

# IFKAD 2016

11th International Forum on Knowledge Asset Dynamics

## Towards a New Architecture of Knowledge: Big Data, Culture and Creativity

### PROCEEDINGS

15 - 17 June 2016  
Dresden - Germany



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Dynamics***

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***Towards a New Architecture of  
Knowledge: Big Data, Culture  
and Creativity***

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## FOREWORD

Imagine a conference that is truly open – open to a broad range of disciplines and fields of specialisation, yet still maintaining a clear focus of topic – open to highly experimental formats of interaction, yet still keeping standards of scientific discourse – open to participants from young potentials to distinguished experts, yet enabling fruitful exchange to all directions. This is what we as organizers had in mind when programming the 11th edition of IFKAD. What is more, our conference not only endeavours in novel degrees of openness, but also in an ambitious task of “scientific structural design”.

With our conference subtitle “Towards a New Architecture of Knowledge” we indicate that the structures and patterns of knowledge research – as done by the knowledge managers, creativity trainers, information analysts, and other participants at IFKAD – have to be set into a comprehensive picture. This picture, however, is not yet automatically defined. We still must actively design it. We need to take different perspectives in order to imagine the overall scheme. In view of radically changing demands on knowledge work as an eminent factor for personal, organizational, and societal success, we have to rethink its structures. We need to discover new ways of creating, processing, and sharing knowledge beyond the paths of established disciplines.

In this sense, IFKAD2016 addresses three key perspectives towards a new architecture of knowledge, whose interconnections have grown into core drivers for future knowledge work: Big Data, Culture, and Creativity.

Ubiquitous information and communication technologies produce an ever-expanding amount of data, whose value is hard to tap with principles of conventional data processing – but how to design new methods of analysis? Organizational and community culture is a decisive frame for unprejudiced and venturesome intra- and entrepreneurship, which may result in disruptive solutions – but how to display and nurture the volatile facets of culture? Finally, creativity is one of the remaining human faculties that cannot be replaced by computers by now – but how to reach higher levels of creativity and discover new application fields?

To answer these questions IFKAD 2016 provides an open platform for researchers, practitioners, and policy makers to present original approaches, models, and tools. To overcome disciplinary boundaries and enable dynamic discussion, we have designed experimental new conference formats. We hope their application within interactive sessions and co-creation workshops not only helps to boost knowledge exchange among participants, but also gives a fresh and fruitful atmosphere to IFKAD.

We are really honoured for your participation and we look forward to meet you in occasion of IFKAD 2017.

*Joerg Rainer Noennig, Peter Schmiedgen, Giovanni Schiuma*



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## The Intellectual Capital and its Relationship with the Competitiveness: a Study in Higher Education Institutions of México.

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### Structured Abstract

**Purpose-** It has been conferred on the Higher Education Institutions (HEI), knowledge transfer, training and development of scientific research, but it is thanks to the intellectual capital that universities achieve their corporate goals, to allow quantification and measurement intangible assets such as human, relational and structural capital to manage their resources. Proper management of intellectual capital enables a further increase in the competitiveness of higher institution. This research focused on identifying the relationship between intellectual capital and competitiveness variables in four universities in Mexico

**Design/methodology/approach** – The base of intellectual capital (IC) is knowledge, intangible resource and major source of innovation in creating value for organizations and

competitiveness (Diaz, 2012), it is considered a resource of knowledge that organizations use to generate a lead competitive (Kwantes, 2007). The quantitative study was cut, descriptive, explanatory and correlational in which the relationship between intellectual capital and competitiveness, implemented in IES of Mexico is established through a survey of 120 academics who collaborated on the study. The questionnaire was designed with 73 closed questions using Likert scale to inquire about the intellectual capital and the factors influencing competitiveness as IES, obtaining a Cronbach alpha reliability of .858. Frequencies were obtained by sphericity test for the characterization of teachers and factor analysis was applied to the correlation of variables finally performing the ANOVA for hypothesis testing.

**Originality/value** – The methodology to analyze the correlation between intellectual capital and competitiveness variable, HEI where the study was applied.

**Practical implications** – The results of the study show that planning, leadership, measurement, technology, vision and strategy, decision making, learning and knowledge in higher education institutions influencing competitiveness and create an opportunity to develop intellectual capital and increase their quality.

**Keywords** – Intellectual capital, competitiveness, institutions of higher education.

**Paper type** – Academic Research Paper / practical book

## 1 Introduction

Currently the theme of intellectual capital in the Higher Education Institutions (HEI) is being a key resource for universities, due to the importance that has been given to information and knowledge, as means through of which educational institutions contribute to the training of professional cadres. In this regard (Osorio, 2003) has proposed that both information and knowledge constitute a resource that allows the competitiveness of organizations, who say universities are not alien to perform internal processes to achieve a certain level of institutional competitiveness.

Universities institutions manage intangible resources to achieve greater competitiveness, developing knowledge, skills and attitudes in staff through constant training and exchange of information, in which is given responds to the needs and problems that occur daily in the institutional dynamics in the field of teaching, educational administration and development of educational programs, efforts to strengthen staff expertise within collaborates in university organizations to create value, and pretend innovate the educational service and thus achieve competitive advantages as an educational institution.



Unquestionably it has been conferred on the HEI as part of its mission, the transfer of knowledge through teaching function where the formation of intellectual capital of professionals cadres is carried out, using various ways and means in achieving learning and implementing various teaching strategies to achieve their educational objectives, knowledge is the main intangible resource of educational institutions is through this how they administer, coordinate and organize academic activities, however this is not possible without the collaboration of academic staff and research. The other substantive functions such as the research and promotion play a key role in the development of intellectual capital, contributing with their results in the generation and application of knowledge, scientific and technological development and thus to solving problem that society presents.

Intellectual capital is the intangible essential resource that can achieve competitive advantages in the universities and obtain comparative positions relative to other institutions, but education and training skills are achieved in students and which takes after process of acquiring knowledge, specific skills and to work in the field work and professional skills.

In the last ten years the development of ICT has helped organizations to increase their competence and has been a resource to develop their intellectual capital, create new products, services, patents, projects and technology among others, with knowledge management and intellectual capital variables that have acquire fundamental importance in organizations (Osorio, 2003), ideas that are applicable in the field of universities.

The use of Information and Communication Technologies (ICT), today within universities institutions, it is being a fundamental support for access to information, it is this technological resource which enables approach to knowledge, share information and generate appropriation, accumulation and transfer knowledge, bringing the academic performance of executives, students, teachers and researchers increases, as it has raised Malhotra (2000), cited in Sanchez, Melian and Hormiga (2007), considering that knowledge refers to how the organization, aided by technology and organizational processes, acquires, uses or share knowledge. The intellectual capital and knowledge management are the tools for an institution to develop, be competitive in all areas related to research and knowledge, contributing to the creation of more value of a university. It is considered that technology resource available to educational institutions, contributes to the competitiveness of the organization and is one of the resources that raises more

difficulty in managing (Demuner & Market, 2011). The rapid development of technology is affecting all fields in society and especially to universities as it is here where students, teachers and all the staff that is part of the institution, make use of information systems and technological development, the ability to acquire and use technology to be essential to favor learning, so that universities institutions, make the necessary adjustments and improvements to stay, survive or compete in the prevailing modern and globalized world.

This work is the result of applied research to faculty from four public institutions of higher education in Mexico: University of Guadalajara, Autonomous University of Nayarit, Superior Technological Institute of Patzcuaro and the Universidad Juárez Autónoma de Tabasco, where the relationship is analyzed between the variables of intellectual capital and competitiveness.

## 2 Literature review

### 2.1 Intellectual Capital

To introduce the topic below is a table with the conceptual evolution that has taken the term intellectual capital, in order to gather and present the main contributions by various authors who have contributed to the definition.

Table 1 Concepts of intellectual capital

Authors, year	Definition of intellectual capital
Kenneth, 1969	Means intellectual action, rather than mere knowledge or pure intellect.
Funk and Wagnal, 1977	Has very complex connotations and is often used as synonymous with intellectual property assets intellectual and knowledge assets. It can consider this as part of the total inventory of capital or as social capital based on knowledge the company owns.
Dierickx and Cool, 1989	Is simply the stock of knowledge in the company.
Stewart, 1991	Is all that cannot be touched but that can make money for the company.
Edvinsson and Sullivan, 1996	It is that knowledge that can be converted into benefit in the future and which is formed by resources, such as ideas,

	inventions, technologies, software, designs and processes.
Jonson, 1996	Tangible assets search even less, such as a company's ability to learn and adapt.
Bradley, 1997	Is the ability to transform knowledge and the rest of intangible assets in generating resources wealth, both for companies and countries.
Edvinsson and Malone, 1997	It is like an iceberg: "above the surface rise financial and physical, visible and impressive resources under the sun, below there is something unseen, much more large, the importance of all though nobody knows knows their environments. "
Stewart, 1997	"Is intellectual material, knowledge, information, intellectual property, experience, which can be used to create value. It is collective brainpower. It is difficult to identify and distribute even more efficiently. But who finds and exploits, triumphs ".
Euroforum, 1998	Set of assets of a company that, despite not being reflected in traditional financial statements, generate or will generate value in the future for it.
Stewart, 1998	Is the sum of all knowledge possessed by employees and give the company advantage competitive.
Bueno, 1999	Is a measure of value generated at a time of time variable background that explains the effectiveness organizational learning and, therefore, it allows assess the efficiency of knowledge management.
Petty and Guthrie, 2000	Although consists of a structural part, comprising software, distribution networks, among others, and a part human, including human resources belonging the organization and external, within which are suppliers and customers, argue that the concept of Intellectual Capital is different from active intangible.
Lev, 2001	Considers that intangible resources are those that value may be generated in the future, but which, however, they have a physical or financial body.
Nevado Peña and López Ruiz, 2002	Is the set of company assets that, while not are reflected in the financial statements, generate or will generate value for it in the future, as result of issues related to capital human and other structural and the ability to innovation, customer relations, quality processes, products and services, the cultural capital and communicational, leading to the generation of profits futures.
Batista Canino, Melian Gonzalez and Sanchez Medina, 2002	It is the combination of intangible or intangible assets, being included staff knowledge, ability to learn and adapt, relationships with customers and suppliers, brands, product

	names, internal processes and R & D capacity, among others, an organization that although they are not reflected in the traditional financial statements, generate or generate value future and which may sustain an advantage sustained competitive.
Viedma, 2003	Is equivalent to core competencies or capabilities essential.

Source: Own based on Alarcon Alvarez, Goyes and Perez, 2012.

Brătianu, (2006); Joia (2008) and Monagas, (2012) argues that intellectual capital is create, obtain and manage, arguing that is the ability to transform knowledge and intangible assets in resources that create wealth, thereby providing the ability to turn invisible, such as knowledge about resources to create wealth assets, not only within organizations, but within relationships, intellectuals to achieve goals and success (Monagas, 2012) elements.

According to the previous definitions of the mentioned authors it can be said that intellectual capital through time has taken the term intangible resource referring to the skills that humans play within the organization or institution which has become a fundamental tool for the development of them when making decisions that affect the competitive improvement, therefore we speak of valuable capital that covers the skills and knowledge of employees that fit with the organization and all activities training in order to grow the competitiveness and productivity of employees. (Martinez-Lorente, 2015) claim that human capital ponders routines and unit processes have limited value; as a consequence of depth and experience.

As it can be seen, the concept has incorporated issues relating to knowledge, intellectual property, information, experience, learning, knowledge or intangible assets, intangible resource and more recently the core competencies of an organization.

In the case of the institutions, intellectual capital is the most valuable thing any institution can have, whether governmental or private. However usually it is one of the weakest factors of a large number of institutions (Schmelkes, 2012) and according Ferreira cited by Silva and Ferreira (2015), it states that the issue of intellectual capital at a university leads to a debate in the aspect of knowledge, which is distinguished as very difficult and complex to standardize. Intellectual capital within institutions of higher education involves a process through which knowledge is produced in universities; involves a series of academic activities to take advantage of intangible assets in the knowledge base and future competitiveness as an institution, that is, are those related to

knowledge, intellectual development and educational processes carried out by an institution, that enable research assets and technological development, training of human capital as well as the use and exploitation of information technologies for education.

Intellectual capital has had some approaches according to certain periods in which this concept has evolved, bellow shows in a general form this evolution.

Table 2: Overall development of intellectual capital

Period	Contribution
End of 1980	First attempts by specialists to build the basis for measuring intellectual capital (Sveiby, 1988). They were practical rather than theoretical contributions to conservative results.
Early 1990	Systematic initiatives for measuring and reporting intellectual capital abroad (eg Celemi and Skandia;. SCSi, 1995). In 1990 Skandia AFS designated "Director of Intellectual Capital" Leif Edvinsson to. This is the first time the role of managing intellectual capital is elevated to a formal position, with an air of corporate legitimacy.
Mid of 1990	Nonaka and Takeuchi (1995) discloses a highly influential work "The knowledge creating company". Although the book concentrate on knowledge, the distinction between knowledge and intellectual capital is fine enough to make it a relevant book in the pure foci of Intellectual Capital. In 1994, a supplement to the annual report of Skandia is done focused on presenting an assessment of the stocks of the company in Intellectual Capital. "Browsing Intellectual Capital" generated interest from other companies shall endeavor to follow the example of Skandia (Edvinsson, 1997). Celemi in 1995, uses a "review of knowledge" to provide a detailed assessment of the state of Intellectual Capital.
End of 1990	Intellectual capital becomes a more consolidated topic with researchers and academic conferences, articles work, and other publications are a significant audience. A growing number of large-scale projects (eg. The draft MERITUM, Danish, Stockholm) begin, with the aim of introducing greater academic rigor in research of intellectual capital, standardize concepts and classifications. In 1999, Harvey and Lusch introduced intangible intellectual capital liabilities, as you can see there is more of a theoretical development accelerated.
Beginning of 2000	Caddy (2000) defines intellectual capital as the difference between assets and intangible liabilities. Some authors (Konar et al 2001;. Porto 2003, Viedma, 2003; Garcia-Ayuso et al ., 2004), presented the appearance of intangible liabilities in different spaces. Kaplan and Norton (2004), provide a macro view of the

	strategy of an organization. Andriessen (2004), performs a state of art of different models intellectual capital. Arend (2004) studies the strategic liabilities in companies. Rivero Diaz (2009), proposes a model and method for measuring intellectual capital through the perceived value.
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Source: Own based on Alarcón et al, (2012)

It can be focus that currently, intellectual capital has gone to be an important tool in making business decisions, which is a modern management technique that maximizes the contribution of organizations to society, constituting the measure of intellectual capital a necessary tool to know the true value of the company (Alarcon et al, 2012).

## ***2.2 Characteristics of intellectual capital***

Luna (2006) states that intellectual capital consists of: innate intelligence, knowledge, technology, emotional intelligence, memory, values, ethics, innovate, invent, learn and decide. Other characteristics that are exposed by Brenda (2013) which states that also consists of intellectual property: copyright and related rights, as well as the experience and reputation, which is essential for the intellectual capital can become an active profit, which can identify, protect and develop.

The main similar feature that has been found in the aforementioned authors denotes something intangible, which cannot be easily measured, because knowledge cannot touch; Nor you can say that both know someone or what level of knowledge has; that is why intellectual capital is an intangible asset.

Romo, Villalobos and Arias (2011) state that in higher education institutions, the essential is the sustainable development to train professionals that work investigating and promoting educational solutions in science and technology.

From the previous, it is seen that intellectual capital is the combination of relatable resources to academic organization and activities of an institution, including the knowledge, experience and skills of employees, as well as all resources linked to the external relations of the institution.

It is essential that despite the complexity of the intangible element, intellectual capital should be evaluated in all areas of the organization, not only in the main areas or positions that impact on decision making, so it is considered that domestically, the limited knowledge that organizations have about their intangible resources and capabilities for exploitation limits the process of decision making and somehow affects the profitability

of it, because not enhanced the capabilities of its staff in each job. Therefore, to improve their management and control measurement of intellectual capital is important and necessary. This way, one could know what the potential of a company and its market value when it faces competition (Alarcon et al, 2012).

It is convenient then to be able to measure intellectual capital in institutions of higher education as considered by Ramirez and Tejada (2013) than for information or disclosure is necessary to have internal information systems for measuring the intangible elements of the universities. Intellectual capital information in the HEI is necessary because depends on knowledge, an element that is essential within these institutions.

A basic factor for university organizations to achieve success is the ability to identify, determine, audit, measure, renovate, increase, and ultimately manage these resources within and identify the perceptions of all staff that makes up the organization for their potential and performance, since knowledge is increasingly oriented to solving real problems, especially when the knowledge generated is efficiently used to increase competitiveness.

### ***2.3 Conceptualizations and scope of competitiveness***

Sosa, Reyes Lopez (2014) authors state that competitiveness is an aspect in the field of business world that increasingly acquires relevant, derived from the demands of the globalization economic environment.

It is considered that the concept is related to the ability to increase the level and living conditions of the habitants, generating sustained increases in productivity levels and inserted into international markets, among others (Padilla, 2006).

In practical life, it reflects the extent to which a country within a system of free trade and fair market conditions, produce goods and services that meet the test of international markets, while maintaining and increasing the real income of the population long term (OECD, 1996). However, even though the productivity of a country is clearly determined by the ability to sustain their income levels, it is also one of the key determinants of investment returns, being a key to explaining a growing economy factor (World Economic Forum, 2009). It is understood by competitiveness in the business environment, the ability to produce quality goods and services, with a fair price and when appropriate, that within the globalization process involves being in organizational conditions to compete successfully with their commercial rivals and meet customer needs more efficiently and effectively, knowing what they want before your competitor.



#### ***2.4 Competitiveness in the field of HEI***

Within the scope of the HEI is an element being present in the life of institutions, and is reflected by attempting to innovate educational services, search as an educational institution higher levels of social recognition, work for higher levels of academic quality and thus obtain levels of prestige level international, national, state or local.

In general it is proposed that all organizations whatever their purpose is, must create competitive advantages, but they need to make that advantage by the use of intellectual capital (Joia, 2008). Also, Stevens (2011) believes that intellectual property and experience are used to generate wealth. The competition focuses on analyzing the experience, values, contextual information and perception of each of the individuals within an institution, since current educational reforms are stressing the need to prepare students through competitions and this perspective for competitiveness have greater relevance in the HEI is necessary to have a dynamic management team, updated, open to organizational, technological and aware that intellectual capital is a resource that must be cared for change because it is the most valuable so you can count on an educational institution (Schmelkes, 2011).

The above implications lead to understand the importance of creating competitive advantages within organizations regardless of the type and rotation of the organization, recognizing what raised Prusak (1996) cited in (Alarcon et al, 2012), as the main source creation of competitive advantages of a company lies primarily in their knowledge or more specifically on what you know, in how you use what you know and in their ability to learn new things relevant to the organization.

The competitiveness is divided into three factors: performance, technology and costs, which are present in systems of manufacture of productive enterprises.

Organizational performance factor is a concept that involves economic and operational aspects of the organization, includes the objective of competitiveness and business excellence, related to cost, flexibility, speed, dependency or quality, so evaluate the performance of an organization, it is the first step in making strategic decisions aimed at improving the competitive position of the organization.

As for the technology factor for all organizations involved in the globalization of markets, it is considered that its modernization process would be more fast if they had the support and advice through training in the use and application of technological systems, to support its management and production to compete and include systems that can

improve performance and productivity, otherwise, its performance may be affected and be less competitive in price and costs.

Measuring competitiveness in HEI involves several approaches, some authors consider the knowledge and efficient capital management as a contribution to the increased competitiveness supported by research and generating more knowledge. In some organizations competitiveness is an essential element so that it can be distinguished within society (Canizares, Holgado, Marquez and Muñoz, 2011). In contrast to Opre, Zaharie, & Opre, (2008) talk about competitiveness in universities is that they have a well trained and informed by an excellent culture of quality teaching staff. The main source of competitive advantage are the people who work in higher education institutions within the competitive environment, (Dorado, Diaz, Heredia, Gold, and Salas Rodriguez, 2015).

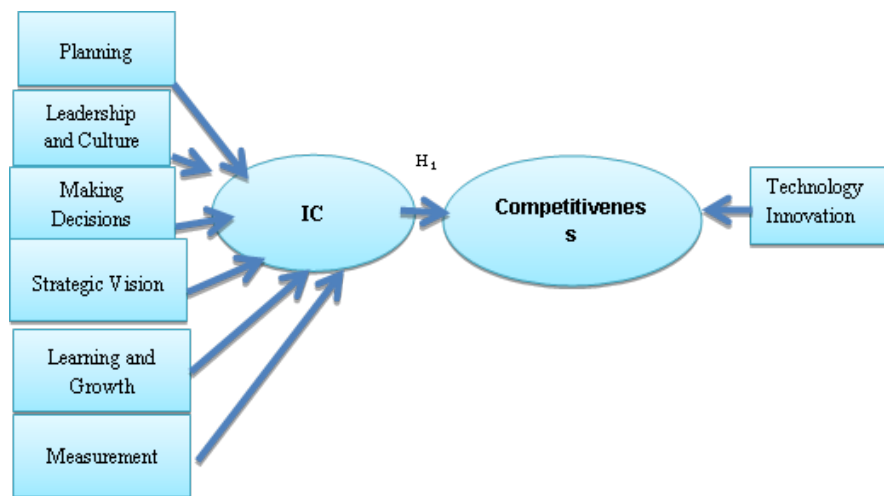
Stancu, Vacaroiu, Stancu, & Constantin (2014) these authors assert that competitiveness is always at the forefront of technological changes and new information and be able to face any educational situation within the HEI. Thus they mention that competitiveness is important for HEI, as the intellectual capital when combined with how to compete enhances the efficiency of institutions of higher education.

## ***2.5 Study methodology and obtained results***

The study used the descriptive, exploratory and correlational method in order to investigate the properties of the investigated phenomenon, characteristics related to the variables analyzed in universities and without influencing the intellectual capital and competitiveness (Danhke, 1989) variables. The descriptive part allowed generally to describe institutions; exploratory approach it enabled universities and investigate the phenomenon itself has not been previously explored and the question correlational, identify the relationship between intellectual capital and competitiveness variable in the Higher Education Institutions in Universities participants in the study.

The study was quantitative using inductive-deductive method to analyze indicators that included each of the variables so you can get to the widespread phenomenon of knowledge within investigation.

The construct took into account the following variables and factors.



Source: Own

Figure 1. Theoretical Construct

A questionnaire was designed, addressed to the academic staff of universities, whose instrument contemplated 73 reagents with closed questions and a Likert scale to measure the reaction of the study subjects to the categories, ranging ratings from 1 to 5 was designed, 5 with 1 being the highest and lowest value, interpreted as strongly disagree and agreement.

The sample consisted of 120 academic applying a margin of 95% confidence level and 5% error. Statistical data processing was using SPSS (Statistical Package for Social Sciences) program and to test the hypothesis test Bartlett sphericity was applied in addition to determining the factor analysis. The instrument is validated through test KáiserMeyer-Olkin (KMO) and as to the reliability with Cronbach's Alpha resulting .858, finally, the variance of one factor was applied ANOVAs.

In table 3 show the data got in KMO and Bartlett test.

Table 3.- KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.858
Bartlett's Test of Sphericity	Approx. Chi-Square	7.7103
	Df	2628
	Sig.	.000

Table 4. Extracted variance

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	27.037	37.037	37.037	27.037	37.037	37.037	12.448	17.052	17.052
2	6.361	8.714	45.751	6.361	8.714	45.751	10.739	14.711	31.763
3	2.795	3.829	49.58	2.795	3.829	49.58	7.697	10.543	42.306
4	2.395	3.281	52.861	2.395	3.281	52.861	3.875	5.308	47.614
5	1.848	2.532	55.393	1.848	2.532	55.393	2.652	3.633	51.247
6	1.779	2.437	57.83	1.779	2.437	57.83	2.225	3.048	54.295
7	1.671	2.289	60.119	1.671	2.289	60.119	1.99	2.726	57.022
8	1.541	2.111	62.23	1.541	2.111	62.23	1.898	2.599	59.621
9	1.489	2.04	64.27	1.489	2.04	64.27	1.629	2.232	61.853
10	1.379	1.889	66.159	1.379	1.889	66.159	1.602	2.195	64.048
11	1.332	1.824	67.984	1.332	1.824	67.984	1.526	2.091	66.139
12	1.169	1.601	69.585	1.169	1.601	69.585	1.493	2.046	68.185
13	1.135	1.554	71.139	1.135	1.554	71.139	1.469	2.012	70.197
14	1.108	1.517	72.657	1.108	1.517	72.657	1.463	2.004	72.201
15	1.066	1.461	74.117	1.066	1.461	74.117	1.399	1.916	74.117
16	0.983	1.346	75.463						
17	0.942	1.291	76.754						
18	0.929	1.273	78.027						
19	0.854	1.169	79.196						
20	0.818	1.12	80.316						
21	0.778	1.065	81.382						
22	0.761	1.043	82.424						
23	0.732	1.003	83.427						
24	0.677	0.927	84.355						
25	0.635	0.87	85.225						
26	0.624	0.855	86.08						
27	0.597	0.817	86.897						
28	0.566	0.775	87.672						
29	0.537	0.735	88.407						
30	0.513	0.703	89.111						
31	0.496	0.68	89.79						
32	0.468	0.642	90.432						
33	0.445	0.61	91.042						

34	0.416	0.569	91.611						
35	0.4	0.547	92.158						
36	0.38	0.521	92.679						
37	0.356	0.488	93.167						
38	0.337	0.462	93.629						
39	0.31	0.425	94.054						
40	0.304	0.416	94.47						
41	0.278	0.38	94.851						
42	0.263	0.36	95.211						
43	0.261	0.357	95.569						
44	0.236	0.323	95.892						
45	0.23	0.315	96.207						
46	0.203	0.279	96.485						
47	0.191	0.261	96.746						
48	0.187	0.257	97.003						
49	0.184	0.253	97.256						
50	0.175	0.24	97.496						
51	0.17	0.233	97.729						
52	0.158	0.216	97.945						
53	0.151	0.207	98.152						
54	0.143	0.195	98.348						
55	0.122	0.168	98.515						
56	0.119	0.163	98.678						
57	0.11	0.151	98.829						
58	0.099	0.136	98.965						
59	0.096	0.131	99.096						
60	0.087	0.119	99.215						
61	0.079	0.109	99.323						
62	0.069	0.095	99.418						
63	0.063	0.086	99.505						
64	0.062	0.085	99.59						
65	0.054	0.074	99.664						
66	0.048	0.066	99.73						
67	0.041	0.056	99.786						
68	0.039	0.053	99.84						
69	0.032	0.044	99.884						
70	0.025	0.034	99.918						
71	0.024	0.033	99.951						

72	0.019	0.026	99.977						
73	0.017	0.023	100						

Extraction Method: Principal component Analysis.

Posterior a total variance was obtained explained, same as presented in table 4.

The total variance explained indicates the load factor for both the rotated solution to the non-rotated. 27 037 showing the percentage of the total variability of the 73 variables the total sample.

The 15 factors included in the model explain exactly 74% of the total variability, which was an acceptable percentage.



Source: Own

*Figure 2.- Component Matrix*

In order to explain the correlation matrix and variables grouped into categories for the smallest possible number of factors (figure 2), the technique was applied factor analysis to represent the relationship between the set of items interrelated present in the correlation matrix. The technique shows results on three factors by a linear combination of all variables, so that the first principal component expresses the highest proportion of variance sample (Hernandez, Fernandez & Baptista, 2003).

Coefficients with which standardized variables were obtained are expressed in terms of the 15 factors representing the correlation between the factors and variables. In component 1, the planning variables are correlated and decision saying that the staff takes the information provided by the institution in order to apply it in their work (P50), best practices are used to support the development and growth of the institution and evaluate

the performance of staff (TD53), the institution uses empirical and intuitive decision-making (P43) information, not institutional practices are formalized still performing activities of knowledge management (P51) in the institution's relations subordinates do not prevent that people receive necessary information (P49), the staff asks questions in order to improve their job (P42), teachers share documents in databases for the benefit of other employees (P45), the institution considers employees as a source of critical value and not as burdens (TD39) in the institution an organizational structure is very flexible and free flowing communication (TD41), the Teachers rely on information from corporate databases (P46) in the institution is common among teachers tutoring (P44) in the process of knowledge sharing the role of institutional research supports and contributes to the institution (TD47), the information they obtain teachers of reports or documents the aggregate to do better their work (P48), the staff uses the information requested and extracted to the objectives in your work area (P52).

In component 2 variables and measurement technology correlate where its said that the department uses technology to capture and store knowledge (TEC67) has taken the technology with a clearer vision to solve problems in the department (TEC65), resources are allocated to increase the capacity of knowledge (MED71), communication barriers in the department are reduced using technology (TEC64), changes preferences and knowledge management (MED69), are reflected in the department updated the information technology and hardware (TEC66) in the institution are effective research activities to improve planning and decision making (MED72), the staff is trained to use new technologies (TEC62), to achieve the objectives of the department it has a annual report including recommendations of strategies (MED68).

In component 3 variables vision and strategy, and relates learning growth where leadership intended to guide stakeholders including scope, priority and limitation (VE7) in knowledge management leaders share their knowledge demonstrating their personal commitment (VE4), planning is reviewed as knowledge management and fits with the institution (AC2), are built and maintained leadership skills in managing knowledge to guide staff and achieve coordination of activities ensure success (VE5), which is occurring in the management initiatives knowledge ensure the application, implementation, monitoring, measurement, evaluation and analysis (VE6), developing management practices impact of the strategy affects other units requiring external



cooperation (AC1), promoting projects of collaborative teamwork being physically separated (AC11 ).

In component 4 leadership variables and relates culture as in the department considered the effectiveness and efficiency as organizational strategies (LD55), the learning organization is facilitated by creating a good working environment (LD56) in the department experiences and knowledge are shared to motivate staff to work together (CL58 ).

In planning component 5 variable states that in order to share knowledge department staff must find experts in other parts of the institution (P26).

In the component 6 refers to the variable of decision making for the exchange of personal knowledge are important interactions between face to face employees (TD32).

In the component 7 the variable of vision and strategy indicate that none of the components VE1, VE2, VE3, VE4, VE5, VE6 and VE7 not apply within the items, (VE8).

In component 8 with the measurement variable in the exchange of knowledge there are barriers between management and internal staff of the institution (MED73).

The component 9 has the variables of learning and knowledge for knowledge management activities of the organization not the roles and responsibilities of personnel (AC6) are specified.

In its variable component 12 learning and seeking knowledge in the department improve competitive advantage (AC7).

In the component 14 the variable of decision mentions that students provide feedback to the institution (TD37).

### **3 Conclusions**

According to the data obtained in the statistical analysis we can see that factors influencing more intellectual capital within the variable for competitiveness of higher education institutions are planning, leadership, measurement, technology, vision and strategy, decision making, learning and knowledge and based on these results it can be concluded that higher education institutions create an opportunity for management and capital to develop and can take advantage within institutions to increase their quality.

Likewise, technology plays a key role in both intellectual capital and for the competitiveness of the HEI.

It was found that within the intellectual capital more leadership better planning, a more culture more strategic vision, and learning and growth more better decision decisions.

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