



Romanian Journal of Regional Science

The Journal of the Romanian Regional Science Association

Vol. 3 No. 2, Winter 2009

INTELLECTUAL CAPITAL COMPONENTS AS CAUSES OF REGIONAL DISPARITIES. A CASE STUDY IN ROMANIA

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Biographical notes

Bogdan-Vasile Ileanu is Assistant Professor of Statistics and Econometrics in The Academy of Economic Studies Bucharest, Department of Statistics and Econometrics. Starting with 2007 he is a Ph.D. candidate in statistics having the main goal to develop a method for intellectual capital measure. His research objectives are connected with financial econometrics, human and intellectual capital measure, regional analysis, statistical analysis etc.

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Abstract

Starting from a Logit model developed in the past we try to provide empirical support for counties disparities regarding intellectual capital factor influence. The study presents some correlation between economic performance, structure of activity in the county and intellectual components: human capital, organizational capital and customer capital. Because of various differences between counties we may consider that specific models are more indicated to analyze local behaviour. Also the results can give important information about association of counties by factor development and can also show the gaps between administrative organization forms with main purpose: a future more efficient investment and development.

JEL Classification: C51, R11, R15

Keywords: *intellectual capital, logit model, human capital, SME, structural capital, counties disparities*

1. Literature review

Today, when the natural resources have a negative tendency of evolution, the key to succeed is the development, investment and the good use of intellectual resources. It is the moment to shift the concentration from tangible to intangible; also it is time to change vision for the future. The intellectual capital is the undeveloped source of future success. In the whole world many companies have announced successful experiences about intellectual capital management. For example we can mention: Skandia Insurance Company which developed Skandia Navigator System, Maxon Telecom which applied the first methods of the “Intellectual Capital Statement” and others.

There is no universally accepted definition of IC in the literature. Following Edvinsson and Malone (1997, p. 44), Intellectual Capital is the possession of knowledge, applied experience, organizational technology, customer relationships and professional skills that provide the firm with a competitive edge in the market’. Bontis et al. (1999) argued the importance of Intellectual Capital flows and defined IC as ‘the collection of intangible resources and their flows’. This definition implies the dynamic nature of IC and its development through time.

There is a widely accepted three-category IC classification into human, structural, and customer or relationship capital (Saint-Onge, 1996; Edvinsson and Malone, 1997; Sveiby, 1997; Roos et al., 1997; Stewart, 1999). First, human capital is represented by the intangible assets embodied by individuals. Roos et al. (1997, p. 32) argued that people generate capital through competence (represented by skills and education), their attitude (which covers the behaviour of employees

towards their work) and their intellectual agility (represented by innovativeness and openness to changes). Second, structural capital is owned by the firm (Stewart, 1999, p. 109). Following Bontis, it includes routines and structures. Stewart (1999, p. 109) states that culture is also an extensive and valuable element of structural capital. Third, customer capital is owned by every firm that has customers (Stewart, 1999, p. 143). Customer capital can be broadened to relationship capital, which also includes relationships with other subjects such as business partners, tourism promotion organizations, government, local community, competitors, creditors, special interest groups, the media and the public. The product value does not arise directly from IC but is created by flows within IC (Saint-Onge, ; Roos et al., 1997; Stewart, 1999, pp. 164–165; Sveiby, 2001), which demonstrate the relationships between pairs of IC categories. In their definition of IC, Bontis et al. (1999) spoke about flows of IC. The service–profit chain (Heskett et al., 1992) also partly shows the importance of IC flows. Studies in the context of IC research (Bontis, 1998; Bontis et al., 2000) have found relationships among human, structural and customer capital and confirmed IC’s impact on business performance. A study of 13 hotels in Norway (Engstrom et al., 2003) found a strong connection between human and structural capital. The conversion of IC into financial results should be realized. The financial capital of a firm can only be increased by increasing customer capital, which can be increased by the flows from human and structural capital (Saint-Onge, 2001). Stewart (1999, p. 77) also noted that Intellectual Capital turns into financial results in customer relationships

2. Methodology and research study

2.1 Methodology

The applied research is done on a representative sample of small and medium enterprises (SME). Data collection was made with face-to-face method by field-work interviewers. All the respondents were specialist in HR. The sample is a cross stratified by number of employees, NCAE (domain activity) and regions. After data collection, we have cleaned the database; we have solved non-answers with statistical methods. We attached codes to the answers. Some of the questionnaires which did not pass the logical correlation test were deleted. In this case we have enough data for econometric models just for 21 counties. The counties with at least 15 valid cases are: Vrancea, Vaslui, Timis, Teleorman, Olt, Neamt, Ilfov, Iasi, Ialomita, Dolj, Dambovita, Cluj, Bucharest, Brasov, Botosani, Braila, Bihor, Bacau, Arges and Alba.

The study starts from the base model of the study elaborated by James Ohlson in 1995 and according to Dooley it is defined like $MV_t = BV_t + NI_t + NFM_t + \varepsilon$, where: MV_t represent the market

value of equity at time t , BV_t represent the book value of the equity at time t , NI_t is the net income at time t , NFM represents the non financial measures such as human capital and customer capital using the components presented in Skandia Navigator model.

The market value of a company is explained, in Skandia model, as a sum o financial capital and nonfinancial capital. Non financial capital is represented by intellectual capital divided by components: Human capital and Structural capital. The structural capital is divided also in Customer capital and Organizational capital. The organizational capital is the effect of the Innovational and Process capital.

Human capital represents the sum of knowledge and all other skills of the employees of the company. It also contains the culture the values and all the principles developed in the company during the years. **Structural capital** represents the data bases, software, organizational structures, patents and other factor which sustains the employees' productivity. In conclusion structural capital is represented by clients and by company organizational structure. Intellectual capital equals the sum of human and structural capital.

2.2 Case study

In our case, because we don't have the possibility to evaluate the monetary value of the companies we'll try to use an qualitative aggregate indicator of the enterprise performance composed from several factors: In this case we'll use a binary variable which measure the performance, where 1 means that the company had better performances compared to the last year and 0 means it had lower performances.

The factors used to explain the performances are:

Personal changes (coefficient of migration), which is defined as a rapport between the number of new employed persons and the number of persons who left the company in the last year, (**used as x_1**). This variable is used to measure the structural and organizational capital. A good structure and a good management should give moderate rates of mobility. This indicator could be also considered as human capital indicator. The question was recoded in a binary question using the "mean criteria". If the personal changes had greater values than the mean the new variable took the "1" value and in all other cases it had "0" value.

Number of days of training per employee (used as x_2). This indicator contributes to evaluate the organizational capital through the innovational capital impact. Also it may be considered an indicator of human development. This indicator was collected as close question with the following possible answers: “1=no training”, “2=1 to 5 days of training”, “3=6 to 10”, “4=over 10 days”. For better relevance it was transformed in a binary variable as follows 0=no training and 1 in rest.

The percentage of investments for product innovation, processes and organization (used as x_3). This indicator contributes to evaluate the organizational capital through the innovational capital impact; The answers were: coded with values between 1 and 6 which where 1=0% investments into innovation; 2=1-5%, 3=6-10%, 4= 11-21% 5=21-50% and 6=over 51%

The turnover percentage gained from new product sold (used as x_4). The new products sold show the impact of investments in two types of finalities: relational capital and innovational capital; The answers were: coded with values between 1 and 6, where 1=0% investments into innovation; 2=1-5%, 3=6-10%, 4= 11-21% 5=21-50% and 6=over 51% percents from turnover invested.

The company ancientness (used as x_5). The ancientness contributes to “brand value”. The relational capital is well developed by brand value but only if the innovational factor sustains the brand culture. The brand value will be more valuable if it will be sustained also by the quality of products, services offered and also by the good relation with customers and clients. The answers were collected as absolute values. We recoded this variable as follows: 1=the company has less than 5 years, 2=the company has between 6 and 18 years old and 3=the company has more than 18 years old. We took 18 years as cut value because of economical importance of this number of years value.

The wage changes in the last year (used as x_6). The changes in employee’s salaries should be also an indicator of human capital progress. We had predefined answers as: 1=the salary decreased, 2=no changes, 3=increase of salary with 1 to 5 %, 4=increase with 6-10%, 5=increase with 11-15%, 6=increase with 16-20% and 7=increase with 20%.

The company innovation efforts (used as x_7). The variable is used to measure innovation capital. In the initial form the variable has several nominal expression as answers (1=investments in new products, 2=new technologies, 3=new management and marketing approaches, 4=IT development,

5=human resources training, 6=none of the previous). It was recoded as binary variable with **1**= the company had efforts to develop the new products, IT or new technologies, training of human resources etc and **0**= the company did not have any of the above mentioned goals.

The influence of each variable on the intellectual capital form could be represented as follows:

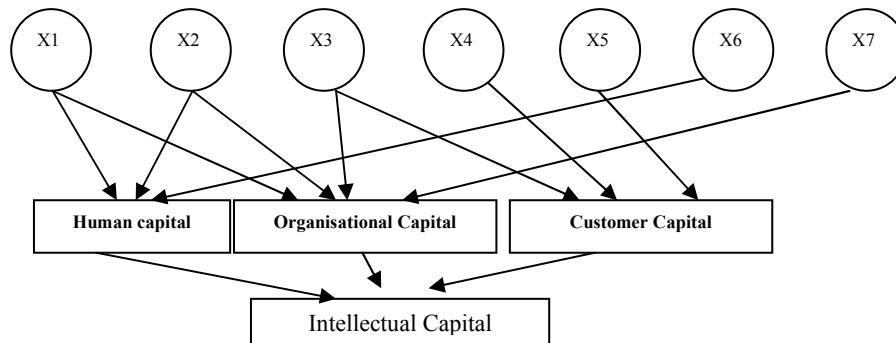


Figure 1. Intellectual Capital components

Along with these factors we attached a new variable (type) which takes into account the type of enterprises. This variable is coded with values 1=micro-enterprise (1 to 9 employees) 2=medium enterprise (10-49 employees) and 3=large enterprise (over 49 employees).

Using a logit model developed with these variables (Ileanu, B-V., Isaic-Maniu, A., 2009) we estimated the parameters for the general model (including all the 21 counties). The result shows **only two** significant parameters at 5% level (See Annex 1). As we know from other studies that all the factors included have a good significance it is indicated to analyze the factor implication in each county. After the estimation of 21 logit models we obtained the following synthetic table with significance of each factor (See Annex 2).

We had no valid multiple logit model in counties such as Teleorman, Braila, Brasov, Arad and Arges because of activities' structure from the sample. In these counties there is some important percentage of activities such as Commerce, Transportation or Construction where the investment in the intellectual capital is not existent or in some cases is very weak developed.

Non-significance of logit model above mentioned by informational redundancy could be explained also by taking into account the informational redundancy. This informational redundancy

determines an effect of multi correlation between variables X2 to X7. Multi correlation discovered here has a negative impact from econometric point of view because it increases the standard errors of estimated parameters in the logit models. If we analyze from economical point of view this multicorrelation is a good sign in the perspective of intellectual capital. The correlation found here between **intellectual capital** components shows that the investment in **human capital** is also sustained in other elements of intellectual capital elements such as customer or organizational components.

Now the next purpose is to create some clusters from analyzed companies and see if there are similar characteristics present in more counties. For this goal we applied Principal Component Analysis using the most significant factors discovered in the logit models. We used as source factors the variables X2, X3, X4, X5, X6 and X7 above described. We didn't use X1 because it looks like it has a low significance across counties. After we choose three principal we used the cluster method to group the SMES¹.

In the most analyzed counties we can find all the three clusters formed by different proportions of companies. In each county, each cluster is formed by a number of SMES represented as percentage of total SMES in the county. The dimension of circles represented on the map is proportional with the percentage of companies from the cluster. We choose three categories of clusters to be represented on the map:

- Small clusters -in which less than 25% of companies within a county have similar characteristics;
- Medium clusters- in which 25% to 50% of companies within a county have similar characteristics;
- Large clusters where over 50% of companies within a county have same intellectual capital components developed.

¹ Principal Component Analysis and Cluster Analysis were made in SPSS software

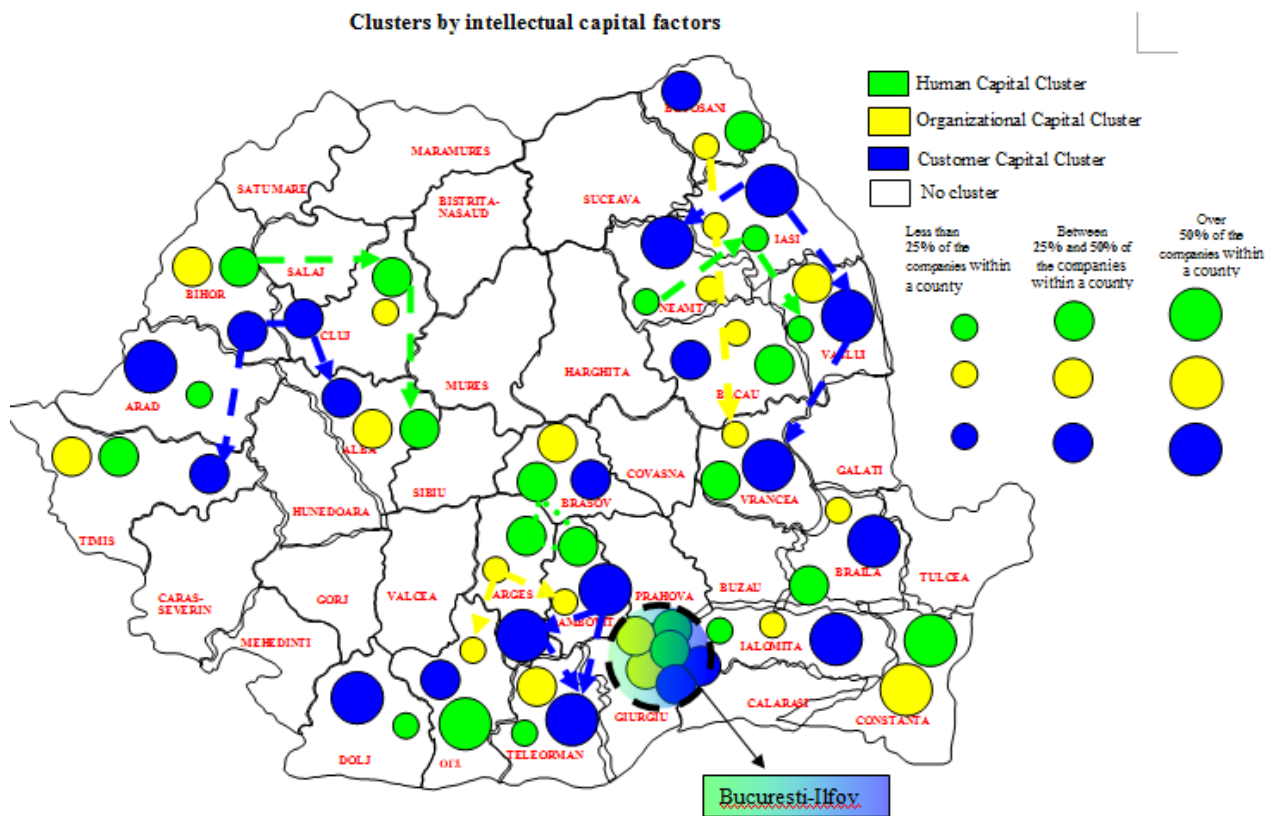


Figure 2. Territorial distribution of intellectual capital components clusters

Analyzing figure 2 we observe a non-uniform distribution of cluster formed. In this way we can distinguish few significant clusters described in the following paragraphs:

In the West-North-West and West part of the Center region we have a medium cluster formed between Timis, Bihor, Cluj and Alba. This cluster, marked with blue arrow on the map, connects companies within a county or between counties taking into account customer relation. This cluster attracts different counties from economic point of view. Economic power of Cluj or Timis attracts neighbor counties with lower performances. This direction of economic relation is shown in the Customer capital defined here. Another cluster met between counties Cluj-Alba-Bihor is defined by Human Capital components. If we have an overview on the entire area we cannot see huge discrepancies between counties regarding intellectual capital components. This equilibrium keeps the trend of economic climate avoiding large gaps met between other regions or other counties.

A more complex situation is in the South around Bucharest-Ilfov Area. Here we can see more clusters and more variability. Between Arges-Dambovit and Brasov we have a similar behaviour

regarding Human Capital. The companies from here invest in general in human capital components and in the same time keep customer capital at a reasonable level. Discrepancies appear regarding organizational capital. For example if in Brasov a good percentage of companies are interested in this source of intellectual capital, in the south in Arges and Dimbovita the attraction of organizational factor is almost missing. In fact regarding organizational capital in these two counties we can see a similar behaviour with Olt county rather than Brasov. These differences could be determined by many factors. Brasov county comes from a different cultural area with other history compared with South area. In Brasov there are still present tendencies of organizing inherited from ancient sass. In the south it is specific the Latin influence: more relation less organization. Also these discrepancies could be explained by taking into account the structure of the companies by domain activity. The percentage of companies which have main activity in commerce or transportation decreases from North to South in the same manner as interest to organizational capital factor. Bucharets-Ilfov is a cluster which has no typical behavior compared with other studies or other domains. Always Bucharest-Ilfov area is a good example of economic practice for the other Romanian areas regarding economic performance. The same thing can be see here. The intellectual capital components are developed in a good equilibrium with an efficient contribution on the long term development. A big part of companies from counties around Bucharest-Ilfov area define a cluster by customer relations. Teleorman-Arges-Dimbovita cluster by companies interested in customer relation could be an effect of strong economic pole of Bucharest area and the need of economic relation determines companies around Bucharest to interact with companies within this area. Also another cause could be the creation of small enterprise having main activity commerce around Bucharest with main purpose of reducing unemployment.

Regarding the North-East area, here we can see larger clusters between counties than in other parts of Romania. Unfortunately in this part of the country the clusters formed are showing low importance given by companies to intellectual capital factors and as result a low importance given to knowledge based economy, the future economy. One cluster is done by SMES from counties Botosani, Neamt, Iasi, Bacau and Vrancea and it shows a lack of interest regarding organizational factors. Other cluster established between SMES from counties like Neamt-Iasi-Vaslui-Vrancea shows a concentration of investment to develop the relation channels. The Human Capital Cluster (marked with green on the map) connects counties Neamt, Iasi and Vaslui. The behavior seen in this area could be explained by the attraction of economic pole given by Iasi County. Around Iasi small enterprises are attracted into relation within and between counties. The same tendency is viewed in Braila and Ialomita counties with low developed economy.

3. Conclusion and future researches

A general overview shows that equilibrium between intellectual capital factors development is strong correlated with economic development.

As a result we can say that Intellectual capital is generated by the economic power but also on the long term intellectual capital thru his correlated components generates economic advantage.

In particular, regarding Human Capital approach, investments in this domain is made in general by medium or large company and less by small companies. In this sample we have in general small and medium enterprises so the results, of low development, are normal.

Better results or more relevant could be obtained from a more specific regional study. So we'll try to test and add other indicators with relevant significance. Also we'll try to add more data for all the counties in order to estimate more accurate models of analysis.

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Annexe 1.

Dependent Variable: Y

Method: ML - Binary Logit (Quadratic hill climbing)

Sample (adjusted): 5 1026

Included observations: 384 after adjustments

Convergence achieved after 3 iterations

Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
X1	0.223811	0.347772	0.643556	0.5199
X2	0.125505	0.164238	0.764161	0.4448
X3	-0.091319	0.120915	-0.755229	0.4501
X4	0.067124	0.109314	0.614044	0.5392
X5	-0.404657	0.211807	-1.910496	0.0561
X6	0.481134	0.078471	6.131356	0.0000
X7	-0.018715	0.403752	-0.046353	0.9630
Mean dependent var	0.809896	S.D. dependent var		0.392895
S.E. of regression	0.367986	Akaike info criterion		0.865514
Sum squared resid	51.05101	Schwarz criterion		0.937531
Log likelihood	-159.1787	Hannan-Quinn criter.		0.894079
Avg. log likelihood	-0.414528			
Obs with Dep=0	73	Total obs		384
Obs with Dep=1	311			

Annexe 2.

		HC OC	HC CC	OC CC	CC	CC	HC	OC
		x1	x2	x3	x4	x5	x6	x7
1	ALBA			SIG.	SIG.	SIG.	SIG.	
2	ARAD	There is no multifactorial model with at least 2 significant factor						
3	ARGES	There is no multifactorial model with at least 2 significant factor						
4	BACAU			SIG.		SIG.	SIG.	
5	BIHOR			SIG.	SIG.			
6	BOTOSANI			SIG.	SIG.		SIG.	
7	BRAILA	There is no multifactorial model with at least 2 significant factor						
8	BRASOV	There is no multifactorial model with at least 2 significant factor						
9	BUCURESTI		SIG.			SIG.	SIG.	SIG.
10	CLUJ				SIG.	SIG.	SIG.	
11	DAMBOVITA			SIG.		SIG.	SIG.	
12	DOLJ		SIG.		SIG.			
13	IALOMITA			SIG.		SIG.	SIG.	
14	IASI				SIG.		SIG.	
15	ILFOV					SIG.	SIG.	SIG.
16	NEAMT			SIG.	SIG.			SIG.
17	OLT			SIG.	SIG.	SIG.		
18	TELEORMAN	There is no multifactorial model with at least 2 significant factor						
19	TIMIS			SIG.		SIG.	SIG.	
20	VASLUI	SIG.	SIG.			SIG.		
21	VRANCEA		SIG.	SIG.	SIG.	SIG.	SIG.	

*SIG =the factor is significant at level close to 5%