

THE ROLE OF HUMAN RESOURCES IN INCREASING THE COMPETITIVENESS OF THE FIRM

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Abstract: *The premises of this article lie in the need to address two important interrelated concepts: human resources in the R&D sector and competitiveness. The aim is to identify and demonstrate the role of R&D personnel in enhancing the competitiveness of a company by using an econometric model - linear regression - having as a prerequisite the current status of the researchers in relation to the subject. We try to identify whether the human resources of the R&D sector can be considered the source of a competitive advantage or not. The result of this article highlights the value of human resources, their strategic activities, and their influence on company performance.*

Keywords: *human resources, R&D activity, competitiveness*

JEL Classification: *J21, J23, J4, J48, M51, M54, O0, O12, O15, O32*

1. Introduction

Many of the challenges faced by firms that want to innovate are reduced to talent management, an area directly influenced by human resources.

Smith, A. (1776), in the *Wealth of Nations* highlights the role of the human factor training. In his view, man for whom work and time have been spent has to show a higher level of qualification, being compared to an expensive and performing car.

Mill, J.S. (1970) considers man a capital that serves as a goal in whose name there is wealth.

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Also, Marshall A. (1980) highlights investment in education and training as a development factor, the most valuable capital is the one invested in the human factor.

Doz and Prahalad (1988) and Adler and Bartholomew (1992) consider that much of the research on the role of human resources in global competitiveness has focused on management.

The role of human resources is also well emphasized by Schuler, Dowling and De Cieri (1993) who believe that effective human resources implementation is a key factor in achieving competitive advantage. The close link between personnel and competitive advantage is also revealed by Lado and Wilson (1994).

Thurow, L. (2000) thinks that wealth is achieved by controlling knowledge and highlighting intellectual capacities and not by means of productive equipment. According to Becker, G. (1997), professional training determines the productivity of the firm providing such programs, realizing that profit is gained from the training of personnel. Similarly, Lucas R.E. (1988) finds out a close link between investment in human resources and productivity growth. In the author's view, the human factor is associated to the concept of "knowledge".

Besides foreign authors who have made a notable contribution to revealing the role of human resources in increasing the competitiveness of the company, there are also many Romanian authors who have highlighted the correlational approach to the two concepts.

Mihai Drăgănescu (2003) points out that the process of innovation in the economic and social development based on knowledge is achievable through human capital. The importance of human resources is also addressed in studies published within the Institute of National Economy and the Centre for Economic Information and Documentation, which highlight the link between economic development, income generation and human development.

Vocational training is of particular importance and reveals the role of the workforce in acquiring knowledge for the development and application of innovations. Competitiveness Enhancement Strategies must provide firms with access to a skilled workforce that has the ability to develop innovations within the firm. The degree of training and experience is fundamental for the firm's ability to adopt and use new knowledge for innovation. In this respect, the decisive role returns to R&D activities. Synthesizing, the above-mentioned

confirms, by a series of national and international bibliographic references, the essential role of human resources in increasing the competitiveness of the firm, with a positive relationship between two concepts.

2. Methodology of research

We intend to highlight the role that human resources play in increasing the competitiveness of an innovative firm, namely, whether the two concepts are interconditioned.

The econometric model was used to establish the relationship between the role of the R&D personnel in increasing competitiveness.

The simple linear regression was used as the main tool. Simple linear regression is the method that allows us to establish the relationship between two continuous (quantitative) variables, in our case the R&D personnel (independent variable) and the turnover (dependent variable).

The relationship is called the regression equation of Y depending on X, $Y = a_0 + a_1X + e$. The graphic representation highlights the potential relationship between the two.

Values are recorded for EU countries (EU-28), in 2015 (the lack of data did not allow for a wider analysis), and the data source is Eurostat.

The usefulness of this article is to highlight the decisive contribution of the human factor to technological innovation and, implicitly, to increase the competitiveness of the company through innovation

3. The correlation between the R&D personnel and the firm's turnover

Competitiveness can be analyzed in terms of results and determinants and lies in the company's ability to position itself on the market.

In this respect, a number of bibliographic references identify R&D spending, innovation capacity, education level, spending on investment in human capital, and knowledge dissemination as key factors with significant implications for competitiveness.

In this context, we intend to highlight the role that human resources play in increasing competitiveness, in other words, if there is a relationship of interdependence between the two concepts, *i.e.* if they are interdependent.

The competitiveness of the firm is strongly correlated with turnover and we have used this indicator as a measure of competitiveness. So, we used the graphical representation to demonstrate to what extent the R&D

personnel influence the firm's turnover. The analysis is based on a sample of 28 countries in the EU.

Regression Statistics	
Multiple R	0.962877984
R Square	0.927134012
Adjusted R Square	0.924331475
Standard Error	113947.9245
Observations	28

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	4.2954E+12	4.2954E+12	330.819428	2.62011E-16
Residual	26	3.37587E+11	12984129502		
Total	27	4.63299E+12			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-19225.01727	25644.04498	-0.749687394	0.46017318	-71937.10614	33487.0716	-71937.1061	33487.0716
X Variable 1	2.835354602	0.15588771	18.18844216	2.6201E-16	2.514922827	3.15578638	2.51492283	3.15578638

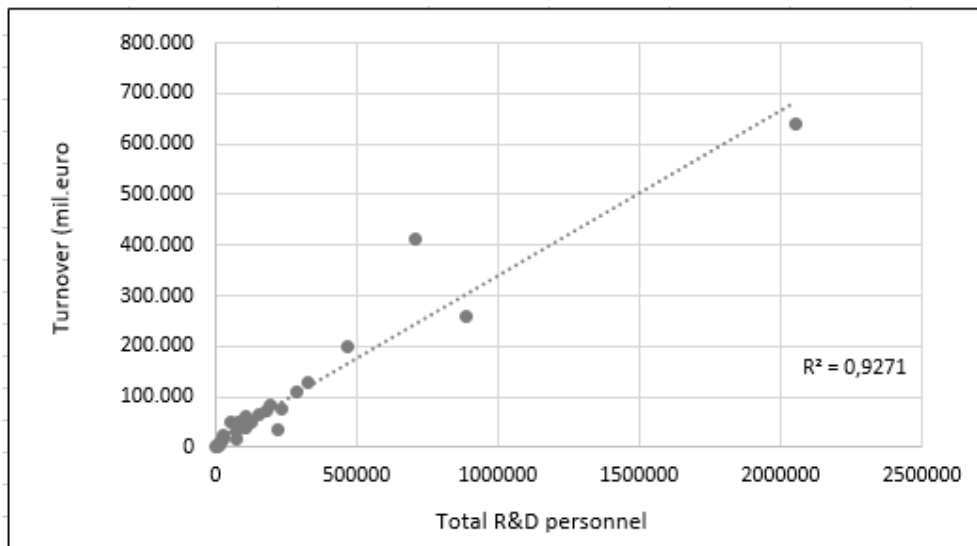


Figure 1 - Correlation between R&D staff and company turnover

Source: Eurostat, Code : rd_p_persocc, tin00149 (2015)

The logarithmic form of the correlation corresponds to the equation $y = 0.327x + 12795$ and reveals the role of the R&D personnel in increasing the competitiveness of the firm. The value of the correlation coefficient (0.92) indicates a positive correlation between the two variables.

4. Results

The validity of the correlation is accomplished through the Eviews program, verifying the following hypotheses regarding the model errors: the error independence hypothesis, the homoscedasticity hypothesis, the normal error distribution hypothesis.

Error hypothesis (LM self-correlation Error Test)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.497697	Prob. F(4,23)	0.7376
Obs*R-squared	2.230503	Prob. Chi-Square(4)	0.6934

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 11/27/17 Time: 12:49

Sample: 1 28

Included observations: 28

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y	0.004222	0.017554	0.240531	0.8120
RESID(-1)	0.077155	0.209697	0.367935	0.7163
RESID(-2)	0.075929	0.203238	0.373597	0.7121
RESID(-3)	-0.502850	0.389027	-1.292583	0.2090
RESID(-4)	0.150425	0.400599	0.375500	0.7107

R-squared	0.019813	Mean dependent var	9612.855
Adjusted R-squared	-0.150654	S.D. dependent var	38388.46
S.E. of regression	41178.74	Akaike info criterion	24.24966
Sum squared resid	3.90E+10	Schwarz criterion	24.48756
Log likelihood	-334.4953	Hannan-Quinn criter.	24.32239
Durbin-Watson stat	2.031004		

The test implies solving the equation by the smallest square method and calculating the u_t residues as error estimators e_t . This creates the auxiliary equation:

$$u_t = b_0 + b_1x_{1t} + \dots + b_kx_{kt} + \rho_1u_{t-1} + \rho_2u_{t-2} + \dots + \rho_pu_{t-p} + \varepsilon_t$$

where,

b_1, b_2, \dots, b_k , respectively $\rho_1, \rho_2, \dots, \rho_p$ - model parameters, ε_t - random variable that complies with normal distribution assumptions (normal, zero average), lack of heteroscedasticity and self-correlation.

We solve the equation and then calculate nR_2 , (R_2 is the determination coefficient). If nR_2 is bigger than $\chi_p^2(\alpha)$ the assumption is rejected (the errors are not autocorrelated) at the significance threshold α .

According to the LM error-checking error correlation test, there is no error autocorrelation

Homoscedasticity hypothesis (White Test)

The regression model parameters are estimated: $y = x_{\beta+\varepsilon}$ by the least squares method. After determining the residues in the original regression, regression is calculated:

$$e^2 = a + ax + ax^2 + u$$

Heteroskedasticity Test: White

F-statistic	0.219074	Prob. F(2,25)	0.8048
Obs*R-squared	0.482275	Prob. Chi-Square(2)	0.7857
Scaled explained SS	0.730375	Prob. Chi-Square(2)	0.6941

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 11/27/17 Time: 13:34

Sample: 1 28

Included observations: 28

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.933521	1.568776	-0.595063	0.5571
LOG(Y)^2	-0.008114	0.012660	-0.640889	0.5274
LOG(Y)	0.185051	0.283586	0.652537	0.5200

R-squared	0.017224	Mean dependent var	0.101254
Adjusted R-squared	-0.061398	S.D. dependent var	0.193257
S.E. of regression	0.199102	Akaike info criterion	-0.289043
Sum squared resid	0.991039	Schwarz criterion	-0.146307
Log likelihood	7.046606	Hannan-Quinn criter.	-0.245407
F-statistic	0.219074	Durbin-Watson stat	1.567192
Prob(F-statistic)	0.804788		

The White Test confirms that the residues are homoscedastic and the coefficients are statistically significant at a significance level more than 5%.

5. Conclusions

In this study we analyse the importance of human resources within the company and their role in increasing competitiveness. According to the analysis we confirm the positive connection between the two concepts.

The success of the R&D activity, implicitly of the related personnel, involves significant financial resources in order to train the personnel through for broadening their knowledge and skills horizons. Quality of the workforce is an essential factor in creating a favorable environment for the firm to become competitive through R&D and to adapt rapidly to change.

We believe that this article reflects the image of the interdependencies between the human factor and the company's competitiveness and this can be a basis for documenting future topic studies.

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