

Exploiting Intellectual Capital for Economic Renewal

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ABSTRACT

This study proposes a model to analyze the relationship between leadership, intellectual capital (human, structural, and relational), and their contribution to economic renewal. The study contributes to the literature and higher education institution (HEI) management, by examining empirically and in greater depth, the antecedents and determinants of this problem. This study applies variance-based structural equation modeling, using partial least square on a sample of 195 academics from 52 countries. The results show that leadership has a positive and direct impact on human, structural, and relational capital, and that human capital has positive and direct impact on the structural and relational capital of the studied HEIs. Hence, we found that only the structural and relational capital of the HEIs have positive and direct impact on the contribution to economic renewal.

1. INTRODUCTION

The rise of the knowledge economy¹ underpins the importance of knowledge management, intellectual capital, and innovation in economic development, and the role that higher education institutions should play as vehicles for knowledge and technology transfer to the innovation system [2].

The management literature distinguishes two different roots in knowledge research [3], one centered on knowledge management and another centered on knowledge as a manageable asset, that permit better organizational performance. From here arise two different concepts, intellectual capital (IC) management and knowledge management.

Each perspective relies on the management of knowledge with a different focus, but the distinction is not easy [4]. One is focused on the identification and management of knowledge (knowledge management), and the other on the management of strategic and valuable knowledge resources (IC). IC refers to all intangible assets and knowledge resources that support organizations in the value creation process by increasing their capacity [5].

HEIs for education and research are assumed to be a key element of the innovation systems (regional and national) by affecting the economic activities, mainly because of the potential of HEIs to contribute to the performance of the innovation system by generating and diffusing knowledge. Nevertheless, these capacities may vary from country to country, mainly because of HEI regulations, HEI systems, and local cultures. It may vary from institution to institution due to the education system in general, and an institution's approach to imparting education and creating new knowledge (IC).

HEIs are recognized as knowledge centers of higher education that also lead research with the aim of advancing world knowledge. HEIs are, therefore, under constant competition with each other based mainly on the level and quality of their teaching and research, most commonly disseminated through publication in specialized conferences and journals and through industry interaction.

To fulfill the needs of faculty members, the HEIs, and industry, the transition to a new paradigm is

¹ Godin notes that Forey and OECD were responsible for introducing the concept of the *knowledge-based economy* as we use it today and its economies, which are directly based on the production, distribution, and use of knowledge and information. The term knowledge-based economy refers to at least two features of the new economy: knowledge in quantitative and qualitative terms is increasingly relevant, and communication technologies and information are the drivers of the new economy. Other terms and expressions arise associated with this emerging new phenomenon, as the term *knowledge worker* referred to the worker whose raw material and final product is knowledge and information; and the expression *knowledge firms*, considered those that create value by using and applying knowledge where this knowledge is also used as a source of competitive advantage. Roldan et al centered on *knowledge-creating companies* by analogy to a living organism.

required. To do so, HEI IC as the potential to increase HEI-industry linkage should be identified.

In this sense, this research attempts to identify the pattern and potential of HEI's IC and its propensity to engage knowledge interactions between HEI and the different economic activity sectors. So, the main purpose of this research is to explore the potentialities of the exploration of the HEI's IC through multiple channels and knowledge interactions with organizations, its potentiality to increase innovation of organizations, and consequently support the economic recovery of countries.

Pursuing these general purposes, the objectives of the study are:

1. To analyze the IC of the HEIs and the different types of knowledge interactions with surrounding organizations.
2. To determine the impact of the different HEI's knowledge interactions on economic activity, namely the innovativeness of organizations.

2. EXPLOITING INTELLECTUAL CAPITAL FOR ECONOMIC RENEWAL

IC management takes into consideration all kinds of intellectual activities of the company — from the creation to the dissemination of the knowledge — but with a strategic focus on the creation and extraction of the value of the knowledge (improving the capabilities of value creation). Davenport [6] states that this is how the company turns knowledge into performance.

In this case, knowledge dissemination describes all types of direct and indirect, personal and non-personal interactions between HEIs and/or organizations aimed at exchanging knowledge to improve the innovation process [7]. Those interactions use diverse channels to transfer knowledge depending on the degree of codification and tacit qualities of knowledge [7].

IC is increasingly considered a source of competitive advantage. Furthermore, sustainable competitive advantage is conducive to superior performance [8], and competitive advantage based on knowledge is more sustainable [9] because the more the organization knows, the more they can learn [10].

IC management is therefore a process to extract the value of organizational knowledge [11]. There are various strategic and operational barriers to the management of IC, essentially, the difficult task of identifying and measuring these intangible assets and establishing goals and plans for them.

IC is referred to as those intangible, hidden assets and knowledge resources that help the process of value creation in organizations, increasing their competitive capacity [12-15]. It is stated that every time that a knowledge transfer or a conversion is done, the organization's value grows.

It's internationally accepted that IC is composed of three main components, namely human capital, structural/organizational capital, and relational capital [12, 16, 17].

Human capital corresponds to the present and potential value of the aggregate knowledge of the individuals and its implementation [18]; and the value of the knowledge and talent that is embodied in people who make up the organization, representing its know-how, the capacities, the knowledge, talent, competence, attitude, intellectual agility, creativity, and others held by employees that generate value for the organization [17, 19, 20].

Structural capital is the value embedded in the organization, which includes formal rules and informal norms [18], among others. It is defined as the knowledge, skills, experiences, and information that are institutionalized, codified, and used by databases, patents, manuals, structures, systems, routines, and processes [21].

Relational capital is considered the result of competitive and social intelligence based on the value of relations and actions of the company shared with the external environment and stakeholders of the organization. It is, for example, the knowledge derived from the market, customer and supplier interactions, and relations with government associations or industry [22]. Through relationships with business partners and stakeholders, organizations can gain access to external knowledge. There's some evidence, for instance, that spatial proximity between organizations facilitates this interaction [23], and, consequently, organizations could exchange more knowledge and eventually have a higher innovative performance [24]. Pike et al. [25] cite various empirical studies showing that encouraging and maintaining the knowledge flows beyond the boundaries of the organization and across different scientific areas, results in more productive R&D efforts.

Several authors have found a positive relationship between the different IC components (human, structural and relational capital) and the creation and maintenance of competitive advantage. For

instance, some authors consider human capital as a key strategic asset of companies [20]. Other studies support the relationship of IC to business performance [26], and still others focus on the relationship of IC to organizational innovativeness [15, 27]. On the other hand, some authors argue that IC is an innovation input [15, 28] and that the different innovative capacities vary by the type of knowledge needed [29].

There remains some doubt whether there are some components of IC more valuable than others. The identification of the elements of IC is not sufficient to ensure the effective management of them [30]. There is evidence that the idiosyncrasies of the companies affect the relative value of each component and their interrelationships.

Intangible assets are enablers and sources of value, as they transform resources into value-added performance. This is a key element for HEIs, too, despite the fact that institutions are not business-oriented organizations. Somehow, though, they are driven to an academy-industry orientation. For instance, as stated by the European Commission [31], the main goals for HEIs must be production, diffusion, and knowledge transfer.

However, IC has been insufficiently studied in the HEIs and similar knowledge-based organizations. A few initiatives of IC implementation in HEIs are remarkable, such as the Austrian Research Centers Initiative, reported by Leitner et al. [32], which is mandatory for Austrian Universities since 2006, and make IC reporting essential to enhance transparency, foster the management of intangible resources, and set initiatives for performance orientation. Other initiatives could be highlighted in the existing academic literature, like the ICU-Report, funded by the European Commission in the V Framework Program, in the framework of the Observatory of European Universities, the PRIME Project [33], and the Danish IC Guidelines [34, 35].

These three initial initiatives led to the development of other works along this line in other countries, focused mainly on academic performance (research and teaching), like Spain [36] and United Kingdom [37], among others.

The Bologna Declaration's challenge for HEIs (applied to the European Union) focuses on the path to achieving excellence in the educational area and, to a lesser extent, in the research function. In this sense, HEI systems are also focused on evaluating human capital (the researcher-professor performance) and they do not pay enough attention to other intangible HEI elements (e.g., structural and relational capital). Some authors argue that HEIs should use the IC framework as a heuristic tool to aid them in their new management challenges and diffuse their intangible resources and activities to their stakeholders and society at large [32, 38]. Some authors support this path, considering that an IC framework provides a valid attempt to meet the new demands of public institutions, that the IC report is a useful tool for internal and external purposes [32, 38, 39], and is a valid attempt to meet the new demands and missions of public institutions.

Being a knowledge center is one of the main missions of the HEIs, with several possible roles, such as:

1. Activities of education and research,
2. Activities of education and research on demand; i.e., in response to a direct demand of business and industry.

But the reality is that not all faculty members have the same profile; some are mainly teachers, in essence, so they wouldn't perform business related activities properly, nor want too. Others have a more entrepreneurial profile, so they could be focused mostly on HEI-industry linkage activities.

Internal and external pressures for academic-industry linkage on the HEIs system are demanding changes that will lead to a destructive process rather than a constructive one, if not properly managed. The university culture system in the U.S., for example, encourages more active participation by faculty in the commercial exploitation of research, while in European HEIs it does so to a much lesser degree [40].

The HEIs may contribute to the innovation system by varied forms of interaction and not only by offering a new kind of technologic development [7].

HEIs are assumed to be a key element of regional innovation systems; however, our knowledge about their role in the innovation system is still quite fragmented and doesn't provide sufficient guidance for policy [41].

HEIs, in the new knowledge society, especially in the European educational space, are usually considered an important ingredient of innovation; but to do so, they have to face significant changes, passing from the role of producers and guardians of knowledge to that of generators and transfer agents of useful knowledge as the intensification of industry-academy relations has been added [38]. And there is the so-called HEI's *third mission*² that refers to activities whereby HEIs address social welfare needs and private and public economic objectives [42]. Nevertheless, this notion is not a matter of debate as it depends greatly on the point of view and strategic focus of one or other HEI, the configuration of their activities, the territorial embedding, and the country or region (micro/macro) institutional framework [43]. So, these new demands require new forms of management and new resources that will enable HEIs to make a more dynamic contribution to the development process.

A large and serious debate is taking place, particularly in Europe, about the mission of HEIs and whether the reinforcement of an academia-industry linkage truly fulfills the HEI mission or if it will threaten the real role of HEIs as unbiased generators of knowledge for the pursuit of profitable endeavors [40].

The real situation is that HEIs are expected to assume quite a different kind of function, inclusive of greater responsibilities to the regional innovation system, as they are knowledge generators, by essence. But by their non-profit nature, particularly in Europe, they aren't aware of how to commercialize the results of their research activities – if they're even interested in doing so [41].

The knowledge exchange and research cooperation between public HEIs, and their research and knowledge creation and dissemination to organizations has received, in recent times, increasing attention in the analysis of its impact on economic innovativeness and technological change [40]. But some important limitations arise from both sides of this border.

Firstly, due to the HEI's mission and internal organization, it doesn't (usually) have a structure and support for faculty members to perform activities with the business sector, neither by monetary or other indirect reward to complement ever falling university salaries. And when the HEIs rewarded this faculty extension activity, it often became a subject of conflict between those directly involved in these activities and those who are not. Also, the severe economic crisis we are suffering, mainly in Europe and the U.S., has a deleterious effect on the country's labor, especially in public HEIs, which are constantly under budgetary uncertainty. This situation promotes the so-called brain drain that many countries experience, resulting in a discontinuity in research efforts and poor development of the critical mass necessary to increase research potential.

HEIs are also facing a constant need for resources and are continuously being put through the budget ringer, which forces them to look for new ways of financing. So, the inclusion of a university overhead on the faculty for involvement in extra activities is also a source of conflict, since some feel they have the most work and the HEIs assume that those activities were possible only because of the infrastructures, resources, and name that HEIs provide. They believe they should receive a higher proportion of the return. The evaluation issue also is part of the problem, as faculty members feel they should be evaluated by these extension activities.

Besides this, leadership (the rector, dean, responsible department head) play a crucial role in the organization and dissemination of the knowledge, as they, directly or indirectly, are drivers of the human, structural, and relational capital as result of their internal policies.

On the other hand, many businesses look to the HEIs as potential suppliers of solutions, and are willing to develop professional bonds with faculty members, especially alumni turned business managers [40]. Conversely, the view that the majority of clients have of the HEIs is that they are bureaucratic institutions, excessively academic and therefore not in touch with the real needs of businesses. They also hold the impression that HEIs cannot be trusted to deliver or to comply with previously defined business agreements, as a public institution is not subject to the same rules as those governing business [40].

Despite these constraints, the HEIs keep undergoing R&D and knowledge creation activities, and they might have an indirect effect on the economic development [41].

These indirect effects on the innovation system are even more difficult to assess. They might occur, for instance, through the transfer of knowledge from the academic field through external links of cooperation, as it seems to have an important influence on the innovativeness and innovative

² The third mission of HEIs is not entirely new. In the U.S., the land grant universities established during the second-half of the century, have the mission to serve the local communities, focusing on agricultural needs and aiding regional development [1].

performance of organizations [44]. In this sense HEIs, through scientific research programs and other academic interactions with organizations and economic environment (structural and relational capital), might play an important role by influencing and determining knowledge breakthroughs in the industry. Besides this interaction, HEIs have a direct and determinant effect on human capital development through graduate students that have the potential to change the skills patterns of human capital of the organizations and through the effect of mobility from HEIs to organizations as skilled workers or, even, researchers [7].

The generic economic and social benefits of HEI-industry linkage have long been recognized as an important source of industrial innovation, particularly in some industries [45]. Nevertheless, study of the HEI-organization linkage has been focused mainly on the context of technologic transfer from HEIs to organizations [46], and on the spin-off formations of new organizations by university members [47], among others.

We find both formal and informal linkages between academia and industry such as consulting by faculty to businesses, investment in pre-competitive R&D, financial support from businesses to students, technology licensing, and the creation and incubation of businesses from research results, among others [40].

The intensity of the effect of HEIs on the innovativeness of private organizations differs depending on the quality of the HEI's research and on the intensity of their interaction in the regional space [48]; so, the knowledge gained about the significant factors that are relevant to a successful result of this interaction is still rare. Nevertheless, it seems that the mere presence of an HEI doesn't seem to be a significant guarantee of the performance of the innovation system [41].

Innovation that may serve as the basis for competitive advantage [49] is strongly linked to knowledge [50-52]. Peng et al. [50] describe the innovation-knowledge linkage as the essence of innovation, and has been characterized as the pursuit of new knowledge for discovery. Therefore, the alignment of knowledge, as an intangible resource, with innovation strategy could enhance performance and culminate in a competitive advantage. Innovation is a basic component of competitiveness in the international environment. The success and survival of companies depend to a large extent on their ability to incorporate innovations into their strategies.

SMEs are considered the greatest economic potential but also have the highest risk of failure [40]. Some research has found that innovative SMEs appear to have a low degree of dependence on institutions for supporting innovation, such as HEIs and technological centers [14].

Hence, we propose the following hypothesis:

H1: HEI's leadership determines the HEI's human, structural, and relational capital.

H1.1. leadership directly and positively influences the HEI's human capital.

H1.2. leadership directly and positively influences the HEI's structural capital.

H1.3. leadership directly and positively influences the HEI's relational capital.

H2: HEI's human capital has a direct and positive impact on structural and relational capital.

H2.1. human capital has a direct and positive impact on structural capital.

H2.2. human capital has a direct and positive impact on relational capital.

H3: HEI's human, structural, and relational capitals are directly and positively related to economic renewal.

H3.1. human capital contributes directly and positively to economic renewal.

H3.2. structural capital human capital contributes directly and positively to economic renewal.

H3.3. relational capital and human capital contribute directly and positively to economic renewal.

As shown in:

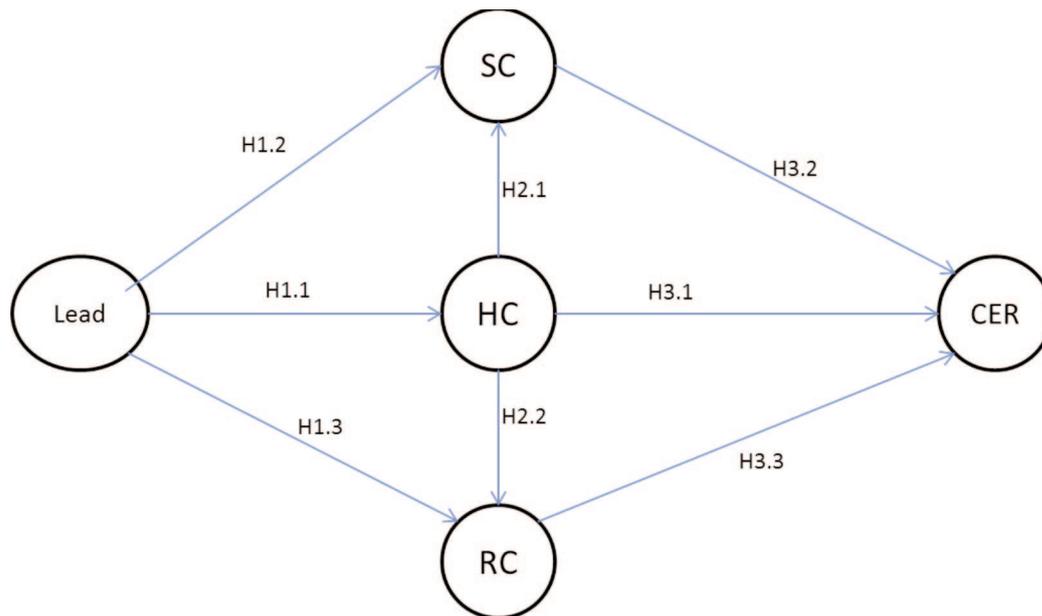


Figure 1. Proposed Model

3. METHOD

3.1 Sample selection

This study analyses 195 academic respondents from 52 countries: 53.8 percent from European countries; 13.3 percent from Asian countries; 26.2 percent from American countries; and 6.7 percent from African countries. The predominant age groups are 41-50 years (34.9 percent), 31-40 years (26.7 percent) and 51-60 years (21.5 percent). Academics mainly represent public HEIs (71.3 percent). Regarding the leadership question, most of the academics self-identify as director (30.3 percent), department head (28.2 percent), dean (22.1 percent), rector (13.8 percent), and a small portion in other types of responsibilities (56 percent).

We use the snowball sampling method [53] as we distribute the survey using social networks, such as LinkedIn and Facebook. Using this snowball sampling technique, potential respondents receive email invitations or website invitations containing the URL of the host survey website. The data were collected between May, 2014 and September, 2014.

3.2 Measures

In this section we present the measures of this study and their dimensionality and epistemic relations³ (representing the relationship between indicators and construct).

We have used a formative measurement model, adapting the Santos-Rodrigues, H., Figueroa, P., and Fernández-Jardón, C. [54] scale to measure the human, structural, and relational capital and adapting the same scale to measure the contribution to economic renewal. Additionally, we use the Spanish Big-Five Inventory [55] to analyze leadership, and we introduce (in the human capital) some happiness indicators of the European Values Study [56].

As to leadership, a unidimensional construct models this variable using nine reflective items for its measurement. The human capital construct uses 4 reflective items for its measurement. Structural capital uses 13 reflective items for its measurement. Relational capital uses 8 reflective items for its measurement. And the contribution to economic renewal construct uses 11 reflective items for its measurement. All items were measured using a 7 point Likert scale, from 1-strongly disagree to 7-strongly agree (all measures used in this study are listed on Table 1).

3.3 Data analysis

To test the research model, we apply the Partial Least Square (PLS) technique using SmartPLS2

³ There are two types of epistemic relations. First, a reflective measurement model establishes that changes in the construct lead to variations in its indicators. Second, the formative measurement model posits that the indicators altogether influence the construct [1].

software [57]. Partial Least Square (PLS) is a variance-based structural equation modeling technique [58]. We used this technique because the model supports complexity in terms of relationships and level of dimensionality; the study is focused on the prediction of the dependent variable; and this study adds new measurements and relations to previous literature [1].

4. RESULTS

4.1 Measurement model

To evaluate reflective measurement models, reliability and validity must be analyzed [58].

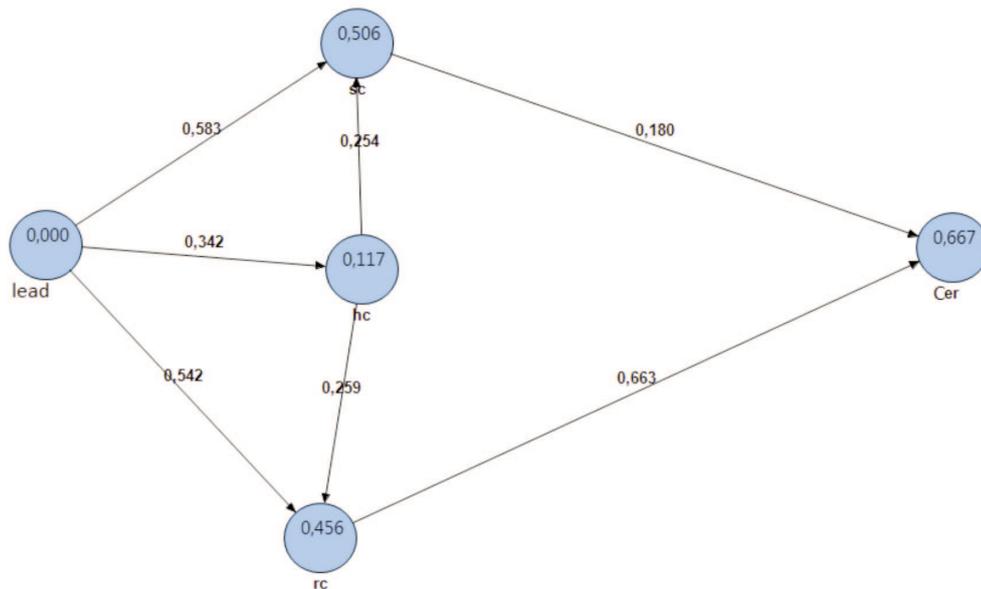


Figure 2. Measurement Model

In our study, we analyze first the individual item reliability, and we verify that the factor loadings are all greater than 0.7, satisfying the reliability condition. To analyze the construct reliability, we analyze the composite reliability and the Cronbach’s alpha, where both should be greater than 0.7. This condition is satisfied in all reflective constructs and dimensions (Table 1).

To analyze convergent validity, average variance extracted (AVE) was analyzed. As AVE surpassed 0.5 [1], we conclude that all reflective dimensions and constructs attain convergent validity.

Table 1. Measurement Model

Construct/Dimension/indicator	Cronbachs Alpha	Loading	Composite Reliability (CR)	Average Variance Extracted (AVE)
Leadership	0,9389		0,9487	0,6735
lead1 “My superior interact with “customers” (students, associations, firms) by listen to their needs and accept challengers “		0,8229		
lead2 “My superior interacts with the external community “		0,8446		
lead3 “My superior interacts with the internal academic community”		0,7288		
lead4 “My superior interacts with the external community “		0,8303		
lead5 “My superior listen well to all “noise” for ideas (with outputs)”		0,8544		
lead6 “My superior like to take risks “		0,731		
lead7 “My superior rewards successes “		0,8281		
lead8 “My superior is positive, enthusiastic, energetic, and an exemplary person”		0,8943		
lead9 “My superior is reliable “		0,8369		

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Construct/Dimension/indicator	Cronbachs Alpha	Loading	Composite Reliability (CR)	Average Variance Extracted (AVE)
Human Capital	0,9243		0,9382	0,6555
CH4		“I feel comfortable with my research achievements “		0,7507
CH8		“Taking all things together, I’m very happy with my academic and research achievements “		0,8745
CH9		“I’m very satisfied with my life as a whole these days “		0,7949
CH10		“My work contributes a lot to my happiness “		0,8133
Structural Capital	0,9586		0,9633	0,6689
CE2		“The suggestions made by academics are mostly implemented “		0,7785
CE4		“Employees are encouraged to “think” and propose new ideas for improving processes and services “		0,8592
CE5		“Academics are free to give creative ideas, and are not afraid of failures”		0,8286
CE6		“Our institution has a set of processes and procedures focused on promoting learning and innovation “		0,812
CE9		“I see my institution as innovative, willing to undertake new experiments and with the courage to take risks “		0,8341
CE10		“My institution has a work environment that encourages the active participation of people in the institution decisions “		0,8378
CE11	0,8296	“There is a high degree of trust between the academics of our institutionl		
CE13		“Our academics are open to reveal their true thoughts and ideas through formal and informal interactions with others peers “		0,7823
CE14		“Our academics trust the people who make strategic decisions “		0,8475
CE15		“Our academics trust in our institution “		0,8528
CE16		“My institution recognize the role played by the investigation I develop “		0,7838
CE17		“My institution recognize the importance of my participation in international projects “		0,7806
CE18		“My institution recognize the success of the projects where I participatel		0,799
Relational Capital	0,9341		0,9459	0,6868
CR1		“Our Institution uses networks with customers (former students or other) to improve regional/national innovation “		0,8536
CR2		“Our Institution uses collaborative networks of providers to improve regional/national innovation “		0,8875
CR3		“Our Institution uses collaborative networks of competitors to improve regional/national innovation “		0,8875
CR4		“Our Institution cooperates with knowledge institutions (such as universities, R & D laboratories, etc.) to improve regional/national innovation “		0,8454
CR5		“Our students are satisfied with our services, courses and innovative solutions we provide them”		0,8033
CR6		“Our students do many innovative suggestions “		0,7124
CR7		“We see in our competitors as a source of innovation “		0,7866
CR8		“Our suppliers are an important source of innovation “		0,8393
Contribution to Economic Renewal	0,9656		0,9697	0,7444
CER1		“Our Institution collaborate with SME’s, developing joint projects, that support regional/national innovationl		0,8577
CER2		“Our Institution s collaborate with other HEI’s projects, that support regional/national innovation “		0,8625
CER3		“Our Institution collaborate in competitors projects, that support regional/national innovation “		0,8175
CER4		“Our Institution collaborate in supra national projects, that support regional/national innovation”		0,8634
CER5		“Our Institution strongly contributes to regional economic development”		0,8639

continued over

Construct/Dimension/indicator	Cronbachs Alpha	Loading	Composite Reliability (CR)	Average Variance Extracted (AVE)
CER6 "Our Institution contributes to economic development through the educational outputs"		0,81		
CER7 "Our Institution contributes to economic development through projects outputs"		0,8708		
CER8 "Our Institution contributes to economic development through the interaction with SME's"		0,8752		
CER9 "Our Institution contributes to economic development through scientific knowledge transfer to the environment "		0,8861		
CER10 "Our Institution contributes to the innovative capacity of the region, as a whole"		0,8942		
CER11 "Our Institution contributes to the innovative capacity of the firms of the region "		0,885		

*** p<0,01 (based on t (4999, two-tailed test)

To analyze the discriminant validity (which indicates if the construct is different from the other constructs), we have demonstrated that the correlations among the constructs are smaller than the square root of AVE (bolded in Table 2).

Table 2. Discriminant Validity

	(1)	(2)	(3)	(4)	(5)
(1) Contribution to Economic Renewal	0,863	0	0		
(2) Human Capital	0,4276	0,810	0		
(3) Relational Capital	0,8099	0,444	0,829		
(4) Structural Capital	0,7209	0,4535	0,8155	0,981	
(5) Leadership	0,5555	0,3416	0,6301	0,6703	0,821

So, with this analysis we verify the discriminant validity of the constructs, and we validate the measurement model.

4.2 Structural model

To evaluate the statistical significance of path coefficients, we use bootstrapping (with 5000 resamples) in this analysis to generate standard errors, t-statistics, and confidence intervals of standardized regression coefficients. With this analysis we verify that all direct effects are significant (Figure 1 and Figure 2).

Analyzing the percentile bootstrap at 95 percent confidence interval also validates the statistical significance of path coefficients. This result supports H1 and H2 (and their sub-hypotheses (Table 3). It doesn't validate the H3.1 hypothesis.

Table 3. Effects on Endogenous Variable

Hypothesis	Direct effect	t-value (bootstrap)	Percentile 95% confidence interval	Support	Explained variance
H1.1 lead-> hc	0,342	21,555	[0,225; 0,372] Sig.	Yes	12%
H1.2 lead -> rc	0,542	57,465	[0,525; 0,561] Sig.	Yes	29%
H1.3 lead -> sc	0,583	59,561	[0,563; 0,602] Sig.	Yes	34%
H2.1 hc -> sc	0,254	26,321	[0,2367; 0,2747] Sig.	Yes	6%
H2.2 hc -> rc	0,259	23,563	[0,237 ;0,2797] Sig.	Yes	7%
H3.1 Hc->cer	NA	NA	NA	NO	NA
H3.2 sc -> cer	0,180	12,480	[0,151; 0,210] Sig 0	Yes	3%
H3.3 rc -> cer	0,663	49,234	[0,634; 0,689] Sig.	Yes	44%

NA: Not applicable

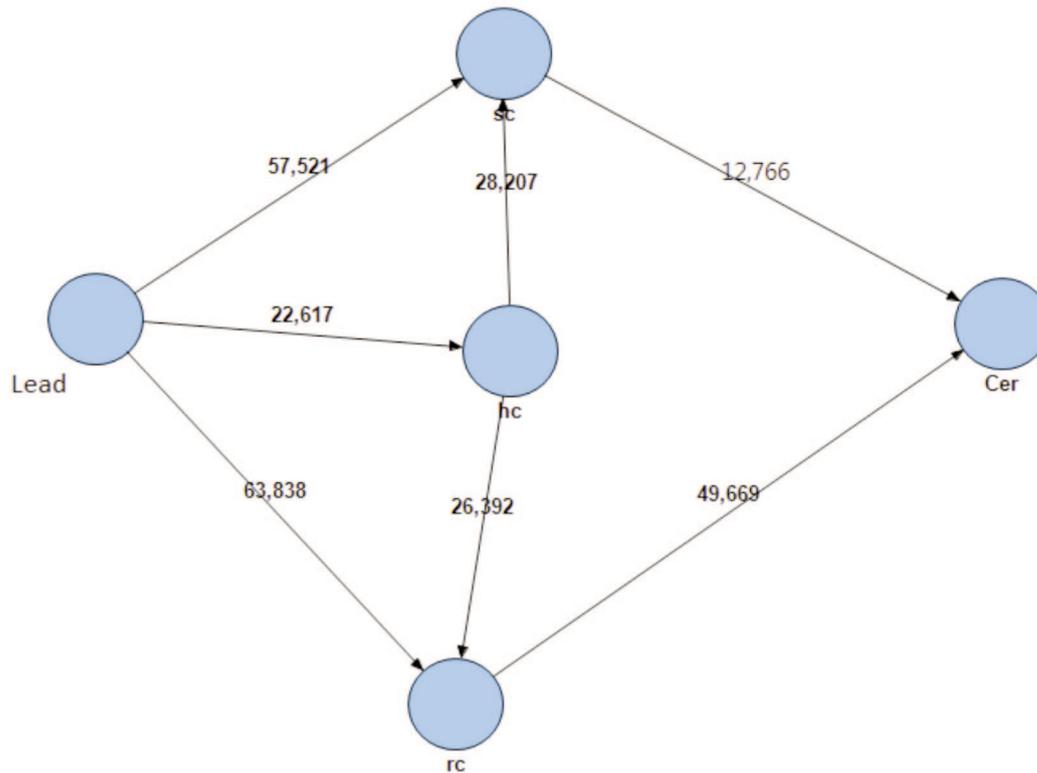


Figure 2. Structural Model (bootstrap analysis)

With this analysis, we verify that the entire supported hypothesis explains part of the variance, namely, relational capital explains 44 percent of the contribution to economic renewal, and leadership explains 34 percent of the structural capital variance.

5. DISCUSSIONS AND CONCLUSIONS

HEIs are committed to improving innovation capacities, which is central for competitiveness and growth. The ability to work with different partners is thus essential to creating the necessary networks. The new mission requiring multiple roles of HEIs is creating serious internal tensions that require new mechanisms to deal with them [38]. In this sense, the identification and management of IC elements might foster this linkage.

Although some HEIs are not profit-oriented organizations, they are also involved in the global competition for performance in value-generating processes. HEIs have some similarities to commercial organizations as they need to create value, they have corporate social responsibilities, and networks have increasing importance [36].

It is in this sense that IC contributes to the disclosure of the hidden value of knowledge assets of HEIs, supporting the notion that there is a clear need to identify and measure one of the main assets of the HEIs: the value of its knowledge and how it might contribute to the innovation system. This might lead to having efficient knowledge management systems that contribute to economic renewal through innovation.

Accordingly, the results of the model indicate that leadership has an important influence on structural capital (explaining 34 percent of the variance), relational (explaining 29 percent of the variance), and human capital (explaining 12 percent of the variance).

In general, it is assumed that scientific knowledge can play an essential role in innovation and economic development [41]. The concept of knowledge diffusion, therefore, has become as relevant to the university's mission as its knowledge creation mission [40]. In our research, we conclude that human capital has impact on structural and relational capital, but human capital, by itself, has no direct and important impact on the contribution to economic renewal. Only structural and relational capital have direct and positive impact on the contribution to economic renewal. With regard to this issue,

HEIs should increase and support their human capital, jointly with structural and relational capital.

Academics and other authors argue that HEIs should use an IC framework [38]. As the IC framework addresses different stockholders simultaneously, it provides a better understanding of the key drivers of the value creation process of public institutions, namely the HEIs.

Several empirical research studies undertaken in European countries and the U.S. have analyzed the impact of HEIs on the innovation system. The results are similar in both regions, showing that the contribution of HEIs to private sector R&D is significantly limited by the proximity of HEIs [41].

With regard to this issue, we conclude that HEIs have a positive and important effect contributing to economic renewal, namely by knowledge transfer.

6. LIMITATIONS AND FUTURE RESEARCH

This research has some normal limitations in its results and conclusions. Regarding the statistical technique used for testing the model, we assume a linear relationship between the latent variables and focus on prediction rather than on causality [1]. The antecedents and outcomes of the model increase knowledge on the issue studied, but generalization of the results to other models is a limitation. Other statistical techniques might be used to deepen the knowledge about this problem.

The data were collected during 2014, a small interval of time; longitudinal studies might constitute an opportunity for future research.

Based on this research, we didn't find a relevant relationship between human capital and contribution to economic renewal; rethinking the human capital items might also constitute a future research opportunity.

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ANNEX

N^{ber} countries	Country	N^{ber} of answers	Continent
1	Argentina	1	America
2	Bahrain	1	Asia
3	Bosnia and Herzegovina	2	Europa
4	Botswana	2	Africa
5	Brazil	29	America
6	Cameroon	1	Africa
7	Canada	1	America
8	Colombia	2	America
9	Croatia	4	Europa
10	Czech Republic	1	Europa
11	Denmark	1	Europa
12	Dominican Republic	1	America
13	Egypt	1	Africa
14	El Salvador	2	America
15	Ethiopia	3	Africa
16	Finland	1	Europa
17	Germany	1	Europa
18	Greece	2	Europa
19	Guatemala	7	America
20	India	6	Asia
21	IRAN	4	Asia
22	IRAQ	2	Asia
23	Ireland	1	Europa
24	Italy	4	Europa
25	Jordan	1	Asia
26	Korea, South	2	Asia
27	Lithuania	1	Europa
28	Malaysia	2	Asia
29	Malta	1	Europa
30	Nicaragua	4	America
31	Oman	1	Asia
32	Peru	1	America
33	Philippines	1	America
34	Poland	8	Europa
35	Portugal	47	Europa
36	Puerto Rico	1	America
37	Romania	5	Europa
38	Russia	1	Asia
39	Saudi Arabia	1	Asia
40	Somalia	1	Africa
41	Spain	17	Europa
42	Sri Lanka	1	Asia
43	Sudan	2	Africa
44	Taiwan	1	Asia
45	Tanzania	2	Africa
46	Turkey	4	Europa
47	United Arab Emirates	2	Asia
48	United Kingdom	2	Europa
49	United States of America	1	America
50	Uzbekistan	1	Asia
51	Yugoslavia (Former)	2	Europa
52	Zimbabwe	1	Africa