Characteristics of intellectual capital for the research process in some university centers of the colombian Caribbean

Características do capital intelectual para o processo de pesquisa em alguns centros universitários do Caribe colombiano

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Abstract

The characteristics of the intellectual capital model for the research process in Higher Education institutions of the City of Cartagena are described. Research with a quantitative, positivist, analytical approach, field designs, in a non-experimental, transversal or transactional way, descriptive type. The study population group is made up of vice-rectories of the research area, coordination's, headquarters or leaders of the research area, who are in charge of the management and viability of the research processes in 7 universities of Cartagena de Indias, survey, an instrument was used with alternatives of closed Likert-type

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answers, the Statistics of the data was Descriptive systematized in Microsoft Excel, SPSS and R.3.2.3. In general, the researchers of the different institutions state that they totally disagree with the fact that the intellectual capital of their institutions presents these characteristics. In general, HEIs do not comply with being an open and flexible model, but it is required to be more systematic, adaptive, dynamic and innovative.

**Keywords:** Intellectual Capital. Education. Research. Scientific Production. University.

**Introduction**

With the globalized changes of the current world, the large and industrialized economies are based on knowledge, recognizing this is the starting point to know that the content and structure of economic activities and the foundation of the society of the first world countries are They are distinguished from the underdeveloped by the pace at which they produce and apply the new knowledge obtained in the academy to social life (Hernández et al., 2019).

In accordance with the above, it is clear that societies are based on knowledge because a set of physical artifacts and the function of organizations require the applicability of knowledge. In developed societies, the hallmark is based on the fact that knowledge is the...
engine of growth and development of its processes and social indicators (Hernández et al., 2018). This is why the main value of research in academia is to provide a critical evolution and a broad debate in the societies that constitute it, always in search of structural change in the market in terms of supplying satisfaction of needs through investigations (Carrasco et al., 2019). Knowledge, innovation and learning are complementary aspects that help the development of the academy and therefore of society. This triad dynamically and recursively frames the processes of creation and management of knowledge as intellectual capital and as a source of organizational learning (Hernández et al., 2020).

In what was said by Herrera et al., (2016), a model has been proposed that describes the characteristics of intellectual capital within academia and presents them as three central elements of informal flows: systemic, which structures and interrelates intellectual capital in the research process, the second is open, Structure related to the different nature of the agents or subjects of knowledge that make up the environment of the organization in terms of strengthening research, the third is dynamic, which includes the variability of the structure in the projection and construction of intellectual capital. In the words of Villamizar et al., (2016) complement these characteristics by adding that they must also be innovative, adaptive and flexible.

In accordance with the above for the city of Cartagena de Indias, geographically located in the Caribbean zone in northern Colombia, where the public and private Higher Education Institutions (HEIs) currently operate: University of Cartagena, University San Buenaventura, Technological University of Bolívar, Comfenalco University Foundation, Free University, Rafael Núñez University and Antonio Arévalo Technological Foundation. They have in their organizational hierarchy an area dedicated to research as vice-rector or as a subdivision of the academic area, which are in charge of the management and production of intellectual material through research groups, young researchers, research professors, interns attached to the seedbeds institutional research.

**Methodology**

The work carried out was with a positivist quantitative approach, analytical type, field design, in a non-experimental, transactional or cross-sectional way, descriptive type. The study population group is made up of vice-rectories of the research area, coordinations, headquarters or leaders of the research area who are the ones who manage intellectual production in HEIs. The
population was made up of 7 higher education centers in the City of Cartagena. Table 1 shows the distribution of the population in the different strata.

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Institution</th>
<th>$N_i$</th>
<th>$p_i$</th>
<th>$n_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>University Cartagena</td>
<td>88</td>
<td>0.62</td>
<td>Four, Five</td>
</tr>
<tr>
<td>2</td>
<td>Bolivar Technological University</td>
<td>fifteen</td>
<td>0.11</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>University Antonio Narino</td>
<td>7</td>
<td>0.05</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>San Buenaventura-Cartagena University</td>
<td>10</td>
<td>0.07</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Comfenalco Technological University Foundation</td>
<td>6</td>
<td>0.04</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Antonio Arévalo Technological Foundation-TECNAR</td>
<td>6</td>
<td>0.04</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Rafael Núñez University Foundation</td>
<td>10</td>
<td>0.07</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>142</strong></td>
<td><strong>1</strong></td>
<td><strong>73</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Distribution of the sample in HEIs  
Source: self made

In what corresponds to the way in which the data was collected, a survey was used, with 5 single and closed response alternatives for the statements, through the Likert scale, in which the person surveyed must denote their acceptance or rejection of the statement asked, it was applied in a self-administered way, the scale goes between 1 and 5 (5= TA: Totally Agree, 4= PA: Partially Agree, 3= N: Neutral, 2= DA: Partially Disagree , 1= ADD: Totally disagree), evidencing that, with a lower score, the influence of the variable is more latent in the problem, that is, a lower score shows a latent need to strengthen the intellectual material through strategies for growth of the research area in the IES of the City of Cartagena de Indias.

To process the data, a double-entry matrix approach was carried out, where the data supplied by the surveyed subjects of the investigation were raised for a systematized attention, the results obtained and their respective analysis are then shown. Statistics of a descriptive nature were used for the distribution of frequencies, percentages and calculation of arithmetic measures, with the help of the Microsoft Excel program, in addition the data obtained with the results obtained by means of the SPSS and R.3.2 software were used and compared.

**Results and Discussion**

Regarding the characteristics of the intellectual capital for research in universities of the Colombian Caribbean, in Table 2, it can be seen that in general the researchers of the different institutions state that they are in total disagreement with the fact that the intellectual capital of their institutions presents such characteristics, generally having an average of moderate or domain of 2.83. However, on average for the flexible characteristic it shows the highest average (3.38), this indicator is the one that shows the greatest disagreement on
the part of the researchers, followed by the fact that it is not an open model (3.03); while for
the others the average is below 2.9. In general, the HEI model does not comply with being an
open and flexible model, but it is required to be more systematic, adaptive, dynamic and
innovative.

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Systemic Characteristic</th>
<th>Dynamic Characteristic</th>
<th>Flexible Feature</th>
<th>Adaptive Characteristic</th>
<th>Innovator Characteristic</th>
</tr>
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<tr>
<td></td>
<td>fa %</td>
<td>fa %</td>
<td>fa %</td>
<td>fa %</td>
<td>fa %</td>
</tr>
<tr>
<td>(1) Totally disagree (ADT)</td>
<td>90 42.9</td>
<td>85 40.5</td>
<td>63 30</td>
<td>116 55.2</td>
<td>110 52.4</td>
</tr>
<tr>
<td>(2) Partially disagree (PDA)</td>
<td>41 19.5</td>
<td>39 18.6</td>
<td>30 14.3</td>
<td>12 5.7</td>
<td>5 2.4</td>
</tr>
<tr>
<td>(3) Neutral (N)</td>
<td>12 5.7</td>
<td>8 3.8</td>
<td>36 17.1</td>
<td>17 8.1</td>
<td>23 eleven 63 30</td>
</tr>
<tr>
<td>(4) Partially agree (PA)</td>
<td>29 13.8</td>
<td>55 26.2</td>
<td>46 21.9</td>
<td>61 29</td>
<td>49 23.3</td>
</tr>
<tr>
<td>(5) Totally agree (TA)</td>
<td>38 18.1</td>
<td>23 eleven</td>
<td>35 16.7</td>
<td>4 1.9</td>
<td>23 eleven twenty-one 10</td>
</tr>
<tr>
<td>Total</td>
<td>210 100</td>
<td>210 100</td>
<td>210 100</td>
<td>210 100</td>
<td>210 100</td>
</tr>
<tr>
<td>X of the indicator</td>
<td>2.54</td>
<td>3.03</td>
<td>2.81</td>
<td>3.38</td>
<td>2.54 2.72</td>
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<tr>
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<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Under Dominion Moderate</td>
</tr>
<tr>
<td>indicator</td>
<td>1.61</td>
<td>1.51</td>
<td>1.56</td>
<td>1.46</td>
<td>1.44 1.65</td>
</tr>
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<td>dispersion</td>
<td>moderate</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low moderate</td>
</tr>
<tr>
<td>of the dimension</td>
<td>2.83</td>
<td></td>
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<td></td>
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<tr>
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<td>Moderate dominance</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>of the dimension</td>
<td>1.54</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>dispersion</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Characteristics of intellectual capital
Source: self made

It is possible to appreciate that only 18.1% of the leaders surveyed stated that they fully
agreed and 13.8% partially agreed with the systemic characteristic, which represents 31.9%
of favorable presence of this indicator for the research process in HEIs, taking as a basis, that
the systemic characteristics of the intellectual capital measurement model are aimed at
strengthening research, that there are recognitions of the research work carried out by research
teachers and that there is a number of people with international professional experience in
research. While 42.9% contemplate totally disagreeing, 19.5% partially disagree, resulting in
an unfavorable presence of 62.4%. On the other hand, a 5.7% of the informants maintained a
neutral attitude. Which allows us to infer that in most of the HEIs of Cartagena this
characteristic is applied very badly to the research process.
The foregoing is far from what was established of this characteristic by Ibáñez & Quintero (2015), who affirm that the systemic characteristic, interrelated structure and completes the six main components that configure, such as subsystems (capitals) of the elements and explanatory variables and indicators of the intangible or intellectual assets that make up the Intellectual Capital model for the strengthening of research, its recognition, based on national and international professional experience, which are ordered and integrated with logical relationships that will be presented. This is reinforced by Paucar (2017), in his work based on a model of intellectual capital of the Ministry of Education of the Junta de Andalucía. Indicators of human capital and knowledge management,

The second indicator, the open characteristic, has that 11% of the surveyed research leaders state that they fully agree and 26.2% partially agree, which represents 37.2% of favorable presence regarding this indicator of HEIs, the importance of research as a substantive function, that there are open characteristics of the applied intellectual capital measurement model aimed at strengthening research, the existence of teachers with years of seniority who carry out research and that there is a number of people who participate in internal research work groups. On the other hand, 19.5% of the research group leaders stated that they partially disagreed, and 42.9% totally disagreed, which is equivalent to 62.4% of unfavorable presence, being the percentage of researchers who remained in a neutral position of 5.7%. This allows us to infer that some of the higher education institutions in the city of Cartagena this indicator is present, but in others it is not used strategically to produce intellectual capital.

This characteristic should be improved in accordance with what was stated by Luz (2018), since the open model will present a structure related to the agents or subjects of knowledge that make up the environment of the organization, and that is explained by the set of relationships that the organization and the people that compose it can maintain with it. This is reaffirmed by Rubio & Blandón (2021), when they affirm that this characteristic allows the model a structure related to the different nature of the agents or subjects of knowledge that make up the environment of the organization in terms of strengthening research and that It makes it possible to explain the set of relationships that it and the people that make up the research groups can maintain with it.

On the other hand, regarding the third indicator, dynamic characteristic, developed in table 12; It is found that 16.7% of the research leaders surveyed state that they fully agree and 21.9% partially agree, which represents 38.6% of favorable presence when giving their opinion on this indicator, based on the use of the dynamic characteristic of the model.
measurement of applied intellectual capital aimed at strengthening research, reduction of management costs with respect to the last research exercise on total spending on R&D&I, and on the number of innovation projects developed in foreign countries in the last 3 years for research teachers. On the other hand, 14.3% of the leaders of research groups stated that they partially disagreed, 30.0% totally disagree, which is equivalent to a 44.3% unfavorable presence, being significant the percentage of surveyed researchers who remained in a neutral position with 17.1%. This reflects that in some of the higher education institutions in the city of Cartagena there is the presence of the dynamic characteristic for the research process. But in others, this feature may not be used to produce intellectual capital through the research process to publicize the management of research projects. This reflects that in some of the higher education institutions in the city of Cartagena there is the presence of the dynamic characteristic for the research process. But in others, this feature may not be used to produce intellectual capital through the research process to publicize the management of research projects.

The foregoing must be corrected since, as Gazera & Lizi (2020) proposes, the dynamic characteristic of an intellectual capital model is the "relevance tree" structure based on the justification of its internal logic, by which its components, elements, variables and relationships (accelerators-entrepreneurship and innovation capital) allow the observation of their temporary or dynamic evolution from the strengthening of research, with management costs through innovation projects. Likewise, it is confirmed by Muñoz (2019), when he affirms that the model is dynamic, because it intends to offer a set of elements and variables, indicators and relationships that should allow the observation of its temporal evolution.

The fourth indicator, flexible characteristic, shows that 1.9% of the surveyed research leaders state that they fully agree and 29.% partially agree, which represents a 30.9% favorable presence regarding this indicator of HEIs. , so that there are flexible characteristics of the applied intellectual capital measurement model aimed at strengthening the research process, the existence of external rotation in research for teachers and that there is a number of people promoted in the teaching ladder for research activities . On the other hand, 5.7% of the research group leaders stated that they partially disagreed, 55.2% totally disagreed, which is equivalent to a 60.9% unfavorable presence, being the percentage of researchers who remained in a neutral position of 8.1%. This allows us to infer that this indicator is present in
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some of the higher education institutions in the city of Cartagena, but in others it is not used strategically to produce intellectual capital for the research process.

The foregoing contradicts what was stated by González & Rodríguez (2017), stating that the flexible characteristic of the model allows its proposed elements and variables to be ordered and applied in a differentiated way according to the needs of the organization, depending on the strategy and its intangible management model. This may imply that some element and variable may appear indistinctly in one or the other component or capital, expressing itself with different levels of aggregation such as the strengthening of research, with external rotations of researchers and promotion of these in the teaching ladder through the presentation of projects. This is confirmed by Varela (2016), when he states that the model is flexible,

The fifth indicator, adaptive characteristic, shows that 11% of the research leaders surveyed state that they fully agree and 23.3% partially agree, which represents 34.3% of favorable presence regarding this indicator of HEIs, so that the adaptive characteristics of the applied intellectual capital measurement model exist, aimed at strengthening the research process, the existence of a number of people who positively value their work environment and that a number of people are satisfied in the collaborator relationship. On the other hand, 2.4% of the research group leaders stated that they partially disagreed, 52.4% totally disagreed, which is equivalent to a 54.8% unfavorable presence, being the percentage of researchers who remained in a neutral position of 11%. This allows us to deduce that some of the higher education institutions in the city of Cartagena have this indicator, but in others this characteristic is not used strategically to produce intellectual capital for the research process.

The foregoing must be corrected since this characteristic is what will allow, according to Pérez & Urbáez (2016), that the model can be adapted to each organization depending on the strategy and management model of intangibles that the organization has. Which is reaffirmed by Martínez (2015), when he affirms that this characteristic makes it possible for each organization to adapt the current research proposal to the requirements of people who value their work environment in a satisfied way, both in the elements and variables, as with the expected indicators.

The sixth indicator, innovative characteristic, has that 10% of the surveyed research leaders state that they fully agree and 8.6% partially agree, which represents 18.6% of favorable presence regarding this indicator of HEIs, so that the innovative characteristics of the applied intellectual capital measurement model aimed at strengthening the research process are evidenced, that there are commitments from workers to innovation, and that there
are a number of innovation projects developed jointly with foreign partners. On the other hand, 27.6% of the leaders of research groups stated that they partially disagreed, 23.8% totally disagreed, which is equivalent to 51.4% of unfavorable presence, being a significant percentage of researchers who remained in a neutral position of 30%. This allows us to deduce that very few of the higher education institutions in the city of Cartagena have this indication present, and that in most HEIs this characteristic is not used strategically to produce intellectual capital for the research process.

What makes urgent the need for this to be corrected within the IES, the City of Cartagena, since the introduction of something new, unknown up to now, in a certain context or improvement of something already known, such as the total quality improvement processes, the research process, the commitments of workers and partners is essential (Duque, 2017). This is confirmed by Fico (2018), when he affirms that the model is innovative with respect to other intellectual capital initiatives that have emerged so far, if it complies with the above.

**Conclusions**

It is perceived that in general the researchers of the different institutions state that they are totally in disagreement with the fact that the intellectual capital of their institutions presents these characteristics, having in general an average of moderate dominance. However, on average for the flexible characteristic it shows the highest average, this indicator is the one that shows the greatest disagreement on the part of the researchers, followed by the fact that it is not an open model, while for the others the average is below. In general, the HEI model does not comply with being an open and flexible model, but it is required to be more systematic, adaptive, dynamic and innovative.

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