Innovating Organizations in the Czech Republic and Utilization of the Innovative Potential of Human Resources

Erika Urbankova and Ekaterina Mikhalkina

***Abstract*—The modern era is characterized by its dynamics, frequent changes, open economies, technological development and the transfer of information. A significant role in the area of success and competitiveness of organizations in national and international markets is played by innovating activities. This requires successful integration of human resources into those activities. The article focuses on the analysis of the share of innovating and non-innovating businesses on the market in the Czech Republic out of the total of active organizations within the period of 2008-2010. In connection with that, the article focuses on the types of innovative activities, the motives and factors leading organizations toward innovative activity. The article includes the analysis of methods for the encouragement of creativity and the development of innovative potential among employees according to the size of innovating and non-innovating businesses in the Czech Republic.**

***Index Terms*—Czech republic, innovation, human resources, organizations, human capital, statistical method.**

I. Introduction

Within a centrally planned economy, the economy of the Czech Republic was focused primarily on heavy industry. In the 1980's, the state sector had a 97% share of the production of the economy. With the transformation of the economy from centrally planned to a market economy and with the creation of the private sector, new jobs were created, which absorbed a large portion of the labor force. Within the last decade, significant differences have existed between sectors in terms of productivity; the processing industry and the services sector have played a dominant role. Innovative activities of companies (the chemical industry, the development of nanotechnologies) are becoming the current trend; an emphasis is placed on the area of ecology and a careful approach in regard to the environment (ecological agriculture and organic foods, a significant potential for diversification of agricultural activities – plant production for the manufacture of ecological fuels, for the production of heat and electrical energy, biomass, agricultural tourism, etc.), and, at the same time, companies are expanding onto new markets – primarily eastern countries such as Russia, China, Vietnam, Romania, etc.

II. Theoretical Basis

Human capital defined by V. Bures contains all of the knowledge, abilities, competency, expertise and creativity of the employees of an organization [3]. Experts concur that the people in an organization represent wealth and an asset, the development and utilization of which it is appropriate to invest in from a long-term standpoint. Human capital is associated with the transfer of information and implicit and explicit knowledge within a business. According to M. Armstrong, an organization must achieve its objectives through innovativeness and increasing the productivity of all of its key resources [1]. J. Bartak perceives the systematic education of human resources as a decisive tool for innovative processes, whereby such education also satisfies the human need for self-realization and recognition [2].

The Czech Statistical Office defines innovative/innovating businesses (organizations) as those which have introduced product innovation or process innovation (comprising technical innovations) or have introduced marketing innovation or organizational innovation (comprising non-technical innovations). Non-innovative/non-innovating businesses are considered to be those that have not introduced product, process, marketing or organizational innovation. In the Czech Republic, innovations are divided up into technical and non-technical. Technical innovations include: product innovations and service innovations (the creation of a new product – nanotechnologies or a new service – internet banking, e-learning) and process innovations (the improvement of production methods, the use of new technologies). Non-technical innovations include: organizational innovations (for example, job reorganization, innovation of motivational tools, innovation in employee education) and marketing innovation (new product design). The public judges the third type of innovations, called ecological innovations (for example, organic foods, solar energy, eco cars, etc.), very positively [4]. According to E. Grublova, an innovating organization is characterized as follows: a shared vision among all employees; a mission and the will to innovate; a strong leader; effective team collaboration; shard knowledge; barrier-free communication; the willingness of employees to accept changes and to become involved in innovations; a pro-innovation culture; a learning organization and the development of the creative thinking on the part of human resources [5]. That means that the predominant role in organizations is played by a culture and top management supporting innovative activity as a normal, everyday activity among all employees. That is the environment of a business where creativity is supported, ideas are appreciated and innovations are rewarded. According to G. Hamel, a prominent advisor in the field of management, there are

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several deep-rooted myths in practice regarding innovation that are an obstacle in the development of innovative potential. They are the following myths: innovations only come from great thoughts; innovations only pertain to the creation of new products; innovations can only be created by employees from the research and development department; innovations are risky and costly [6].

III. Objective and Methodology

The objective is to analyze the share of innovating and non-innovating organizations on the market in the Czech Republic out of the total of active organizations within the period of 2008-2010. In connection with that, the article focuses on the types of innovative activities of organizations, motives and factors leading organizations toward innovative activity or, on the other hand, inactivity. The article includes an analysis of the methods for the encouragement of creativity and the development of innovative potential among employees according to the size of innovating and non-innovating businesses in the Czech Republic.

In the article, the statistical method of the x^2 is utilized, and by way of contingency Tables in the Microsoft Office Excel 2007 program. For the analysis of the strength of the correlation between the analyzed qualitative attributes, the Pearson contingency coefficient was used, reaching values of <0; 1>; the significance of the values is as follows: 0 to 0.1 negligible correlation; 0.1 to 0.3 weak correlation; 0.3 to 0.7 medium correlation; 0.7 to 1 strong correlation. The calculation of the Pearson contingency coefficient: $C = \sqrt{\frac{x^2}{n \oplus x^2}}$. Whether the analyzed correlation between qualitative attributes is statistically significant is ascertained by way of the x^2 test. Such test is based upon the difference between actual (empirical) frequencies n_{ij} and theoretical (expected) frequencies $n_{oj.}$ The zero (null) hypotheses H_0 of the non-correlation of the analyzed variables are tested against the alternative hypothesis H_1 of the correlation of the factors. The test criterion has the form: $\chi^2 = \sum\sum \frac{(n_{ij} - n_{oj})^2}{n_{oj}}$, where theoretical frequencies: $n_{oj} = \frac{n_i \times n_j}{n}$. The calculated value of the test criterion was compared with the critical value in statistical Tables $x^2_{\alpha(k-1).(m-1)}$, where k represents the number of variations of the first attribute and m the number of variations of the second attribute. If $x^2 \triangleright x^2_{\alpha(k-1).(m-1)}$, we rule out the zero hypothesis of the non-correlation of the factors. A pre-condition for the use of the x^2 test in contingency Tables is such that the proportion of theoretical frequencies lesser than 5 cannot exceed 20% and none of the theoretical frequencies can be lesser than 1 [7].

The main methods used for the scientific research can be considered to be the method of description, the method of statistical testing. In the processing of the article, statistical data and information of the Czech Statistical Office (CSU) and EUROSTAT formed the basis.

IV. Innovation in Czech Republic

Innovation activities in the Czech Republic are shown in Table I. In the Czech Republic within the analyzed period of 2008–2010, 51.7% of organizations innovated out of the total number of economically active entities; the proportion of non-innovating businesses thus comprised 48.3%. The leading position in terms of the number of innovations was held by organizations that have over 250 employees. The rule of proportion applies, that the smaller the organization, the lesser the willingness to engage in innovative activity. Foreign affiliations were more active in innovations than domestic businesses. Organizations tended to prefer innovations of a non-technical nature, i.e. marketing innovations (for example, a change in the design of a product) and organizational innovations (for example, job reorganization). It was foreign affiliations that focused on these types of innovations, and domestic businesses focused on the area of process innovations and product innovations.

TABLE I: Innovating and Non-Innovating Organizations in Czech Republic, 2008-2010

Businesses with innovative activities	Businesses with technical innovations	Businesses with non-technical innovations	Businesses without innovative activities
51.70%	34.80%	42.40%	48.30%

Source: Czech statistics office

TABLE II: Selected Factors Limiting Activity of Innovating and Non-Innovating Organizations, 2008-2010

Factors limiting innovative activity of organizations in the Czech Republic	Innovating organizations	Non-innovating organizations
Lack of financial resources within the business	30.8%	24.9%
Lack of qualified workers	10.8%	6.6%
Lack of information on technology	2.1%	3.3%
Lack of information regarding markets	2.5%	5.2%
Difficulties in seeking a collaborating partner	3.5%	4.8%
Uncertain demand for innovated goods or services	11.0%	9.0%
Innovations were not required	5.2%	25.1%

Source: data of the Czech statistical office, own processing

Information acquired from innovating as well as non-innovating organizations regarding limiting factors hindering their innovative activities is very helpful. After ascertaining the reasons that lead non-innovating organizations to inactivity, supporting measures can be put on the market for the elimination of de-motivating factors, to increase the ability and willingness to become an innovator. From data from the Czech Republic (Table II), it is evident at first sight that the most significant limiting factors are slightly different for innovating and non-innovating businesses. Innovating businesses consider the most significant limiting factor to be a lack of financial resources (30.8% of innovating businesses), and further, they mention a lack of qualified workers and uncertain demand for innovated goods and services. Non-innovating businesses also consider a lack of funds to be a significant limiting factor (24.9%), but 25.1% of those businesses mentioned the fact that innovation was not required as the

main factor limiting activity.

However, not only research institutions and universities are equipped with innovative potential and not only specialists and highly qualified workers represent a source of creative and innovative ideas for a business. A very valuable and oftentimes neglected source of creativity and ideas for a company are its own human resources on all levels of the business. Many innovative ideas come about specifically from their initiative, primarily process innovations in regular activities in businesses on operational levels. Tab III shows that innovating organizations focus on several types of methods that are to help the development of creativity among employees. Some of the methods function as a motivating factor. The method used most often among both types of organizations is financial motivation of employees, followed by stimulus by way of non-financial motives, brainstorming and employee training directly designed for the development of creativity.

TABLE III: METHODS FOR ENCOURAGING NEW IDEAS AND DEVELOPMENT OF CREATIVITY AMONG EMPLOYEES IN THE CZECH REPUBLIC IN INNOVATING ORGANIZATIONS FOR THE PERIOD OF 2008-2010

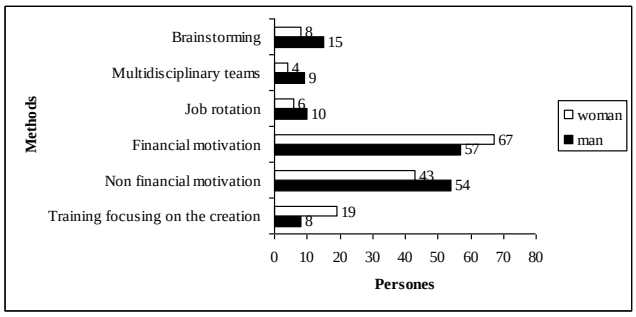
Brainstorming at meetings	47.9%
Multidisciplinary teams	27.6%
Regular job rotation within the business	11.5%
Financial motivation of workers	56%
Nonfinancial motivation of workers	46.1%
Employee training focusing on the development of creativity	43.6%

Source: Data Czech statistics office; own processing

On the basis of the ascertained methods for the encouragement of new ideas utilized in innovating organizations, a survey study was conducted among employees at a selected innovating business active within the processing industry. In the survey study, closed-end questions with only one possible answer were utilized, 300 employees were surveyed (of which 51% were men and 49% were women). The main objective of the survey study was to ascertain: a) which method employees consider to be the most effective in encouraging their creativity and innovative potential – whether the selection of the method depends on the gender of the respondent; b) whether employees are interested in the systematic encouragement of their creativity – whether interest depends on the level of education of the respondent.

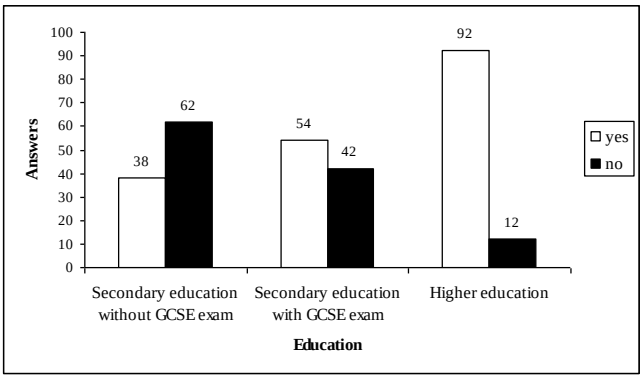
For statistical assessment, contingency Tables and the x^2 test were used. Zero hypotheses were set: a) H_0: The selection of the method for the encouragement of creativity does not depend on the gender of the employees; b) H_0: Interest in systematic encouragement of creativity does not depend on the education of employees.

The null hypothesis H_0 is determined as the selection of the method for the encouragement of creativity does not depend on the gender of the employee. Fig. 1 shows the empirical frequencies. The result of the survey study provided the following findings (Fig. 1): a total of 41.3% of respondents consider financial motivation to be the most effective method of encouraging their ideas; further, 32.3 % of respondents indicated non-financial motivation; further, 9% of respondents mentioned training focusing on the development of creativity; the method of brainstorming was mentioned as the most effective by 7.6% of respondents; team work is preferred by 4.3% of respondents and 5.3% indicated job rotation within the business as the most effective method.



Source: own calculation

Fig. 1. Actual frequencies - the favorite method for the encouragement of creativity



Source: own calculation

Fig. 2. Actual frequencies - interest in systematic encouragement of creativity

The null hypothesis H_0 is determined as Interest in systematic encouragement of creativity does not depend on the education of employees. Fig. 2 shows the empirical frequencies. In regard to the question of whether they are interested in systematic encouragement of their creativity, 68% of respondents replied positively and 32% of respondents replied negatively. Three levels of education were monitored – secondary school education without graduation, secondary school education with graduation, and university education. The greatest interest in systematic encouragement was seen among university-educated employees (88.5% of employees with a university education replied positively); these employees also very often indicated non-financial evaluation in addition to financial evaluation as the most effective stimulus. This was followed by employees with a secondary school education with graduation (56% of employees with a secondary school education replied positively) and after that, employees with a secondary school education without graduation (38% of employees with a secondary school education without graduation replied positively); these two groups of

employees very often indicated financial evaluation as the most effective stimulus.

Actual frequencies were arranged into contingency Tables and converted into theoretical frequencies. By way of theoretical frequencies, it was ascertained that the preconditions for the use of the test are fulfilled in the case of both hypotheses. Table IV sets out the calculated statistical values of the χ^2 test according to the formula set out in the methodology, the stipulated alfa significance level, critical Table value χ^2_α for 2 levels and for 5 levels of discretion and the Pearson contingency coefficient.

TABLE IV: RESULTS OF STATISTICAL ANALYSIS OF QUALITATIVE ATTRIBUTES

Statistical Indicator	H_0: Selection of Method to Encourage Creativity Does Not Depend on Gender of Employees	H_0: Interest in Systematic Encouragement of Creativity Does Not Depend on Education of Employees
χ^2	11,4735	67,46147
Significance level α	0.05	0.05
Critical value χ^2_α	15.1	9.21
Pearson contingency coefficient (C)	0,19193	0,428472

Source: own calculation in the excel 2007 program

A statistically conclusive correlation between the two attributes is examined by way of the χ^2 test. In the case of the zero hypotheses *"The selection of the method for the encouragement of creativity does not depend on the gender of the employees"*, the value of such test was 11.47. The critical value at a significance level of 0.01 for 5 levels of discretion is 15.1. In view of the fact that $\chi^2 \lhd \chi^2_{\alpha(k-1).(m-1)}$: we confirm H_0 and it can be said that the selection of the method for the encouragement of creativity does not depend on the gender of employees. The Pearson contingency coefficient is 0.19 - this is a weak direct correlation between the analyzed attributes. Women in the survey study preferred primarily financial stimulation, non-financial stimulation and creativity training. On the other hand, men often indicated financial and non-financial evaluation and brainstorming as the most effective method. In the case of the zero hypotheses *"Interest in systematic encouragement of creativity does not depend on the education of employees"*, the value of this test was 67.46. The critical value at a significance level of 0.01 for 2 levels of discretion is 9.21. In view of the fact that $\chi^2 \rhd \chi^2_{\alpha(k-1).(m-1)}$: we rule out H_0 and it can be said that interest in systematic encouragement of creativity depends on the education of employees. Pearson contingency coefficient is 0.42 - this is a medium direct correlation between the analyzed attributes. The statistical correlation between the analyzed attributes in the case of both hypotheses is proven with a 99% probability.

V. CONCLUSION

Despite the fact that innovation activities represent an improvement of the competitive position on the market of goods and services for an organization and increase the efficiency of organizations, the Czech Republic can be considered to be not very active in this area, so-called moderate innovators, who place below the EU average. The number of innovating organizations in the Czech Republic is 51.7%. Below the EU average are also countries such as Italy, Spain, Slovakia, Greece, and others. Above the EU average are countries such as Germany, France, Switzerland, Denmark and others. The willingness and ability of organizations to actively innovate has its basis primarily in the economy of a given state and support on the part of the government and research institutions. Countries such as Switzerland, Sweden, Germany, Denmark, USA and Japan are considered to be on the leading edge in innovations. Switzerland and Germany are improving their innovation results the fastest. The most successful innovation infrastructure is attributed to the Scandinavian countries, primarily Sweden and Finland. Here, they have created a flexible system that helps organizations in the implementation of innovative ideas and together they thus increase the competitiveness and efficiency of the entire economy. Primarily insufficient financial resources, an insufficient number of qualified workers, and an uncertain demand for products were mentioned as the main factors limiting innovation activities in innovating businesses. Among non-innovating businesses, the issue was primarily that of financing innovation activities and it was also very often mentioned that there was no impulse for innovations.

Qualified human resources are key for the transfer of professional knowledge and the creation of so-called revolutionary innovations (development of a new product, nano-material etc.), but organizations can draw upon ideas representing so-called evolutionary innovations (i.e. product development, process improvement) from all of their employees within the business. Through the utilization of human resources as a source of creativity and ideas, a business has, on the one hand, broad innovation potential available (can successfully introduce innovations into regular procedural processes, which improves efficiency and lowers costs for an organization) and, further, this leads to motivation for workers and their development, as employees better identify with the objectives of the business and participate in its growth. The method of financial evaluation, the method of non-financial evaluation, brainstorming and creativity training can be mentioned as the main methods utilized by innovating businesses for the development of creativity among employees. An example of one of many companies in the Czech Republic utilizing the innovative potential of all employees can be Škoda auto a.s., which actively supports creativity and creative activity among its employees. Employees of the said company have contributed ideas for decreasing costs for the operation of production machinery, savings of packaging material, the speeding up of some activities or savings of material necessary for production. Such innovative activity is recognized by the company, as in the year 2011 it provided the company with savings in the amount of approximately CZK 98 million. The company is planning more global development of innovative potential among its human resources and the involvement of a greater number of

workers in such activities. Employees can utilize an internal company information system, serving innovation purposes, for suggestions for improvement and savings in production.

A survey study among employees at an innovating company in the processing industry provided information about priorities among methods for the encouragement of creativity. Financial evaluation (41.3%) was indicated most often, then followed by non-financial evaluation (32.3%), and training focusing on creativity (9%). Through statistical testing of qualitative attributes, it was found that the selection of a method for the encouragement of creativity does not depend on the gender of employees. Women preferred primarily financial stimulation, nonfinancial stimulation and creativity training. Men often indicated nonfinancial evaluation, financial evaluation and brainstorming as the most effective method. Further, statistical testing of qualitative attributes showed that interest in systematic encouragement of creativity depends on the education of employees. The greatest interest in systematic encouragement was seen among employees with a university education (88.5% of employees with a university education replied positively); these employees also very often indicated nonfinancial evaluation as the most effective stimulus). This was followed by employees with a secondary school education with graduation (56% of employees with a secondary school education replied positively), and, after that, employees with a secondary school education without graduation (38% of employees with a secondary school education without graduation replied positively); these two groups of employees very often indicated financial evaluation as the most effective stimulus).

Innovations help organizations to maintain market shares, expand onto foreign markets, increase volume of production, speed of sales turnover, implement cost savings, increase productivity of employees, their participation and identification with the objectives of the company, acquire new customer segments and increase profitability. The achievement of higher competitiveness and efficiency of an organization enriches the market with differentiated products, lower priced products and higher quality products.

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REFERENCES

[1] M. Armstrong, *Management of Human resources*, Prague: Grada Publishing, 2007.
[2] J. Bartak, *From Knowledge to Innovation*, Praha: Alfa, 2008.
[3] V. Bures, *Knowledge management*, Prague: Grada Publishing, 2007.
[4] Czech Statistics Office. (2008-2010). *Innovation activities OD Enterprises in Czech Republic*. [Online]. Available: http://www.czso.cz/csu/2010edicniplan.nsf/p/9605-10
[5] E. Grublova, *Management of Changes and Innovations*, High school Olomouc, o. p. s., 2010.
[6] G. Hamel, *The Future of Management*, Prague: ManagementPress, 2009.
[7] L. Svatosova, B. Kaba, and M. Prasilova, *Sources and Business Data Processing*, Prague: Czech Agricultural University in Prague, 2006.

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