THE ROLE OF ORGANIZATIONAL INNOVATION IN ACHIEVING AND MAINTAINING COMPANY'S BUSINESS EXCELLENCE

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The dynamics of the contemporary environment with all its characteristics has greatly encouraged further research of the impact of innovation on the company's performance due to the paradigm that defines an innovation as means to enhance the competitiveness of enterprise. Thanks to the efforts of scientists, corporate managers and owners of capital can now choose from a variety of management tools to measure the innovation and success of the enterprise. In this paper, the methodology of Croatian Innovation Score (in Croatian: Hvatski Kvocijent Inovativnosti - HKI) is applied to assess the condition and the activities undertaken in order to build innovation capacity, and an assessment of the perception of innovation at the enterprise level, whereas the methodology of BEX index (Business Excellence Index) was used to measure business excellence of an enterprise. Applying the methodology on a sample of large manufacturing companies from Bosnia and Herzegovina, the composite innovation indices and business excellence indices were first calculated. The standard multiple regression has been applied to explain the relationship between innovation and business excellence of an enterprise. The results obtained in this research are encouraging and stimulating for the managers of the studied companies to strengthen the innovation capacity in order to advance on the business excellence ranking scale.

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1. INTRODUCTION

This paper is based on the presumption that the implementation of innovation positively affects the financial performance of companies that are being assessed for their business excellence. In their research, Tidd, Bessant & Pavitt (2005) point out that companies which implement innovations in order to improve their processes and differentiate their products / services are significantly ahead of their competition in terms of market share, profitability, companies' growth, and net income. Urban and Hauser (1993) highlight innovation as being essential for creating a competitive advantage and company's subsistence, although innovation is at the same time extremely risky activity that constantly requires enormous financial and human resources. Bearing all the above in mind, the managers' task is to ensure the continuity of innovation. However, in order to reduce the business risks of investing in innovation they also need information about the efficiency and effectiveness of resources that the company has invested in the innovation process. Synchronization of innovation capacity development, strategy options, processes and innovation models not only considerably contribute to the risk reduction of investing in innovation, but it also leads to achieving company's business excellence.

In this study, authors analyze the relationship between innovation and business excellence of large manufacturing companies from Bosnia and Herzegovina using the methodologies established by Croatian scholars that have been tested on Croatian companies (Antoljak, Mitrović et al., 2011; Belak & Aljinović, 2008). The study comprises 36 large manufacturing companies for which their composite index of innovation will be calculated so as to pre-calculate summary data for innovation capacity categories, innovation processes and strategies and for innovation results. Composite index of business excellence (BEX) is to be calculated for the sample companies. Business Excellence Model (BEX) evaluates the existing and expected business excellence. Hereafter, the paper explores the correlation between innovation and company's business excellence by using the HKI and BEX indices.

The main objective of this paper is, using standard multiple regression, to determine the correlation between innovation and business excellence of large manufacturing enterprises in B&H based on composite innovation and business excellence indices, operationalized according to HKI (innovation) and BEX (business excellence) methodology.

The aim of this paper is to research the degree of innovativeness of companies in Bosnia and Herzegovina and to give an answer to the following research question: *"Are innovative companies achieving excellence?"* The main research problem is insufficient previous research into the degree of innovativeness of the companies in Bosnia and Herzegovina, as well as non-existing systematic measurement of the influence of innovations on companies' business excellence.

2. THEORETICAL FRAMEWORK AND RESEARCH HYPOTHESES

There are different concepts of measuring the impacts of innovation implementation on company's performance, primarily the financial ones, and these include: sales per employee, export per employee, rate of sales growth, total assets, number of employees, profit margin of the core business, return on investment, etc. (Archibugi & Sirilli, 2000). The most commonly used performance measures for assessing the effects of innovation are: productivity, sales, export, return on invested capital and the number of employees (Lööf et al., 2002, Bessler & Bittelmeyer, 2008).

Many studies have confirmed the positive relationship between innovation and company's performance. Lööf (2000) analyzed the existence of a positive relationship between innovation output, which was measured as the amount of sale of new products per employee, and five indicators of company's performance: increase of the total number of employees, value added per employee, sales per employee, profit per employee and return on assets. Positive relationship for all five indicators has been confirmed.

However, *not all studies yielded the same results.* In their study, Klomp and Van Leeuwen (2001) confirmed a positive relationship between innovation output and sales growth, but could not confirm the connection between innovation output and increase in the number of employees. Bessler and Bittelmeyer (2008) argue that, by implementing innovation, companies achieve competitive advantage only in the short period, which is consistent with Schumpeter's "creative destruction" thesis.

Several authors have studied the degree of innovation implementation in the countries that recently joined the European Union, as well as in countries in transition. Masso and Vahter (2007) have concluded in their study that innovative companies and costs for innovation activities are in a positive correlation with the companies' foreign market orientation, the presence of legal

institutions, responsible for innovation protection, and access to national subsidies. Furthermore, their study noted that larger companies tended to introduce more innovations, while sources of funding presented significant barriers for enterprises to undertake innovation activities. They found that innovations of processes had a positive effect on company's performance in terms of productivity, but innovations of products did not seem to have that effect. Studies conducted in various transition countries have reached similar conclusions. Roud (2007) researched companies in Russia. He came to the conclusion that the size of the company and the availability of subsidies had a positive effect on decision-making regarding investing in innovation. He also showed that innovation positively affects the productivity of companies, whereas the company's size has a negative impact. The results of many studies indicate that the innovation presents a phenomenon that is determined by a great number of factors (Crespi, 2004).

Following the results of the abovementioned studies, the working research hypothesis is formulated:

Hypothesis: A higher degree of innovation within an organization significantly determines its business excellence.

The degree of innovation in organization, as an independent variable, is measured using the methodology of Croatian Innovation Score (in Croatian: *Hrvatski Kvocijent Inovativnosti – HKI*). Research methodology of HKI employs a combination of best practices to research innovation. HKI assesses the condition and the activities undertaken in order to build the company's "capacity to innovate" and it evaluates the perception of innovation at the enterprise level. The survey estimates innovation capacity and company's innovation in the broader sense of the term, and partly reviews the data related to the implementation of R&D activities. The questionnaire is an essential tool of this research and it consists of 29 questions divided into three groups. The questionnaire used for research purposes of HKI is a standardized one.

Business excellence, the dependent variable, is measured by applying the methodology of Business Excellence Model (BEX). Business Excellence Model (BEX) enables quick and easy assessment of company's business excellence. It illustrates and measures business excellence of a company in two dimensions and those are: (a) current business excellence (the lagging dimension), (b) expected business excellence (the leading dimension). Financial indicators used to estimate the actual company's performance results are: profitability, value creation, liquidity, and financial strength. BEX index is not dependent on the

indices from the capital market, but it contains an entirely new indicator (index) - the financial strength of the company. The overall business excellence is estimated via BEX index as it follows: (a) a company is qualified as *good* company if the value of BEX index is greater than 1, (b) a company is qualified as *needs improvement* if the value of BEX index is between 0 and 1, (c) if the resulting value is negative, the company's existence is qualified as *endangered*. This type of company classification on the basis of BEX has been statistically confirmed by empirical testing of historical data. Business excellence implies an excellent performance resulting from key activities.

3. METHODOLOGY

3.1. Sample and data sources

Empirical research has been carried out on a number of large enterprises in B&H for which reliable data relating to the number of employees and financial performance were provided. Proportional stratified sampling method was applied to conduct the research. Large and medium-sized enterprises dominate the economic structure of B&H in terms of employment share, ownership of fixed assets and realized income. On the other hand, when compared with large and medium-sized businesses, small businesses are faced with a number of problems regarding the innovation. Firstly, the resources at their disposal, e.g. money or adequately trained staff, are to a great extent limited. A major problem arises from the lack of constant income from the existing products, the so-called cash cows, which would enable the transition to entirely new products and markets.

Enterprises in B&H are classified in accordance with the laws of administrative units, namely in B&H there are two entities plus Brčko District, which imposes a considerable problem in identifying clusters of companies of a certain size. The presence of two separate legal systems in both entities, the Federation of Bosnia and Herzegovina and the Republic of Srpska, further complicates the problem of identifying clusters of companies of a certain size, in our case large enterprises. Pragmatic reasons regarding data availability have prompted us to use the classification of companies in accordance to the Law on Accounting and Auditing of the Federation of Bosnia and Herzegovina (*Official Gazette*, No. 83/09) and the Small and Medium-sized Enterprise Development Act of the Republic of Srpska (*Official Gazette of the Republic of Srpska*, No. 67/05). According to these laws, legal entities are classified depending on the average number of employees, total annual turnover and fixed assets value determined on the date of the financial statements in the financial year. Business

entities must meet at least two of the above mentioned three criteria depending on the legally prescribed framework. According to the criteria listed and in accordance with the laws stipulated, in B&H there are 286 large companies operating in the economic activities.

The survey covered only active companies listed in the Statistical Business Register (SPR) which is run and administrated by the Agency for Statistics of Bosnia and Herzegovina in cooperation with the Federal Office of Statistics for the Entity of Federation of Bosnia Herzegovina, the Republic Institute of Statistics for the Entity of Republic of Srpska (RS) and Statistical Bureau of Brcko District[1]. The target population of this survey are manufacturing companies. The stratification of the target population was carried out in accordance with the entity to which the company belongs, company's classification according to the number of employees and business activities which are as follows:

- Section A – Agriculture – Level of Division (two codes KD B&H 2010),
- Section B - Mining and quarrying – Level of Division (two codes KD B&H 2010),
- Section C - Manufacturing – Level of Division (two codes KD B&H 2010),
- Section D - Electricity, gas, steam and air conditioning supply – Level of Division (three codes KD B&H 2010),
- Section E - Water supply; sewerage, waste management and remediation activities – Level of Division (two codes KD B&H 2010),
- Section F – Construction – Level of Division (two codes KD B&H 2010).

The population of this study consists of 134 major companies operating in the six areas of activity that make 46.58% of the total number of legal entities. The number of enterprises and population structure is shown in Table 1. The study was conducted on a sample of 36 companies. The sample had the characteristics of the proportionally stratified quota and random samples. Firstly, companies were organized into six areas, then the relative weighting factor of each area was calculated and multiplied by the sample size - as a result we obtained quotas for certain areas. Company's administrative entity (the Federation of B&H or RS) presented criteria for determining the number of companies of particular stratum for each quota. Thereafter, every company from

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[1] See: http://www.bhas.ba/?option=com_content&view=article&id=46&lang=en

a particular stratum (administrative entity) within the quota (business activity) is ensured an equal probability of being included in the sample.

Table 1. The structure of large manufacturing companies in B&H within the population and the research sample

Activity	Large companies in B&H		Sample of large companies in B&H			
	N	%	N	%	F B&H	RS
Manufacturing	82	61.20%	23	63.89%	20	3
Construction	16	11.90%	4	**11.11%**	4	0
Production and supply of electricity	14	10.40%	5	13.89%	1	1
Mining and quarrying	10	7.50%	2	5.56%	1	4
Agriculture	7	5.20%	2	5.56%	1	1
Water supply	5	3.70%	0	0.00%	0	0
Total number of manufacturing companies	**134**	**100%**	**36**	**100.00%**	**27**	**9**

The main tool for collecting primary data about the innovation of large companies in Bosnia and Herzegovina was a questionnaire. Starting points for content structuring of the questionnaire were research objectives, expected results, and the necessity for comparison with other relevant research of companies' innovation. The questionnaire used in this study was developed by the consulting firm Sense Consulting, the Croatian business magazine Lider and VERN University of Applied Sciences in Croatia. The questionnaire is designed to assess the level of innovation of Croatian firms - Croatian innovation score – Hrvatski kvocijent inovativnosti (in Croatian, abbreviated as HKI) (Antoljak, Mitrović et al., 2011). It measures the extent and level of company's innovation through the analysis of their *innovation capacities* (10 questions)*, strategies and procedures* (10 questions), *processes and models* (9 questions) that lead to the creation of innovation. At the time of a global economic crisis, when additional investments are rarely accessible, HKI provides companies with certain tools that in various business operations can help increase competitiveness, revenue, profit - and all this by increasing innovation.

The methodology that defines the company's innovation quotient is original and it relies on the practices from other studies with similar subject matter – e.g. the European Innovation Scoreboard and the Global Innovation

Index – as well as many other national and international studies on the innovation. Designed questionnaire was delivered to the sample companies.

Financial indicators essential for calculating company's BEX were collected and obtained by the Agency for providing financial, IT and intermediary services in the Federation of B&H (AFIP), which among other is in charge of receiving and processing semi-annual and annual statements of legal entities. The financial data for companies from RS were collected from BonLine's database (regional partner of Dun & Bradstreet), which allows subscribed users to access basic financial statements of legal entities for a period of five years. In addition, it provides a range of additional information services regarding the creditworthiness of legal entities. Financial indicators of BonLine's database were used to compare and verify financial indicators from AFIP's database.

4. RESEARCH RESULTS

4.1. Enterprise innovation

Companies included in the study provided answers to 29 questions. The answers reflected their views on the level of innovation through analysis of the state of their innovation capacities, strategies, procedures, processes, and models in the three-year period from 2009 to 2011. The previously described innovation methodology of HKI was applied to calculate both the overall innovation and the innovation of each of the three categories for all 36 companies. In the column "Name of the Company" companies' identification numbers were entered in order to protect the identity of the companies.

The best-rated company according to the quotient of innovation in this study achieved 84 out of a maximum of 116 points and it operates in the field of generation and supply of energy. A total 72% of the companies included in the survey identified innovation as being among the top three priorities of the business operations. Nearly 80% of companies that participated in the survey consider themselves to be innovative and claim to be perceived as such by their partners, customers and suppliers.

Innovation capacity is the ability to carry out innovation activities and to develop potential for creating innovation. In order for this potential to fully develop it is essential to constantly upgrade and develop the innovation system based on innovative employees, innovative procedures, processes, organization, culture, and innovation strategy. In addition, 47% of surveyed companies noted

that they did not have any organized system for motivating employees to create new ideas and forward it to management, but rather that the ideas were a result of spontaneous processes. However, the ideas that arise spontaneously are very often not exactly what the company needs for a particular area. Thus, it is motivation that should encourage an employee to come up with an idea for an exact issue. Furthermore, 27% of companies stated that there is no mention of innovation in their employment contracts.

Examples of leading companies in the world with the most developed systems of innovation suggest that one of the key factors for the development of an innovative enterprise is a clearly organized system with an appointed officer in charge, i.e. a Chief Innovation Officer. In terms of innovation capacity of enterprises and with regards to the source funding for the development of innovation, 57% of companies stated that funding for innovation development comes solely from their own resources.

Moreover, the evaluation of ideas and innovation within the organization is very important for the development of innovation. Implementation of the rewarding system greatly motivates employees who are then more willing to offer new ideas and to take part in building a corporate culture that values innovation. According to the research, more than half of the companies reward innovations solely with salary increase, bigger bonuses or one-time cash prizes. Practice shows that proposing new ideas and creating an organizational culture that stimulates creativity and innovation in all the areas of a company is best encouraged through a combination of tangible and intangible rewards. This type of a system is used by 8.3% of the surveyed companies.

Innovation processes and innovation strategies are closely intertwined and they point out the way a company develops its innovations and illustrate whether the innovations are a part of the business planning and thinking or they occur unintentionally. While innovation processes ensure a transparent and organized system within an organization, innovation strategy provides guidelines and strategic framework for the systematic development of innovation, thereby ensuring greater efficiency in achieving the desired innovation results, namely in the implementation of innovation.

A total of 83% of companies indicated that they conducted independent research activities, whereas 52% of companies reported that they carried out their own development activities. Innovation meetings with a goal to design innovation and to improve business processes are held once a month in 39% of the surveyed companies, while meetings with the goal to improve business

processes are held once a week or more often in 36% of the surveyed companies. According to research results, 42% of companies identified the strategy of innovation as the integrated part of the overall business strategy, that is as such known to all employees, while 6% of companies reported not having any development strategy of innovation.

Observing the **results of innovation** it should be underlined that the investigation into innovations implies a long-term period but they eventually have to result in the form of new or significantly improved products / services, processes, procedures and business methods in different business areas and organizational aspects. On the basis of this research it is clear that most companies do not have their own research and development program, they hope to have a *lucky break* while trying to succeed.

Numerous studies have shown that companies that invest in R&D have a greater competitive advantage, better profit, greater market share, as well as better chances of survival on the market (Ettile, 2006; Hsieh, Mishra, Gobeli, 2003; Wöhrl, Hüsig, Dowling, 2009). The resources of each company are limited so before investing in research and development it is necessary to carry out an analysis of return on investment.

Management makes a decision about which projects to invest in and decides how the success of the R&D is measured. In addition, R&D is important since it takes time to develop a product of whose necessity a customer is not yet aware of (Ettile, 2006). There is no universal rule in managing the R&D, nor are there any mathematical algorithms that will ensure success. Every company is unique and as such operates in its own specific environment. By increasing innovation capacity and improving innovation processes, companies create a predisposition for the development of a number of new products, and thereby gain better prospects for their commercialization, while making products of innovation the foundation of their business organization.

4.2. Business excellence

Financial indicators for every company in the sample have been calculated applying the methodology of BEX in the following way.

The profitability indicator (ex_1) is measured by the ratio of annual earnings (consisting of interest and profit before tax) and capital (measured by total assets).

$$(ex_1)\,PROFITABILITY = \frac{EBIT}{TOTAL\ ASSETS}$$

Indicator of value creation (ex2) is based on the ratio of the actual company earnings and earnings which could be achieved by investing in a second best option. It takes into account equity and price of capital, i.e. interest rate a company would gain on an endowment. The interest rate of 4 % was calculated in this study. If the value of the indicator (ex_2) is equal to 1 or higher the company is creating value.

$$(ex_2)\,VALUE\ CREATION = \frac{NET\ BUSINESS\ PROFIT}{EQUITY\ CAPITAL\ x\ PRICE}$$

Indicator of corporate liquidity (ex3) is measured using classical index of working capital ratio to total assets. Limit liquidity measure totals 25 % of working capital relating to assets. The company is considered to be liquid if liquidity measure is 25%, or higher.

$$(ex_3)\,LIQUIDITY = \frac{WORKING\ CAPITAL}{TOTAL\ ASSETS}$$

Indicator of financial strength (ex4) is based on the ratio of theoretically free cash flow from all the activities, i.e. the profit increased by amortization and depreciation, and coverage of all liabilities from this money. In this model, the maximum value of this indicator is limited to 10 as the additional research has indicated that shortening of time for covering liabilities from profit and amortization to less than 6 months no longer has a significant effect on excellence.

$$(ex_4)\,FINANCIAL\ STRENGTH = \frac{5\,(PROFIT + D + A)}{TOTAL\ LIABILITIES}$$

The weighting coefficients for each indicator are determined by the authors of the BEX methodology, and then added up to calculate the Business Excellence Index over the three years. BEX index is calculated by applying the following mathematical expression:

$$BEX = 0{,}388\,(ex_1) + 0{,}579\,(ex_2) + 0{,}153\,(ex_3) + 0{,}316\,(ex_4)$$

The ranking of business excellence is determined by the range of BEX index value and is based on the indicators from the previous table where

companies are systematically classified into categories of business excellence ranking over the period of three years, as illustrated in Table 2.

Table 2. The dynamics of companies according to business excellence ranking over the 3-year period

Business excellence index (BEX) value	Business Excellence Ranking	Number of large companies		
		2009	**2010**	**2011**
Higher than 6.01 four years consecutively	World class			
Higher than 6.01	World class candidate	3	3	3
4.01 - 6.00	Excellent	3	6	5
2.01 - 4.00	Very good	8	6	10
1.01 - 2.00	Good	9	10	8
0.00 - 1.00	Marginal area	11	9	9
Less than 0.00 (negative)	Poor	2	2	1

Measured indicators taken into account were calculated for a relatively short period of time of three years, and as a result of that none of the companies ranked as world class. However, considering the leading trend there is a great chance that at least two out of three companies currently ranked as world class candidate will in the next two years achieve world class ranking. The number of companies ranked as excellent and very good has significantly increased in 2011 in comparison with 2009 which suggests that if the management continues with improvements these companies can expect to keep the same ranking or gain a better one in the next three years.

A significant number of large companies in the sample ranked good but with pronounced downward trend in the last year. For this reason, the management of these companies should start with improvements in order to maintain the achieved ranking or even to achieve higher business excellence ranking.The number of companies ranked as marginal area has decreased but nevertheless these companies still dominate in the sample of large companies in B&H. The management of these companies is urged to take actions to address the areas of improvement in order to upgrade business performance and avoid serious business crisis.

In 2011, only one company ranked as poor and its existence is endangered. Urgent restructuring and upgrading is needed, otherwise poor business operation will continue which will endanger its survival (the probability is over 90 %). In addition, this study has resulted in some very important findings and the most significant ones are noted as following:

- 72% of large manufacturing companies from B&H included in the study stated innovations as being among the top three business priorities;
- 80% of the companies regard themselves as innovative and claim to be perceived as such by their partners, customers, suppliers;
- The best rated company operates in the field of generation and supply of energy, but is still very far from achieving the preferred level of innovation accomplishing only 72.41% of the maximum number of points;
- 57% of companies finance their innovation development solely from their own resources;
- 42% of the surveyed companies indicated that the strategy of innovation development is an integrated part of the overall business strategy, and as such is recognized by all the employees;
- Most companies do not have their R&D program and they hope for a *lucky break* while striving for success;
- Most companies have maintained their business excellence ranking from the previous year through the activities aimed at innovation improvement undertaken by managers, but a number of companies have progressed in the second and third year;
- 50% of the companies studied realized business excellence index value lower than 2 in the third year of the period covered, which ranks them as *good* and lower;
- Only 8.33% of the companies achieved BEX value higher than 6, and they are accordingly ranked as - A (candidate for *world class*).

4.3. Reliability of the innovation measurement scale and construct relationship

Although research in innovation of organizations in Bosnia and Herzegovina is not as nearly developed as in most European countries, due to their undoubtable economic significance, this region is also starting to sense the need for a more comprehensive and overall scientific analysis. However, surveys conducted so far differ significantly in terms of the degree of scientific substantiating, the types of research methods used and the reliability of the results obtained. This diversity has enabled an insight into a wide range of factors that, in our study, proved to be of significance in determining the reliability of innovation in organizations. Furthermore, the heterogeneity of previous results has helped to identify some potential sources for error and one-sidedness resulting from the lack of scientific foundation in research, or some other reasons that occur despite the proper application of the scientific method.

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Decision-makers ask for more and more information while trying to make successful decisions. Hence the constant need to improve the quality of the statistical data collected. This applies to different areas of research, as well as to the monitoring of various indicators of social and economic development.

In many of the SPSS statistical procedures, there are different ways of dealing with missing values. For the purposes of statistical analyses, the exclude cases pairwise option was used, which implies that the case (the company) will be excluded only from those analyses for which some essential information are missing. Thus, these cases will be analyzed too when possible, i.e. when there is a certain minimum amount of data for the analysis.

The reliability of the measurement scale (questionnaire) indicates the extent to which it is free from random errors. There are several indicators of reliability. The method of internal consistency was applied in this paper. Internal consistency is the extent to which all of the test items measure the same latent variable/construct.There are several ways to measure internal consistency but it is most commonly measured with Cronbach's alpha. Cronbach's alpha shows the average correlation of all the values on the scale. For a small number of items (questions) on the scale (less than 10), alpha is sometimes low. In that case, the mean inter-item correlation is calculated and noted in the survey. The average mean inter-item correlation on a scale normally ranges between 0.2 and 0.4. If the questionnaire contains negatively formulated items, they must be converted into affirmative form before reliability test, otherwise Cronbach's alpha is low (incorrect). In this study, measurement scale (questionnaire) consists of 29 items, for which reliability was calculated.

First, the number of sample units (companies) and the number of items (questions/variables) have to be determined. Reliability analysis of the measurement scale for the established hypothesis comprises of all 36 companies.

Table 3. The reliability of the measurement scale of innovation

Cronbach's Alpha	Cronbach's Alpha based on Standardized Units	Number of items in a scale
0.8155	.807	29

The acceptable alpha coefficient value is above 0.7, whereas the optimal alpha is higher than 0.8. In our example, Cronbach's alpha is 0.8155, which indicates excellent reliability and internal consistency of the scale (the 29-item scale). The column *Item (Question) – Scale Correlation* lists values that indicate

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the extent of correlation for each variable, i.e. each question, with the total score. A value lower than 0.3 indicates that it is possible that the variable is measuring something different from the scale. In our case, most of the parameters are higher than 0.3. If the coefficient alpha of the scale is low (less than 0.7) and all data errors have been removed, it is recommended to delete all the items with low value of the Item-Total Score correlation. The Column *Alpha if question is deleted* illustrates the impact of removing any item from the scale on the alpha value. If any value in that column is higher than the final alpha (0.815), that item should be removed from the scale, as this would increase the alpha coefficient. At the other hand, removing items from the existing scale will prevent you to compare your results with other studies that have calculated these items. In our case, apart from the first question, there is no other value that is significantly higher than 0.815, therefore all items (questions) are included into the further analysis.

In this study, the standard multiple regression will be employed. The underlying assumptions of multiple regression are the following: representativeness of the sample, multicollinearity, singularity, normality, linearity, homoscedasticity, error independence, and outliers. Multiple regression estimates the proportion of variance in the dependent variable that can be explained by the independent variables. It also shows the relative contribution of each independent variable.

Table 4. Model – summary indicators

Multiple Correlation Coefficient	Coefficient of determination	Standard Error of the Estimate
0.904	0.817	2.82031

In the table above, correlation coefficient r=0.904 confirms a very strong correlation between the observed variables. The coefficient of determination, r-squared of 0.817 indicates the proportion of the variance in the dependent variable (BEX value for 2011), that can be explained by the model. This means that our model accounts for 81.7% of the variance of the dependent variable of BEX value in 2011 for 36 companies studied.

5. CONCLUSION

On the basis of the obtained empirical results, the hypothesis can be accepted, which is best supported by the correlation coefficient and coefficient of determination values, as well as by other results obtained and presented in this paper.

The paper clarifies a number of practical issues, related to the reliability of the scale for innovation, thus establishing propositions for practical research into various fields, for which it is necessary to determine the level of results validity, reliability and to calculate to what extent they can represent a basis for making right business decisions. Determining the correlation between research and representative results of the observed indices provides an excellent opportunity for a thoughtful assessment of scientific methods applied, and for identifying possible sources of error that reduce the reliability of the obtained results. The preliminary results in this paper are encouraging for further research. With regards to this, future research should focus on the following analyses: the reliability of particular sets of questions of innovation scale, dynamics of correlation between the observed indices for a certain period of time (e.g., 2009-2011), hierarchical (sequential) multiple regression and correlation of aggregate values.

All these results suggest that large manufacturing companies in B&H have many opportunities to develop their own innovation capacities, processes and strategies, inasmuch as they first establish a systematic approach towards innovation and idea creation along with realizing that spontaneity alone does not create quality mechanism for the development of innovation capacity.

Similar results were shown by a recent study of Croatian Innovation Score (HKI), carried out by Antoljak, Mitrović et al. (2011). They concluded that small enterprises have best recognized the importance of innovativeness for achieving competitiveness on the market, while at the same time medium and large enterprises need to focus more of their efforts on reducing time required for launching new products and services on the market (time-to-market). The same research also reveals that only one third of enterprises has established systematic innovation process – from basic idea to commercialized product – which means that a very small part of enterprises has significant share of their revenues generated by new products and services sales.

The main recommendation for large manufacturing companies in B&H is to firmly commit to strengthening innovation capacity on their path towards the establishment of innovative company. On this path it is essential to constantly evaluate the achieved level of business excellence in order for investments in innovation to be efficient and effective, and as such to pave the way towards achieving the competitiveness of the company in the target markets.

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ULOGA ORGANIZACIJSKE INOVACIJE U POSTIZANJU I ODRŽAVANJU POSLOVNE IZVRSNOSTI PODUZEĆA

Sažetak

Dinamičnost suvremenog okruženja i njegovih karakteristika su uvelike potaknuli istraživanje djelovanja inovacija na rezultate poduzeća, s obzirom na paradigmu, koja promatra inovaciju kao način za unapređenje konkurentnosti poduzeća. Zahvaljujući rezultatima znanstvenog istraživanja, menadžeri i investitori mogu birati između velikog broja menadžerskih alata, kako bi mjerili inovacije i uspješnost poduzeća. U ovom se radu koristi metodologija hrvatskog kvocijenta inovativnosti (HKI), kako bi se procijenili uvjeti i aktivnosti izgradnje inovacijskog kapaciteta, kao i procjena percepcije inovacija na razini poduzeća. Metodologja Business Excellence Index (BEX) se koristi za mjerenje poslovne izvrsnosti poduzeća. Koristeći opisanu metodologiju na uzorku velikih proizvodnih poduzeća iz Bosne i Hercegovine, izračunati su kompozitni indeksi inovacija i poslovne izvrsnosti, nakon čega je na njih primijenjena standardna multipla regresija. Na ovaj se način objašnjava povezanost između inovacija i poslovne izvrsnosti poduzeća. Rezultati istraživanja su ohrabrujući i stimulirajući za menadžere analiziranih poduzeća, a kako bi povećali svoj inovacijski kapacitet te napredovali u ostvarenju poslovne izvrsnosti.

APPENDIX

*Table 1. Composite Innovation Index of large manufacturing companies
in the B&H sample*

Name of a company/ ID Number	Total HKI (max 116)	Category		
		Innovation capacity	Innovation process and strategy	Innovation results
4272126030007	62	1.4	2.6	2.4
4272031910000	62	1.4	2.6	2.4
4272019110006	66	1.8	2.3	2.8
4236004800000	52	1.1	2	2.3
4227018430001	43	1.2	1.5	1.8
4272029000004	64	1.6	2.5	2.6
4227248350007	84	2.1	3.8	2.8
4272072270007	82	2.1	3.8	2.6
4272016790006	79	2.2	3.5	2.4
4245044170008	78	2	3.4	2.7
4209133550004	75	2.1	3	2.7
4400842150003	71	1.9	2.6	2.9
4236098430006	72	2.2	2.7	2.6
4227003590002	70	1.6	3	2.7
4227040010008	69	2.4	2.7	2.0
4245001870006	69	1.9	2.8	2.4
4272070570003	62	1.7	2.8	1.9
4227112960006	68	1.7	2.9	2.4
4272071200005	67	2.4	2.3	2.2
4400263550008	65	1.8	2.3	2.7
4272079280008	63	1.8	2.4	2.3
4227169640008	62	2.1	2.3	2.0
4272048050004	68	1.4	2.9	2.8
4209339500003	54	0.9	2.5	2.2
4227031530007	60	2.3	1.5	2.4
4200934630002	55	1.8	1.9	2.0
4281104300000	52	1.3	2.2	1.9
4227207670005	49	1.5	2.1	1.4
4400408540006	38	1	1.2	1.8
4236097460009	67	1.6	3.1	2.2
4400794320007	34	1.2	1.1	1.2
4400106370004	61	1.7	2.8	1.8
4401006950000	66	1.7	2.9	2.2
4400570050004	64	1.9	2.9	1.8
4401387900003	65	1.1	2.7	3.0
4401354720000	42	1.2	1.5	1.7

Table 2. Business excellence index and ranking of large manufacturing companies in B&H in 2009, 2010, 2011

Company ID	2009		2010		2011	
	BEX	Business Excellence Ranking	BEX	Business Excellence Ranking	BEX	Business Excellence Ranking
4272126030007	5.22	Excellent	3.41	Very good	4.41	Excellent
4272031910000	3.73	Very good	7.49	World class	2.96	Very good
4272019110006	1.79	Good	2.30	Very good	2.04	Very good
4236004800000	1.01	Good	0.84	Marginal area	0.63	Marginal area
4227018430001	0.22	Marginal area	3.77	Very good	2.77	Very good
4272029000004	1.62	Good	1.61	Good	1.17	Good
4227248350007	0.77	Marginal area	1.11	Good	0.03	Marginal area
4272072270007	5.30	Excellent	5.63	Excellent	11.84	World class
4272016790006	2.31	Very good	1.96	Good	1.97	Good
4245044170008	2.05	Very good	1.80	Good	1.64	Good
4209133550004	1.75	Good	4.95	World class candidate	5.33	World class candidate
4400842150003	1.18	Good	0.53	Marginal area	0.51	Marginal area
4236098430006	0.34	Marginal area	0.79	Marginal area	1.32	Good
4227003590002	2.65	Very good	2.75	Very good	2.76	Very good
4227040010008	3.72	Very good	1.85	Good	2.33	Very good
4245001870006	1.75	Good	3.78	Very good	3.72	Very good
4272070570003	1.80	Good	4.16	Excellent	3.71	Very good
4227112960006	0.38	Marginal area	1.77	Good	1.26	Good
4272071200005	0.58	Marginal area	1.31	Good	3.70	Very good
4400263550008	2.85	Very good	4.39	Excellent	6.91	World class candidate
4272079280008	1.24	Good	0.64	Marginal area	0.92	Marginal area
4227169640008	0.47	Marginal area	0.73	Marginal area	0.82	Marginal area
4272048050004	0.89	Marginal area	0.47	Marginal area	0.42	Marginal area
4209339500003	0.70	Marginal area	1.49	Good	1.00	Good
4227031530007	7.83	World class candidate	9.03	World class candidate	8.41	World class candidate
4200934630002	2.50	Very good	2.83	Very good	2.88	Very good
4281104300000	7.58	World class candidate	5.19	Excellent	4.72	Excellent

4227207670005	-3.37	Poor	-0.93	Poor	0.34	Marginal area
4400408540006	0.14	Marginal area	-0.81	Poor	-3.63	Poor
4236097460009	5.16	Excellent	4.85	Excellent	4.97	Excellent
4400794320007	2.82	Very good	1.89	Good	2.49	Very good
4400106370004	6.15	World class candidate	6.56	World class candidate	5.15	Excellent
4401006950000	-0.33	Poor	0.43	Marginal area	0.39	Marginal area
4400570050004	0.49	Marginal area	0.43	Marginal area	1.38	Good
4401387900003	0.02	Marginal area	0.68	Marginal area	0.60	Marginal area
4401354720000	1.14	Good	1.44	Good	1.43	Good

Table 3. Statistics of questions and Cronbach alpha statistics

	Scale Mean if item deleted	Scale Variance if item deleted	Item-scale correlation	Alpha if item deleted
VAR00001	60.17	136.771	-0.1305	.832
VAR00002	61.14	128.523	0.2669	.812
VAR00003	61.44	136.025	-0.1554	.821
VAR00004	61.94	125.483	0.4026	.807
VAR00005	60.81	130.961	0.1178	.818
VAR00006	61.06	124.397	0.5792	.803
VAR00007	62.00	130.514	0.3008	.812
VAR0008	61.69	132.790	0.1520	.815
VAR0009	60.50	117.514	0.4756	.803
VAR00010	60.06	124.683	0.3942	.807
VAR00011	61.08	124.136	0.4166	.807
VAR00012	61.08	125.221	0.4279	.807
VAR00013	59.92	119.393	0.5103	.802
VAR00014	59.31	128.447	0.2950	.811
VAR00015	60.56	115.168	0.4665	.804
VAR00016	59.53	128.142	0.3138	.811
VAR00017	59.72	129.406	0.2830	.812
VAR00018	60.00	116.571	0.5509	.799
VAR00019	60.06	115.997	0.7038	.793
VAR00020	61.22	118.235	0.7041	.795
VAR00021	59.81	125.361	0.3646	.809
VAR00022	60.03	134.485	-0.0401	.824
VAR00023	62.31	132.561	0.0920	.817
VAR00024	61.53	130.942	0.1259	.817
VAR00025	60.50	133.171	0.0601	.818
VAR00026	60.53	124.256	0.3465	.809
VAR00027	60.33	129.600	0.1310	.819
VAR00028	59.61	123.559	0.5454	.803
VAR00029	59.86	118.352	0.7000	.795