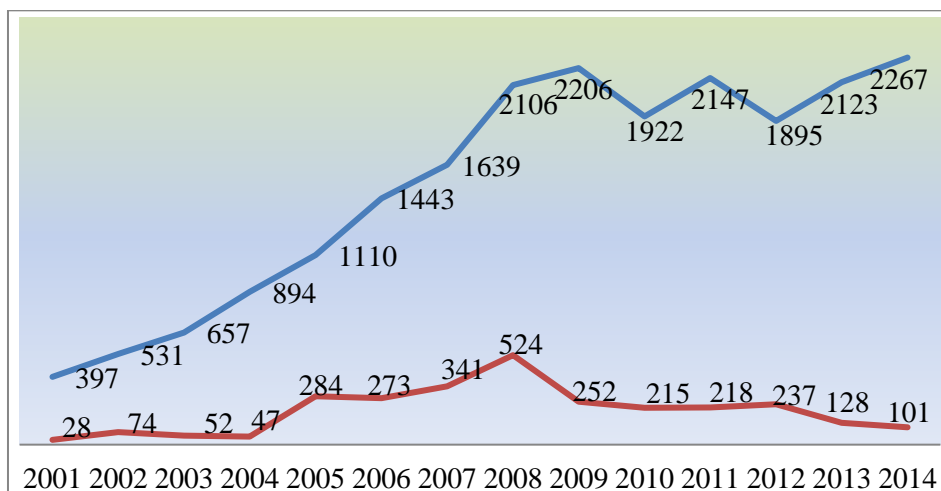
Figure 4. Evolution of the average gross income per month and real gross investments from education in 2001–2014. Note: the value of 2014 is estimated

If before 1990 the abandon rate was very low, the quick economic and social transformations from the beginning of the last decade together with the economic crisis lead to a significant and sudden increase in the abandon rate among the young population for all the levels of education (See Figure 5). In the present, the abandon affects, mainly, the population from the rural area.
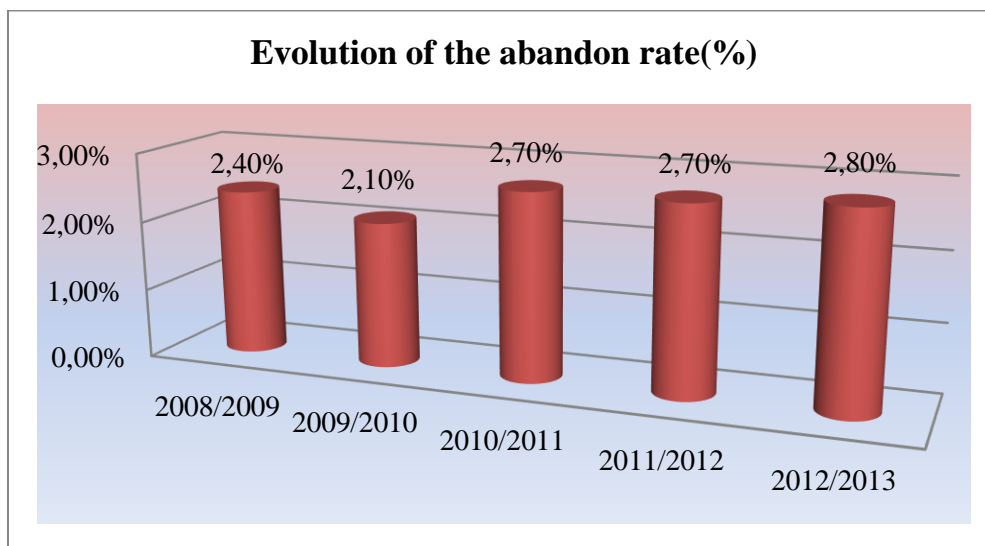

Figure 5. Evolution of the abandon rate (%) during 2008–2013

For the completion of the study regarding the characterisation of the higher education system in Romania, the second stage of the statistic road was analysed, where the main dependencies between the variables were studied. Because of this, for the statistical analysis is essential the identification of correlations, the identification and prioritisation of their influence followed by the analysis of the forms that prove the causal relations and the statistical measurement of the intensity of the correlation. So, by analysing the evolution of the student registered for faculty during 2001–2014, according to the causal variables: the real gross investments from the education system, the average gross income per month from the education system, were obtained the following results of the multiple regression function by using the linear multi factorial regression model (See Table 1)) (Harman, 1967).

$$Yx_{1,}x_2 = 626,65 + 1.11x_1 - 0.13x_2$$

Table 1. The multiple correlations between the numbers of students that registered for faculty as a resulting variable and the real gross investments, the average gross income from the education system as factorial variables

Dependent Variable: Number Students
Method: Least Squares
Sample: 2001 2014
Number of students = C(1) + C(2)* Gross Investments + C(3)
*Income

	Coefficient	Std. error	t-Statistic	Prob.
C(1)	626.65	65.00	9.64	0.00
C(2)	1.11	0.22	4.87	0.00
C(3)	−0.13	0.04	−2.83	0.01
R-squared	0.78	Mean dependent var		646.851
Adjusted R-squared	0.86	S.D. dependent var		156.213
F-statistic	11.93	Durbin-Watson stat		1.76
Prob (F-statistic)	0.00			

The intensity of the relation between the variables of this multi factorial regression model are measured by the multiple correlation report ($R_{y/x1,x2}$) whose value is 0.88, the relation between the variables being strong and direct. The stochastic relation between the variables is high. The determination coefficient shows a 78% from the variation of the number of students registered for faculty is explained by the influence of the other variable, the real gross investments and the average income. The 22% difference represents the influence of other factors. The verification of the truthfulness of the regression model and the multiple correlation report based on 'Fisher' criteria is leading to the following conclusion: because the probability (F-statistic) is smaller than 0.05 the multi factorial regression model is valid, with a significance level of 0.05 (Andrei and Bourbonnais, 2008).

The Durbin–Watson test, used in the primary regression analysis, registered a value of: DW_{calc} =1.76, value compared with the critical values of statistics for α = 0.05, p = 3 and n = 14; d_1 = 0.69 si d_2 = 1.97 showing the fact that it cannot be said if the errors are positively autocorrelated. Verifying the normality of errors using **Jarque–Bera tes**t one observes that JB_{calc} = 1.26 < χ^2_{tabel} = 5.99 which means that the errors are normally distributed (see Figure 6).

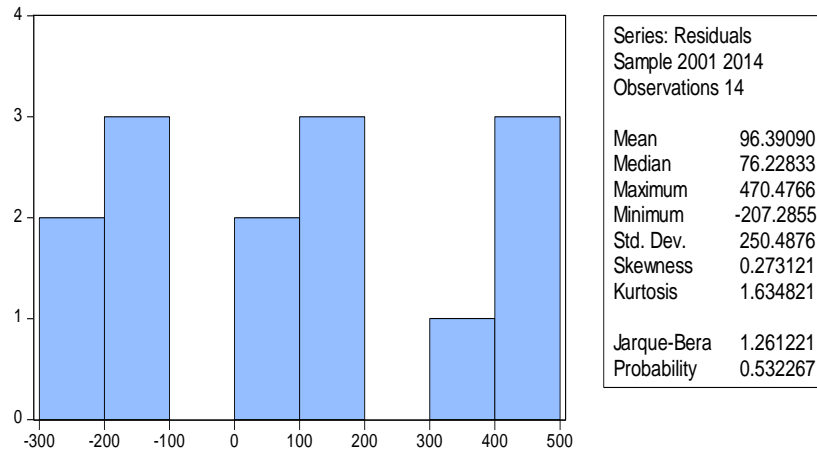| Series: Residuals	
Sample 2001 2014	
Observations 14	
Mean	96.39090
Median	76.22833
Maximum	470.4766
Minimum	-207.2855
Std. Dev.	250.4876
Skewness	0.273121
Kurtosis	1.634821
Jarque-Bera	1.261221
Probability	0.532267

Figure 6. Histogram-normally test

Likewise, from the correlogram, it can be said that the point from the graphic network are uniformly spread concluding that the relation between the included variables in the multi factorial model is linear, direct and significant (Voineagu, V.at all, 2007).
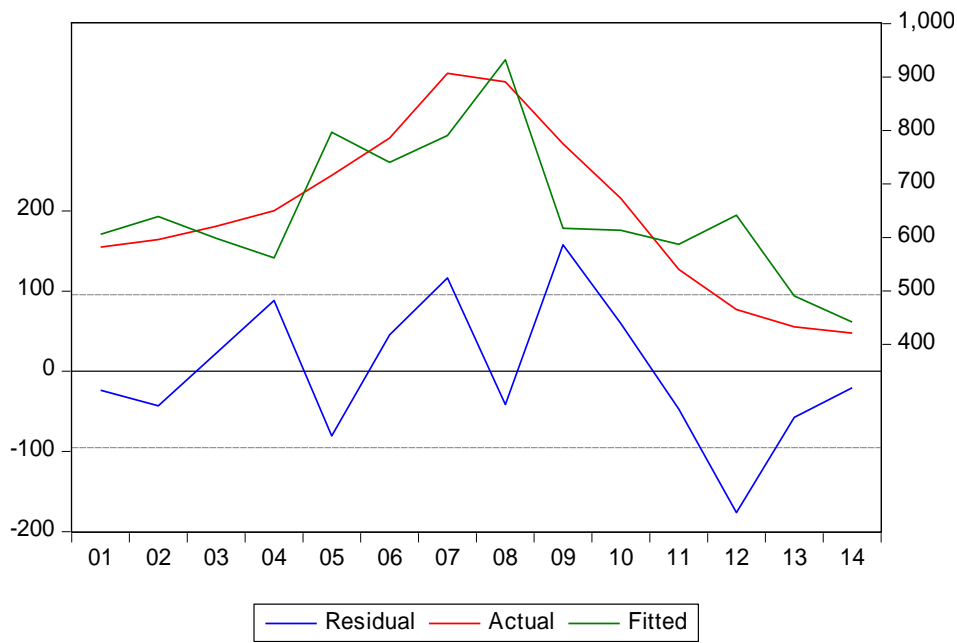

Figure 7. Actual, fitted, residual graph

To detect errors autocorrelation using empirical methods that test Breusch-Godfrey. With this test will analyse the existence of autocorrelation of order k, k $\neq$ 1. It is assumed that the error of the regression model is given by the equation:

$$\varepsilon_t = \rho_1 \varepsilon_{t-1} + \rho_2 \varepsilon_{t-2} + ... + \rho_k \varepsilon_{t-k} + v_t \text{ , for t = k,...,n, but } v_t \sim N(0, \sigma_v^2)$$

In order to evaluate the statistical presence of an autocorrelation of the order k to be used the following statistical hypotheses:

$$H_0: \rho_1 = \rho_2 = ... = \rho_k = 0$$;the residuals are not correlated

$$H_1: \rho_1 \neq 0 \text{ or } \rho_2 \neq 0 \text{ or } \rho_s \neq 0;$$ the residuals are correlated

It is seen by applying statistical software (EViews) statistical probability F is 0.006 (small) model shows autocorrelation of order 2. (see Table 2)

Table 2. Breusch–Godfrey test for multiple regression model

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	8.571786	Prob. F(2,10)	0.0068
Obs*R-squared	8.019723	Prob. Chi-Square(2)	0.0181

In further analysis to allow the connection of correlation between the dependent variable number of students in **high-university** and factorial variables included in Model : Cross investment in education and income education is relatively stable homoscedasticity using White test errors. White test is a statistical test which takes as its starting point the explanation of the observed errors in relation to one or more exogenous variables. (Voineagu et al., 2007). Analysing by the application management software and database analysis (EViews) shows that $F_c = 7.29 > F_{tabel} = 3.59$ and $LM = 9.6 > \chi^2_{0,05;2} = 5.99$, errors are heteroskedastic (see Table 3)

Table 3. White test for model

Heteroskedasticity Test: White

F-statistic	7.295750	Prob. F(3,10)	0.0071
Obs*R-squared	9.609530	Prob. Chi-Square(3)	0.0222
Scaled explained SS	4.487405	Prob. Chi-Square(3)	0.2134

The disadvantage is that regression method does not take into account the relationships between independent variables.

In conclusion, determining the factors influencing the most of the development of the phenomena analysed, projects establishing the practical measures for assuring the optimal conditions for development, intensification and weakening of the influence of the undesired factors, can be realised.

5. Conclusions. Improvement directions

The Romanian education system is confronting structural failures, due to the increase of the instability of the labour market and the proliferation of austere economic policies in adjusting the value of GDP. Also, open competition on the labour market, both in the EU and countries outside the EU underline the necessity to adapt the education system to the actual and future requests of the society through the contribution of research and information technology to the development of eco-knowledge (The National Institute of Statistics, 2005). As regards the Romanian higher education must be taken into consideration the following aspects:

- Is a system that continues the tradition of financing without conceiving overtaking ways and means of this status;
- The system promotes yet equal criterions of organisation and administration;
- The system has accepted quantitative developments and formal multiplications instead sustaining the performance, quality and compatibility;
- The system has gradually been opened to international collaboration;

So, the education system must assure, not only the development of the competencies, skills and abilities of the schooling population, but also an educational offer more flexible, based on a correlation between the number of graduates and the demand on the labour market, for all the fields of activity. (The Economic and Social State, Synthesis, the National Institute of Statistics, 2011–2012). Also, under the pressure of the system of competition market in forming, the state companies had to resist in front of some different market competitive requirements (on internal and external market). This accommodation to the new requirements of the market was weight by their outrun equipment's and endowments, the absence of necessary capital for new investments, by traditional leadership, rigid and bureaucratic, and also the reduced capacity of labour force to adapt them to the requirements for new labour skills, because of the fact that it was prepared for a specialisation extremely narrow.

By the recommendations of improvement of the methodology of internal and external evaluation of the study programs, the Romanian universities can create their own code of quality management with the most performance practice from the European Space Education. The focus of the universities on the students, the expression of results through cognitive and functional competencies (professional and transversal), and also by different acquisitions (values, beliefs and attitudes in career and life) that aim to increase the transparency and attractiveness of the study programs, the competition and educational efficiency of those (Korka, 2009).

The problem of the quality in the Romanian education system is still a sensitive subject that requires a great attention. Unfortunately the making of the quality commissions, both for the higher education and the high school did not deliver the expected solution for the real compatibility of the Romanian and European education system and why not, the global one.

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