Biplot Methodology Applied to an Intellectual Capital Model

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Abstract: The global economy is changing. Resources are scarce and companies, of all sizes, need to be more competitive and productive. The company's financial risk ratings have demonstrated numerous weaknesses. The funders, shareholders or even the State need tools that improve the quality of their decision making. Several authors argue that the real competitive advantages resulting from the management of intangible assets, i.e. assets of knowledge, as a condition for achieving the productivity and competitiveness. However, organizations have always valued the knowledge; the novelty is the recognition that knowledge is an asset that must be managed with the same attention given to other assets. The literature contains numerous definitions of knowledge. Nonaka and Takeuchi (1995) consider knowledge as "a dynamic human process of justifying personal belief about the truth" and the understanding how crucial to the creation of knowledge to differentiate between tacit knowledge (which is obtained through practice) and explicit is. In this sense, knowledge is the information to be used by the human mind allowing the decision-making. And knowledge management is the ability that the organization has to identify and codify knowledge, stimulate their development and facilitate its implementation (Lopes and Matos, 2005). The knowledge management can also be understood as the orientation of the dynamics of subjectivity and objectivity within the organization (Rowley and Gibbs, 2008), maximized through use of new technologies and organizational networks. From this perspective, knowledge management is the quality of the interactions of individuals, teams, processes and customers and its ability to identify and encode the same knowledge, stimulate their development and facilitate its implementation. Following the conceptualization these are the dimensions that allow us to define intellectual capital. But to manage in times of market globalization, in which trust is based on evidence, becomes crucial to know whether it is possible to audit and certify assets of organizations. Therefore, it is necessary to create reliable and accessible tools in this field. Thus, intellectual capital management, in a form which is able to be audited and certified in order to control the quality and dynamism of the knowledge generated in the organization, will enable the partner organizations (customers, suppliers and lenders) to determine the capacity for innovation, and verify the conformity of their management parameters, compared to a reference standard. Considered this conceptualization, Matos and Lopes (2009), proposed a methodology to audit intellectual capital management, which has been refined through several researches. This paper summarizes the results obtained with one of these researches. Using the biplot methodology (Gabriel, 1971) it was possible to reconfirm the proposed methodology. It shows that development degree of intellectual capital can be audited in a credible way, using this methodology.

Keywords: intellectual capital management, ICM, knowledge, biplot

1. Introduction

Several authors have advocated the importance of measuring intellectual capital from a strategic perspective as a way to assess the management and development of intangible assets.

Based on the ICM - Intellectual Capital Model (Matos and Lopes, 2009), we developed a methodology that allows auditing the intellectual capital management.

ICM is composed of four Quadrants, which are assessed by parameters.

In previous research (see Matos and Lopes, 2012) was presented the empirical research that led to the identification of reliable indicators to validate each parameter.

As a result of this research, we created an instrument (questionnaire format), composed of a set of indicators (97 indictors) to audit intellectual capital management.

Using the biplot methodology (Gabriel, 1971) we propose to reconfirm the consistency of the proposed methodology.

The Following sections summarize the main aspects of the research.

2. Literature review

The growing importance of intellectual capital has its foundations in several studies carried out since the 70s, which focused on so-called invisible assets.

Among these studies highlight the works of Hiroyuki Itarni (1991).

However, intellectual capital has gained prominence only after the works of Sveiby (1997), in Sweden. The author gave a new vision of intellectual capital considering the intangible assets as the main strategic issue that should be put to the organizations.

Since then, several authors proposed models and methodologies for assessing the intellectual capital of organizations. The further development of these models was found with authors such as Edvinsson and Malone (Edvinson and Malone, 1997).

Edvinson and Malone (1997), proposed a model, "Skandia Navigator", which divides intellectual capital into two categories: human capital and structural capital. Thus, according to this vision, intellectual capital is the sum of structural capital and human capital, this being the basic capacity for the creation of high quality value.

Sveiby, (1997), developed a measurement methodology, "The Intangible Asset Monitor", by dividing the intangible assets into three groups: individual competence, internal structure and external structure. This methodology is based on quantitative and qualitative indicators to assess the intellectual capital. The "Intangible Asset Monitor" is used by several companies around the world that offer an overview of intellectual capital. The "Skandia IC Report" is the result of that assessment. Sveiby (1997) recommends replacing the traditional accounting methodology with a new methodology that contains a knowledge perspective. For the author, this methodology is very important to complete the financial information and evaluates the company´s efficiency and stability.

Among the most relevant methodologies are also the Balanced Scorecard" (Kaplan and Norton, 1992, 1996, 1996a) the "IC Accounting System" (Mouritsen et al., 2001), the "Value Explorer" (Andriessen and Tissen, 2000), and the "Intellectual Capital Benchmarking System" (Viedma, 2001).

These different approaches are based on the measurement of organizations intangible assets.

Andriessen (2004, 2004a) by applying the "theory of multidimensional value measurement" to the nations, gives a new vision to strategic intellectual capital management.

Williams (2000, 2001) in an attempt to sort and classify proposals to measure intellectual capital, proposed a classification of intellectual capital models depending on the type of the expected result and the identification of intellectual capital, according to the following categories: Scorecard Methods (SC), Direct Intellectual Capital Methods (DIC), Market Capitalization Methods (MCM) and Return on Assets Methods (ROA).

To understand the abundance of attempts to measure intellectual capital, a list with some of the most stated models is presented, which were classified according to the classification of Williams (2000).

Table 1: Chronological classification of methods and methodologies for measuring intellectual capital accordance with Williams Classification (2000) Source: Authors' - Adapted from Sveiby (2010)

Williams Classification	Model	Author
MCM	*The Invisible Balance Sheet*	*Sveiby (1990)*
SC	*Balanced Scorecard*	Kaplan & Norton (1992)
DIC	*Citation - Weighted Patents*	*Dow Chemical (1996)*
DIC	*Technology Broker*	Brooking (1996)

Williams Classification	Model	Author
DIC	*Citation-Weighted Patents*	Bontis (1996)
DIC	*Human Resource Costing & Accounting*	Johansson (1996)
MCM	*Tobin´s Q*	Tobin (1997)
ROA	*Economic Value Added (EVA™)*	Stern Stewart & Co (1997)
MCM	*Calculated Intangible Value*	Stewart (1997)
SC	*IC-Index™*	Roos et al. (1997)
ROA	*Value Added Intellectual Coefficient (VAIC™)*	Pulic (1997)
SC	*Skandia Navigator™*	Edvinsson & Malone (1997)
SC	*Intangible Asset Monitor*	Sveiby (1997)
DIC	*Accounting for the Future (AFTF)*	*Nash H. (1998)*
DIC	*HR Statement*	*Ahonen (1998)*
DIC	*Inclusive Valuation Methodology (IVM)*	McPherson (1998)
ROA	*Calculated Intangible Value*	Luthy (1998)
SC	*Intelect Model*	Euroforum (1998)
MCM	*Investor Assigned Market Value (IAMV™)*	Standfield (1998)
SC	*Holistic Accounts*	*Rambøll Grou (1999)*
ROA	*Knowledge Capital Earnings*	Lev (1999)
SC	*Nova Model*	Camisón, Palácios et al.(1999)
SC	*Intangible Value Framework*	Allee (2000)
SC	*Value Creation Index (VCI)*	Baum et al. (2000)
SC	*IC Rating™*	Edvinsson (2000)
DIC	*The Value Explorer*	Andriessen & Tissen (2000)
DIC	*Total Value Creation, TVC™*	Anderson & McLean (2000)
DIC	*Intellectual Asset Valuation*	Sullivan (2000)
SC	*Intellectual Capital Rating*	Joia (2000)
DIC	*Inclusive Valuation Methodology*	M´Pherson & Pike (2001)
SC	*Knowledge Audit Cycle*	Schiuma & Marr (2001)
SC	*Intangible Assets Statement*	Garcia (2001)
SC	*Modelo de Heng*	Heng (2001)
SC	*Meritum Guidelines*	Meritum (2001)
SC	*Value Chain Scoreboard™*	Lev (2001)
DIC e MCM	*FIMIAM*	Rodov & Leliaert (2002)
SC	*Public Sector IC*	Bossi (2003)
DIC	*The 4-Leaf Model*	Leliaert, Candries et al. (2003)
SC	*Danish Guidelines*	Mouritzen, Bukh et al. (2003)
SC	*IC-dVAL™*	Bonfour (2003)
SC	*Chen, Zhu and Xie Model*	Chen, Zhu & Xie (2004)
SC	*IAbM*	Japanese Ministry of Economy, Trade and Industry (2004)
SC	*SICAP - EU Project*	Bueno (2004)
SC	*Intellectus*	IADE (2003)
SC	*National Intellectual Capital Index*	Bontis (2004)
SC	*Topplinjen / Business IQ*	Sandvik (2004)
SC	*Intellectual Capital Value Creation*	Boedker, Guthrie et al. (2005)
DIC	*The Plexus Model*	Litschka, Markom et al. (2006)
SC	*Intellectual Capital Statements for Europe (InCaS)*	InCaS Consortium (2006)
SC	*Intellectus Model*	Sanchez-Canizares et al. (2007)
DIC	*Dynamic Monetary Model*	Milost (2007)
DIC	*EVVICAE™*	McCutcheon (2008)
SC	*Regional Intellectual Capital Index (RICI)*	Schiuma, Lerro et al.(2008)
SC	*ICU Report*	Sanchez (2009)

These models and methodologies will not be developed as this is not the objective of this paper. On the other hand, it is assumed that the readers of this paper will be able to access the different approaches in these models, easily.

The model used in this paper is the "Intellectual Capital Model" (ICM) (Matos and Lopes, 2009).

The choice of this Model is linked to the need for being able to identify, in an integrated and consistent way, the complexity of the factors in the framework of organizational knowledge. Compared with other models, ICM seems to be more adapted to evaluate the intellectual capital management.
The ICM - Intellectual Capital Model - consists of 4 Quadrants specified by their parameters (Matos and Lopes, 2009).
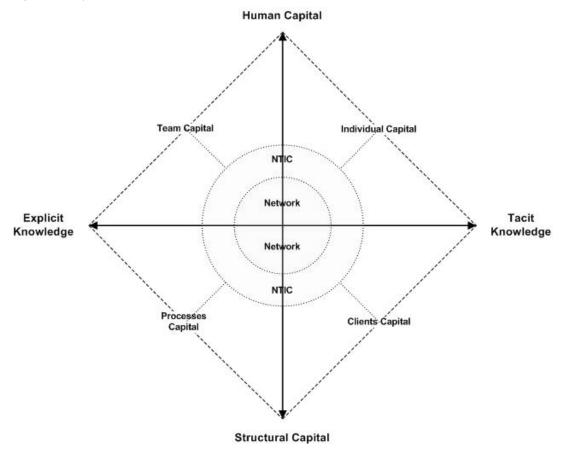

Figure 1: ICM - intellectual capital model (Matos and Lopes, 2009)

The Quadrant Individual Capital, Team Capital and Processes Capital are related to the company's internal environment, the Quadrant Clients Capital is related to the external environment.

Individual Capital

In ICM, is called Individual Capital Tacit Knowledge / Human Capital Quadrant. It is the knowledge inherent to the individual himself, and containing the real source of value, talents and the skills to generate innovation. Here, one has included the theoretical and practical knowledge of the individuals and the capacities of different types, such as artistic, sporting or technical.

Individual capital is interpreted as personal skills, social skills, qualifications, experience and formal education or skills that each individual is willing to put at the service of the company, in view of ongoing customer orientation. When individuals combine these skills with the ability to realize the company's business this is very valuable individual capital.

This individual capital can be increased when the company invests in recruitment and selection, training / qualification, in talent management and personal development. Whenever the company dismiss any employee, or where there are factors of internal or external that affect the performance of individuals (e.g.: motivation, compensation, the downgrading of skills), the individual capital may decrease.

Companies that want to create knowledge must invest in training and skills, but not all the know-how is acquired through formal channels. Much of this knowledge comes through the work that is

developed at the company's result and, particularly, the interaction of the teams, especially teams that adopt innovation and development and also the interaction of individuals with the customer.

Team Capital

The Team Capital is the Human Capital / Explicit Knowledge Quadrant. The team shares the explicit knowledge. In this area, knowledge applies to the individual in the form of facts, concepts or tools.

The team capital results from the way skills of individuals are combined, creating an affiliation group. Team capital assumes the existence of a type of group that shares common goals and differentiates itself from others by their level of performance in a given task.

The teamwork is just an intangible asset but that results in the ability to perform tasks with efficiency and effectiveness, while generates satisfaction of team members.

Teams are generating value for the organization and they are an essential source of competitive advantage.

Teams operationalize the sharing of tacit knowledge from individuals and convert it into explicit knowledge or formalized in the form of specifications, process descriptions, rules, regulations, among others. When this tacit knowledge of individuals is shared with the collective, it earns a higher value and is able to pass the structural capital.

We highlight the role of training / qualification, such as determining the possibility of transformation of tacit knowledge into explicit knowledge, since this parameter functions as inducer and facilitator of a team culture with a focus on total quality client service.

The alignment between the different leaders of the company is a determining factor in the continuing development of teams, including the creative teams.

Communication in teams is essential, because it is what allows the interactions between individuals.

New technologies and networks are also essential in these processes of knowledge transfer.

Processes Capital

When the explicit knowledge of the teams is associated with the structural capital it emerges formalization and development of organizational memory, which supports, in turn, improving processes with a focus on total quality.

The processes capital corresponds to knowledge that is not of individuals but of the organization and it is recognized in the structural capital.

This Quadrant represents the ensemble of shared knowledge, summed up by experts (scientific community), recognized as the most advanced form of knowledge.

This type of knowledge covers, among other dimensions, the organizational routines or the organizational memory. Organizational memory represents the register of an organization, represented by a set of documents and artefacts. Its goal is to expand and amplify knowledge through its acquisition, organization, dissemination, usage and refinement. Organizational memory can be a way of registering tacit knowledge, making it explicit, so that through business processes it becomes part of the patrimony of the company, to be shared and recreated.
The structural capital result from the way of the know-how belonging to people is embedded in the company, producing organization, providing answers to customer needs.

Also, the ability to attract and retain skilled people is the structural capital, where they decided the processes of recruitment and selection, career development, reward systems, motivation, challenging tasks, internal organization, among others.

Organizations have their own history which is documented through computerized files or files on paper resulting from routines that are being assimilated and in standardized in procedures manuals.

Access to this information is facilitated through information management, held with the support of information technologies and communication.

We can say that the capital process includes all powers to the customer orientation and all internal routines.

The management of the intellectual capital of a company is thus a very important task which is to create processes that facilitate the creation of more structural capital.

When companies invest in innovation and development, they make people's skills incorporated into structural capital.

An example of this are the companies that use CRM systems (Customer Relationship Management) that incorporate the knowledge of individuals and transform into better skills in relationship management market.

The product quality, process or service depends therefore on how the structural capital is developed and incorporated in the organization at the level of processes.

This information, though difficult to describe the reports of the companies, are very important for lenders (investors, shareholders and creditors), for assessing sustainability in the long term.

Clients Capital

The Clients Capital is the result of the interaction Structural Capital / Tacit Knowledge. This typology represents the organizational knowledge in its practical form and is already incorporated into the tacit experiences formalized in the team. This knowledge, although hidden, becomes accessible through interaction, and it is the main characteristic of the performance of highly specialized teams.

The customer capital arises when individuals are able to create solutions (products or services) to meet the needs or solve customer problems.

The customer relationships that allow the formation of this capital, stable over time, requires a continuous work to establish long lasting relationships.

Market research and analysis of customer satisfaction are some of the actions that can measure the image that customers have of the company. The systematization of the results of these studies, standards and procedures, is an example of structural capital transformation into clients' capital.

The customers are difficult to retain, whereby knowledge of the company must be invested in processes that facilitate the fixation of these clients.

The correct use of networks and new technologies is crucial in interacting with customers and therefore to build a stable clients capital.

Clients focus, assumes that there is a continued investment in innovation and development in order to meet needs previously scheduled.

The clients' capital thus includes all the knowledge that the company has in the market, including indicators to know the size of the target market and market potential, clients' preferences, the purchasing decision factors and reputation or image of company in the market.

The clients' capital can be valued by upgrading skills of individuals and teams.

The analysis of the movements of clients' capital should enable to predict in which direction they move the company's financial forecasts.

NTIC and Network

In the presented Model the Network and NTIC are essential in the relationship between the 4 Quadrants.

Thus, the companies that put the NTIC at the service of human resources have a great advantage, because they can reduce the administrative difficulties in solving simple problems, increase the quality of services and promote continuous improvement and personal growth.

The approach to the concept of Network is not a new concept. The network, as a social concept, is the genesis of the social constructs of individuals. More recent is the approach to the concept of network system as a factor in the acquisition of knowledge and innovative action. In conclusion, the NTIC are crucial to have effective Networks.

In the ICM, the relational capital is the result of several interactions that take place within the organization and that allows to transform tacit knowledge into explicit knowledge. This knowledge is put to the service of customers and all stakeholders, allows organizations to achieve high performances.

ICM parameters are:

I – Individual Capital Quadrant
Training / Qualification and Talent management
Valuation of Know - How and Innovation
Investment in Innovation and Development (ID)
Existence of a Policy for Talent Retention

II – Team Capital Quadrant
Training / Qualification Team
Team Work
Innovation in teams
Leadership in teams

III – Processes Capital Quadrant
Processes Systematization
Registration of Organizational Knowledge
Existence of Certification, environmental and social policies
Partnerships
Investment in Innovation and Development (ID)
The Brands Creation and Management
Complaints System
The Existence of Awards

IV – Clients Capital Quadrant
Market Audits
Management of the Clients' Satisfaction
Complaints Clients System
New Markets and Internationalization
Networks
New Technologies of Information and Communication

Use of New Technologies of Information and Communication - Use of NTCI and Networks are considered global parameters that allow us to connect the four quadrants.

In previous research (Matos and Lopes 2012), we created an ICM instrument (questionnaire format), composed of 97 indicators to audit intellectual capital management.

3. Empirical research

3.1 Biplot methodology

A biplot (Gabriel, 1971) is a simultaneous representation of rows and columns of a data table, using the appropriate markers.

The biplot, Galindo variant (1985) allows a joint representation - on the same scale - of rows and columns using markers that satisfy the following properties: the cosine of the angles between the markers of the variables representing the correlations between these variables, the distances between the line markers represent dissimilarities between the lines (the closest is the most similar) and the angles between the markers and line markers of the columns represent relationships between the rows and columns.

The flexibility and interpretability of biplots - which allow the representation of the results of main component analysis and express visually the correlation matrix between variables – was the main reason of its choice, to express, concise and graphically some of the conclusions of this research.

The graph was obtained by the program *BiplotsPMD* - Vairinhos (2004).

3.2 Hypothesis

Hypothesis: Biplot methodology confirms the theory according to which the instrument with 97 indicators is appropriate to audit the management of intellectual capital.

3.3 Results and interpretation

In Figure 2 we present a biplots of the data frame used with the 97 selected indicators. Groups of indicators presented were obtained automatically.
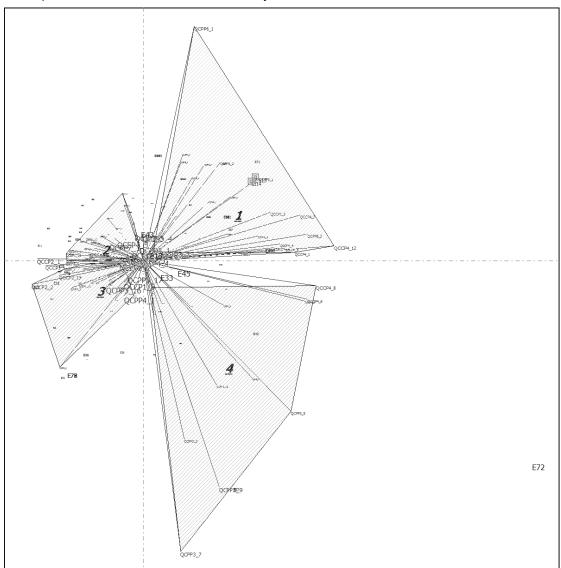

Figure 2: Biplot of the 97 indicators

Figure 2 shows a biplot, built with 97 indicators (columns of data frame) and 114 companies (rows of the data frame). These indicators are grouped into four quadrants (see number 1, 2, 3 and 4).

The indicators at the center have very little explanatory value, although the content of quadrants is in agreement with theory, once the meaning of indicators are associated with each of the quadrants this is closer to the meaning associated to the quadrant predicted by the theory.

The smaller the angle, between the indicators, the greater the correlation between them.

We tried to discover the eventual consistency of the quadrants predicted by the theory and these groups discovered, based on purely mechanical procedures, from the observed data. Any agreement between the meaning of the quadrants, postulated by the theory and the meaning of the quadrants shown by mechanical procedure could support the theory formulated.

If this hypothesis is rejected (Hypothesis: The rankings have nothing to do with one another) it is because the coincidences aren't random and in this situation, the classification, suggested by biplot, is consistent with the ICM theory.

We followed the following methodology:

- The biplots quadrants and theory quadrants were numbered in the usual way, in the opposite clockwise direction 1 ,2 ,3, 4. (This does not mean, for example, that a quadrant 1 of biplot has the same meaning as quadrant 1 of the theory).

- Using SPSS, we built a contingency table using as lines the quadrants of the theory and for columns the quadrants of biplot in figure2. At the intersection of one raw (quadrant of the theory) with one columns (quadrant o biplot of figure 2) is the count and row percentage of indicators in the intersection of these quadrants. The result can be seen in Table 1.

- As an example, it be seen in Table 1, that the intersection line corresponding to a quadrant 1 of the theory, with   quadrant 2 of biplot coincide in 13 indicators (81%) of 16 considered by the theory for the first quadrant. This suggests that biplot associating its second quadrant to quadrant one of theory, and so on.

- To make sure that these associations are not the product of chance, we performed - using SPSS - a new Chi-square test of independence between theory quadrants and the quadrants "discovered" by the biplot was made.

- The null hypothesis of no relationship between the quadrants of the theory and the biplot was rejected at the 0.05 level, which leads us to assume the existence of a significative relationship between the two classifications.

- Examining table 2 (*Crosstabulation* per quadrant of Figure 2), it is seen that the biplot - automatic procedure - finds evidence of four quadrants or groups. The correspondence is as follows: Theory 1 corresponds to 2 of biplot; Theory 2 corresponds to 3 (or 2) of biplot; Theory 3 corresponds to 1 of biplot; Theory 4 corresponds to 1 (3 or 4) of biplot.

Table 2: *Crosstabulation* per quadrant of figure 2

				Figure 2				
				1	2	3	4	Total
Quadrant	0	Count		1	6	0	0	7
		% within NrQuadrant		14,3%	85,7%	,0%	,0%	100,0%
	1	Count		1	13	2	0	16
		% within NrQuadrant		6,3%	81,3%	12,5%	,0%	100,0%
	2	Count		1	7	7	0	15
		% within NrQuadrant		6,7%	46,7%	46,7%	,0%	100,0%
	3	Count		12	3	10	7	32
		% within NrQuadrant		37,5%	9,4%	31,3%	21,9%	100,0%
	4	Count		9	1	5	7	22
		% within NrQuadrant		40,9%	4,5%	22,7%	31,8%	100,0%
Total		Count		24	30	24	14	92
		% within NrQuadrant		26,1%	32,6%	26,1%	15,2%	100,0%

Table 3: Chi-square in Figure 2

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	54,104[a]	12	,000
Likelihood Ratio	61,789	12	,000
Linear-by-Linear Association	2,440	1	,118
Nr of Valid Cases	92		

It is noted that there is significative evidence of consistency between the contents of the quadrants obtained by biplots (97 indicators) and the expected content of these quadrants, which suggests, although empirically, which groups of indicators in accordance with the quadrants, are consistent.

But now arises another question: Are the 97 indicators consistent with biplot of Figure 2? Eliminating indicators, structures that are obtained do they have the same meaning?

According to the analysis, we conclude that the associations indicated between the theory quadrants and the biplots quadrants do not occur randomly.

Table 4: Indicator *crosstabulation* / parameter (97 indicators)

		Figure 1				
		1	2	3	4	Total
Parameters	Market Audits	2	0	2	4	8
	Existence of Certification, environmental and social policies	1	0	2	6	9
	Brands Creation and Management	4	0	0	0	4
	Partnerships	2	1	1	0	4
	Existence of Awards	2	0	0	1	3
	Training / Qualification and Talent management	0	3	0	0	3
	Training / Qualification Team	0	2	1	0	3
	Innovation in teams	1	2	0	0	3
	Investment in Innovation and Development (ID)	1	3	2	0	6
	Investment in Innovation and Development (ID)	3	0	0	0	3
	Leadership in teams	0	1	2	0	3
	New Technologies of Information and Communication	0	5	0	0	5
	New Markets and Internationalization	7	0	0	3	10
	Existence of a Policy for Talent Retention	0	3	0	0	3
	Networks	1	1	0	0	2
	Registration of Organizational Knowledge	0	0	3	0	3
	Management of the Clients' Satisfaction	0	1	2	0	3
	Processes Systematization	0	0	2	0	2
	Team Work	0	2	4	0	6
	Complaints System	0	2	3	0	5
	Valuation of Know - How and Innovation	0	4	0	0	4
Total		24	30	24	14	92

We will also characterize the meaning of the quadrants of biplots suggested by Figure 2. This is achieved by examining which indicators are grouped into quadrants suggested by each of these biplots.

We consider this coherence between the two analyses, confirmed by the *Chi2 test,* as empirical evidence in support of ICM.

The quadrant 1 of Figure 2 - that corresponds to quadrant 3 of the theory - groups 7 indicators of the parameter New Markets and Internationalization, 4 indicators related to the parameter Creation and

Brand Management, and 3 indicators for the parameter investment in innovation and development (ID) – these are 14 indicators for a total of 24. It is therefore natural to associate the meaning of this quadrant to Internationalization / New Markets, Creation and Brand Management and ID Investment.

Quadrant nr. 2 of Figure 2 - that corresponds to quadrant 1 of the theory - groups 5 indicators of the parameter New Technologies, 4 indicators of the parameter Valuation of Know-how of Employees, 3 indicators of the parameter Training / Qualification and Talent Management, 3 indicators of the parameter Talent Retention Policy and 3 indicators for Investment in Innovation and Development (ID) - i.e. 18 of 30 total. It is therefore natural to associate the meaning of this quadrant to these 4 parameters.

Quadrant nr. 3 of Figure 2 - that corresponds to quadrant 2 of the theory - groups 4 indicators of parameter Teamwork, 3 indicators of Parameter Complaints System and 3 indicators of parameter Register of Organizational Knowledge - i.e. 10 indicators in total of 24. It is therefore natural to associate the meaning of this quadrant to these 3 parameters.

Quadrant nr. 4 of Figure 2 - that corresponds to quadrant 4 of the theory - groups 6 indicators of parameter Certification, Environmental and Social Policy, 4 indicators of parameter Market Audits and 3 indicators of the parameter New Markets and Internationalization - i.e. 13 indicators in total of 14. It is therefore natural to associate the meaning of this quadrant to these 3 parameters.

4. Conclusion

The *Crosstabulation* was done at 97 indicators, seems to indicate a good approximation between the suggested indicators and those which were considered relevant according to the results of previous studies indicating a good refinement of 97 ICM indicators and therefore we can say that the biplot presents itself as a good tool for visualizing the results.

Finally, the representation in Biplots allowed us to visualize that there is a great consistency between the contents of the quadrants, obtained by Biplots, and the expected content of these quadrants, which confirms, although empirically, the theory.

We can also conclude that the data indicate similarities with other researches (see Matos and Lopes 2011, 2012) which there are an adjustment of the parameters to the theoretical model (ICM).

The instrument (questionnaire format), has established the following distribution by quadrants:

I – Individual Capital Quadrant
Training / Qualification and Talent management – 3 indicators
Valuation of Know - How and Innovation – 4 indicators
Investment in Innovation and Development (ID) – 7 indicators
Existence of a Policy for Talent Retention – 4 indicators

II – Team Capital Quadrant
Training / Qualification – 7 indicators
Team Work – 3 indicators
Innovation in teams – 3 indicators
Leadership in teams – 3 indicators

III – Processes Capital Quadrant
Processes Systematization – 2 indicators
Registration of Organizational Knowledge – 3 indicators
Existence of Certification, environmental and social policies – 9 indicators
Partnerships – 4 indicators
Investment in Innovation and Development (ID) – 3 indicators
Brands Creation and Management – 4 indicators
Complaints System – 4 indicators
Existence of Awards – 3 indicators

IV – Clients Capital Quadrant
Market Audits – 8 indicators

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Management of the Clients' Satisfaction – 3 indicators
Complaints Clients System – 2 indicators
New Markets – 10 indicators
Networks - 3 indicators
New Technologies of Information and Communication – 5 indicators

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