THE COMPLEXITY OF BIOECONOMIC PROJECTS FROM THE PERSPECTIVE OF THE DYNAMICS OF INTELLECTUAL CAPITAL AND HUMAN RESOURCES

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Abstract: The intellectual capital can be defined as the totality of non-monetary and non-physical resources, which are totally or partially controlled by the organisation and contribute to bringing value to the organisation. This represents the collection of intangible assets and based on the knowledge a company has. This article presents a convincing and solid method to measure the relation between the project manager competency model and the intellectual capital, which includes the human capital, the structural capital and the relational capital, in order to provide an efficient conceptual model within the bioeconomic projects.The results are significant because they confirm the importance of the project managers' competencies. Moreover, the results of the study are this stable and reliable because we use trustworthy instruments to measure the indicators.

JEL classification: M10, M21

Key words: **intellectual capital**; human capital; **relational capital**; structural capital; **human resources.**

1. INTRODUCTION

The intellectual capital supposes the addition of the entire intellect of the members of the organization and its use. The intellectual capital represents a complex of useful knowledge, which includes the organization's processes, technologies, patents, skills of the employees and information on the clients, suppliers, and interested parties (Stewart, 1997).

Sveiby (1997) emphasized in the definition of the intellectual capital two basic aspects: one that is specific to man, reflected in the knowledge, experiences and intelligence level of the employees, and another one which is organized and reflected in the knowledge resources stored in the data bases of an organization, processes, culture and philosophy (Suha, 2014). Therefore, the conclusion is that the collection of resources is based on knowledge (intangible) the nature of an organization and their flows, and also the conversion of the knowledge resulted in competitive advantage, value and profit, are the nucleus of the intellectual capital of an organization (Bontis, 2001). The factors of the intellectual capital are: human capital, the structural capital and the relation capital . The human capital refers to the combination of individual factors and labor force. It can contain knowledge, skills and technical skills, personal characteristics, such as energy, attitude, trust, commitment, learning capacity; it includes the skills, imagination and creativity, the availably to share information, to be part of a team and to focus in relation to the objectives

of the organization (Weaherly, 2003). It is particularly important for professional service firms, because it represents the basic competence of the organization, but it remains difficult to codify.

The structural capital covers a series of different notions related to the company, rather than to the employee himself. The structural capital is divided in the organizational capital (innovation and process capital) and the capital of the client (Edvinsson and Malone, 1997). The structural capital is the knowledge held in the organization, in the structures built to support the personnel in their intellectual work. It helps the organization in transforming the individual human intelligence in knowledge that can be measured and developed at an organizational level. Without good and reliable structures for the mobilization of the human capital, these will remain only in the minds of the employees. In other words, by valorizing the human capital and making it useful for the entire organization, the structural capital is created. (Bontis, 2001). The relation capital must be regarded as part of the structural capital of the firm. The human capital includes the competence, attitude and intellectual agility, but not the relation capital, which is considered only as belonging to the structural capital category. The relation between the structural capital and the one of the relationship is however focused on relations with the clients, the suppliers, the partners, the shareholders and other interested parties (Roos *et al.*, 1997). The relation capital consists of a large variety of external relations between the organization and its clients, suppliers, competitors, and partners. Suggested measurements of the relation capital include the longevity of the relationship, based on the hypothesis that the relation capital value increases over time (Bontis, 2001). The approach based on competences in education and training gives the opportunity to identify and develop the skills necessary for the employees to perform their job. The competence is a term that can be used on a large scale, but which can mean different things to different persons. However, it is generally accepted that a corresponding knowledge, skills and behaviors are causally connected to the higher performance at the place of employment (Boyatzis, 1982).

The project management competence is the capacity to manage the professional projects, by applying the best practices regarding the design of the management process of the project and applying the project management methods. The project management competence requires knowledge and experience in the field, which allows the project to respect their deadlines and limits.

2. OBJECTIVES

One has attempted in this article to measure the relationship between the intellectual capital and the competence models at the place of employment, in order to efficiently design a conceptual model for the organizations oriented towards the bioeconomic projects, such as the energetic industry research ones.

3. METHODOLOGY

The case study in this research is carried out on 30 project managers from six companies in the electric energy industry field. Nowadays, the most important form of energy that is used all over the world is the electric energy. The development of the energetic industry, in line with the increase in routine needs, one of the most important strategies in the energetic industry.

The research hypothesis is:

H1: There is a positive and significant relationship between the intellectual capital (human, structural and relational) and the model of competence of the project manager (knowledge, performance, personnel, industrial and organizational competences).

The study questions are:

1. What are the characteristics of the competences of the project managers within the organizations?
2. What is the status of the intellectual capital in the organizations?
3. Are the components of the intellectual capital connected to the project managers' competence model?
   - 3.1 Is there a relation between the project managers' knowledge competences and the intellectual capital?
   - 3.2 Is there a relation between the project managers' qualification competences and the intellectual capital?
   - 3.3 Is there a relation between the project managers' personal competences and the intellectual capital?
   - 3.4 Is there a relation between the project managers' industrial competences and the intellectual capital?
   - 3.5 Is there a relation between the project managers' organizational competences and the intellectual capital?
4. How great is the efficiency of the project managers?
5. Is there a relation between the components of the project managers' competences and the efficiency of the project managers?
6. Is there a relation between the intellectual capital and the efficiency of the project managers?
7. What are the characteristics of the conceptual model for this research?

After the development of the research model and of the hypothesis, it is required the measuring of the main variables described in the theoretical research framework to collect primary data in order to test the research hypothesis. After examining the relevant studies, a number of items have been developed to measure the research variable and their respective dimensions. Therefore, the dimensions of the intellectual capital have been measured by means of the developing elements, as follows: five items for the "human capital", eight items for the "structural capital" and two items for the "relation capital". The dimensions of the project managers' competences have been measured by means of the developing elements by referring to the PMCDF model (for knowledge, performance and personal competences), and the opinions of the experts who use the Delhi technique (for organizational and industrial competences), as follows: twelve articles for the knowledge competence, twelve items for the performance competence, six items for the personal competence, ten items for the organizational competence and three items for the industrial competence. The evaluation of the project managers' efficiency is based on the PMCDF model. According to the experts and the parameters of the Karan Prakash - model are resumed to 18 indicators for the evaluation of the project managers' efficiency parameters. In order to measure the effectiveness of each component, the questions will be commented on each person.

The following are taken into account: the general presentation of the project; the management, planning and administration of costs, the management of problems and obstacles, the change; the communication management, the interested parties' expectations management; the documents management; the risk management, the quality management;

the procurement management, the human resources management, the measures and metrics management, leadership, managerial skills and execution skills, cognitive skills, efficiency, professionalism. These elements represent the main indicators for the evaluation of the project managers' efficiency. The research followed a survey project where one used structured and unstructured questions in order to evaluate the project managers' competences. Also, it followed a study project where one used structured and unstructured questionnaires in order to evaluate the dimensions characteristic to the intellectual capital. The research population consisted of six energy companies that operate in Romania. The analysis unit consisted of the project managers. The population that participated in the study is of 30 persons. Based on the total population, the response ratio was of 95.0%, which is considered very high (Hair *et al*, 1998).

The content and the validity towards the research instrument were assured through the following number of procedures, which are: carrying out a thorough examination of the relevant information in the literature which refer to the model of competence of the intellectual capital and of the project manager; the design of the measuring elements by referring to well-known studies, where researchers have developed and used confidence scales in order to measure the same constructs; carrying out a pilot study stage before the start of the study, by which five academic professors specialized in the human resources management, the project management and the intellectual capital management field acted as arbitrators for the questionnaire. Plus, twenty probationers that are working in six research institutes have been interviewed and were asked comments and suggestions regarding the formulation and elaboration of the items in the questionnaire. The obtained collective feedback was used to improve the design of the questionnaire and of its elements. As for the validity of the construction, the analysis of the exploratory factor was carried out in order to test the components of the competence model regarding the intellectual capital and the project management, in terms of identification of the dimensions which contain measuring elements. In order to do so, four hypotheses have been respected: the adequacy of the sampling; the minimum equal value for each factor should be one; a 0.40 loading factor for each element as threshold for keeping the element; the varimax rotation was used. The study variables should be normally distributed; this makes possible the generalization of the results of the analysis beyond the collected sample. Therefore, the Kolmogorov-Smirnov (K-S) test was performed. The result of the test indicated that the data are not being normally distributed. In order to adapt to this non-normal, the research design was transformed by modifying the square root and the transformation of the logarithm. The transformation of the data is an acceptable way to reduce the variability of the data, as long as the same mathematical application is made on each observation.

The reliability of the constructions has been measured by calculating the Cronbach's alpha coefficient for the resulted factors. The closer the Cronbach's alpha value is to one, the greater the internal consistency factor between the elements (Hair *et al.*, 1998). All the constructions have been very reliable, varying from 0.830 to 0.965 (table 1).

Table 1. Validity of the research constructs

Construct	Number of items	Cronbach's alpha Coefficient
Knowledge competence	12	0.965
Performance competence	12	0.952
Personal competence	6	0.854
Organizational competence	10	0.933

Industrial competence	3	0.837
Human capital	5	0.897
Structural capital	8	0.890
Relation capital	2	0.830

Source: the author's own concept

4. ANALYSES

The results of the data analyses are presented in this section of the research. In the data analysis, the frequency tables describe some characteristics of the project managers: demographic characteristics (age, education, work experience, work unit and gender); project managers' competences characteristics (knowledge, competence, technical competence, interpersonal, industrial and organizational competences) and their efficiency. The Pearson and Spearman correlation tests establish the relations between the managers' competences and the intellectual capital.

The results of the tests show that the project manager's competence characteristics are expected. In order to investigate this hypothesis, one compares the scores form the components of the model of competences of administrators. In this test, the null hypothesis and the research hypothesis are as follows:

The null hypothesis: the characteristics of the project manager's competences are not a condition. (More than a half of the project managers' competences based on the component scores did not obtain a satisfying score.)

Alternative hypothesis: the characteristics of the project manager's competences are a condition. (More than a half of the project managers' competences based on the component scores receive a good score.)

The proportion of the managers with the corresponding competence score 0.98 and the p value is lower than 0.001, thus the null hypothesis at 0.05 is rejected. The characteristics of the project managers' competences are desired (table 2).

Table 2. Project managers' competence characteristics

Sample	50
Favorable number	49
Compared to the sample	0.98
P value	below 0.001

Source: the author's own concept

Also, based on the questionnaires results regarding the intellectual capital, the conditions are not adequate for the research institutes based on projects. The testing proportions are used to investigate this hypothesis by comparing the managers' scores to the intellectual capital components. In this case, the null hypothesis and the alternative hypothesis are the following:

The null hypothesis: the intellectual capital of the samples is not desirable. (More than half of the managers did not obtain a satisfying score based on the scores to the intellectual capital components.)

The alternative hypothesis: the intellectual capital of the sample is desirable.

The proportion of the respondents with an optimum intellectual capital is of 0.32, and the p value is equal to one, thus the null hypothesis at the 0.05 level is not rejected (table 3). The intellectual capital of the samples is not a condition.

Table 3. Intellectual capital characteristics

Sample	50
Favorable number	16
Compared to the sample	0.32
P value	1

Source: the author's own concept

The main research hypothesis was tested through the regression of the project managers' competence model and of the intellectual capital, by using the multiple regression analysis. The Pearson, Spearman and Kendall coefficients are presented in table 4. The amount of the p value in any correlation coefficient is greater than 0.05 and that means there is no direct correlation between the project managers' competences and the intellectual capital in the project-oriented energy companies.

Table 4. The coefficient of correlation between the project managers' competences and the intellectual capital

Relation between the components		Correlation coefficient	P value
CC - CI	Pearson correlation coefficient	-0.028	0.696
	Spearman correlation coefficient	-0.014	0.847
	Kendall correlation coefficient	-0.011	0.824
CP-CI	Pearson correlation coefficient	-0.070	0.325
	Spearman correlation coefficient	-0.049	0.493
	Kendall correlation coefficient	-0.034	0.481
CPer-CI	Pearson correlation coefficient	-0.009	0.904
	Spearman correlation coefficient	-0.014	0.839
	Kendall correlation coefficient	-0.011	0.817
CInd -CI	Pearson correlation coefficient	-0.104	0.141
	Spearman correlation coefficient	-0.080	0.259
	Kendall correlation coefficient	-0.058	0.262
CO-CI	Pearson correlation coefficient	-0.143	0.043
	Spearman correlation coefficient	-0.153	0.031
	Kendall correlation coefficient	-0.105	0.034

Source: the author's own concept

CC – knowledge competence
CP – performance competence
CPer – personal competence
CInd – industrial competence
CO – organizational competence
CI – intellectual competence

There are direct relations between the components of the project managers' competences and the efficiency (E) of project managers as shown in table 5. According to the significance of the regression equations coefficients and the significant values of p are lower than 0.001, the regression of the models is significant to 0.05. This confirms once

again there is a significant relation between the components of the project managers' competences and their efficiency.

The regression equations are:

· Efficiency = 150.071 + 0.543 * Knowledge competence (CC)
· Efficiency = 10.801 + 1.364 * Performance competence (CP)
· Efficiency = 28.033 + 1.899 * Personal competence (CPer)
· Efficiency = 158.254 + 4.138 * Industrial competence (CInd)
· Efficiency = 150.246 + 2.159 * Organizational competence (CO)

Table 5. The relations between the components of the project managers' competences and the efficiency of the project managers

Relations between the components		Correlation coefficient	P value	Regression equation establishing coefficient
CC – E	Pearson correlation coefficient	0.317	< 0.001	0.100
	Spearman correlation coefficient	0.258	< 0.001	
	Kendall correlation coefficient	0.176	< 0.001	
CP-E	Pearson correlation coefficient	0.844	< 0.001	0.712
	Spearman correlation coefficient	0.842	< 0.001	
	Kendall correlation coefficient	0.744	< 0.001	
CPer-E	Pearson correlation coefficient	0.674	< 0.001	0.454
	Spearman correlation coefficient	0.590	< 0.001	
	Kendall correlation coefficient	0.395	< 0.001	
CInd -E	Pearson correlation coefficient	0.246	< 0.001	0.060
	Spearman correlation coefficient	0.267	< 0.001	
	Kendall correlation coefficient	.0.199	< 0.001	
CO-E	Pearson correlation coefficient	0.276	< 0.001	0.060
	Spearman correlation coefficient	0.256	< 0.001	
	Kendall correlation coefficient	0.181	< 0.001	

Source: the author's own concept

Also, the positive regression coefficient indicates a direct relation between the efficiency of the project managers and that of the intellectual capital as presented in Table 6. According to the report test, managers with better efficiency scores than 0.91 and the p values are equal to one, thus the null hypothesis to 0.05 significance is rejected. The efficiency of the project managers is desirable.

Table 6. **The relations between the efficiency of the project managers and the components of the intellectual capital**

Relations between the components		Correlation coefficient	P value
CU – E	Pearson correlation coefficient	-0.057	0.420
	Spearman correlation coefficient	-0.043	0.549
	Kendall correlation coefficient	-0.030	0.533
CS-E	Pearson correlation coefficient	-0.065	0.358

	Spearman correlation coefficient	-0.037	0.598
	Kendall correlation coefficient	-0.029	0.553
CR-E	**Pearson correlation coefficient**	-0.083	0.241
	Spearman correlation coefficient	-0.066	0.352
	Kendall correlation coefficient	-0.047	0.329
CI-E	**Pearson correlation coefficient**	-0.071	0.317
	Spearman correlation coefficient	-0.046	0.522
	Kendall correlation coefficient	-0.033	0.491

Source: the author's own concept

CU – human capital
CS –structural capital
CR – relation capital
CI – intellectual capital
E – efficiency

5. CONCLUSIONS

The results of the study are so stable and reliable, because we are using the confident instrument to measure the indicators as standard and detailed testing. We have five standard methods to evaluate the competences of the project managers and, also we are using valid and reliable questionnaires to evaluate the intellectual capital and the efficiency of the project managers.

These observations indicate an investment in human resources with an important role for the success of the organization. The concept of intangible success factor is used to refer to the individual non-physical assets, and also the activities related to the improvement or valorization of the assets, namely any intangible phenomena that need to be measured. The research ways show how the organizations can measure certain non-physical assets, such as the knowledge of the employees and their efficiency.

Plus, results show that the energy companies and the Ministry of Energy have knowledge on the human resources that work in tradition structures where the price is not intellectual capital.

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