A Theoretical Model for the Report of Intellectual Capital

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Abstract: Intellectual capital has become a key element of the knowledge economy. Their management is a factor that influences the competitive advantage of companies. The main objective of this paper is to present a methodology (ICM - *Intellectual Capital Model*) that allows the audit of intellectual capital management in small and medium enterprises (SMEs). From the conducted research, it can be concluded that the model is technically robust and determines that the management of intellectual capital is likely to be audited and certified in order to control the quality and dynamism of the knowledge generated and allowing the partner organizations (customers, suppliers and enders) to estimate the innovation capacity and verify the conformity of their management parameters, compared with a reference standard. Indeed, the results of surveys also show that the proposed model forms the basis of a credible accreditation system for intellectual capital management in the majority of Portuguese SMEs. This paper also contributes to enhance the discussion around the value of organizations intangible assets and therefore to change the current concepts of economic development.

Keywords: intellectual capital management, audit, ICM

1. Introduction

The competition between companies not only results in the production process as seen in the industrial age. At the moment, the skills, creativity, values, culture, motivation, among others, are differentiating factors.

Indeed there has been a high consensus on the importance of intangible assets as a source of economic competitiveness of enterprises. However, it has not been possible to establish credible metrics, accepted unanimously, to measure these assets.

Understanding the intellectual capital of an organization, manage it and turn it into a competitive advantage for enterprises requires new talents.

The OECD (2010: 1) states that investment in intangible assets and multifactor productivity increases have been responsible for over two thirds of the growth in labour productivity in many countries.

According to this organization, the World Bank estimates that the predominant form of wealth for most countries is intangible capital.

The European Commission has also given much importance to the issue of intangible assets, including those related to more innovation policies.

It is recognized that SMEs make up 99% of the productive capacity of the European Union, which are the main source of innovation. However, with the current financial crisis, the financing of these companies has been very difficult (European Commission, 2008).

Thus, we can say that a report of the management of intellectual capital presented with credible metrics, recognized and accepted by the various stakeholders, may be a safety tool and at the same time can be used as an important marketing tool.

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The following sections of this paper present ICM methodology as a valid tool for auditing the intellectual capital management.

2. Literature review

2.1 Methodologies for measuring intellectual capital

Several authors have postulated the importance of measuring intellectual capital in a strategic perspective. Thus, there have been many models and methodologies, which represent different approaches to the measurement of intellectual capital.

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) 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, Direct Intellectual Capital Methods, Market Capitalization Methods and Return on Assets Methods.

To understand the diversity of attempts to measure intellectual capital a listing of some models that have been presented is presented below (Table 1), which were classified according to the classification of Williams (2000).

Table 1: Chronological classification of methods and methodologies for measuring intellectual capital, according to the Williams classification (2000)

Williams Classification[1]	Model	Author
MCM	*The Invisible Balance Sheet*	*Sveiby (1990)*
SC	*Balanced Scorecard*	Kaplan & Norton (1992)
DIC	*Citation - Weighted Patents*	*Dow Chemical (1996[2])*
DIC	*Technology Broker*	Brooking (1996)
DIC	*Citation-Weighted Patents*	Bontis (1996)
DIC	*Human Resource Costing & Accounting*	Johansson & Nilson (1996)
MCM	*Tobin´s Q*	Tobin (1997)
ROA	*Economic Value Added (EVA™)*	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 Assets Monitor*	Sveiby (1997)
DIC	*Accounting for the Future (AFTF)*	*Nash H. (1998)*
DIC	*HRSstatement*	*Ahonen (1998)*
ROA	*Calculated Intangible Value*	Luthy (1998)
SC	*Intelect Model*	Euroforum (1998)
MCM	*Investor Assigned Market Value (IAMV™)*	Standfield (1998)
SC	*Holistic Accounts*	*Rambøll Group (1999)*
ROA	*Knowledge Capital Earnings*	Lev (1999)

[1] Market Capitalization Methods (MCM)

Scorecard Methods (SC)

Direct Intellectual Capital Methods (DIC)

Return on Assets Methods (ROA)

[2] Described in Bontis (2001)

Williams Classification[1]	Model	Author
SC	*Modelo Nova*	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*	McPherson & Pike (2001)
SC	Based on EFQM Model	Caba & Sierra (2001)
SC	*Knowledge Audit Cycle*	Schiuma & Marr (2001)
SC	*Intangible Assets Statement*	Garcia (2001)
SC	*Heng Model*	Heng (2001)
SC	*Meritum Guidelines*	Meritum (2001)
SC	*Value Chain Scoreboard™*	Lev (2001)
DIC / 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 e 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 - CIC (2003)
SC	*National Intellectual Capital Index*	Bontis (2004)
SC	*Topplinjen/ Business IQ*	Sandvik (2004)
SC	*Intellectual Capital Value Creation*	Boedker, Guthrie et al. (2005)

Williams Classification[1]	Model	Author
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*	Sánchez, Elena & Castrillo (2009)

Source: Authors' - Adapted from Sveiby (2010)

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

The model presented 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).

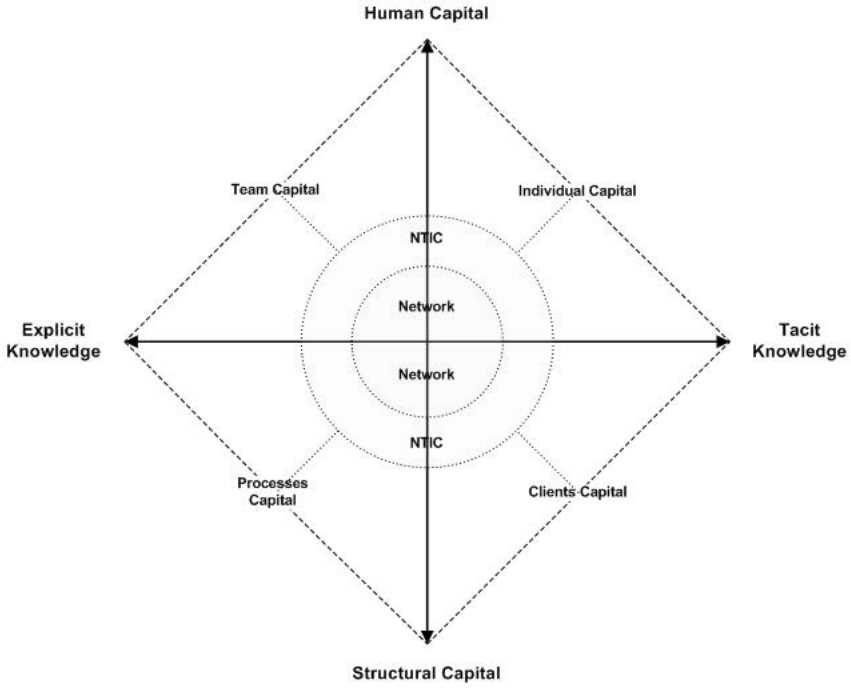


Figure 1: ICM - Intellectual Capital Model (Matos and Lopes, 2009)

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.

2.2 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.

2.3 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.

2.4 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.

2.5 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.

3. Description of ICM Parameters

I – Individual Capital Quadrant

1. Training / Qualification and Talent Management

The training / qualification is understood as the capacity of individual employees to form or qualify.

The company should have a, clearly defined, policy of training and qualification of human resources with clear guidance of the objectives of this policy. The qualification of human resources should be understood as an instrument of strategic development.

Talent management is presented as integral part of the management of intellectual capital, which is a determinant of organizational success.

The purpose of this parameter is to analyze how the company encourages the acquisition of knowledge and the development of the talents of each of their employees, from the best, the most creative and to those who play most elementary tasks in the company.

2. Valuation of Know - How and Innovation

All employees of a company have a set of skills and knowledge that, when placed at the service of its goal, can be decisive. Moreover, these skills and knowledge are inexhaustible. The problem is that companies often do not value and do not encourage these skills and knowledge, and employees, in return, do not have any interest in the placing their knowledge in service for the organizations, even considering to offer knowledge in excess, that can generate more work that is not compensated by the company.

However, this knowledge is crucial for the development of innovation capacities of individuals.

Thus, the purpose of this parameter is to check how the company rewards and encourages the development and provision of expertise and knowledge of individual employees.

3. Investment in Innovation and Development (ID)

Innovation is the source of competitive advantages of companies, depending on its organizational performance and even survivability, competing in markets.

The company should have a strategic planning where innovation and development are planned, with evidence of its implementation and of their contributions to the development of a competitive organizational performance.

The purpose of this parameter is to ensure that investment in research and development conducted by the company, has as main purpose the simplification of processes and / or increases innovation, especially disruptive innovation.

4. Existence of a Policy for Talent Retention

As important as creating talent is retaining it.

With the departure of people, the organization loses the wealth of experience, hardly replaceable and therefore losing a network of unquantifiable relationships.

Involve people in organizational development (creating new teams and / or new business) may be an alternative that does not necessarily entails an increase of salaries, as the compensation policy of the organization may be more comprehensive.

This parameter should look for evidence of the existence of such policies

II – Team Capital Quadrant

1. **Training / Qualification**

The training / qualification should be understood as an instrument that enables the exchange of synergies between the elements of the company.

The company should have a policy of training and qualification of human resources clearly defined, with clear guidelines on the team culture, with the objective of transforming groups into cohesive teams, highly motivated and productive.

The purpose of this parameter is to check the existence of this policy of training and qualification.

2. **Team Work**

Work must be organized into teams, whose size will be most appropriate to meet the size and needs of the company.

Each client should be seen as a global project team, demonstrating the team culture.

Internal customers also can not be forgotten, and should also be part of the focus of the work team.

The performance evaluation should reward teamwork and should be indexed to a compensation system perfectly defined and known to all employees.

This parameter must be a culture of teamwork, customer-focused (internally and externally).

3. **Innovation in Teams**

In a company, teams can be encouraged to be innovative (disruptive innovation teams) or simply improvement teams (incremental innovation teams).

Although the most common are the improvement teams, it is essential that the two types of innovation are present.

The purpose of this parameter is to check the existence of constant encouragement.

4. **Leadership in Teams**

The leadership seems to be essential for success, since it supports the very experience of team spirit.

The main function of the leader should be to reconcile and unite the interests of team members, promoting and stimulating creativity and the mobilization of resources (material and immaterial), having a single focus that is the customer.

The communication between the leader or leaders and team members, should facilitate the process of organizational integration.

Whatever type of leader, the organization shall control the alignment between the different leaders.

The purpose of this parameter is to check if the leadership is aligned with the culture of talent management.

III – Processes Capital Quadrant

1. **Processes Systematization**

The purpose of this parameter is to verify that the systematization of electronic processes exists to allow the sharing of knowledge between different stakeholders, and that it is formalized and capable of being transmitted.

2. **Registration of Organizational Knowledge**

Organizational knowledge must have registration forms, including computer, which protect and facilitate their transmission within the company. This parameter must verify the operability of the record of organizational knowledge.

3. **Existence of Certification, Environmental and Social Policies**

Companies must be holders of certifications, including the ISO 9001:2000 quality certification.

Environmental policies should be integral components of other policies of the company.

The interaction with the external environment of the company, should include not only the environmental context, but also social.

This parameter should show the existence of certifications and environmental and social policies.

4. **Partnerships**

The company must belong to a network of partnerships involving various stakeholders, demonstrating the contribution of these partnerships to its organizational project.

The purpose of this parameter is to demonstrate how the process - keys are used to manage the relationship with their partners.

5. **Investment in Innovation and Development (ID)**

The company should demonstrate how innovation and development allows the connection and process simplification. The parameter should allow the verification of this evidence.

6. **The Brands Creation and Management**

The purpose of this parameter is to demonstrate that the company's strategy is based on a process of creating and managing brands which allows the improvement of the reliability of products or services and organizational differentiation.

7. **Complaints System**

The company should have a formal system of registering complaints that serve internal relationships and organizational commitment of employees. This system should be assessed as part of the culture.

8. The Existence of Awards

The prize is understood as the recognition of the relationship process / customer, resulting from the interaction of explicit knowledge with the structural capital.

Thus, the purpose of this parameter is to check whether the company has had awards resulting from this recognition.

IV – Clients Capital Quadrant

1. Market Audits

A systematic audit market should enable the company to meet the market in which it competes, identifying opportunities and threats and defining clear strategies for market access.

2. Management of the Clients' Satisfaction

The analysis of customer satisfaction / suppliers (involving the entire value chain that lies outside the boundaries of the company) should be part of organizational routines. Reports should be obtained to allow the management of the company's relationship with customers, in a perspective of total quality.

This parameter should verify how the company manages its relationship with customers.

3. Complaints Clients System

The formal system of recording and processing external complaints should be part of the company's culture as a key element in the relationship with customers.

This system should allow adequate treatment of complaints within the parameters and timeline indicated for the area of the business activity.

Thus, this parameter must demonstrate that complaints handling are part of a process and are an intrinsic element in the culture of the company.

4. New Markets

The parameter wants to check if the company demonstrates a strategy of integrated market, where internationalization is one of the goals.

Market strategies must be accompanied by internal strategies of innovative products and services for new markets.

Common Parameters

1. New Technologies of Information and Communication

New technologies are an essential tool to the organizational development of companies.

All employees, regardless of their area of expertise, should master new technologies, in accordance with the specifications and requirements of their role in the organization.

New technologies should be used as a management tool and integrated in a culture of Network, where individuals of the teams participate actively, creating a team culture focused on the overall performance of the organization.

New technologies must work even as a tool for management, maximizing organizational performance through improved processes rigorously memorized.

New technologies are essential in the register of organizational knowledge, and should allow the existence of interactive databases and systems of electronic contacts that allow connections with suppliers, customers and other stakeholders.

New technologies are therefore a key element in improving the quality of service of the organization.

Companies that put new technologies at the service of human resources have a great advantage over those that do not, since it eliminates the administrative formalities in solving simple problems, increasing the quality of services and to foster a continuous improvement and participatory environment and personal growth.

The company's human resources must demonstrate competence in the use of new technologies.

2. Networks

Networks, supported by new technology, are fundamental for the development of a culture of Network where employees actively participate in the organization.

The networks should support a "Pouch Interactive Ideas" that fosters the development of individual talents.

Networks closer together, employees and teams provide forums for knowledge sharing and enable the dissemination of good practices.

The company should focus on processes of learning and transferring the best practices to the organization and its managers.

The teams integrated in interactive networks discuss and improve the quality of processes in view customer satisfaction.

The company must demonstrate the participation in Networks, showing that this participation is in their strategic planning. There it should be described how the relationships and use knowledge are obtained, demonstrating the effect of this participation in various aspects of its mission, strategic planning and operations.

4. Empirical research

4.1 Methodology

This research aims to further validate previous studies performed by the authors (Matos and Lopes, 2009, 2010, 2011).

We intend to identify the indicators to evaluate each parameter of Intellectual Capital Model (ICM) and to examine the psychometric properties (reliability and validity) of ICM parameters.

According Carmines and Zeller (1979), reliability concerns confidence in the constancy of the results of several applications of the same test. To study the reliability of the questionnaire we have adopted the method of internal consistency by determining the Cronbach's alpha (Cronbach, 1951) coefficient that, according to Nunnally (1978), provides a good estimate of reliability. The value of this coefficient can vary between 0 and 1.

For Nunnally (1978) an instrument is classified as having acceptable reliability when Cronbach's alpha is at least 0.70.

Construct validity will be determined by factor analysis (CFA). The extraction method used was the Principal Component Analysis (PCA).

4.2 Sample

The initial sample consists of 1107 Portuguese SMEs considered the "PME Leaders' (SME leader), the best SMEs based in Portugal, in 2010.

This classification is awarded annually by IAPMEI - Portuguese Agency for SMEs and Innovation.

The “PME Líder” companies are proposed by one of seven major banks in Portugal and must obey certain criteria. These companies are, from various sectors, as through the quality of their results and high competitive standards, having good financial ratios and profitability above the national average. These companies are actively contributing to the dynamics of development and employment in Portugal, being responsible for 37 000 direct jobs. Its turnover in 2010 exceeds 4.5 billion euros.

From this total sample we obtained a total of 112 responses, corresponding to the same number of subjects of analysis, which respects the rules of a minimum of 10 observations per item, proposed by Biddle, Markland, Gilbourne, Chatzisarantis and Sparkes (2001).

4.3 Instrument specificity

As a tool for validating these properties we used a questionnaire that has been developed by the authors (see Matos and Lopes, 2009, 2010, 2011).

To facilitate analysis, we divide the global instrument in various groups of questions (a total of 140 questions) according to each of the ICM Quadrants. Networks and New technologies were also considered.

The questionnaire consists of statements about the applicability of each parameter to the business context of each SME, according to a Likert scale of 5 points (1 = never applies, 2 = applies somewhat, 3 = moderately applies 4 = applies very much and 5 = applies completely). This version follows the adaptation of the questionnaire proposed by Matos and Lopes (2011).

We conducted a questionnaire pre-test in a convenience sample consisting of 10 SMEs in the same sector of the main sample.

4.4 Statistical procedures

Initially, we carried out most of the descriptive statistics concerning the variables assessed using Likert scales.

Subsequently, we proceeded to determine the internal consistency using Pearson's correlation coefficient.

Reliability was determined using Cronbach's alpha coefficient.

The significance level adopted to reject the null hypotheses is $p < .05$, which corresponds to a probability of wrong rejection of 5%.

Since the sample size was over 30 (Pestana and Gajeiro, 2008), we used the Central Limit Theorem to determine the arithmetic average of the indicators of each parameter.

We conclude with a Principal Component Analysis (PCA) for each parameter.

For statistical data, we used the computer software SPSS - Statistical Package for Social Sciences, version 18.0.

5. Results

5.1 Reliability

The average of each indicator is in the interval [1.31, 3.49], the standard deviation is in the range [-0.541, 1.995], the variance is in the range [0.306, 3.978], the minimum is 1 and the maximum 9.

A visual examination of the shape of the distribution showed that almost all the variables had a slight bias towards higher scores but they did not look very different from the normal distribution curve.

Calculating the matrix of correlations between items were excluded indicators with values lower than 0.30. We used the criteria proposed by Cohen (1988): values between 0.10 and 0.29 can be considered small, values between 0.30 and 0.49 can be considered as average, and values between 0.50 and 1 can be interpreted as large. So we decided to eliminate all indicators with a correlation less than 0.30.

Initially we applied the Cronbach's alpha in all issues of the questionnaire and we exclude issues that had Cronbach's alpha values below 0.6.

With these procedures, we eliminated 43 indicators and the study of the instrument dimensionality continued based on the remaining 97 indicators.

We conducted twenty two Principal Component Analysis to explore the setting of the questions that allow you to check each parameter.

The final Cronbach's alpha reliability coefficients parameters are averaged 0.7 and 0.9.

Based on these analyses, we reduced the number of items constructs representing each parameter.

We had attention to the soundness of the contents of each item, obtaining an instrument small enough.

With the Principal Component Analysis, we verified the existence of latent variables that explain the total variance of the indicators of each parameter.

Conducted a Principal Components Analysis, the first component explains a very large percentage of the variance of these indicators together.

5.2 Validity

Given the above results that provide empirical evidence of the proper selection of indicators for each parameter, we find that it is legitimate to add indicators in each group and calculating the respective mean, since all quantities are expressed in equal ranges.

There are thus obtained, averages of groups of variables that are continuous variables, which makes sense to apply normality tests, especially since, in many cases, the number of parts is high, approaching the conditions of applicability of the Central Limit Theorem of Lindeberg.

On the set of 22 variables obtained, now makes sense to try to fit a model theory. Our initial hypothesis is that underlying these 22 variables there are, at most, four factors, corresponding to the 4 quadrants of the ICM.

We intend to exploit the adjustment factor loadings in the ICM and to verify if it was possible to find a reduced number of factors representatives of the entirety of the parameters.

The study on the number of factors to retain was made based on a set of indicators, corresponding to the average of 22 parameters of ICM, observance of the Kaiser criterion, according to which if chosen factors whose variance is greater than 1 (initial eigenvalues> 1).

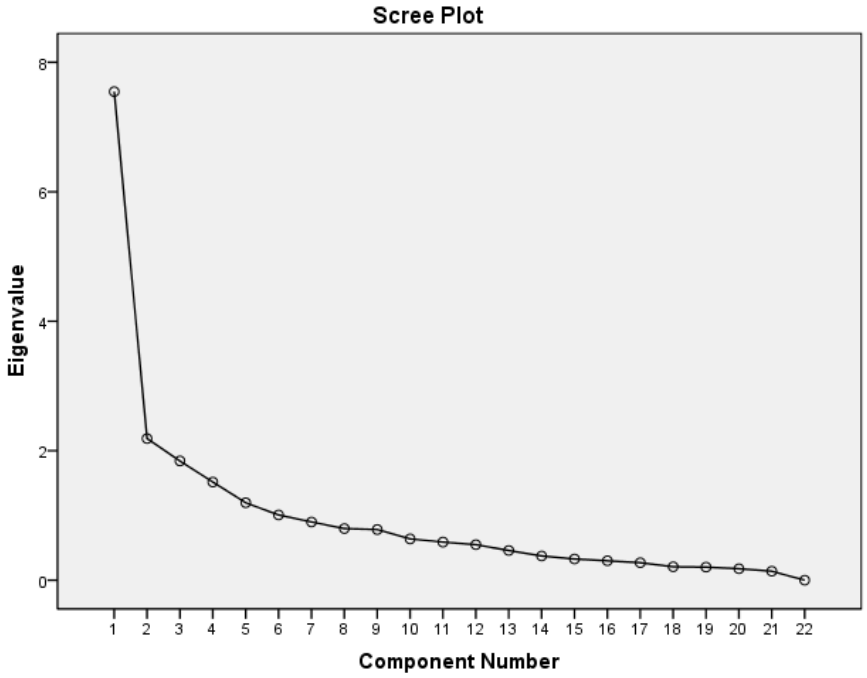
We used a principal component factor analysis and analyzed the loads of factors.

The results point to the extraction of 6 factors explains about 70% of the total variance (see table 2). If we consider only 4 factors, the variance explained by this model, would correspond to about 56% of the total variance - which, if not a full corroboration of the theory, is important evidence in support - see scree plot that corroborates this analysis.

Table 2: Total variance explained

Component		Initial Eigenvalues			Rotation Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
D	1	7,547	34,304	34,304	4,132	18,782	18,782
	2	2,188	9,947	44,251	3,244	14,743	33,526
	3	1,842	8,371	52,622	2,679	12,175	45,701
	4	1,516	6,890	59,512	2,174	9,884	55,585
	5	1,196	5,437	64,949	1,570	7,137	62,722
	6	1,007	4,578	69,527	1,497	6,805	69,527
	7	,899	4,085	73,612			
	8	,798	3,625	77,238			
	9	,782	3,555	80,793			
	10	,638	2,898	83,691			
	11	,588	2,674	86,364			
	12	,549	2,494	88,858			
	13	,459	2,086	90,944			
	14	,373	1,696	92,640			
	15	,328	1,490	94,130			
	16	,299	1,359	95,489			
	17	,269	1,223	96,712			
	18	,208	,943	97,656			
	19	,201	,914	98,570			
	20	,177	,803	99,373			
	21	,138	,627	100,000			
	22	-1,149E-16	-5,224E-16	100,000			
Extraction Method: Principal Component Analysis.							

Source: Authors'



Source: Authors'

Figure 2: *Scree plot* of factor analysis

Table 3: Matrix components

	Component					
	1	2	3	4	5	6
QCEP3	,823	-,010	-,115	-,178	-,006	,022
QCIP3	,773	,141	-,076	-,057	-,059	,155
PRT	,725	,040	-,023	,117	,127	,064
QCEP1	,676	,268	,181	,092	-,151	,227
QCCP1	,674	-,185	,290	-,394	,177	-,230
QCEP2	,674	,263	-,197	-,037	-,068	,036
QCPP5	,647	-,190	-,017	-,042	,404	,139
QCPP1	,634	,336	,165	,199	-,173	-,142
QCIP4	,618	,197	-,339	-,051	-,245	-,083
PNT	,596	-,510	-,136	,507	-,080	,067
QCPP4	,596	-,510	-,136	,507	-,080	,067
QCIP1	,576	,492	-,402	,026	,083	-,194
QCCP4	,571	-,415	-,036	-,394	,026	-,226
QCPP8	,569	-,369	-,055	-,403	,104	,002
QCPP3	,548	-,291	,463	-,254	-,216	-,143
QCIP2	,529	,465	-,489	-,113	,080	-,080
QCPP7	,500	,349	,356	,198	,359	-,057
QCEP4	,486	-,137	,142	,453	-,242	-,340

	Component					
	1	2	3	4	5	6
QCCP2	,428	,150	,668	,102	,026	-,085
QCPP2	,211	,253	,307	-,259	-,612	,434
QCCP3	,081	,311	,382	,155	,447	,263
QCPP6	,429	-,329	-,183	-,047	,131	,564
Extraction Method: Principal Component Analysis.						
a. 6 components extracted.						

Source: Authors'

6. Conclusion

From the analyzed literature we can conclude that there are no perfect methods of measuring intellectual capital, i.e., none of the methods can answer all needs. Different authors try to choose the method according to the context and the goals they wish to achieve.

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

The psychometric properties (reliability and validity) of the instrument were validated.

The internal consistency of the indicators was verified based on correlations and Cronbach alpha, considering that the internal consistency should not increase when the indicator is eliminated.

The factor structure was examined using the extraction method of Principal Components.

The analyses provide abundant empirical evidence that underlying the data collected with the retained indicators (97 indicators and 22 indicators mean) there is a factor structure 4-6 common factors - which is compatible with the theory of the 4 quadrants of the ICM.

After this analysis we examined the internal consistency of the proposed instrument and refined by eliminating indicators that contributed to decrease the theoretical soundness and content, we can see that the 22 parameters of Intellectual Capital Model (ICM), and determine if the indicators show adequate (a total of 97) to assess each of these parameters.

The instrument has the following presentation:

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

The Brands Creation and Management – 4 indicators

Complaints System – 4 indicators

The Existence of Awards – 3 indicators

IV – Clients Capital Quadrant

Market Audits – 8 indicators

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

Finally the survey results allow us to conclude that ICM parameters are robust approach to auditing the intellectual capital management in SMEs, as they meet the criteria for its psychometric properties.

These parameters will be the basis for the accreditation Model of intellectual capital management we intend to produce. According to this Model, SMEs companies will be able to recognize, to value and to empower their intellectual capital and move on to a performance stage, based on innovation.

Here, it is important to reflect briefly on the meaning of certification and of accreditation. Looking at the concepts, certification consists of evaluating compliance with creditability, using reference elements based on recognized standard methodologies. The accreditation consists of a technical evaluation phase leading to, in view of the global nature of the certification, being incorporated into a recognized group where the best practices are used, driving all the accredited entities towards a permanent search for a standard based on excellence.

Effectively, the accreditation of the intellectual capital management would be a public declaration where a particular company meets a set of accreditation criteria, pre-established by the accrediting body.

The accreditation will be seen as a quality and recognition stamp and as an indicator of the company's ability regarding intellectual capital management.

The accreditation criteria are based on the ICM Model (Matos and Lopes, 2009) parameters as presented above.

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