Muamer Bezdrob
PING d.o.o. Sarajevo
Bosnia and Herzegovina
E-mail: mbezdrob@ping.ba

Mirha Bičo Ćar
University of Sarajevo
School of Economics and Business, Bosnia and Herzegovina
E-mail: mirha.car@efsa.unsa.ba

INTERACTIVE IMPACT OF INNOVATION AND EDUCATION ON BUSINESS PERFORMANCE DURING THE ECONOMIC DOWNTURN

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Abstract

In times of quick changes and great business and economic uncertainty, innovativeness becomes a strategic priority of any business organization. The same opinion applies to the improvement of employees' knowledge and skills through regular education activities. Such a strategic orientation is especially hailed during and after recession by both managers and academia. The purpose of this research is to investigate whether the companies from the F B&H that had pursued such a strategy have achieved a better business performance. For that purpose, beside the archival data from the Federal financial office, data were also collected from a questionnaire which was sent to 270 companies in the F B&H, yielding 120 valid responses. For the purpose of data analysis, a multivariate analysis of variance (MANOVA) was employed. The research results show that only simultaneous investment in innovation and education has a significant effect on business performance, which is the most important research finding.

Keywords: innovation, education, business performance

1. INTRODUCTION

Ever since Joseph Schumpeter (1939) argued that innovation is one of the main drivers of economic changes, there has been a strong belief that innovations represent a critical source of competitive advantage (Crossan and Apaydin 2010). Likewise, knowledge acquisition and creation through the process of people training and education represent an essential source of competitive advantage, too (Castellanos and Martin 2011). Such a conception was particularly emphasized after Peters and Waterman (1982) ground-breaking proposition about the people as the firm's most valuable asset.

During and right after economic downturns, the first impulse within the firms and firms' management, and even the advice given to them, is to consolidate the scarce organizational resources by cutting costs and prohibiting all but irremissible expenditures (Rhodes and Stelter 2009). Contrariwise, both innovation and education processes impose additional and, more often than not, considerable expenses to the firms' budgets. However, investing in the increase of innovative activities is among five strategic top-priorities of contemporary business organizations (HBR Analytic Services 2011). In addition, a strong positive correlation between innovation and people training and education (Kimberly and Evanisco 1981; Mol and Birkinshaw 2009) implies that investment in these activities is essential for the positive outcome of any organizational innovative effort.

Another important issue related to the very core of this study is the mutual influence between performance, innovation and education. There are many studies which point to the positive correlation between the processes of innovation and education and business performance (Klomp and van Leeuwen 2001; van der Sluis *et al.* 2008), but studies that analyse interdependence of these three variables are quite rare.

Combining all these arguments, it could be considered that investing in both innovations and employees' knowledge and skills improvement, through regular education activities, should be a strategic priority of any modern business organization, irrespective of the present economic state and cycle. Accordingly, the main focus of this study is the mutual effect which innovation and staff education have on organizational performance during and after the great recession economy of 2008. Thus, the basic research question of this study is:

> *RQ: Can the interactive effect of innovation and education (training), in the immature and underdeveloped market condition of the Federation of Bosnia and Herzegovina, produce differences in the firms' performance outcome?*

This research question outlines the purpose and scope of this study. Its primary goal is to examine the impact of firm's innovativeness, as well as the moderating role of the firm's educational system on business performance. The

research model should be based on the existing literature and should be applicable to the market conditions of the F B&H.

2. LITERATURE REVIEW

Doing business in a modern hyper-competitive market is almost impossible without the continuous development and improvement of competitive advantages. At the beginning of the 20th century, Joseph Schumpeter has identified innovation as a main driver of economic changes (Schumpeter 1939). Ever since then, the theory and practice of management records continual growth of research works on innovation as a crucial source of competitive advantage.

Very often, the concept of innovation is treated interchangeably with the concepts of invention and creation (Man 2001, cited by Job and Bhattacharyya 2007). Both these latter concepts are related to the act of designing something that previously did not exist, while the concept of innovation relates to the implementation of previously created ideas. Furthermore, the term innovation is used in many different ways. Thus, in this study, innovation is regarded in accordance with the following definition: "*changes or modifications made to the form, quality or status, whether to the system, behaviour, structure, process, product or service of an innovative organization, where such a change or modification represents a significant departure from the previous state*" (Bezdrob 2012, p. 11).

To properly comprehend the innovation phenomenon, it is necessary to identify the main reasons for undertaking innovative activities, as well as the factors which have the greatest impact on the success rate of innovation processes. The main innovation implementation reasons that could be identified within the existing literature are: *survival of the organization* (Land 1973, cited by Herring and Galagan 2011); *competitive advantage creation* (Hill and Jones 1995; Dess and Picken 2000; Helfat *et al.* 2007), and *business performances improvement* (Klomp and van Leeuwen 2001; Stock and Zacharias 2011; Huang *et al*. 2011).

Factors that affect the success rate of innovation processes in organizations are different and related to both the characteristics of organization and organizational environment. Crossan and Apaydin (2010) point to (and explain) the following meta-constructs of innovation processes: a) innovation leadership – on the individual level and at the group level; b) managerial levers – mission, goals and strategy, organizational learning and knowledge management, organizational culture, etc.; and c) business processes – meta-constructs that support innovation through initiation. Moreover, the effectiveness and innovation quality are mainly determined by permanent employee learning and development (Wang and Ahmed 2001).

Apart from innovation, one of the key sources of sustained competitive advantage is organizational knowledge and employees' education (Nonaka 1991).

The main reasons for investing in employees' education are: changes in technology, increased complexity and uncertainty of the business environment, growing demands of modern business in terms of new skills (Bahtijarević-Šiber 1999). Likewise, the main objectives of educational programs are: improved organizational competitiveness (Nonaka 1991), increased inimitability of human capital (Fahy 2000), avoiding obsolescence of employees' knowledge, and orientation and socialization of new employees (Bahtijarević-Šiber 1999).

Although the literature makes a precise distinction between the concepts of learning, training, education and staff development (Bahtijarević-Šiber 1999; Rahimić 2010), in this study the term education covers all activities that are related to the advancement of knowledge, skills and habits of employees.

Unfortunately, due to the constant turbulences in the modern business environment, the knowledge gained during formal education processes rapidly outdates. Moreover, that type of knowledge is insufficient for the present and, especially, for the future requirements of the job position. Thus, the mere survival of any modern enterprise considerably depends on a continual process of staff education. In order to provide the maximal effect and return, training in modern firms becomes all the more extensive in terms of financial costs and time consumption. In order to improve the work efficiency and performance of each employee as well as of the whole organization, education programs must be fully relevant to the business objectives and goals, and they must encompass all firm's employees (Bartel 1994; Hurley and Hult 1998; Mat and Razak 2011).

Since firms are interested in organizational processes advancement and maximization of the results of firms' activities, it is clear that they are interested in those factors that have the biggest impact on business performance. It is evident that the employees' knowledge and skills improvement, through regular education and training activities, and organizational innovation contribute to the firm's competitive advantage and business performance improvement (Klomp and van Leeuwen 2001).

Staff education and organizational innovation act as complementary activities in respect to business performance. More precisely, staff training has a positive effect on innovation (Laursen and Foss 2003), which in return has a positive relation to organizational performance (Klomp and van Leeuwen 2001). Accordingly, it could be claimed that simultaneous investment in educational and innovation processes will result in a superior business performance.

3. DATA AND METHODOLOGY

To test the research model, an archival research of financial reports from the firms that are registered in the F B&H was conducted, along with a survey questionnaire, which was sent to 270 firms that were randomly chosen from within the whole population of the firms that comply with the following profile:

- employing at least 20 people,
- established in 2002 or earlier,
- not belonging to financial, health care, social welfare, educational or public sector.

A total of 152 responses (56.3%) were received, out of which 120 were valid (44.44%). The responding firms have the average size of 170.7 (S.D. 290.7) employees and the average age of 17.5 (S.D. 4) years. The estimated population of the firms that comply with the described profile is about 1500, so the expected statistical error is around 9% (95% confidence level). The firms are proportionally distributed among different industries and different geographical parts of the F B&H.

3.1. Measures and Research Design

All variables were measured using data from the conducted survey (independent variables) and from the official balance reports of the corresponding firms (dependent variables). The measurement spans a five-year period from year 2006 to year 2010.

3.1.1. Dependent Variables

The research design is primarily determined by the objective and balanced view of business performance, which must take into account a balanced picture of various aspects of firm's operations. Thus, the measure of business performance is completely based on the balanced scorecard (BSC) principles (Kaplan and Norton 1992). For that purpose, measures from previous research (Bezdrob and Bičo Ćar 2012) were adopted for the purpose of this study:

- *"Average Labour Productivity"* (Y_1) – measure related to the "Internal business process" perspective of BSC method, calculated as (logarithmic transformation used):

$$Y_1 = \frac{1}{4}\sum_i \left(\frac{Sales}{No.\ of\ Employees}\right)_i, \qquad i = [2006, 2007, 2009, 2010]$$

- *"Average Return on Invested Capital"* (Y_2) – measure related to the "Financial" perspective of BSC method, calculated as:

$$Y_2 = \frac{1}{4}\sum_i \left(\frac{Net\ Profit}{Equity + Long\ term\ Debt}\right)_i, \qquad i = [2006, 2007, 2009, 2010]$$

- *"Number of Employees Change"* (Y_3) – measure related to the "Learning and growth" perspective of BSC method, calculated as:

$$Y_3 = \frac{(No.of\ Employees)_{2010} - (No.of\ Employees)_{2006}}{(No.of\ Employees)_{2006}}$$

- *"Total Revenue Change"* (Y_4) – measure related to the "Customers" perspective of BSC method, calculated as (logarithmic transformation used):

$$Y_4 = \frac{(Sales)_{2010} - (Sales)_{2006}}{(Sales)_{2006}}$$

3.1.2. Independent Variables

As it is directed by the research question, the research design must ensure comparison between three groups of firms:

- *Group 1* – innovative firms which have well-established educational systems,
- *Group 2* – innovative firms which do not have well-established educational systems,
- *Group 3* –non-innovative firms.

Obviously, this is a simple case of a single three-level independent variable – *"Firm Type"* (X_1), which differentiates these three types of firms.

Although it is usually considered differently (OECD 2005), in order to avoid accidental innovative activities, it was assumed that only those firms that had introduced at least one new production process and one new product, during the period from the year 2006 to the year 2010, were really innovative.

3.2. Results

Table 1 contains the means and standard deviations of all model dependent variables for all three groups of independent variable X_1. To test the differences between the defined groups of firms, MANOVA was employed in order to examine a set of four dependent variables, which represents the firms' performance outcome.

As it could be seen from Table 1, firms are almost equally distributed among three groups, with sample sizes of 34, 36 and 36. Since there are four dependent variables in the model, these sample sizes provide for the identification of large effect sizes with the required statistical power of 0.8 (Hair *et al.* 2009).

Table 1. Descriptive statistics of dependent variables for groups of X_1

Dep. variable	Group of X_1	N	Mean	Std. Deviation
Y_1 *Average Labour Productivity*	Group 1	34	11.72	1.05
	Group 2	36	11.49	0.88
	Group 3	36	11.50	0.69
	Total	*106*	*11.57*	*0.88*
Y_2 *Average Return on Invested Capital*	Group 1	34	0.10	0.10
	Group 2	36	0.05	0.06
	Group 3	36	0.02	0.07
	Total	*106*	*0.05*	*0.08*
Y_3 *Number of employees change*	Group 1	34	0.51	0.59
	Group 2	36	0.28	0.60
	Group 3	36	0.21	0.63
	Total	*106*	*0.33*	*0.62*
Y_4 *Total Revenue Change*	Group 1	34	0.43	0.49
	Group 2	36	0.19	0.44
	Group 3	36	0.18	0.40
	Total	*106*	*0.26*	*0.45*

Graphical representation of the same data is displayed in Figure 1.

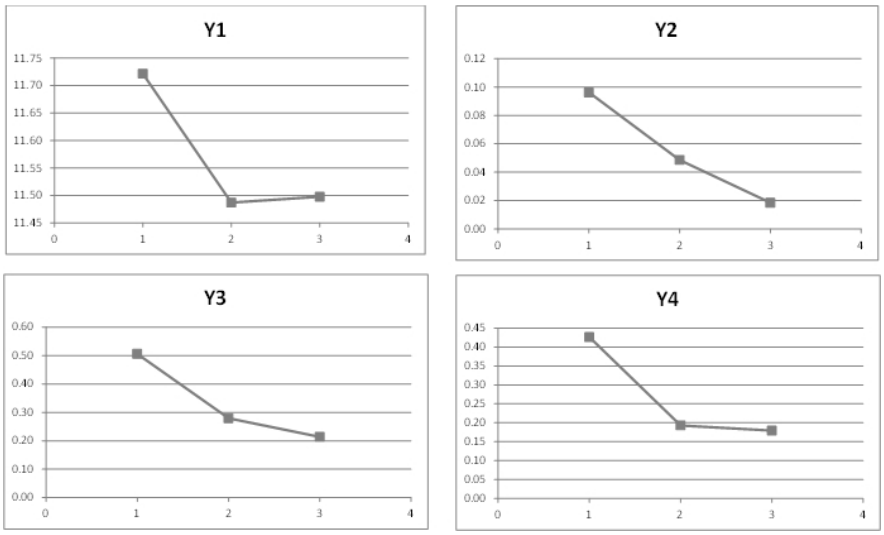

Figure 1. Graphical Display of Performance Measures for Groups of X_1

3.2.1. Assumptions

The most important assumptions for MANOVA – independence, normality and homoscedasticity, were evaluated through the SPSS. Independence of observations is provided as much as possible by a random selection of the responding firms.

Originally, the dataset contained 120 cases, but there were six outliers which laid more than five standard deviations away from the mean value. These outliers had a strong negative impact on the normality of the dependent variables, so these cases were removed from the dataset. Furthermore, variables Y_1 and Y_4 showed significant non-normality (skew > 2, kurtosis > 7), thus the logarithmic transformation was used for these two variables to remedy this violation.

The assumption of the homogeneity of variance-covariance matrices among all groups was checked through two tests. First, univariate homogeneity was assessed by the Levene's test. As it could be seen from the test results (Table 2), this assumption was met (significance > 0.05).

Table 2. Levene's Test of Equality of Error Variances

Dependent variable	F	df_1	df_2	Sig.
Y_1 – *Average Labour Productivity*	2.82	2	103	0.06
Y_2 – *Average Return on Invested Capital*	2.14	2	103	0.12
Y_3 – *Number of Employees Change*	0.17	2	103	0.84
Y_4 – *Total Revenue Change*	0.61	2	103	0.54

The second step assumed testing the equality of the variance-covariance matrices for all three groups using the Box's test. The obtained results from this test were statistically significant at $p < 0.001$, meaning that there was a significant difference between the three groups on all variables collectively. In accordance with the recommendation (Field 2009), eight cases (four cases from each of group 2 and group 3) were randomly removed from the dataset in order to equalize the groups' sizes. Upon this deletion a much better result from the Box's test was obtained ($M = 30.094$, $F(20, 37852) = 1.420$, $p = 0.100$), roughly indicating the equality of covariance matrices. Therefore, the assumption of homoscedasticity was also met.

3.2.2. The MANOVA Model Estimation

Since all assumptions were met, the next step was to assess whether there exist significant differences for all performance variables across the three groups of firms, first all dependent variables together and then each of them individually (Hair *et al.* 2009).

All four most commonly used multivariate tests are statistically significant at $p < 0.001$, indicating that the set of performance variables has a significant difference between three types of firms (Table 3).

Table 3. Multivariate Tests for Group Differences in Performance

Test	Value	*F*	df_1	df_2	η^2	Power[1]
Pillai's Trace	1.17*	16.18	12	306	0.39	1.00
Wilks' Lambda	0.004*	156.78	12	265	0.84	1.00
Hotellings T^2	210.14*	1727.79	12	296	0.99	1.00
Roy's Largest Root	209.94*	5353.38	4	102	0.99	1.00

[1] – Computed using $\alpha = 0.05$; * - $p < 0.001$

Additionally, univariate tests for all four dependent variables indicate that each of them individually has a significant main effect (Table 4). Results from both multivariate and univariate tests show that the four performance variables have a statistically significant difference across the three types of firms.

Table 4. Univariate Tests for Group Differences in Performance

Variable	Type III Σ of sq.	Adj. R^2	df	Mean Square	F	η^2	Power[1]
Y_1 – *Avg. Lab. Prod.*	14180.68	0.99	3	4726.89	6058.69***	0.99	1.00
Y_2 – *Average ROIC*	0.41	0.38	3	0.14	22.88***	0.40	1.00
Y_3 – *No. of Emp. Chg.*	13.15	0.24	3	4.38	11.85***	0.26	1.00
Y_4 – *Total Rev. Chg.*	8.67	0.28	3	2.89	14.64***	0.30	1.00

[1] – Computed using $\alpha = 0.05$; *** – $p < 0.001$

The last step in the MANOVA model estimation procedure is the examination of differences across specific group pairs for all dependent variables. For that purpose, a priori tests were conducted, comparing each of the innovative types of firms (groups 1 and 2) with the non-innovative firms (group 3). The results of the "between groups" comparison are presented in Table 5.

Table 5. Between Groups Comparison Results

Dependent Variable	Group 1 vs. Group 3			Group 2 vs. Group 3		
	Estim.	Hyp.	Diff.	Estim.	Hyp.	Diff.
Y_1 – *Avg. Lab. Prod.*	0.22	0	0.22	-0.01	0	-0.01
Y_2 – *Average ROIC*	0.08	0	0.08***	0.03	0	0.03
Y_3 – *No. of Emp. Chg.*	0.29	0	0.29*	0.07	0	0.07
Y_4 – *Total Rev. Chg.*	0.25	0	0.25*	0.01	0	0.01

* - $p < 0.05$; *** - $p < 0.001$

This contrast type, known as *simple contrast*, was well fitted to the main interest of this study. Namely, to examine the impact of firm's innovativeness on business performance and, simultaneously, the moderating role of the firm's educational system it makes sense to perform exactly this type of comparison.

3.2.3. Discussion

All conducted tests, both multivariate (Table 3) and univariate (Table 4), show a significant main effect of the firm type (variable X_1) on business performance, which is indicated with four dependent performance variables. This means that there exists a significant difference in firm's performance depending on the group that a particular firm belongs to. The pattern of performance decrease between groups of firms could be observed from Table 1 and, especially, from the diagrams displayed in Figure 1.

A MANOVA follow up analysis (Table 5) has showed that a significant (genuine) group difference exists for three dependent variables – Y_2, Y_3 and Y_4, between Group 1 and Group 3, while same cannot be asserted for the comparison between Group 2 and Group 3. For the fourth dependent variable (Y_1) there were no significant differences for any group comparison.

These research findings suggest that, even though more than a half of the surveyed firms were innovative during the observed period, only those firms that simultaneously invest in innovation and employees' knowledge and skills improvement have achieved superior performance. In other words, the research model provides an important insight relating to the interactive impact of innovation and education on firms' performance.

4. CONCLUSION

This study aims to explore the interdependence between innovation, education and firm's performance outcome during the economic downturn. Relying strongly on the existing knowledge base, efforts were focused on the design of an appropriate research model that could be applied to the market conditions of the F B&H.

The analysis has shown that the interactive effect of innovation and staff education (training) does produce a difference in firms' performance outcome. More specifically, only those firms that simultaneously invested in innovation and their educational system have achieved a significantly higher performance outcome than non-innovative firms. This represents the single most important finding of the study.

There are a few different limitations that apply to this research. First, a single dataset was used in this study and no validation of the model was performed. Furthermore, all collected data come from one country only, so the obtained results could be generalized only for the population from which the sample was drawn. Thus, future studies may validate the model and make it more general by applying it to different datasets.

This research and its results contribute to the body of knowledge related to organizational performance by providing a further insight into the mutual interaction between innovation and education and their combined impact on business performance.

REFERENCES

Bahtijarević-Šiber, F. (1999). Management ljudskih potencijala. Zagreb: Golden marketing.

Bartel, A.P. (1994). Productivity Gains from the Implementation of Employee Training Programs. *Industrial Relations*, Vol. 33, No. 4, pp. 411-425.

Bezdrob, M., Bičo Ćar, M. (2012). Performance Measurement Model – Developing and Testing a Measurement Model Based on the Simplified Balanced Scorecard Method. *Zagreb International Review of Economics and Business*, Vol. SCI, No.1, pp. 79-98.

Bezdrob, M. (2012). *Uticaj inovacija u menadžmentu na dugoročne performanse preduzeća – Provjera teorijskog modela inovacija u menadžmentu na primjeru preduzeća u FBIH*. Doctoral Dissertation. University of Sarajevo.

Castellanos, R.M.M., Martín, M.Y.S. (2011). Training as a Source of Competitive Advantage: Performance Impact and the Role of Firm Strategy, the Spanish Case. *The International Journal of Human Resource Management*, Vol. 22, No. 3, pp. 574–594.

Cook P. (1998). The Creativity Advantage – Is Your Organization the Leader of the Pack? *Industrial and Commercial Training*, Vol. 30, No. 5, pp. 179–184.

Crossan, M.M., Apaydin, M. (2010). A Multi-Dimensional Framework of Organizational Innovation: A Systematic Review of the Literature. *Journal of Management Studies*, Vol. 47, No. 6, pp. 1154-1191.

Dess, G.G., Picken, J.C. (2000). Changing roles: Leadership in the 21st century. *Organizational Dynamics*, Vol. 28, No. 3, pp. 18-34.

Fahy, J. (2000). The resource-based view of the firm: some stumbling-blocks on the road to understanding sustainable competitive advantage. *Journal of European Industrial Training*, Vol. 24, No. 2-4, pp. 94 – 104.

Field, A. (2009). *Discovering Statistics Using SPSS*. 3rd Edition, London: Sage Publications Ltd.

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. (2009). *Multivariate Data Analysis*. 7th Edition, Upper Saddle River: Prentice Hall.

Harvard Business Review Analytic Services (2011). *Closing the Gap: How Companies Achieve Smarter New Product Development and Make Better Decisions with Technology*. Boston: Harvard Business School Publishing.

Helfat, C.E., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D., Winter, S.G. (2007). *Dynamic Capabilities: Understanding Strategic Change in Organizations*. New York: Wiley-Blackwell.

Herring, S., Galagan P. (2011). Why Innovation? Why Now? *T+D*, Vol. 65, No.9, pp. 26-28.

Hill, C.W.L., Jones, G.R. (1995). *Strategic Management: An Integrated Approach*. 4th Edition, Independence: Houghton Mifflin College Division.

Huang, L., Chen, S.K., Han, S.B. (2011). The Effects of Business Reorganization and Technical Innovation on Firm Performance. *Journal of Business & Economic Studies*, Vol. 17, No. 1, pp. 29-36.

Hurley, R.F., Hult, G.T.M. (1998). Innovation, Market Orientation and Organizational Learning: an Integration and Empirical Examination. *Journal of Marketing*, Vol. 62, No. 3, pp. 42-54.

Job, P.A., Bhattacharyya, S. (2007). Creativity and Innovation for Competitive Excellence in Organizations. *In proceedings of Conference on Global Competition and Competitiveness of Indian Corporate*. Kerala: Indian Institute of Management Kozhikode, May 18-19, pp. 53-63.

Kaplan, R.S., Norton, D.P. (1992). The Balanced Scorecard—Measures that Drive Performance. *Harvard Business Review*, Vol. 70, No. 1, pp. 71-79.

Kimberly, J.R., Evanisko, M.J. (1981). Organizational Innovation: The Influence of Individual, Organizational and Contextual Factors on Hospital Adoption of Technologies and Administrative Innovations. *Academy of Management Journal*, Vol. 24, No. 4, pp. 689-713.

Klomp, L., van Leeuwen, G. (2011). Linking Innovation and Firm Performance: A New Approach. *International Journal of the Economics of Business*, Vol. 8, No. 3, pp. 343-364.

Laursen, K., Foss, N.J. (2003). New human resources management practices, complementarities and the impact on innovation performance. *Cambridge Journal of Economics*, Vol. 27, No. 2, pp. 243-263.

Mat, A., Razak, R.C. (2011). The Influence of Organizational Learning Capability on Success of Technological Innovation (Product) Implementation with Moderating Effect of Knowledge Complexity. *International Journal of Business and Social Science*, Vol. 2, No. 17, pp. 217-225.

Mol, M.J., Birkinshaw, J. (2009). The Sources of Management Innovation: When Firms Introduce New Management Practices. *Journal of Business Research*, Vol. 62, Issue 12, pp. 1269-1280.

Nonaka, J. (1991). The Knowledge-Creating Company. *Harvard Business Review*, Vol. 69, No. 6, pp. 96-104.

OECD (2005). *Oslo Manual - Guidelines for Collecting and Interpreting Innovation Data*. 3rd Edition, Paris: OECD Publishing.

Peters, T.J., Waterman, R.H. (1982). *In Search of Excellence*. New York: HarperCollins.

Rahimić, Z. (2010). *Menadžment ljudskih resursa*. Sarajevo: School of Economics and Business.

Rhodes, D., Stelter, D. (2009). Seize Advantage in a Downturn. *Harvard Business Review*, Vol. 87, No. 2, pp. 50-58.

Schumpeter, J.A. (1939). *Business Cycles: A theoretical, historical and statistical analysis of the Capitalist process*. New York: McGraw-Hill.

Stock, Zaharias, (2011). Patterns and Performance Outcomes of Innovation Orientation, Journal of the Academy of Marketing Science, Vol. 39, No. 6. Pp. 870- 888.

Van der Sluis, J., van Praag, M., Vijverberg, W. (2008). Education and Entrepreneurship Selection and Performance: A Review of the Empirical Literature. *Journal of Economic Surveys*, Vol. 22, No. 5, pp. 795-841.

Wang, C.L., Ahmed, P.K. (2001). The Role of Learning and Creativity in the Quality and Innovation Process. *University of Wolverhampton*, http://icms-web2.unv.wlv.ac.uk/PDF/uwbs_WP007_01_Wang_Ahmed.pdf [accessed 14.05.2013.]