

Methodology for Determining the Level of Intangible Development of the Region

Julia Kolesnikova
Kazan (Volga region) Federal University, Kazan

Venera Zagidullina
Kazan (Volga region) Federal University, Kazan

Emil Valeev
Kazan (Volga region) Federal University, Kazan

Gleb Bychkov
Kazan (Volga region) Federal University, Kazan

Albert Fatkhullin
Kazan (Volga region) Federal University, Kazan

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ABSTRACT

The level of non-material development of a region depends on many indicators, such as the degree of development of human, social and reputational capital, and the degree of development of relations of intangible property. However, at present, there is no quantitative assessment of the presented factors. Intangible assets are the only indicator that is regularly quantitatively taken into account in the regions of Russia. Nevertheless, intangible assets do not fully reflect the level of the region's intangible development, since their accounting is regulated by IFRS and RAP. Intangible assets do not reflect, as a rule, the social, reputational and information capital of the region, do not take into account its historical and cultural heritage, which, in our opinion, have an impact on the level of non-material development of the region.

Keywords: intangible development, human capital, social capital and reputational capital.

1. INTRODUCTION

The level of non-material development of the region depends on many indicators, such as the degree of development of human, social and reputational capital, the degree of development of relations of intangible property. However, at the present time, there is no quantitative assessment of the factors presented, the only indicator that is regularly quantified by regions of the Russian Federation is intangible assets. Nevertheless, intangible assets do not fully reflect the level of non-material development of the region.

With the help of correlation that was calculated between the total volume of intangible assets in the region and a number of other indicators, and a methodology for determining the intangible development of the territory, based on six statistical indicators we can determine the level of non-material development. We received a

rating of the regions of the Russian Federation in terms of the level of non-material development based on the proposed methodology.

We concluded that the level of non-material development in the region is determined by the degree of its economic development and the level of staff qualifications (high average salaries) and the development of industries closely related to patenting and scientific developments - the extractive and petrochemical industries. Therefore, the extracting and petrochemical industry is becoming one of the determining factors of the non-materially developed regions of the Russian Federation.

The proposed methodology for determining the level of non-materially developed regions can be adapted to assess the intangible development of countries.

Keywords: intangible development, intangible property, human capital, social capital.

2. DEVELOPMENT OF A MODEL FOR DETERMINING THE LEVEL OF INTANGIBLE DEVELOPMENT

We conducted studies, during which a correlation was calculated between the total volume of intangible assets in the region and a number of other indicators, such as:

- the number of researchers holding a degree (degree);
- Number of staff engaged in research and development (NIR);
- gross regional product per capita (VRPotn);
- Innovative activity of organizations (the share of organizations that carried out technological, organizational, marketing innovations, in the total number of organizations surveyed) (innov);
- number of personal computers per 100 households (comp);
- The share of the employed population with higher professional education at the age of 25-64 years, in the total number of employed population of the corresponding age group (education);
- morbidity with the first time in life the established diagnosis of alcoholism and alcoholic psychosis per 100 thousand population (alco);
- morbidity with the first time in life established by the diagnosis of drug addiction per 100 thousand population (narco);
- poverty level (population with cash incomes below the subsistence level) (poverty);
- Unemployment rate (unempl);
- morbidity of the population (sickness);
- Average monthly nominal wage of employees for a full range of organizations in the economy as a whole (wage);
- Number of registered crimes per 100 thousand people (crime).

We assumed that some of these indicators, such as: the number of researchers with a scientific degree, computer availability, innovative activity of organizations, the number of people with higher education has a favorable effect on the production of intangible assets. Intangible assets are the only indicator that most fully reflects the amount of intangible property and is taken into account by the Federal State Statistics Service.

The Hausman test is used with the main aim to test the assumption of uncorrelated unobserved individual effects with regressors. The Hausman test shows that interregional unobservable differences are not accidental with the probability that our model with random effects is 99.9%.

In general, the regression dynamic model of panel data with fixed effects has the following form:

$$y_{it} = \alpha y_{it-1} + \beta x_{it} + \varphi_i + \varepsilon_{it}, (1)$$

where y_{it} - it is the analyzed parameter of intangible assets,

$y_{it-1}x_{it}$ - it is the parameter of intangible assets for the previous period, the matrix of explanatory variables,

φ_i – is an interregional fixed error (does not depend on time),

ε_{it} – it is a random error. It is assumed that X_{it} — it are independent of ε_{it} it for all i and t . Errors ε_{it} — are independent identically distributed random variables, $E(\varepsilon_{it}) = 0$, $\text{var}(\varepsilon_{it}) = \sigma^2$ for all i and t [1]

A model with fixed effects is usually used when the sample with which it works, in fact, represents the general population. The sample of data included 69 regions of the Russian Federation for 7 time periods (2005-2011), totaling 483 observations.

During the study, a number of regions were excluded: the Nenets Autonomous District; because it is considered in total by the Arkhangelsk region, the Karachay-Cherkess Republic, the Khanty-Mansiysk Autonomous Okrug, the Chelyabinsk Region, the Yamalo-Nenets Autonomous District, the Amur Region, the Jewish Autonomous Region, the Kamchatka Territory, the Magadan Region, Primorsky Krai, Sakhalin Region, Khabarovsk Territory, Chukotka Autonomous Okrug - due to the lack of end-to-end data on the full range of analyzed indicators [2].

The "within" transformation is first done to evaluate the regression equation, for each variable, the regional average is subtracted, so the model does not allow estimating non-invariant variables, and then the least squares method is applied.

In accordance with our hypothesis, these factors have a positive effect on the volume of intangible assets. The following factors, according to our hypothesis, have a negative impact on the volume of intangible assets in the region. Such factors as alcoholism, drug addiction, poverty, morbidity and crime do not allow to fully engage in intellectual activity, which will negatively affect the amount of intangible assets in the region.

3. RESULTS OF REGRESSION MODEL OF PANEL DATA WITH FIXED EFFECTS

We tested the factors for multicollinearity. In connection with the internal dependence between explanatory variables, leading to a distortion of the level of their influence on the result. The results of the verification are presented in Table 1.

Table 1. The results of checking factors for multicollinearity in 2011 [3].

	NMAnorm (y)	NIRnorm (x)	narcon (x)	alconorm (x)	unempl (x)	wagenorm (x)	GRPpcn (x)	povert (x)	
NMAnorm	1								
NIRnorm	0,3269	1							
narconorm	-0,0034	0,0831	1						
alconorm	-0,1239	-0,1661	0,0609	1					
unemplnorm	-0,0895	-0,2928	-	0,0557	-0,3057	1			
Wagenorm	0,3807	0,3011	0,0709	-0,1685	-	0,1787	1		
GRPpcnorm	0,3718	0,3395	0,1124	-0,069	-	0,2523	0,7133	1	
povertynorm	-0,0958	-0,3218	-	0,0924	0,0805	0,4824	-0,4448	-0,4233	1

All the explainers were classified by correlation level using t-statistics to test our hypothesis. In our case, the variables are correlated weakly (i.e., within [0; 0.3) and medium [0.3; 0.7)) according to the accepted classification of the influence, which does not lead to a shift in the estimated parameters.

The dependence of the average monthly nominal wage of workers (*wagenorm*) and gross regional product per capita (*GRPpcn ~ m*) is the exception. Since nominal accrued wages have a stronger impact on the dependent variable than the HRVP, we will remove GRP per capita from the model. The poverty level correlates with the unemployment rate, so we do not take into account the poverty level in the model. From Table 4.2.1. It can be seen that the greatest influence from all factors on *y* is the nominal accrued wages (0.38) and the number of personnel engaged in research and development (0.32).

Next, we built a dynamic model of intangible assets of estimating panel data, where variables were taken as explanatory variables that showed a correlation with intangible assets:

- morbidity with the first time in life established diagnosis of alcoholism and alcoholic psychosis per 100 thousand population (*alco*);
- morbidity with the first time in life established by the diagnosis of drug addiction per 100 thousand population (*narco*);
- unemployment rate (*unempl*);
- the number of staff engaged in research and development (*NIR*);
- Average monthly nominal wage of employees for a full range of organizations in the economy as a whole (*wage*);
- intangible assets of the past period (*NMA L1*).

As a result it was revealed that the relationship between the volume of intangible assets and the nominal wage level, the number of personnel engaged in research and development and intangible assets of the past period is significant. The minimum and maximum value of the coefficient for these variables did not change the sign. The volume of intangible assets in the region was dependent variable in the model. A check on F-statistics showed that the model is statistically significant. The coefficient of determination is 0.87. The conducted testing of models has shown that it can be used for forecasting.

We built another model with the same explanatory variables to determine the coefficients for the factors that will be included in the rating. Significant indicators as well as in the dynamic model were: the level of nominal wages, the number of personnel engaged in research., We rated the coefficients of the model using the formula to determine the coefficients that we take for these indicators in the future:

$$NMA_{norm}(i) = (NMA(i) - \min NMA) / (\max NMA - \min NMA) \quad (2)$$

The approach allows us to normalize different sizes and all values range from 0 to 1. We have obtained the coefficients that we will use to compile the rating. For the average monthly nominal accrued wages and the number of personnel involved in research and development, we also carried out a procedure for standardizing the selected indicators, since they have different dimensions.

The regression model of panel data with fixed effects has the following form:

$$NMA_{it} = 0.162wage_{it} + 0.073NIR_{it} + \varphi_i + \varepsilon_{it}, \quad (3)$$

where NMA_{it} - is the analyzed parameter of intangible assets by region for 2011, $wage_{it}$ - is the average monthly nominal wage of employees for a full range of

organizations in total by region for 2011, NIR_{it} - is the number of personnel engaged in research and development for the year 2011. φ_i - is interregional fixed error (does not depend on time), ε_{it} - is random error. $E(\varepsilon_{it}) = 0$, $var(\varepsilon_{it}) = \sigma^2$ for all i and t .

The model was estimated for temporary instability to test the hypothesis. It was found that the explanatory variables may not be significant in each analyzed time interval, which allowed us to use the volume of intangible assets as a dependent variable in the model. The explanatory variables did not change. 69 regions participated in the survey. A check on F-statistics showed that the model is statistically significant.

Table 2. Model of temporal instability of behavior of model [4]

2005	2006	2007	2008	2009	2010	2011
NIR*	NIR***	NIR***	Wage*	NIR**	NIR**	Wage**
Wage**				Wage*	Wage*	

* - The level of significance of the factor

Thus, it can be seen from Table 2 that significant variables are not stable in time. It could be assumed that this instability is due to the crisis phenomena in the economy in 2008.

As a result, the conducted econometric analysis allows to draw a conclusion that there is no strong direct relationship between the volume of intangible assets in the region and explanatory indicators. In our opinion, this fact is explained by the fact that intangible assets are not an adequate reflection of the presence of intangible property in the organization and in the region as a whole.

The dependence of intangible assets was more closely related to the average monthly nominal wage and the number of personnel engaged in research and development in the model of temporary instability and in the model of structural stability. Employees with a higher level of pay are, as a rule, carriers of non-material property, which the organization commercializes.

The employer pays a higher salary to the employee for the alienation of rights to intangible property. The number of personnel involved in research and development correlates with intangible assets, because this particular category of the population is most actively working on the creation of objects of intangible property.

Consequently, it should be concluded that these indicators can be taken into account when compiling a rating of the region in terms of the level of development of intangible property.

The received data testify that intangible assets reflect only a small part of objects of non-material property. Unidentified, client capital, social, reputational and information capital are not always subject to commercialization, as they do not meet the requirements of the Russian Accounting Standards [5].

Objects of intangible property may be presented in the organization in large quantities, but not reflected in the structure of the balance sheet. In addition, the splitting of property rights leads to the fact that a lot of competencies can be formed in relation to a single intangible object (right of use, right of alienation, commercialization right, etc.), quantitative measurement of these powers is possible through accounting of the volume of transactions related to the transfer of authority data in respect of an intangible object, but there is no similar statistics in the context of regions of this kind.

The saturation of the country's regions with resources and production factors is heterogeneous, including intangible objects. Traditionally, there were innovative regions, where more attention was paid to intellectual property. There are regions more involved in innovation activities, regions that have a rich historical and cultural heritage. This fact leads to heterogeneity of saturation of the region with non-material property.

4. METHODOLOGY FOR RATING THE LEVEL OF DEVELOPMENT OF INTANGIBLE PROPERTY IN THE REGIONS.

Our task is to develop a rating of the level of development of intangible property in the regions. We are considering the results obtained in the development model of intangible property, as well as proceed from the developed institutional structure of intangible property when ranking the regions

In our opinion the institutional structure of intangible property includes the following elements: intellectual property, rights to information capital, rights to social capital, licenses and permits of self-regulating organizations, unidentified intangible property [6].

We consider it necessary to take some indicators for rating the regions by the level of development of intangible property, proceeding from these models. Among them are:

- average monthly nominal wage;
- number of staff engaged in research and development.

The highest level of development of intangible property by the factors of the model was shown by such regions as: Moscow, Chukotka Autonomous District, Magadan Region, St. Petersburg, Tyumen Region. The lowest level of development of intangible property observed in the Republic of Dagestan, the Republic of Mari El, the Republic of Kalmykia, the Kostroma Region, the Altai Territory. Sevastopol and the Republic of Crimea were not analyzed due to the lack of comparable statistical data.

We considered it necessary to add a number of indicators of Group 2 with a level of influence of no more than 5% for improving the rating. Since we showed that intangible assets and the factors influencing them do not fully describe all the rights of intangible property. Information capital and social capital, as a rule, are much less commercialized.

It is possible to take the number of subscriber units of mobile radiotelephone (cellular) communication for 1000 people and the number of active fixed broadband subscribers in the Internet per 100 households for the indicator indirectly reflecting its development in addition to the previously considered indicators. Cell phones and Internet access are means of communication, therefore, it is logical to assume that development of information and social capital depends on their using.

It is possible to use such an indicator as objects of cultural and archaeological heritage for reputational and unidentifiable capital. The number of monuments of culture and archeology speaks about the historical past of the region, the attractiveness for tourists, the natural and cultural value of the territory.

Thus, we added four more indicators to the model. Among them are:

- number of cultural monuments;
- number of monuments of archeology;
- number of subscriber units of mobile radiotelephone (cellular) communication for 1000 people;
- the number of active fixed broadband subscribers in the Internet per 100 households.

Table 3. Rating of federal districts by level of development of intangible property [7].

Place in 2014	Federal District	Value
1	Central Federal District	0,51603
2	North-West Federal District	0,30995
3	Volga Federal District	0,19457
4	Siberian Federal District	0,15593
5	Far Eastern Federal District	0,14689
6	Ural federal district	0,14481
7	North-Caucasian Federal District	0,12776
8	Southern Federal District	0,11935
9	Ural federal district	0,14481

The received rating of regions on 6 indicators which is headed by the following top-five: Moscow, St.-Petersburg, Chukotsky autonomous region, the Tyumen area, the Magadan area. The conducted research has made it possible to compile regions. The first 10 leaders are presented in Table 4.

Table 4. The rating of the regions of the Russian Federation in terms of the level of development of intangible property for 2014 [8].

Number in rating 2014	Rating of regions by 6 indicators	Value
1	Moscow	0,28804
2	St. Petersburg	0,18407
3	Chukotka Autonomous District	0,17858
4	Tyumen Region	0,16355
5	Magadan Region	0,15120
6	Kamchatka Region	0,13886
7	Moscow Region	0,13394
8	Republic of Adygea	0,13390
9	Sakhalin Region	0,13233
10	The republic of Sakha	0,12766

If we compare this rating with the existing rating of innovation activity, it can be seen that Moscow and St. Petersburg remain in the top ten in both ratings. The Tyumen region, which is the leader in the level of development of intangible property, ranks 26th place in terms of innovation activity.

These discrepancies once again confirm that intangible property goes far beyond intellectual property and can not be associated solely with the level of technology development and the degree of informatization of society [9]. Relations of intangible property can be formed on objects that are valuable in an industrial society (the right to alienate health, the individual's physical rights). At the same time, the data of our rating remains comparable with the volume of intangible assets in the regions, which is explained by the methodology of its construction.

5. CONCLUSION

Moscow, St. Petersburg and Moscow region have the largest concentration of intangible assets, the creation of intangible property and its commercialization, as a rule, occurs in the head units. Here the management system and transport flows are concentrated.

The Chukotka Autonomous District takes the leading place in the rating according to the level of development of intangible property because:

- the mining industry is developed in the region it is connected with research and patenting of new production methods;
- the region is one of the leaders in terms of GDP per capita and average wages;
- high level of investment activity, due to the wealth of the region with precious metals, contributes to the development of property relations, incl. and on non-material objects.

The Tyumen Region and the Khanty-Mansiysk Autonomous Region occupies the third place in the "socio-economic ranking of the Russian regions" and the second largest economy in Russia. The region also has a developed oil and gas producing industry and an oil refining industry. The region is investment-attractive, which together explains the high place in the rating of the Tyumen region.

In the Kamchatka Region and the Sakhalin Region, offshore deposits are also being developed, in addition, they are border areas with a developed military complex, where scientific developments, communications, etc. are used.

In the Sakhalin and Tyumen regions, much attention is paid to the development of the education sector. The regions with the largest and the lowest population density (Moscow and the Chukotka Autonomous Region correspondingly) fell into the rating on the 1st and 2nd places, which is explained by the relativity of this rating, the majority of indicators are taken per capita.

The Republic of Sakha (Yakutia) has a rich resource potential, mining (diamond, gold, oil, gas, coal and other minerals) the processing industry and the fuel and energy complex are developed here. The Republic of Adygea is characterized by rich recreational resources and rich archaeological heritage.

The percentage of the urban population is another unifying factor for the leading regions. Regions-leaders of the rating with saturation with intangible property, in their majority, have more than 75% of the urban population, in the regions-outsiders the percentage of urban population is lower than the national average. Geographically, the leading regions are zoned. Leading regions also have one of the highest intangible assets per capita, which is explained by the methodology of its compilation.

Moscow, St. Petersburg, Tyumen Region are also in the top ten leaders if we compare the rating on the level of development of intangible property with the rating of the quality of life of the population. At the same time, in 2016, the Magadan Region rated the quality of life of the population as the leader in terms of the growth of positions in 2016 which is explained by the high saturation of intangible property.

There is a tendency to improve the quality of life, as a confirmation that the level of development of intangible property in the ranking of regions drawn up in 2014 in the Far Eastern Federal District

The Republic of Tatarstan has high indicators of intangible assets per 1 resident. In the Republics of Bashkortostan and Tatarstan, the oil and petrochemical industry (associated with patenting) is also developed, the regions are on high positions on the rating of innovation activity and the quality of life of the population. However, in the general rating on the level of development of intangible property, the regions occupy 24 and 32 places respectively.

This fact shows, that the leading positions are ensured at the expense of material production. The propensity to commercialize intangible property and increase capitalization is great, but intangible property can be revalued or maximally capitalized in Tatarstan.

In general, it can be concluded that the level of development of intangible property in the region is determined by the degree of its economic development and the level of staff qualification (high average salaries) and the development of industries closely related to patenting and scientific developments - the extractive and petrochemical industries. The volumes of development of these types of industry are not comparable (much more) with other "non-materially developed" industries in Russia (IT, retail, banks, advertising, pharmacy). Therefore, the extracting and petrochemical industry is becoming one of the determining factors of the non-materially developed regions.

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