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Research paper

On the topic: **The influence of IC on the increase of probability of transition to the higher level of product novelty in small and medium enterprises. The case of Russia.**

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Abstract

The general purpose of this research is to figure out interaction effect between intangibles or intellectual capital components and product innovation in Russian SMEs of the manufacturing industry. The authors propose the new explanation of innovation capability and call into question the widespread belief that all factors of IC enable the company to elevate the innovation development of the main product. We pursue the aim not just to analyze whether intellectual capital factors affect innovation but to shed the light on the main factors which have the strongest influence and to assess what can be the predicted probability of transmitting to the higher level of innovation. The findings confirm that intellectual capital may either boost the probability or remain it at the same level without any significant changes. Thus, the authors anticipate that it will be a useful method for Russian managers and owners according to which they can weigh the benefits and costs and make decisions related to expanding its activity to the broader markets.

Keywords: intellectual capital; product innovation; emerging market; innovative SMEs; competitive advantage.

Introduction

Is it possible to increase the level of GDP by 50% without the rise of energy prices, multibillion investments from the budget or Chinese capital inflows? The analysts of Forbes magazine argue that the best way to accelerate the GDP growth is to convince the government of the Russian Federation to carry out some programs for small and medium enterprises. Despite all assumptions that huge multinational companies are the main force of national economy which enables it to accelerate capital inflows, technological innovations and to attract foreign investors, current target of the government is to change the focus from large companies to small and medium ones. In the current period it is impossible to overestimate the importance of SMEs' contribution for the national economy.

According to the organization of economic development and cooperation, small and medium enterprises are the vital part either for developed or for developing market. Despite the fact that the total number of enterprises in Russia exceeds the number of companies within German market almost by 2 times, 5.5 million and 3.7 million respectively, the result of German enterprises' activity is incomparably higher. Firstly, in the vast majority of European countries this type of enterprises is indicated as the principal employee: for instance, more than 60% of the active population is hired by SMEs in Germany. (OECD,2010). In contrast, approximately the quarter of Russian population works in small and medium enterprises. (Movchan,2011). Secondly, small and medium enterprises are the main contributors to the gross domestic product: approximately 50% of the total GDP is provided by German small and medium enterprises. (Platonova,2015). Oppositely, no more than 20% of gross domestic product in Russia is produced by SMEs. (EIB,2013).

In addition to everything which has been mentioned above, some important statements should be indicated. The efficiency of small and medium enterprises is also reflected in the level of innovativeness. Pursuant to the report of OECD, there are two distinguishing characteristics of high-innovative small and medium enterprises: innovation capability and export orientation. (OECD,2010). Only two indicators are needed in order to calculate innovative capability index: innovative input and innovative output. In accordance to the Global Innovation Index 2014, Russia and Germany stands on the 49th and 13th positions, relatively. Thus, the effectiveness of Russian SMEs' effort to promote innovation has been assessed along with Thailand, Greece and Poland, while Germany is in the top 20th of developed economies of the world with the high level of c innovative opportunities. (Soumitra,2014). It is worth to notice that Global Innovation Index is related either to large or small and medium enterprises. Therefore, the assumption that investigation of small and medium enterprises only will represent even poor results. More than

that, the question of economic efficiency of enterprises should be approached from export orientation angle. Only 0.4% of small and medium enterprises in Russia have international relationships with partners abroad. This level of SMEs' participation within global market is not only significantly lower than in developed countries, for comparison, the figure for German companies is 20%, but incomparable to developing ones as well. (Movchan,2011). There is no doubt that these two indicators of innovative SMEs are closely related to each other. The issue of strong correlation between the level of innovation and the process of the introduction of new product into the market (either domestic or foreign) can be found in numerous publications among professionals from emerging and developed markets. (Guan,2003). The idea rests on the basic idea that innovation capability of the company refers to the adoption new processes into the market or introduction new products for the first time. Innovation advantages of the company enable it to develop new products that satisfy both current and potential market needs. (Adler,1990). As a result, the company which implies process or product innovation is intended to expand the market share and to gain the competitive advantage. (Calantone,2002).

Since vast majority of managers and owners are not interested in the development of modern information systems, upgrading outdated capital stock, the level of competitiveness of Russian companies remains a few steps lower than the level of foreign enterprises. Russian business is characterized by the process of adoption of new technologies, production methods and innovative products, therefore, it does not create a highly needed technology for its own scientific development, i.e. Russian companies often act as imitators, not innovators. So a great fraction of those Russian companies which make innovation activity borrow the principles of innovative technology from developed countries, only tiny percent of them (which is approximately 0.023% of the total) – brought a new product to the market. (Bek,2015).

The innovation development process in Russia is at an extremely uncompetitive level and is complicated by the fact that the Russian market is an emerging market that has a lot of peculiarities and difficulties.

The traditional approach has a widespread appeal that the lack of access to financial resources is the main constraint SMEs in emerging market face with. As a result, it leads to poor implementation of tangible resources. In order to have competitive edge the main purpose is emerging: to compete by means of knowledge accumulation and intangible assets storage. (Helena-Rodrigues,2011).

Theoretical background.

Numerous attempts have been made to deepen and push forward the impact of intangible resources. Lan (2009) assumes that enterprises' entrepreneurial orientation is the key to success of small and medium enterprises within emerging market. The punch line of Lan's approach is that entrepreneurial orientation promotes innovation at their enterprise level, and since creativity is a source of competitive power in the global context, small and medium enterprises have a possibility to enter international market. The entrepreneurial orientation includes the following factors: innovation, risk taking, proactiveness, and firm's attitude towards competition. (Lan,2009). From our point of view, it is worthwhile to narrow dramatically the focus of investigation on tacit resources and innovation capability of the firm. These wealth-created factors which create the competitive edge of the company and assist the company to expand its innovative activity are known as components of intellectual capital (IC). Intellectual capital becomes a significant factor affecting the speed of decision making on innovation and on the efficiency impact of its introduction.

Little advance has been achieved in the studying of the relationship between intellectual resources and innovation in small and medium enterprises within emerging market. There is no doubt that political, economic and social contexts of the developing countries much differ from these in developed areas. Therefore, we can't apply those results which have been achieved for large companies in developed countries to the performance of SMEs within emerging markets. We absolutely agree with Ngah (2009) who argues that the appropriate indicators of IC and innovation depend on the level of market development; we have to assess whether this market is emerging or developed.

Moreover, an aspect of innovations itself has not been subjected to conscious scrutiny. The vast majority of the authors utilize the common indicators for estimation what is the impact of IC towards innovational activity. Innovative inputs apply to resources which are used for the realization of innovative products, whereas outputs are regarded as the results obtained after the process has been finished. (Costa,2014). Since our target is to focus on competitive advantage of the company, we offer to integrate new element. The probability of transition to the higher level of innovative product enables to assess the possibility of the enterprise to withdraw its innovate product from domestic to foreign market relying on the disposable resources. After calculations of probabilities are made the management of the company has an explicit view about its competitive edge, therefore it has a chance to make a decision whether the project about the development of new product is risky or not.

The purpose of this article is to focus on factors of intellectual capital which can be regulated and monitored by the participants of innovation activity. The authors set out to assess whether there is direct effects of intellectual capital on level of product innovation of small and medium enterprises in Russia or not. Furthermore, one of the main targets of this empirical research is to give recommendations to stakeholders about which components they should take care if they are willing to withdraw from local markets to the world level.

Therefore, we set two research questions:

1. Do the components of intellectual capital influence the probability of transition to higher level of product novelty for small and medium enterprises?
2. What are the main components of intellectual capital that may help Russian SMEs to increase the level of novelty?

Literature review

Theoretical impact concerning the affect of intellectual capital on the product innovation is mixed. Several points which are clear: all components of intellectual capital increase the ability of both small and medium business to develop innovative capability of the company; the influence of intellectual capital components in SMEs much differs from the effect of these factors in large firms; the level of market maturity plays a significant role. Besides that, not all authors subscribe to the same point about the key components of IC.

Some authors claim that human capital represents the principal type of IC which has the strongest direct influence on level of product novelty. There are several reasons for that. Firstly, there is no doubt that since 2000s the qualification of the labor force within emerging market has improved while the technological capabilities reflects the same growth rate as it was in 1990s. One of the causes for that is extremely expensive costs which are needed in order to reinforce the quality of fixed assets. Oppositely, human capital doesn't need to invest huge amount of money. All SMEs should set the following purpose: to encourage managers and workers for passing some training courses and exams, to acquire new skills and knowledge. (Jardon,2012). The duty of the senior part is to accumulate all tacit knowledge from employees, to support their innovative ideas and to motivate them for internal discussions. They should try to increase the level of innovation in the company by allowing the tacit knowledge to spread among the employees. Since the scale of SMEs is not so large compared with big corporations, usually It means that managers are familiar with skills and qualification of employees. In that sense they are willing to delegate the duties and integrate functions more efficiently. If they are willing to double the effect from innovative activity, they have to create the decent environment

in the company: frequent training and investing in the acquisition of skills; motivation and satisfaction of employees. (Daou,2014). Helena Santos-Rodrigues et al. (2011) concluded that the establishment of a creative environment around employees is one of the ways to achieve a high level of innovation. This is especially true for small and medium enterprises, since in this case the scale of the company allows the manager to encourage employees for finding new ideas, to inspire and support it, to help employees to develop and refine the idea and to help them to fix the idea. Small scale organizations provide communication between employees; in consequence, it improves the working environment of the company and creates team spirit. Empirical results provided by Binti et al. (2014) conclude that such non-financial incentives enable the company to increase the willingness of employees to participate in the process of new product creation. They prove that there is no positive correlation between the level of salary earned by the employee and motivation to generate new ideas.

Besides, the higher the enterprises' educational level, the larger the investment in human capital should be done, and the more competitive strategy the company has. Since improving educational level has a positive effect on the development of process and product innovations, it helps firms to make updated analysis of consumers' needs, to understand markets, to search for new opportunities, and consequently to respond to market changes properly. (Lan,2009). The widely spread idea is that local knowledge of individuals leads to enhancements in strategic processes and, as a result, to minor product improvements. (Laursen,2003). Consequently, it enables SMEs to accelerate competitive opportunities or innovative capabilities and bring the innovative product to the higher level of novelty.

Others assume that structural capital plays the most significant role among three types of IC. But there are a lot of debates even within the framework of structural capital. Caner (2013), Sun (2015) and others pursue the view according to which the amount of R&D expenditures has strong correlation with the level of innovation intensity. They propose that research and development costs are crucial input which allows the company to have an access to the updated technical information, unique opportunities. Nevertheless, the authors of recent research are absolutely sure that such principle is doomed to failure. Jaruzelski (2011) and other authors (Dumay,2014; Subramaniam,2005; Santos-Rodrigues,2011,2013) subscribe to the point that the company which is willing to build the decent innovation capabilities should focus not on the amount of R&D spending but on the overall business strategy which contains healthy corporate culture, high-quality databases, technical processes which enable the company to understand the costumers' needs and to assess market potential and risks. Since the competition on the emerging market is growing fast, companies with effective corporate strategies know the capacity of their working storage. Thus, it helps them to give the dust to rivals, to generate higher innovative

capacities and to create new products. (Jaruzelski,2011). Costa et al. (2014) make the conclusion that in the condition of SMEs which operate within emerging market structural capital is the only type of IC which affect directly on product innovation, while human and relational capital have indirect influence with the structural capital as the intermediate type. They point out two important features of structural capital in SMEs: product innovation management and strategy (system to manage NPD projects); culture of orientation towards innovation. The company should have a clear view on the role of product innovation. It assesses to allocate the resources and R&D investments more efficiently, to update their technology and to conduct the process of product innovation successfully. As a result, the company will be able to broaden its market share and to promote the product to the higher level of novelty. (Costa,2014; Lan,2009).

The rest of the authors subscribe to the point that the strategy of relying on the components of relational capital may yield strong and continuous development of product innovation. There is no doubt that increased sensitivity towards market needs, which can be gained while dealing with suppliers and customers, turns the innovation activity to more effective process. (Costa,2014). Regardless this fact, researchers tell that some remarks should be made while speaking about the influence of relational capital within emerging market. The vast majority of authors indicate that only vertical relationships which refer to the cooperation with customers and suppliers are associated with product innovation. (Costa,2014). Improving the quality of relations with costumers is a top priority for small and medium businesses, because these businesses try to establish the contact with customers more densely. Clients are considered as a source of new ideas and innovation. Constant observation and surveys with the purpose of identifying the level of customer satisfaction provides regeneration process knowledge. (Santos-Rodrigues,2013). Moreover, those firms which try to concentrate on consumers' needs usually pay much attention on the quality of their product; as a consequence they obtain customers' loyalty and improve the level of their innovative products. (Lan,2009). Moreover, customers and suppliers are not the sole forces which trigger the company to enhance its innovative activity. Some authors pursue the view that cooperation with the government is what really necessary for every innovative company which operate within emerging market. (Al-Ansari,2013; Gonvorun, 2014). Government-backed investment funds become a real assistance in the attempt of the company to expand its market share by introduction of innovation product or process. (Shafiq,2014).

In contrast to large companies, small and medium enterprises are less dependent on competitors and partners' behavior and participation in business associations. Very often researchers add that company's relationships within emerging market are characterized by the lack of institutional trust (the most important assumption of decent and yield relationship) in

order to support their empirical conclusions. That means the lack of enthusiasm and incentive to cooperate and to share ideas with the partners. In that sense the individuals are not willing to take the risk of cooperation. (Renzl,2008). And it even may slow down the innovative process of the company.

In conclusion, the following statement should be noticed: intellectual capital comprises intangible assets which can either create the competitive advantage of the company or facilitate the process of product innovation development. Despite the proved fact that components of IC can be a real assist for small and medium enterprises within emerging market, the authors try to clarify more profound view according to which intellectual capital both stimulate innovation activity and increase the probability of transition to the higher level of product novelty.

On the basis of the above discussion, we set the hypotheses which will be tested in the empirical part of the research. In order to assess the importance of each component and to reveal which factor of IC is able to balloon the level of product innovation we hypothesize some more particular statements:

H1: Human capital components increase the probability of transition to the higher level of product novelty.

H1a: An amount of money earned by the employee does not influence the probability of transition to the higher level of product novelty.

H1b: The more qualified employees work in the company, the higher probability of transition to the new level of product novelty.

H2: Structural capital components increase the probability of transition to the higher level of product novelty.

H2a: Investments into innovation development influence positively the probability of transition to the new level of product novelty.

H2b: Focus on instruments of quality improvements enables the company to increase the probability of transition to the higher level of innovative product.

H3: Relational capital components increase the probability of transition to the higher level of product novelty.

H3a: The presence of strategic partners does not enhance the probability to transit to the new level of product novelty.

H3b: Relationship with the government, either federal or local, raises the probability of transition to the higher level of product innovation.

Methodology

In order to empirically examine the effect of intellectual capital components on the level of product novelty at SMEs which operate within the emerging market, we will now focus on the research methodology that guided our field work.

Initially, the authors establish the indicators that measure intellectual capital and product innovation, and then the sample of the research will be defined. Eventually, empirical analysis with using of econometrical methods will be conducted. We will explain the methods used in carrying out the study and after that we are eager to explain in details the results obtained.

Theoretical framework

Since intellectual capital is a multidimensional concept, the focus on one component of intellectual capital does not have any exploratory power for the observed phenomena. There is the discrepancy between theory and reality. Intellectual capital concept represents factors which should be at different levels of the organization. In order to manage it more successfully the owner has to take into consideration that intellectual capital components are interconnected. From the side of theoretical background, the consideration of each element of intellectual capital enables the researcher to evaluate the impact of the particular component on product innovation success, consequently, more accurate recommendations are made. In the present work we try to address this issue.

Therefore, the model considered in this work, analytically might look as follows:

$$\text{The level of product novelty} = F(\text{HC; RC; SC; external factors})$$

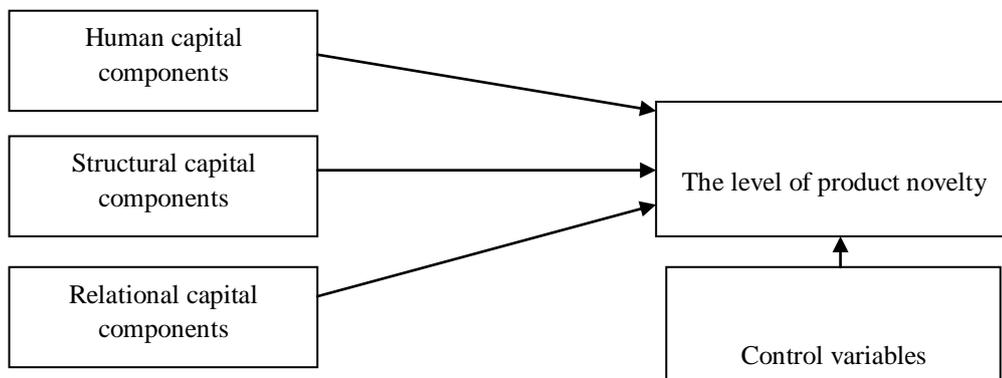


Figure 1. Theoretical framework.

Variable definition and measurement

The first step is to determine factors that measure key constructs of the work: intellectual capital aspects and an appropriate level of product innovation. The presented indicators were chosen subject to the previous literature. Both quantitative and qualitative variables are applied within the following study. Appendix 1 presents the indicators for intangible resources, the description and references to previous works.

Besides that, appendix 1 indicates some information about dependent variable. According to the ideas mentioned above, the main key target of this research is to investigate the affect which is caused by intellectual capital on the development of innovative product. We understand the concept of «innovative product» as product which was introduced by the firm, which declared that it is innovative either in process or in product. Delgado (2011) assumes that the best indicator for the evaluation of the way intellectual capital elements influence innovation activity of the company is to calculate the degree of novelty, from incremental to radical ones. Since our questionnaire does not provide such information, we pursue the view that the degree of product novelty related to the market will be relevant.

In order to avoid unwanted effects of other variables, not included in the model, were chosen as control variables. As control variable the following variables: industry, the region of location of the enterprise and the size of the company. According to the number of research, these three variables may cause the biasness of estimators. Firstly, after years of investigation of manufacturing industry researchers from the HSE found out that the most prosperous branches of manufacturing industry in Russia are food processing industry, chemistry and wood processing. At the same time mechanical engineering and transport look as absolutely backward areas.

Therefore, it is obvious that innovation activity of the most prosperous industries is expanding with the growth rate which exceeds the rate of increase of lagging industries. In addition, some small and medium enterprises do not intend to generate their innovative capabilities due to the fact that there is no demand for new products. Secondly, the region of the location should be noticed as one of the most significant factors which put an impact on the competitive edge of the company and on its ability to create innovative product. Undoubtedly, the greatest fraction of innovators is concentrated in the Central regions of Russia, such as Moscow and Saint Petersburg. Finally, the bigger the company, the more free resources, both tangible and intangible, it has in order to develop the quality of its innovative product. Additionally, companies with the number of employees more than 100 face the economical and political challenges not so frequently as small companies do.

Sample and data analysis

The authors analyzed cross-sectional data (EFIGE) which include Russian manufacturing enterprises. The study was conducted in 2013 based on a survey of the main problems of competitiveness of Russian companies, compiled by the International Institute for Marketing and Social Research GfK Rus accompanied by the National Research University "Higher School of Economics." Chief executive officers, their deputies, financial or commercial directors of 1506 manufacturing enterprises of small and medium-sized business and of 586 large companies were participants of the survey.

Descriptive statistics indicates differences between characteristics of large companies and SMEs. Consequently, it confirms the previous assumptions about various configurations of intellectual capital factors which should be taken into consideration while doing an analysis. The elements of intellectual capital should be chosen according to the size of the company first. This peculiarities are referred both to operational and innovational activities. Appendix 2 presents statistical analysis for independent variables. There is no much differences in human capital components between large and small, medium-sized companies. On average the number of foreign employees in large companies 20% higher than the number of workers in SMEs. In the current period the majority of managers of Russian companies realize the need to attract specialists from abroad or domestic colleagues who worked abroad. The goal is to give the employee the opportunity to develop an innovative project within the framework of domestic companies, but with the application of knowledge and skills obtained in developed countries where the level of innovation activity is much higher than in Russia. It is worth to notice the existence of SMEs where level of managers' salary surpluses the average amount of money gained by the employee in the company by eight times. It may be connected with the fact that despite some scientific assumptions, owners of the companies are still sure that an amount of the salary earned by employee is the principal incentive to generate new ideas, to take part in internal discussions about new product. In the following paper we will try to indicate whether it is true.

In contrast to human capital, the descriptive statistics for both structural and relational capital factors shows the considerable correlation between the results given and the size of the company. There is no doubt that large Russian companies have significantly huger financial strength. More than that, what is necessary that large companies realize precisely what are their strategic goals and mission. Consequently, they bear less risks of loss and they are able to invest much of their profit for software development, for R&D expenditures, for the measures which can facilitate their innovation activity and the processes for new product introduction. But

despite the fact that large companies have more advanced infrastructure and their business is less risky, more than 50% of small and medium Russian enterprises continue to introduce significantly improved or new products into the market while almost 40% of them adopt new technologies.

Additionally, large Russian companies prefer to establish long-run relationships with their strategic partners which operate within domestic area or abroad. In contrast, on average only 22% of SMEs have partners in other region of Russia and less than 10% - partners abroad. It's worth to notice that the Russian government of all stages pays more attention to the activity of large companies than of small and medium-sized. To expand on this point, only 3% of Russian SMEs received support in 2013 from federal authorities, 6% of the total – from regional authorities and 9% - from the federal one. This can be explained by the fact that the authority regards large-scaled companies as the main force of economic growth. The practice of European developed neighbors rejects this point and conducts the policy in preference to small and medium enterprises.

Since the vast majority of studies prove the fact of presence of correlation between IC elements and the process on innovative development, it needs to be stressed that insufficient rates of intellectual capital factors is related to low percentage of companies that create products and technologies which are new for the global market. According to the measure of frequency, only 1.70% of SMEs indicated that their main product is modern not merely for domestic but also for the world market; almost 20% assessed their goods as new for regional market. (Table 1).

Table 1

Measure of frequency

| Valid | Frequency | Percent |
|------------------------|-----------|---------|
| 1 | 201 | 13.30 |
| 2 | 199 | 13.20 |
| 3 | 282 | 18.70 |
| 4 | 25 | 1.70 |
| Number of observations | 707 | 100.00 |

Econometric method

This part of the study gives special emphasis to the analysis of the data. In our research paper we apply an innovative approach to measure the influence of intellectual capital factors on the probability of transition to the higher level of innovative product. Since the key aim of each empirical research is to construct a reliable model and to achieve unbiased estimators, we

examine several characteristics: content validity, construct validity, criterion validity and reliability.

An analysis of the data is conducted via SPSS software. The initial study of each research consists of outliers identification and its exclusion. The existence of outliers is studied by means of boxplot analysis for continues variables, frequency tables and descriptive statistics measures. As a consequence, none of methods which were employed show the presence of outliers. Furthermore, according to the Kolmogorov-Smirnov test, all variables which are observed have normal distribution.

Content validity. Since all items were selected in accordance with previous international literature, we may assume that the model has content validity. We appreciate to have sufficiently high explanatory power.

Reliability. The preliminary analysis for model construction includes estimation of the reliability of the instruments and measurement of internal consistency. Following this purpose, Cronbach’s alpha is implemented. The assessment of this coefficient is based on calculations of average correlations between the variables related to each element of the explanatory factors, from a single administration of the presented questionnaire. (Cronbach,1951). According to Nunnally at al. (1994), the internal consistency is observed when Cronbach’s alpha coefficient is greater than 0.6. Following this rule, the analysis reveals that maximization of the Cronbach’s alpha would require an exclusion of some variables from each category of intellectual capital. (Table 2).

Table 2

Cronbach’s alpha coefficients

| Type of IC | Number of variables | Cronbach’s alpha |
|------------|---------------------|------------------|
| HC | 6 | 0.618 |
| SC | 6 | 0.605 |
| RC | 10 | 0.651 |

Construct validity. Factor analysis through principal component analysis is employed for each of three constructs for the purpose of evaluating the construct validity. The main target of this econometrical method is to reduce the number of variables which have been chosen relying on the previous literature and to define the key components for each type of intellectual capital. We perform factor analysis through principal component analysis with oblique (0-oblimin) or varimax rotation. In order to identify which type of rotation should be applied we have to conclude if the factors are believed to be correlated or not. In other words, in contrast to verimax rotation, oblimin rotation allows the components to have non-zero correlation. In our case we use

verimax rotation for identifying the components of structural and human capital, meanwhile oblimin rotation is employed with the aim to obtain factors of relational capital. (Appendix 3). According to the results which were obtained, since factor loading values are greater than 0.4, we may confirm that all independent items are valid.

As mentioned above, factor analysis enables the researcher to test the validity of the technique. An integral part of factor analysis is the Barlett's test and the coefficient of Kaiser-Meyer and Okin (KMO). These are two auxiliary instruments which give the degree of validity of the employed technique. Table 3 indicates the KMO and Barlett's test results. The Kaiser-Meyer and Okin test reveals that there is a reasonable correlation between the items. Moreover, the significance of p-value for each component is 0.000. The comparison with the 1% significance level, we may conclude that null hypothesis about identity of the correlation matrix. Thus, the statement about an existence of correlation between some variables is approved.

Table 3

Construct analysis

| Constructs | | Cum. expl. var (%) | KMO | Barlett's test | |
|------------|--|--------------------|-------|----------------|------------|
| HC | Rate of the salary | 59.252 | 0.718 | Chi2=1820.645 | Sig.=0.000 |
| | Quality of the labor force | | | | |
| SC | Investments into innovation developments | 51.604 | 0.628 | Chi2=427.138 | Sig.=0.000 |
| | Measures undertaken for quality improvements | | | | |
| RC | Strategic partnership with Russian companies | 57.101 | 0.681 | Chi2=2604.283 | Sig.=0.000 |
| | Strategic partnership with foreign companies | | | | |
| | Relationship with the government | | | | |

Criterion validity. This type of validity is also known as external validity, because it assesses the predictive ability of the model. To assess the criterion validity discrete choice model, in particular ordinal logistic regression, is used. The main objective of this regression is to model ordered responses as functions of explanatory variables.

The function for individual i choosing an alternative j :

$$Y_i = \alpha + X_i\beta_j + e_i, j = 1, \dots, M - 1, \quad (1)$$

where M is the number of categories; X is a vector of explanatory variables; the coefficients α, β are parameters to be estimated; the error term captures all unobservable factors that are able to affect the decision.

We can write the logit model as follows:

$$P(Y_i > j) = g(X\beta_i) = \frac{\exp(\alpha + X_i\beta_j)}{1 + \exp(\alpha + X_i\beta_j)}, j = 1, \dots, M - 1 \quad (2)$$

$$P(Y_i = j) = \begin{cases} P(Y_i = 1) = 1 - g(X_i\beta_1) = \frac{\exp(\alpha + X_i\beta_1)}{1 + \exp(\alpha + X_i\beta_1)} \\ P(Y_i = 2) = g(X_i\beta_1) - g(X_i\beta_2) = \frac{\exp(\alpha + X_i\beta_1)}{1 + \exp(\alpha + X_i\beta_1)} - \frac{\exp(\alpha + X_i\beta_2)}{1 + \exp(\alpha + X_i\beta_2)} \\ P(Y_i = 3) = g(X_i\beta_2) - g(X_i\beta_3) = \frac{\exp(\alpha + X_i\beta_2)}{1 + \exp(\alpha + X_i\beta_2)} - \frac{\exp(\alpha + X_i\beta_3)}{1 + \exp(\alpha + X_i\beta_3)} \\ P(Y_i = 4) = g(X_i\beta_3) = \frac{\exp(\alpha + X_i\beta_3)}{1 + \exp(\alpha + X_i\beta_3)} \end{cases}$$

Therefore, the log-likelihood function for our model is the following:

$$L = \sum [I_{Y_{i=1}} \ln(1 - g(X_i\beta_1)) + I_{Y_{i=2}} \ln(g(X_i\beta_1) - g(X_i\beta_2)) + I_{Y_{i=3}} \ln(g(X_i\beta_2) - g(X_i\beta_3)) + I_{Y_{i=4}} \ln(g(X_i\beta_3))], \quad (3)$$

where $I_{Y_{i=j}}$ is an indicator function for individual i choosing j alternative.

Since p-value of measure of error (-2 Log Likelihood) equals 0.000, we may conclude at 1% significance level we reject the null hypothesis. Thus, we assume that this model has an ability to predict the outcome. Moreover, according to the goodness-of-fit criteria, an observed data is consistent with the model fitted to it.

Additionally, logit model enables to calculate the cumulative predicted probabilities.

$$P(Y_i = 1) = \frac{1}{1 + e^{1.046}} = 0.26$$

$$P(Y_i = 1 \text{ or } 2) = \frac{1}{1 + e^{-0.370}} = 0.59 \quad (4)$$

$$P(Y_i = 1 \text{ or } 2 \text{ or } 3) = \frac{1}{1 + e^{-3.884}} = 0.98$$

$$P(Y_i = 1 \text{ or } 2 \text{ or } 3 \text{ or } 4) = 1 - \frac{1}{1 + e^{-3.884}} = 0.02$$

On the basis of these estimated cumulative predicted probabilities one can easily find out what will be the estimated probabilities for the individual scores.

$$P(Y_i = 1) = 0.26$$

$$P(Y_i = 2) = P(Y_i = 1 \text{ or } 2) - P(Y_i = 1) = 0.33 \quad (5)$$

$$P(Y_i = 3) = P(Y_i = 1 \text{ or } 2 \text{ or } 3) - P(Y_i = 1 \text{ or } 2) = 0.39$$

$$P(Y_i = 4) = 1 - P(Y_i = 1 \text{ or } 2 \text{ or } 3) = 0.02$$

Results

Table 4 contains the estimated coefficients for the model. It should be noted that there are only two variables which are statistically significant. The coefficients for the variables which indicate the presence of investments into innovation developments and the existence of support from the government have an expected sign consistent with the previous literature. Both items influence positively the probability of transition to the higher level of innovation product.

Table 4

Empirical results of regression analysis

| Variable | Coefficient | SE |
|--|-------------|-------|
| Rate of the salary | -0.151 | 0.098 |
| Quality of the labor force | 0.025 | 0.089 |
| Investments into innovation developments | 0.569*** | 0.126 |
| Measures undertaken for quality improvements | -0.010 | 0.098 |
| Strategic partnership with Russian companies | 0.136 | 0.090 |
| Strategic partnership with foreign companies | 0.006 | 0.083 |
| Relationship with the government | 0.361*** | 0.093 |
| Number of observations | 429 | |
| Log likelihood | 939.009 | |
| Pseudo R2 | 0.197 | |

***p<0.01

According to the estimated results, if Russian firm does some investments into R&D processes and in-depth study of the market, there will be more chances that its product turn out to be innovative for the whole country or even for the world. In spite small scope of SMEs, the result of incorporation of new technology into the business model is indicated in the overlapping of the market needs. As mentioned above, the success of small and medium enterprises depends on realization of market demand. If owners or managers of the local company pursue the aim to expand its market share, to reach competitive advantage and to make its product more innovative, they have to focus on methods which are not acceptable for their rivals. The best way in order to make this come true is to increase R&D expenditures and to emphasize its strategy on the development of new technology and process.

The second point proves the fact which is widely recognized. Undoubtedly, by means of innovation policy the government may influence the speed of technological changes within small and medium enterprises. Since during the considerable period technological innovation of SMEs has become one of the main targets of the Russian government it provides an additional

subsidize or cuts off the amount of tax payments. Hence, such strategy realized by the Russian government enables enterprises to invest more money into research and development projects or some technological achievements.

More than that, we have obtained the result that if the company implements some procedures for innovational improvements and its activity is supported by the authority, the probability that it will change the level of innovation product is 26% - within the company, 33% that it will go further to the regional market, 39% - to the Russian market. The probability to withdraw its production toward the global market is just 2%.

According to the findings which were obtained, we conclude that several research hypotheses were validated. (Table 5).

Table 5

Hypothesis test

| Hypotheses | Situation |
|--|-----------|
| H1a: An amount of money earned by the employee does not influence the probability of transition to the higher level of product novelty. | Accepted* |
| H1b: The more qualified employees work in the company, the higher probability of transition to the new level of product novelty. | Rejected |
| H2a: Investments into innovation development influence positively the probability of transition to the new level of product novelty. | Accepted |
| H2b: Focus on instruments of quality improvements enables the company to increase the probability of transition to the higher level of innovative product. | Rejected |
| H3a: The presence of strategic partners does not enhance the probability to transit to the new level of product novelty. | Accepted* |
| H3b: Relationship with the government, either federal or local, raises the probability of transition to the higher level of product innovation. | Accepted |

*- since variables are statistically insignificant

Conclusions

In order to stimulate innovation activity some steps and forces should be applied. By and large, the following statement has been proved both theoretically and empirically: intellectual capital can be considered by the owners and managers of enterprises as a tool that can raise the level of development of innovative business in Russia. It is an essential source of SMEs' success which allows to expand the resource base, to manage the resources of the company more effectively, to improve the competence and motivation of staff, to ensure access to information

about potential future flows of the company, as well as to enhance the innovative equipment of the company and the level of innovation activity greatly. Depending on their financial performance, strategic goals, and market needs each company has to decide what particular attribute of intellectual capital should be introduced. Managers and owners of SMEs in emerging countries have to remember that they are always constrained by numerous factors which may cause negative consequences and risks. Thus, accomplishment of an analysis of all future aspects of intellectual capital and innovations has become extremely crucial.

Our study promotes to close the gap between the influence of the intellectual capital and innovation. In summary, our study contributes in two subject areas: the literature of intellectual capital, as well as innovative literature. The authors offer to implement new significant indicator for the calculation of probability to transit to the higher level of innovative product. Instead of speculating on common elements of innovation it is possible to go further and to predict what will be an outcome after implementation of several intellectual capital factors into the model. Due to the rule of thumb, the probability to withdraw to the new level of innovative product has been calculated. The results prove one more time the fact that the development process in Russia is in an extremely uncompetitive level. The probability to create the product which will be innovative for is just 2%.

By utilizing of econometrical methods, the results which have been reached by the authors of the present paper have yield to the conclusion that not all intangible elements have positive effect on innovational performance of small and medium enterprises. Although some authors pursue the view that human capital is the most essential type of intellectual capital as it provides the company with high educated employees who are ready to generate ideas for product promotion, the results of our investigation show an opposite position. Neither financial incentives, nor high quality of labor force are significant for our sample. The effect of human capital on product innovation performance has to be pondered very accurately. Truth to be told, investments in research and development, high-tech equipments, programs of innovative development, and governmental support are the things that initially evolves in the minds of a great fraction of managers and owners of SMEs in Russia while speaking about innovative perspective of the company. Only minority of them regards employees as the source of innovative ideas.

More than that, we can generally conclude that as a result of scarcity of financial resources, SMEs are not ready to pay much attention on expensive techniques (CRM, SAP, certificates from international organization) which can stand as a decent proof of high quality of the main product.

The limitations of the present research are needed to be mentioned. Firstly, following the purpose to improve the results, it would be more preferred to rely on longitudinal study. It is necessary to consider the dynamics of utilization of the assets. Secondly, expert survey is the basic method of information collecting. This information is subjective and may give biased results of the model. Thirdly, all selected indicators are presented as proxy variables that can not reflect all the phenomena as a whole. Finally, as a consequence of large number of missing data, the investigated sample is quite limited.

Further investigation of the theme will be established on the basis of EFIGE data, which investigates the competitiveness of European countries. The main target is to concentrate on the distinctive features in the activity of innovative small and medium enterprises. Hopefully, it will help to give recommendations to managers and owners of Russian companies about efficient control methods over IC components and innovational capabilities.

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Appendices

APPENDIX 1

Intellectual capital components

| Element of HC | Item description | Measurement | References |
|----------------------------|--|------------------------|------------------------|
| Rate of the salary | Rate of an average salary of white collars and an average salary in the company | Quantitative (%) | Santos-Rodrigues, 2013 |
| | Rate of an average salary of skilled blue collars and an average salary in the company | Quantitative (%) | Binti, 2014 |
| | Rate of an average salary of unskilled blue collars and an average salary in the company | Quantitative (%) | |
| Quality of the labor force | Presence of foreign employees or specialists | Nominal: 1(yes); 0(no) | Lan, 2009 |
| | Managers' experience of working abroad for at least one year | Nominal: 1(yes); 0(no) | Laursen, 2003 |
| | Percentage of employees with higher/academic degree and unfinished higher education | Quantitative (%) | |

| Element of SC | Item description | Measurement | References |
|--|---|------------------------|------------------------|
| Investments into innovation developments | Introduction of a good which is either new or significantly improved | Nominal: 1(yes); 0(no) | Coner, 2013 |
| | Adoption of a production technology which is either new or significantly improved | Nominal: 1(yes); 0(no) | Sun, 2015 |
| | Presence of R&D investments | Nominal: 1(yes); 0(no) | |
| Measures undertaken for quality improvements | Internal information system of planning and resource management | Nominal: 1(yes); 0(no) | Santos-Rodrigues, 2015 |
| | System of sales/purchases management (CRM system) | Nominal: 1(yes); 0(no) | Wang, 2009 |
| | The firm has international quality certificates issued by accredited international organization | Nominal: 1(yes); 0(no) | |

| Element of RC | Item description | Measurement | References |
|--|---|------------------------|-----------------|
| Strategic partnership with Russian companies | Strategic partnership with Russian companies in other regions | Nominal: 1(yes); 0(no) | Renzl, 2008 |
| | Working processes which were realized in co-operation with Russian partners/R&D | Nominal: 1(yes); 0(no) | Costa, 2014 |
| | Strategic partnership with Russian companies (in its region) | Nominal: 1(yes); 0(no) | |
| | Working processes which were realized in co-operation with Russian partners/ production | Nominal: 1(yes); 0(no) | |
| Strategic partnership with foreign companies | Working processes which were realized in co-operation with foreign partners/R&D | Nominal: 1(yes); 0(no) | |
| | Working processes which were realized in co-operation with foreign partners/ production | Nominal: 1(yes); 0(no) | |
| | Strategic partnership with foreign companies | Nominal: 1(yes); 0(no) | |
| Relationship with the government | Organizational support from federal authorities during the last two years | Nominal: 1(yes); 0(no) | Al-Ansari, 2013 |
| | Organizational support from regional authorities during the last two years | Nominal: 1(yes); 0(no) | Shafiq, 2014 |
| | Organizational support from local authorities during the last two years | Nominal: 1(yes); 0(no) | |

| Element of product innovation | Item description | Measurement | References |
|---------------------------------------|---|---|---------------|
| Level of novelty of company's product | The company's product was new for the particular market | Ordered : 1 - New for the company only 2 - New for the Russian market 3 - New for the regional | Delgado, 2011 |

| | | | |
|--|--|---|--|
| | | market 4 - New for the world market | |
|--|--|---|--|

APPENDIX 2

Descriptive statistics

| Variable | Mean | | Maximum | | Minimum | | Standard deviation | | Number of observations | |
|--|-------|-------|---------|-------|---------|-------|--------------------|-------|------------------------|-------|
| | SMEs | Large | SMEs | Large | SMEs | Large | SMEs | Large | SMEs | Large |
| HC: Rate of an average salary of white collars and an average salary in the company | 0.820 | 0.820 | 2.670 | 3.140 | 0.000 | 0.000 | 0.574 | 0.596 | 1366 | 533 |
| Rate of an average salary of skilled blue collars and an average salary in the company | 0.755 | 0.773 | 4.440 | 2.670 | 0.000 | 0.000 | 0.755 | 0.562 | 1366 | 533 |
| Rate of an average salary of unskilled blue collars and an average salary in the company | 0.429 | 0.452 | 8.750 | 1.330 | 0.000 | 0.000 | 0.429 | 0.341 | 1366 | 533 |
| Presence of foreign employees or specialists | 0.080 | 0.280 | 1 | 1 | 0 | 0 | 0.274 | 0.448 | 1479 | 552 |
| Managers' experience of working abroad for at least one year | 0.100 | 0.230 | 1 | 1 | 0 | 0 | 0.293 | 0.424 | 1483 | 558 |
| Percentage of employees with higher/academic degree and unfinished higher education | 0.328 | 0.320 | 1.000 | 0.990 | 0.000 | 0.000 | 0.198 | 0.176 | 1350 | 445 |
| SC: Introduction of a good which is either new or significantly improved | 0.510 | 0.720 | 1 | 1 | 0 | 0 | 0.500 | 0.451 | 1213 | 510 |
| Adoption of a production technology which is either new or significantly improved | 0.360 | 0.610 | 1 | 1 | 0 | 0 | 0.479 | 0.487 | 1195 | 508 |
| Presence of R&D investments | 0.190 | 0.400 | 1 | 1 | 0 | 0 | 0.390 | 0.489 | 1481 | 577 |
| Internal information system of planning and resource management | 0.170 | 0.440 | 1 | 1 | 0 | 0 | 0.377 | 0.497 | 1376 | 566 |
| System of sales/purchases management (CRM system) | 0.150 | 0.380 | 1 | 1 | 0 | 0 | 0.362 | 0.487 | 1378 | 566 |
| International quality certificates issued by accredited international organization | 0.170 | 0.480 | 1 | 1 | 0 | 0 | 0.376 | 0.500 | 1140 | 535 |
| RC: Strategic partnership with Russian companies in other regions | 0.220 | 0.480 | 1 | 1 | 0 | 0 | 0.479 | 0.500 | 1506 | 586 |
| Working processes which were realized in co-operation with Russian partners/R&D | 0.180 | 0.360 | 1 | 1 | 0 | 0 | 0.416 | 0.500 | 1506 | 586 |
| Strategic partnership with Russian companies (in its region) | 0.360 | 0.500 | 1 | 1 | 0 | 0 | 0.268 | 0.449 | 1506 | 586 |
| Working processes which were realized in co-operation with Russian partners/ production | 0.140 | 0.310 | 1 | 1 | 0 | 0 | 0.384 | 0.480 | 1506 | 586 |
| Working processes which were realized in co-operation with foreign partners/R&D | 0.020 | 0.090 | 1 | 1 | 0 | 0 | 0.348 | 0.461 | 1506 | 585 |
| Working processes which were realized in co-operation with foreign partners/ production | 0.020 | 0.100 | 1 | 1 | 0 | 0 | 0.137 | 0.289 | 1506 | 586 |
| Strategic partnership with foreign companies | 0.080 | 0.280 | 1 | 1 | 0 | 0 | 0.144 | 0.297 | 1506 | 584 |
| Organizational support from federal authorities during the last two years | 0.030 | 0.120 | 1 | 1 | 0 | 0 | 0.177 | 0.323 | 1451 | 542 |
| Organizational support from regional authorities during the last two years | 0.060 | 0.210 | 1 | 1 | 0 | 0 | 0.240 | 0.410 | 1451 | 548 |
| Organizational support from local authorities during the last two years | 0.090 | 0.200 | 1 | 1 | 0 | 0 | 0.288 | 0.399 | 1451 | 546 |

Principal component analysis

| Human capital | Component* | |
|--|------------|--------|
| | 1 | 2 |
| Rate of an average salary of white collars and an average salary in the company | 0.888 | 0.011 |
| Rate of an average salary of skilled blue collars and an average salary in the company | 0.906 | -0.046 |
| Rate of an average salary of unskilled blue collars and an average salary in the company | 0.859 | -0.049 |
| Presence of foreign employees or specialists | 0.047 | 0.771 |
| Managers' experience of working abroad for at least one year | 0.079 | 0.723 |
| Percentage of employees with higher/academic degree and unfinished higher education | -0.125 | 0.242 |

*-varimax rotation with Kaiser normalization converged in three interactions.

| Structural capital | Component* | |
|---|------------|-------|
| | 1 | 2 |
| Introduction of a good which is either new or significantly improved | 0.761 | 0.099 |
| Adoption of a production technology which is either new or significantly improved | 0.787 | 0.053 |
| Presence of R&D investments | 0.644 | 0.051 |
| Internal information system of planning and resource management | 0.041 | 0.716 |
| System of sales/purchases management (CRM system) | -0.042 | 0.755 |
| The firm has international quality certificates issued by accredited international organization | 0.214 | 0.580 |

*-varimax rotation with Kaiser normalization converged in three interactions.

| Relational capital | Component* | | |
|--|------------|-------|--------|
| | 1 | 2 | 3 |
| Strategic partnership with Russian companies in other regions | 0.758 | 0.082 | -0.018 |
| Working processes which were realized in co-operation with Russian partners/R&D | 0.757 | 0.095 | -0.161 |
| Strategic partnership with Russian companies (in its region) | 0.587 | 0.091 | -0.388 |
| Working processes which were realized in co-operation with Russian partners/ production | 0.677 | 0.059 | -0.211 |
| Working processes which were realized in co-operation with foreign partners/R&D | 0.145 | 0.106 | -0.770 |
| Working processes which were realized in co-operation with foreign partners/ production | 0.126 | 0.060 | -0.826 |
| Strategic partnership with foreign companies | 0.315 | 0.139 | -0.782 |
| Organizational support from federal authorities during the last two years | 0.056 | 0.684 | -0.072 |
| Organizational support from regional authorities during the last two years | 0.122 | 0.833 | -0.093 |
| Organizational support from local authorities during the last two years | 0.071 | 0.764 | -0.101 |

*-oblimin rotation with Kaiser normalization