INNOVATION, PERFORMANCE AND COMPETITIVENESS THROUGH CLUSTERS

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ABSTRACT

The article addresses clusters, a modern concept of development, because this network of organizations is part of the theory of innovation management. Clusters must innovate within the organizational network by improving strategies that lead to their performance, to meet the requirements of customers and society, to improve competitiveness, and last but not least to provide opportunities for stakeholders interested in this type of network. The establishment of a collaboration network as an objective within the clusters shows that successful innovation requires an efficient collaboration between the actors involved in the private environment, the public environment, universities, catalysts, etc. This article aims to investigate how the cluster has a triggering role in the development of the North-West region of Romania, integrating innovation, performance, competitiveness and to observe how the human factor through the activities undertaken, leads to more efficient investment in human resources and organizational level. The research methodology is based on the use of the organizational environment as a method of quantitative analysis of the collected data. Through this analysis within the sampled group, the interaction between the organizations involved can be quantified and visualized. The results highlight the link between human capital efficiency, knowledge management, investment in human capital, cluster relations, with a significant impact on competitiveness and organizational performance, in the innovative approach of cluster members. This has the effect of optimizing the adoption of organizational decisions, through better communication between cluster members, the integration of new information and educational dimensions, more effective projects and the development of unique partnerships that lead to a development of the analyzed region.

KEYWORDS: *clusters, competitiveness, human resources development, innovation*

1. INTRODUCTION

Clusters are designed to stimulate innovative activity, technological development, transfer of expertise, establishing partnerships, stimulating innovative activity, collaboration between organizations, dissemination of information and all this leading to a pole of regional competitiveness.

Clusters are for the economic environment of the North-West region of today's Romania what professional associations were, before the emergence of new technologies. Unlike previous forms of sectoral collaboration, clusters bring together not only companies in the same field, but also universities and administrations, at local or regional level. In the European Union, clusters have been talked about for almost two decades, as the new support structures for companies, their main goals being to maintain competitiveness, by improving human resources, generating innovation, with the help of universities and creating /maintaining a business environment friendly, by collaborating with administrations. Clusters catalyze the attraction of European funds, both through their own projects and through partnerships or the transfer of information on funding opportunities

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to member companies, and in the next period of business development we could talk about "digital innovation hubs", as communicated Muntean B. (personal communication, 2019).

In the analyzed region, Cluj County is the capital of clusters in North-West Romania, where the clusters Transilvania IT Cluster, Cluster Mobilier Transilvan and AgroTransilvania Cluster obtained "Gold Label", the highest European certification in the field of clusters, and iTech Transilvania Cluster implemented the new concept receiving the certification of "Transylvania Digital Innovation Hub" by the European Commission, implementing projects for the period 2021-2027 through the Digital Europe and Horizon Europe program. The link between the catalysts in the cluster makes it possible for organizations to innovate and have a dialogue that facilitates the development and provision of services and information for unitary and beneficial economic progress for each member, finding concrete solutions for a prosperous, digitized and integrated into the new system which is in a continuous ascent.

Prospects for investment in human resources, innovation and performance in clusters were analyzed on the basis of previous and current research, combined with the literature to gain an insight into the importance of human resource development in clusters and performance. The analysis showed that the components of human capital efficiency have a positive impact on performance outcomes, through the development of skills, abilities, opportunities, compared to the motivation of human resources to achieve that.

Several specialized studies at the cluster level have found that the aim is to improve the quality of life, to integrate and support small and medium-sized enterprises, to develop research and innovation units and to implement partnerships aimed at high living standards. Providing consulting, training, coaching, design and other services needed in the innovation process, practical training of employees in various fields, to update and strengthen knowledge lead to high performance at the organizational level.

In addition to and supporting the major role of human resources in clusters, in the North-West region of Romania, participation in investment projects has led to the integration of critical mass of specialized personnel by creating a regional training center, testing and certification in information and communication technology, regional IT services center, IT specialization centers, stimulating the technology transfer process between academia and business, by supporting interested entities: universities, clusters, other entities with initiatives in developing technology transfer/liaison offices, creation of open infrastructures for research and innovation in the field of new materials and functional coverage through the prism of universities, creation of open infrastructures for research and innovation, creation of a regional e-health training center with an integrated technological platform based on virtual reality applications, the development of skills in industrial parks by building vocational schools and skills training workshops.

Innovation is identified as one of the main challenges for the Romanian industry and, at an extended level, for the country's economy. The insufficient level of innovation of Romanian companies is highlighted in the document "Romania: National Strategy for Competitiveness 2014-2020" as an essential challenge entitled "low competitiveness and a weak research and innovation system".

There are various sources that point to the country's innovation challenges. According to the Report on global competitiveness, in 2015-2016 Romania ranked 5427 (out of 140 countries) in terms of global competitiveness index, and 84th in terms of innovation and complexity.

Innovative clusters are the transition to a digital economy, to modernization, to public-private partnerships, investments in projects, contributing to regional competitiveness and economic growth.

The development of human resources and the acquisition of skills in the field are essential for the development of the industry and especially relevant from the point of view of organizations. Cluster implementation reports lead to transformations of opportunities and determinants with positive effects on smart, regionally sustainable development.

2. ANALYSIS OF THE CHARACTERISTICS OF THE CLUSTERS IN ROMANIA. THE POTENTIAL OF CLUSTER DEVELOPMENT IN ROMANIA

2.1 Collaborative models for clusters

The *agglomeration model* is based on the Local Production Network Paradigm (LPNP) concept analyzed by Hart and Simmie (1997). Within this model, three types of clusters are identified: Cohesive Clusters, New Industrial Districts and Innovative Milieux.

Within each type of cluster mentioned above, the emphasis was on the internal links between different types of enterprises and individuals involved in the innovation process. The novelty component within the last type of clusters consists in the fact that the enterprises that compose it act as a Local Production Network (LPN). Proximity clusters are characterized by a higher degree of internal heterogeneity in terms of production organization than by cohesion (Hart & Simmie, 1997; Capello, 1999).

The Markusen model. From the point of view of cluster structure, Markusen (1996) delimited three types of clusters: network type clusters (industrial district), node and link type clusters (hub and spoke), and satellite clusters. Subsequently, the institutional cluster was added to them. (Paytas et. al., 2004). The essential contribution was made by Michael Porter, who re-established the classic theory of production factors in a new diamond of competitiveness, the clusters being an immediate derivative of Porter's theory. Three successful systems can be referenced: the French, centralized, German, complex combining flexible support schemes at central and regional level and the Swedish, which represents the successful application of the theoretical model "triple helix: industry – research – authorities ".

The accepted "triple helix" model that brings together in a cluster representatives of:

• enterprises – representing the economic side of the cluster;

• universities and research institutes – representing the providers of innovative solutions applicable to the real needs of the enterprises in the cluster;

• local, regional public authorities, etc. (Etzkowitz, 2002)

In Romania, however, experience has shown that the 3 partners of the "Triple helix" model do not cooperate, moreover they do not know each other and do not get to talk to each other. It turned into a model "Four clover" – "Four-leaf clover", the fourth actor being represented by catalyst organizations – consulting firms specializing in technology transfer and innovation (Cosnita & Guth, 2010).

The Cluster Initiative Performance Model (Sölvell et al, 2008) includes social, political and economic environment, objectives research and development of research networks, private lobby and communication with the political sector, commercial cooperation, development of educational infrastructure, innovation and development of new technologies, development and extension of an existing cluster and development process.

Sölvell (2008) defines a new model that involves the factors that lead to the development of the cluster (figure 1).

The existence of clusters is not a new economic phenomenon. We are the forces that determine their emergence and their correlation with international economic activities (Krugman, 2001).

These long-term clusters must perform through sustainable innovation, attracting resources, companies, new skills, venture capital, boosting global attractiveness and access to a dynamic market.

At the level of each cluster there is the manifestation of the agglomeration phenomenon which has several stages that can be delimited by two dimensions: the agglomeration of forces acting at the general level or at the level of companies and related industries on the one hand and the forces that increase efficiency and of flexibility or improvements and innovations on the other hand.
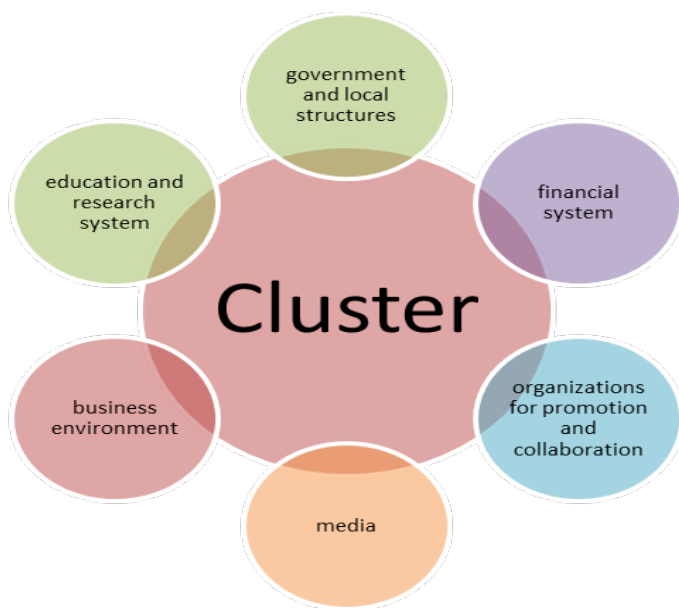
Figure 1. Cluster factors model
Source: adapted from Sölvell (2008)

2.2 Levels and indicators of analysis

In order to analyze the clusters, the relationship that exists at national and regional level must be taken into account by involving all actors involved, following an approach to existing funding sources and conceptualization: competitiveness pole, growth pole, cluster, pole of excellence, etc.
The analysis of the competitiveness of the clusters is made from the perspective of two indicators:

1. Quantitative analysis aimed at:
• Importance – investigates the contribution of the industrial branch to GDP, the turnover of the pole;
• Size – investigates the number of employees by branch / national level;
• Concentration – investigates the number of pole employees / number of employees at national level;
• Specialization – investigates the number of employees pole / number of employees national branch;
• Export – investigates the value of branch exports / total exports;
• Innovation – includes subsidies, dimensions of innovation (human resources, R&D system, support and financing, investments, cooperation and entrepreneurship, as well as outputs of product innovation, process, economic effects.

2. Qualitative analysis aimed at:
• Geographical concentration – investigates the concentration of some industrial branches in a certain regional area;
• R&D – investigates the existence of universities, research institutes in the respective geographical agglomeration.
• Labor force – investigates its availability (quantity), quality and the existence of qualification systems at the level of economic agglomeration.
• Cooperation – investigates the existence of partnership relations between the members of the respective industrial agglomeration. It is a critical factor that differentiates a cluster from a well-represented branch at the regional level.
• Catalyst institutions – investigate the existence of mediators of the clustering process (technology transfer centers, chambers of commerce, consultants, etc.).

• Internationalization: investigates the orientation towards the international markets of the respective cluster.

The cluster is par excellence a qualitative approach, having to do with the desire of cooperation of some actors that harmonize their interests within a common strategy and objectives. At regional level, quantitative analysis logically follows from qualitative analysis, because existing poles of competitiveness must be analyzed. At national level, the quantitative analysis validates the qualitative approach.

Excellence in cluster management is considered to be a general condition for a successful operation in:
• industry and the private sector in general;
• in public sectors, such as education, health, environment, etc.;
• in public administration and government organizations.

Therefore, it is clear that excellent management should also be considered as the main condition for a cluster organization to achieve the greatest effects of the cluster in a given technological, industrial, regional and legislative field:
• for cluster participants,
• for the industrial sector,
• for the development of the regions.

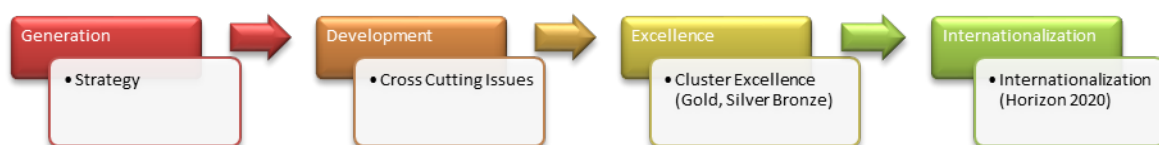The phases of cluster development are presented in figure 2.

Figure 2. Phases of cluster development
Source: adapted from Cosnita and Guth (2010, p. 15)

Economic theory and international practice show the role of clusters as catalysts for competitiveness based on innovation and internationalization. In order to become a fair, competitive, resource efficient society, clusters are catalysts for strategic and structural cooperation in the European value chain, supporting the promotion of industrial modernization through policy initiatives, facilitating SMEs' access to global markets and encouraging smart specialization. , development of emerging sectors, cross-sectoral cooperation and strategic operationalization.
At national level, the role of clusters was highlighted by the Ministry of Economy, based on the document of Industrial Policy of Romania (2008) according to figure 3.
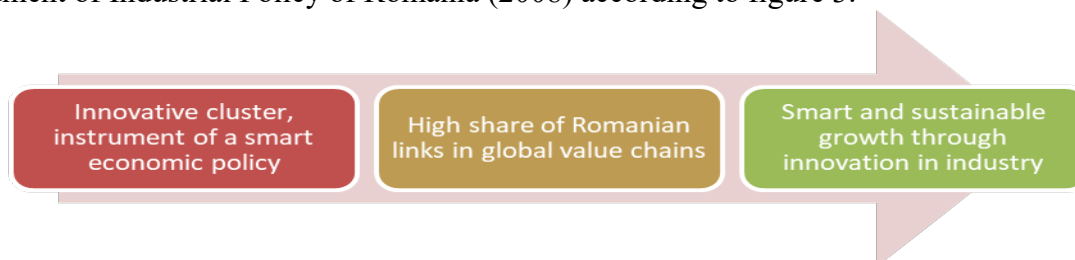

Figure 3. The role of clusters
Source: adapted from the situation of clusters in Romania (2020, p. 3)

In view of the role of the cluster in economic activity and in the context of the current Covid 19 pandemic, they cooperated with public authorities, research and development organizations, industrial actors in streamlining the challenges of the medical sector, the national and European economy, providing the opportunity European Alliance of Clusters to manage the "Covid 19 Connect! Solve! Save!" underlying the facilitation of the interaction of the industrial cluster community on the actions and decisions of the European Commission.

At the level of Romania, the polarization of industrial clusters is represented in figure 4, which shows that Bucharest has hi-tech clusters and electric mobility, followed by Brașov IT, aeronautics and creative industries, Covasna complete ecosystem, Cluj IT polarization, Timiș Pol Automotive and Advertising / Print / Packaging, Iași biotech polarization + medical imaging, Galați logistics / transport and Constanța maritime cluster.
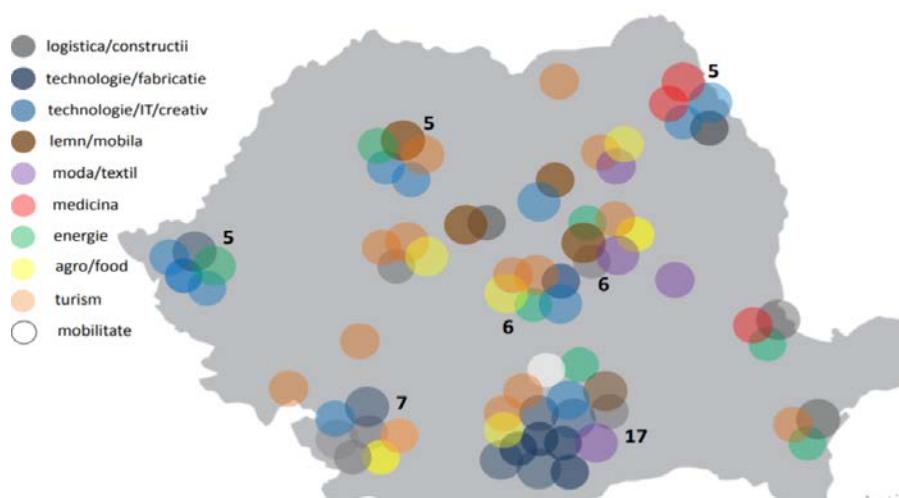

Figure 4. Polarization of clusters
Source: https://www.euractiv.ro/documente/Ionut_Tata_26.05.2015.pdf, p.15

Sources of cluster funding have led to a development and implementation of as many projects as possible by catalysts, SMEs, universities, corporations, public authorities, and as a beneficiary human resources based on training, research, innovation of the organizational system the cluster and the performance obtained as a result of making these investments. In order to develop and streamline the clustering process, certain factors must be taken into account, such as: start-up capital, labor availability, the possibility of research-development-innovation, educational and information infrastructure, the existence of leading organizations, the entrepreneurial environment, living conditions, transport, etc., all of which bring a balance to an area where clustering is in full ascent. The method for improving cluster management is shown in Figure 5.
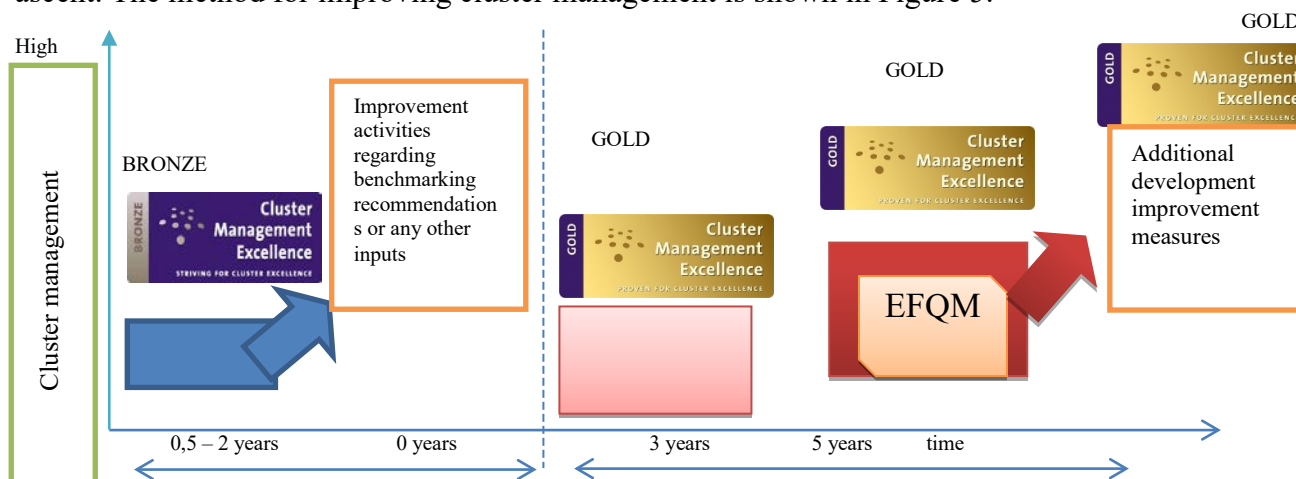

Figure 5. Method for improving cluster management
Source: adapted from *European Cluster Excellence Initiative – ECEI*

2.3. The advantages of clusters on increasing competitiveness

Strengthening the competitive position of the cluster by ensuring social, physical, financial and human capital, will create an environment conducive to its performance. As more value is added to the resources in the cluster, the investments, salaries and prosperity of the area where the cluster is located will increase. Such an evolution through which the cluster becomes efficient, contributing to the improvement of the functional parameters of its member companies and to the improvement of the situation of the entire geographical region in which it is located.

The benefits of clustering from economies of scale and agglomeration, location savings, technology transfer, network effects, availability of human capital and information, have led to the emergence of positive externalities, leading to increased productivity and lower costs., reflected in improved competitiveness.

• The effects on the competitiveness of companies have as components better access to labor resources and input suppliers, access to specialized information available locally, access to public institutions and goods, access to specialized services and infrastructures – top research, training programs, testing laboratories, quality control centers, etc., complementarities resulting from the beneficial effects of clusters on other areas, better motivation and superior possibilities for measuring and comparing performance (benchmarking).

• Effects on the innovation activity lead to the improvement of the companies' ability to perceive the opportunities in terms of, creating the possibility to be in permanent contact with numerous suppliers and institutions giving companies the ability to supply very quickly with the necessary ones, creating a competitive environment, facilitating experimentation at lower costs, interest in innovation and the technological externalities created can improve long-term competitiveness and ensure the sustainability of local businesses.

• Effects on the formation of new companies leads to the constant emergence of new companies for a dynamic economy because potential entrepreneurs in a cluster are better placed to promptly notice existing gaps, shortcomings and opportunities, barriers to entry are lower because there are an available qualified staff for employment, there is market information and links with potential partner companies; local financial institutions are more willing to lend within clusters, because they know better the respective field of activity and the people involved, the specialization facilitates the transition from dependent to independent work. (Mone et. al., 2000).

• Effects on transaction costs, too high transaction costs can slow down the growth of companies, especially those that seek to become global companies (Sölvell, 2008). The level of local employment and the positive externalities generated by the income from the cluster's business could be superior to other forms of economic development (Sölvell et. al., 2003).

Companies operating in a cluster can reduce these transaction costs by forming specialized consortia, by exchanging information and participating in informal networks, by accessing specialized services provided by government agencies (market information, country-specific information, data statistics, etc.) and by establishing working relationships with technical high schools and universities. If the existence of the cluster is justified and beneficial for the companies involved, it makes possible the development of a high potential of local employed labor force, conditions for higher vocational training, the possibility for locals to work in companies with higher productivity, reflected in a high salary level. and the diversification of local demand, which opens new business opportunities, generating economic growth and the evolution on a new, upward spiral of population incomes and prosperity of the area, higher revenues from taxes and fees for local government, reflected in the constant improvement of service quality public and infrastructure in the area, with a favorable effect both on the standard of living of the local community and on the attractiveness of the region for other investments and housing. Each company can have its own options regarding the ways of investing in the human resources at its disposal, in order to develop them from a professional point of view, under the conditions delimited by the legislative

framework. A factor with major influence in adopting the company's policy in the field of vocational training is its investment capacity, in direct connection with the number of employees, the type of capital invested, the field of activity, the human resources management practiced, the availability and motivation of staff. to develop.

2.4. Contributions regarding the study and analysis of the factors of human capital development on the competitiveness of the clusters from the North-West of Romania

2.4.1. Research methodology In the case of this scientific research, the analyzes led to the outline of the existing situation in the North-West development region of Romania, regarding the existence / non-existence of a link between investment activities in human capital and the performance of selected clusters.

The processing, analysis of the obtained data and interpretation of the research results were performed with the help of the programs: SPSS 20.00 (Statistical Packages for the Social Sciences) and Microsoft Office Excel, with the help of which we obtained and performed graphs, correlations, analyzes. The statistical methods used in the research for data analysis and hypothesis testing were selected and applied taking into account the empirical research at international level in the field of clusters, the main purpose being their validation for clusters in the North-West region of Romania.

The method of data collection is the survey, and the tool used is the questionnaire, which was applied to the representatives of the clusters set up in the North-West region in various fields of activity. For data collection we used methods depending on the location and availability of respondents, respectively the survey by email and in the form of an interview, conducted by phone or in the location of the cluster. For the collection of scientific research data, both existing qualitative and quantitative analyzes were used and data analysis, there are a multitude of research methods and procedures, with which we can conclude the existing situations in the analyzed region, highlighting the objectives set at the project level. Research.

The general objective of the research focuses on analyzing the existing links between specialized human capital, the study and evaluation of investment factors in human capital within industrial clusters, in the context of increasing competitiveness in the North-West development region of Romania. This requires deepening the study of the impact that the development of human resources has on obtaining high performances within the Romanian clusters, but also the influence of the cluster relations on the human capital within them.

This research study, as well as the analysis of the literature on the issue of human capital development on the performance of the organization at national and global level, aims to identify and analyze, through the proposed conceptual model, the factors of human resource development that lead to increasing competitiveness. by ensuring the connection between specialized human capital and the performance of the organization, which will generate a competitive advantage over the chosen organizations. By carrying out the research included in the research project, the objective of opening new directions in the field of increasing the efficiency of knowledge management, developing human capital and increasing the performance of organizations will be achieved.

Research on the efficiency of human capital in clusters is a necessity at national and European level, in order to more accurately assess the effects, the application of measures of motivation, involvement, integration into the information system, measures to increase the performance of these organizations by obtaining a better quality of services provided, higher efficiency of production processes, increasing competitiveness and promoting efficient resources, saving time, increasing integration in various markets, innovation and increased social comfort.

Following the study of the sustainability of human capital development, the relevant factors in generating the relevant research data were identified based on the questions in the questionnaire applied to companies in clusters in the North-West region of Romania.

In order to analyze the theoretical model and collect relevant and sufficient data, the support of the North-West Regional Development Agency of Romania, the National Institute of Statistics, was

requested, which provided data on clusters established in this region, grouped by efficiency activities. economic data, data that included the necessary information for the online delivery of the prepared questionnaire.

For the present research study, at the level of the North-West region of Romania, a number of 3 clusters were selected depending on the degree of involvement in human resource development and the size of the cluster at the level of the North-West region of Romania, the most representative (Mobilier Transilvan Cluster, AgroTransilvania Cluster, ITech Transilvania) and with the largest number of members, having 229 members, of which: 169 companies, 11 universities, 7 research and development institutes, 5 other research and education providers , 24 support activities, 6 marketing and communication activities, 7 public institutions.

To collect data from the target group, a questionnaire was developed comprising a number of 59 items, a questionnaire structured in four parts, of which the first part includes general questions on the profile of the respondent (contact details, their function, field of activity). The second part of the questionnaire consists of a number of 19 items, specific to knowledge management. The third part consists of a number of 14 items, specific to investing in human capital, on skills, qualification, specialization. The fourth part consists of a number of 13 items, specific to the relationships within the clusters. The fifth part consists of a number of 11 items, specific to performance, on productivity, quality, innovation.

Regarding the scaling method used for these items, the Likert scale is used, the respondents being asked to assess the degree, in which they agree with the established statements, by giving an answer on a scale from 1 to 5.

Thus, the extracted qualitative and quantitative data will be analyzed with the statistical data analysis programs SPSS 20.00, thus generating statistical and mathematical tests, which conclude the support of the hypotheses launched or their invalidity, regarding the existence of the situation in the region of North-West development of Romania.

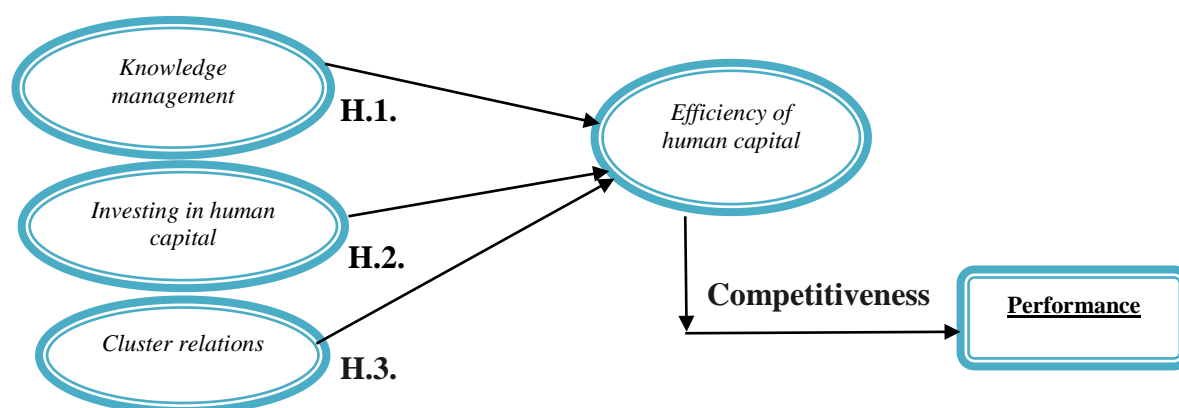The conceptual model is presented in figure 6:

Figure 6. Conceptual model for analyzing the relationship between investment in human capital and cluster performance
Source: (model proposed based on the studied specialized bibliography)

The human resources policy focuses on developing skills, increasing team cohesion and promoting organizational values in the North-West Region and beyond.

2.4.2. Analysis of the fidelity and internal consistency of the questionnaire
For the degree of representativeness for the selected companies, according to the formula Taro Yamane (Israel, 2009), it turned out that a number of 200 questionnaires are needed. A 95% probability and a maximum error of +/- 5% were taken into account in the calculations performed.

Thus, to test the internal consistency, measurement and fidelity of the questions allocated for the components of knowledge management, human capital efficiency and competitiveness, based on the Likert scale, the Croncbach Alpha coefficient (α) was used.

After testing the internal consistency, a Croncbach Alpha coefficient with the value of .837 resulted, which indicates that the questionnaire has a high internal consistency, which leads to the idea that it is valid and will generate conclusive results.

Table 1.The value of Croncbach Alpha
Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.837	.877	16

*Source: (*data analyzed with the statistical program SPSS 20.00)

By analyzing the data using the Guttman model, a model that proposed six fidelity coefficients, which provide the lower limits of real fidelity, which was found to record high values, coefficients found in Table 2., as follows:

Table 2. Split-half fidelity analysis based on the Guttman model
Reliability Statistics

Lambda	1	.785
	2	.883
	3	.837
	4	.743
	5	.859
	6	.
N of Items		16

Source: (data analyzed with the statistical program SPSS 20.00)

The first coefficient ($\lambda 1$) represents a simplistic estimate of fidelity, which is the "cornerstone" for the other estimates, once again proving the existence of the fidelity of the questionnaire. The coefficient ($\lambda 2$) is the Cronbach's internal consistency coefficient, calculated for all 16 items (.883). The fourth coefficient ($\lambda 4$) is exactly the Guttman split-half fidelity coefficient, which is why we can conclude that, through the above-mentioned statistical procedures, it turned out that the use of this questionnaire, which is faithful, consistent, is viable and will generate the expected data. research study.

Following the analysis of the data by Pearson analysis, it resulted that the variables are positively correlated, an aspect that can be seen in the scatterplot graphs, correlations presented in Table 3.

It is found that we are dealing with positive correlations, because the significance thresholds are lower than 0.01. At the same time, the correlation is positive, aspects resulting from the sign of the correlation coefficient and its value.

We can therefore say that there is a moderate and positive correlation between variables, namely knowledge development (0.603), development need (0.593), performance (0.535) and human capital efficiency, and a high correlation between cluster relationships (0.721). and the efficiency of human capital.

Based on the non-directional hypotheses by which the premise of analyzing the existence of a significant link between the variables of capital efficiency and those of increasing competitiveness

was created, by analyzing the correlation coefficients, their connection was analyzed by using parametric statistics.

Table 3. Correlation coefficients between human capital efficiency variables and those of increasing competitiveness with Pearson

		Perception of the effects of professional development	The importance of information sources for cluster relations	Competency analysis	The need for professional development	Vocational training methods	Increasing employee performance	Cluster relations	Performance	Efficiency of human capital	Dissemination of knowledge
Perception of the effects of professional development	Pearson Correlation	1	.290**	.550**	.515**	.529**	.470**	.508**	.453**	.603**	.437**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	204	204	204	204	204	204	204	204	204	204
The importance of information sources for cluster relations	Pearson Correlation	.290**	1	.473**	.532**	.491**	.395**	.438**	.592**	.593**	.500**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000	.000	.000
	N	204	204	204	204	204	204	204	204	204	204
Competency analysis	Pearson Correlation	.550**	.473**	1	.424**	.473**	.401**	.447**	.393**	.480**	.494**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.000	.000
	N	204	204	204	204	204	204	204	204	204	204
The need for professional development	Pearson Correlation	.515**	.532**	.424**	1	.426**	.342**	.520**	.621**	.407**	.499**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000	.000	.000
	N	204	204	204	204	204	204	204	204	204	204
Vocational training methods	Pearson Correlation	.529**	.491**	.473**	.426**	1	.428**	.472**	.505**	.484**	.468**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000	.000	.000
	N	204	204	204	204	204	204	204	204	204	204
Increasing employee performance	Pearson Correlation	.470**	.395**	.401**	.342**	.428**	1	.535**	.521**	.463**	.397**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000	.000	.000
	N	204	204	204	204	204	204	204	204	204	204
Cluster relations	Pearson Correlation	.508**	.438**	.447**	.520**	.472**	.535**	1	.721**	.508**	.390**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000	.000	.000
	N	204	204	204	204	204	204	204	204	204	204
Performance	Pearson Correlation	.453**	.592**	.393**	.621**	.505**	.521**	.721**	1	.579**	.473**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000		.000	.000
	N	204	204	204	204	204	204	204	204	204	204
Efficiency of human capital	Pearson Correlation	.603**	.593**	.480**	.407**	.484**	.463**	.508**	.579**	1	.526**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000		.000
	N	204	204	204	204	204	204	204	204	204	204
Dissemination of knowledge	Pearson Correlation	.437**	.500**	.494**	.499**	.468**	.397**	.390**	.473**	.526**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	N	204	204	204	204	204	204	204	204	204	204

Source: (data analyzed with the statistical program SPSS 20.00)

For testing the hypotheses launched, the simplest method to determine the significance of the correlation coefficient of the ranks ρ, is to compare comparatively, its value with the reference

value, for the desired level of significance, when using the model Sperman, due to the existence of ordinal data with a different distribution from the normal one, data presented in table 4.

Table 4. Correlation coefficients between the variables of human capital efficiency and those of increasing competitiveness

		Perception of the effects of professional development	The importance of information sources for cluster relations	Competency analysis	The need for professional development	Vocational training methods	Increasing employee performance	Cluster relations	Performance	Efficiency of human capital	Dissemination of knowledge
Spearman's rho	Perception of the effects of professional development	Correlation Coefficient	1.000	.289**	.459**	.487**	.456**	.421**	.479**	.447**	.525**	.377**
		Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000	.000	.000	.000
		N	204	204	204	204	204	204	204	204	204	204
	The importance of information sources for cluster relations	Correlation Coefficient	.289**	1.000	.542**	.479**	.535**	.398**	.407**	.502**	.359**	.579**
		Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.000	.000	.000	.000
		N	204	204	204	204	204	204	204	204	204	204
	Competency analysis	Correlation Coefficient	.459**	.542**	1.000	.396**	.474**	.375**	.419**	.365**	.427**	.480**
		Sig. (2-tailed)	.000	.000	.	.000	.000	.000	.000	.000	.000	.000
		N	204	204	204	204	204	204	204	204	204	204
	The need for professional development	Correlation Coefficient	.487**	.479**	.396**	1.000	.380**	.344**	.529**	.605**	.458**	.477**
		Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.000	.000	.000	.000
		N	204	204	204	204	204	204	204	204	204	204
	Vocational training methods	Correlation Coefficient	.456**	.535**	.474**	.380**	1.000	.399**	.415**	.425**	.400**	.480**
		Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.000	.000	.000	.000
		N	204	204	204	204	204	204	204	204	204	204
	Increasing employee performance	Correlation Coefficient	.421**	.398**	.375**	.344**	.399**	1.000	.568**	.505**	.412**	.329**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000	.000	.000	.000
		N	204	204	204	204	204	204	204	204	204	204
	Cluster relations	Correlation Coefficient	.479**	.407**	.419**	.529**	.415**	.568**	1.000	.677**	.518**	.376**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.	.000	.000	.000
		N	204	204	204	204	204	204	204	204	204	204
	Performance	Correlation Coefficient	.447**	.502**	.365**	.605**	.425**	.505**	.677**	1.000	.505**	.428**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.	.000	.000
		N	204	204	204	204	204	204	204	204	204	204
	Efficiency of human capital	Correlation Coefficient	.525**	.359**	.427**	.458**	.400**	.412**	.518**	.505**	1.000	.478**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.	.000
		N	204	204	204	204	204	204	204	204	204	204
	Dissemination of knowledge	Correlation Coefficient	.377**	.579**	.480**	.477**	.480**	.329**	.376**	.428**	.478**	1.000
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.
		N	204	204	204	204	204	204	204	204	204	204

Source: (data analyzed with the statistical program SPSS 20.00)

Table 4. shows that the significance level for all variables is less than 0.01, which indicates that there is a probability of less than 1% that the calculated correlation coefficients result from sampling errors.

It can be observed that the variables used register the low value of the correlation, respectively knowledge management (0.525), development need (0.458), relationships within clusters (.518), performance (.505) at a significance threshold $p <0, 01$.

Following the data resulting from the application of statistical procedures, according to table 4, it is found that all the links between the above-mentioned variables are positive and significant $p <.01$.

It is also found that the strongest correlation between two variables is between the relationships within clusters and performance (.677 **) and the weakest correlation is between the perception of development and the importance of information sources (.289 *). Given that positive and relevant data have resulted, we can say that the hypotheses launched are confirmed.

Regarding hypothesis 1, we can say that it is confirmed, because as noted above, it can be seen in their vast majority, the points of intersection between the two scales, are located within the confidence interval, showing a direct association.

Given the issues found, we can say that there is a positive correlation between the knowledge-based economy as a trigger for investment in human capital, respectively its development within the clusters in the chosen development region.

Regarding hypothesis 2, we can say that this can be confirmed, due to the reasonable values resulting from parametric and non-parametric tests performed on the data provided by the surveyed managers. There is a positive correlation between the economy based on the need for professional development as a trigger for investment in the human capital, respectively of its development within the clusters from the chosen development region.

With regard to hypothesis 3, which is confirmed in this situation as well, it can be observed, in their great majority, the points of intersection between the two scales, they are located within the confidence interval, presenting a direct association.

From the data analysis, a value of .677 was recorded, which is why we can conclude that there is a high correlation between the two variables, which is why we can say that there is a high relationship at the sample level between the relationships between clusters and performance.

In conclusion, we can say that there is a positive correlation between the systemic relations within the industrial clusters and the obtaining of the efficient human capital at the level of the analyzed region.

3. CONCLUSIONS

In the activity of predicting the evolution of the factors of increasing the efficiency of human capital, with the help of models based on econometric methods, we start from the hypothesis according to which the investment in human capital will continue to have, in a predictable period of time, an increasing trend. with the involvement of organizations, cluster members and related to the national and European legislative framework in force. In order to be relevant in establishing the development strategy of the organization, the analysis of the implementation of knowledge management subject to analysis must be compared with the dynamics of the market, the sector of activity and its performance. If the market is more dynamic than the company, it will be noticed that the company will have a certain gap in terms of existing competition in the market.

At the same time, regarding the most obvious obstacles in the implementation of investment measures in human resource training within the organization, is the insufficient allocation of funds to specialized departments to adopt financial measures favorable to stakeholders (organizations, universities, high schools, training centers, employees etc.), followed by the lack of government policies to stimulate clusters, in order to adopt financial measures, not least the low interest in

making a greater effort to obtain European funding in terms of projects carried out and involved in operational, strategic and development measures at regional level.

Regarding the managerial interest in adopting innovative techniques, new and approved by the business environment, in order to reduce operating costs with a new infrastructure, with low costs, by adopting efficiency measures, the use of raw materials, reducing waste , prevention of additional costs incurred and a geographical concentration of the manufacturer, can lead to a nationally and internationally recognized performance.

The incorporation of modern strategies for the efficiency of human capital in organizations, offers the possibility of concluding partnerships with specialized higher education institutions and specialists in the specialized market that creates a professional and innovative training environment, oriented towards a constantly evolving market and implicitly contributed to the shaping of the local economic environment.

Following the statistical analysis using the statistical program SPSS 20.00, it was shown that the proposed model is valid, as well as the fact that there was a significant link between the components and the efficiency of human capital within the clusters, for which we proceeded to analyze the answers submitted by the managers of the target group, data analyzed and sorted according to the 3 clusters.

Of the 3 clusters, the IT cluster has the greatest involvement in the implementation of programs and projects in the field of vocational training and education, with a solid management, assigning in the vast majority a partial and total agreement on the hypotheses launched.

Also, the data analysis shows that investment and relationships within clusters have an important influence on performance (.677) records the highest value of the total values of other variables, which indicates that the company's management is focused on developing and implementing development, competitiveness.

We can conclude that at the level of the North-West development region of Romania, in the assembly of the 3 clusters, there is a continuation of the lack or disinterest of some categories of human resources regarding the implementation of a responsible behavior in appropriating information and putting them into practice. to the performance and competitiveness at the level of the organization, demonstrated both theoretically and from a statistical point of view, an almost absent behavior regarding the dissemination of knowledge and the efficiency of the educational process.

At the same time, it is also found that organizations allocate financial, human, logistical resources, etc. regarding the adoption of the company's management in the direction of investing in human capital and the relations within the clusters that have a significant influence on the company's competitiveness.

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