Intellectual capital and performance

Taxonomy of components and multi-dimensional analysis axes

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Abstract

Purpose – The purpose of this paper is to determine the predominant classification of intellectual capital (IC), in terms of components, using the literature of reference on the relationship between IC and performance and considering multi-dimensional analysis axes (MAAs): organisational, regional and national.

Design/methodology/approach – A systematic literature review (SLR) is presented focussing on empirical studies on IC published in the period 1960-2016. A protocol for action is defined and a research question is raised, gathering data from the databases of: Web of Science, Scopus and Google Scholar. A social network analysis is also provided to determine the type of networks embracing groups, IC individual components and performance type.

Findings – Of the 777 papers included in the SLR, 189 deal with the relationship between IC and performance. The paper highlights the greater development of empirical studies starting from 2004; the organisational MAA is the most studied. The most frequently used groups of components in studies dealing with IC's influence on performance corresponds to a triad of human capital; structural (organisational or process) capital; and relational (social or customer) capital, which determine positively the performance of organisations/regions/countries, but their influence is not linear and depends on various factors associated with the context and surrounding environment.

Practical implications – This study has wide-ranging implications for politicians/governments, managers and academics, providing empirical evidence about the relationships between the components of IC and performance, by MAAs, and a global vision and better understanding of how those IC components have developed and how they are related to performance.

Originality/value – Due to the high number of references covering a wide range of disciplines and the various dimensions (e.g. organisational, regional and national) that form IC, it becomes fundamental to carry out an SRL and systematise its MAAs to deepen knowledge about what has been discovered/developed in this domain, in terms of empirical studies, in order to situate the topic in a wider theoretical-practical context. The paper is exceptionally wide-ranging, covering the period 1960-2016. It is one of the first clarifying studies on systemisation of the literature on IC, by MAA, and an in-depth study of IC's impact on the performance of organisations/regions and countries which may serve as a guideline for future studies using the taxonomy proposed.

Keywords Performance, Intellectual capital, Intangible assets, Systematic review

Paper type Literature review

Introduction

The OECD (2015) recently underlined the importance of intellectual capital (IC), stating that in OECD countries, investment has gradually moved away from traditional areas of investment in physical assets, placing the emphasis on intangible assets. In addition, the relative resilience of investment in intangible assets at times of crisis could be a sign that these assets are cyclically less sensitive than investment in physical assets or benefit more from government actions in the early stages of a crisis.

According to the OECD (2011, 2013, 2016), investment in intangible assets has been responsible for labour productivity growth in developed economies, such as the USA, Japan and the European Union. The same organisation further states that the World Bank estimates that the predominant form of wealth for the majority of these countries is based on IC. The European Commission (2012) has also attributed some importance to the question of IC, especially concerning the intensification of innovation policies (Matos, 2013).

Authors like Wu (2005) and Kristandl and Bontis (2007) refer that the first recorded mentioning of intangibles can be found in 1896 by Lawrence R. Dicksee. Although the term IC was used in pioneering terms by John Kenneth Galbraith in 1969 (Bontis, 1998), its major development started in 1991 by Tom Stewart who significantly popularisatised the concept with the article "Brain Power: How Intellectual Capital Is Becoming America's Most Valuable Asset" (Serenko and Bontis, 2004).

The subject of IC has produced a vast literature covering a great diversity of disciplines, where the term "intangibles" is often used as a synonym of IC (OECD, 1999; Petty and Guthrie, 2000; Alcaniz et al., 2011). However, some of the definitions found (e.g. Brooking, 1996; Roos and Roos, 1997; Sveiby, 1997a, b; OECD, 1999, 2000) make an appropriate distinction by locating IC as a subset of, rather than the same as, a business's overall intangible asset base (Petty and Guthrie, 2000). From these definitions, and succinctly, it is proposed that IC is formed of intangible assets, also called intangible resources, intellectual resources or resources and capacities based on knowledge, among others, which, combined with tangible capital, contribute to producing value added for organisations/regions/nations.

It is widely accepted that IC is a lever for generating value added and improved performance in organisations (Marr et al., 2004), and the latter are expected to pay increasing attention to efficient management of its forms of capital (Martí, 2007). Most of the literature on the theory of IC published in the 1990s and 2000s accompanies the structures, constructions and measures resulting from an accounting and financial perspective, focussing especially on the organisational MAA (Bontis et al., 1999; Bontis, 1999; Bontis et al., 2000). However, recently, this conceptual level has been extrapolated to include also countries (Bontis, 2004). Malhotra (2001) argues that the leaders of national economies try to find reliable ways to measure knowledge assets, for better understanding of how these relate to future performance. So in terms of the MAAs guiding this study, besides organisational IC (OIC), consideration should also be given to national IC (NIC), now widely recognised as a source of competitiveness and productivity for a country (Užienė, 2014), and regional IC (RIC), which also contributes to the growth and development not only of the region but also of the country (Nitkiewicz et al., 2014).

The World Bank and other global organisations recognise investment in IC as a crucial factor in determining economic growth, job creation and quality of life (World Bank, 2013; Užienė, 2014). NIC implies articulation of a system of variables that helps to identify and manage a country's invisible wealth, serving as the root to feed and cultivate future well-being (Bontis, 2004). Many researchers who measure NIC (Bontis, 2004; Bounfour and Edvinsson, 2005; Lin and Edvinsson, 2008, 2011; Ståhle et al., 2015; Ştefănescu-Mihăilă, 2015) recognise the need to assess this type of resource base, and fundamental methodological orientations are beginning to emerge in this field (Užienė, 2014; Gogan, 2014; Mačerinskienė and Aleknavičiūtė, 2015). One of those orientations stands out by identifying and classifying IC and its components also in the MAAs referring to the region (Nitkiewicz et al., 2014). So RIC is considered as a region's capacity to create wealth and intangible assets (Cabrita et al., 2015). In addition, Nitkiewicz et al. (2014) state that regions' growth potential is based to a large extent on intangible assets and unique infrastructure; and Marcin (2013) highlights that countries and regions' potential development is based mainly on intangible resources and on their hidden capacities.

Lerro and Carlucci (2007) state that organisations, regions and countries generate different value added, with different rates of success. To explain why some organisations/regions/countries are more successful than others, or, in other words, create greater value added, it is necessary to deepen knowledge of how IC influences their performance. A growing amount of literature deals with the relationship between IC and the performance of firms (e.g. Pucci et al., 2015; Aramburu et al., 2015; Nimtrakoon, 2015), regions (e.g. Dettori et al., 2012; Lönnqvist and Laihonen, 2013 and countries (e.g. Seleim and Bontis, 2008; Piekkola, 2011).

Therefore, for a better understanding of the IC concept, whatever the axis of analysis, it is necessary to identify the studies carried out since its beginning, and understand at what point these studies began to focus on IC's influence on the performance of organisations/regions/countries, as well as determining the type of performance that is most studied and the main conclusions obtained in these studies.

For clarification purposes, in this study, multi-dimensional analysis axes (MAAs) of IC are understood at the different levels of organisation, region and country, while the components of IC are understood as the classification forms of capital that can be measured (e.g. human capital, structural capital, relational capital, among others).

Considering the above, it is first necessary to systematise the existing literature, aiming to clarify the evolution of the IC concept, in terms of its MAAs and its components, since the majority of recent studies, including bibliometric analyses, meta-analyses, systematic literature reviews (SLRs) or content analysis of IC, deal mostly with the organisational MAA (Marr *et al.*, 2004; Guthrie *et al.*, 2012; Dumay and Garanina, 2012, 2013; Dumay and Cai, 2014; Ferenhof *et al.*, 2015), leaving a gap concerning countries and regions. Second, it is necessary to understand the point from which these studies began to investigate IC's influence on the performance of organisations/regions/countries.

Bearing in mind the statements presented above, the following research question is formulated:

RQ1. What is the predominant classification of IC, in terms of components, in the literature of reference on the relationship between IC and perfomance by MAA?

Therefore, the aim of this study is twofold: to assess the evolution of studies on IC and its application regarding MAAs: organisational, regional and national; and (to determine the predominant classification of IC, in terms of components, in analysing the relationship between IC and performance of organisations/regions/countries.

To review, synthesise and classify existing research on IC, the following sections present a succinct approach to IC. The importance of OIC, RIC and NIC in determining the performance of organisations/regions/countries is analysed, followed by a SLR with regard to IC, identifying the principal empirical studies dealing with the three MAAs in order to fill the gap detected in the literature, given the non-existence of a study clarifying this topic. The models developed to measure and classify the type of IC applicable are identified. Next, to answer *RQ1*, the articles dealing with IC's influence on the performance of organisations/regions/countries are systematised and the types of study made are analysed (considering the sector and typology of performance), regarding the three MAAs. The components or groups of IC's components most commonly used are presented, identifying those that contribute most to strengthening the performance of organisations/regions/countries. Finally, the conclusions, limitations and future lines of research are presented.

Originality is ensured by the non-existence of previous clarifying studies about systematisation of the literature on IC, by MAA, and an in-depth study of IC's impact on the performance of organisations/regions/nations, which may serve as a guideline for future research using the taxonomy proposed, based on the division, systematisation and classification of articles in terms of the three axes identified.

IC: dimensions of analysis
The appearance of new MAAs of IC is intrinsically linked with the advance of research on different units of analysis considering multiple dimensions, namely, individual, organisation, urban space, region (Užienė, 2013) and nation (Užienė, 2014; Gogan, 2014; Mačerinskienė and Aleknavičiūtė, 2015).

As mentioned by Hervas-Oliver and Dalmau-Porta (2007), the results obtained in the different dimensions do not always coincide regarding the importance attributed to each of

the components forming IC, making it necessary to contextualise data and measuring methods. For example, these authors state that the indicators used to measure RIC and NIC depend on the type of region being measured, with it being necessary to adapt to specific regional or national characteristics, such as the technological importance of their industries or clusters. Also, at the organisational level, there are factors that influence consideration of IC, such as the geographical region where the organisation is located, the industry sector and organisational size (Axtle-Ortiz, 2013). Some studies can be quoted, for example, in the case of OIC, Curado (2008) and Shih *et al.* (2011) demonstrated that in the banking sector, human capital is the most valued component of IC, the same occurring in the communications sector (Calisir *et al.*, 2010; Ponsignon *et al.*, 2015) and in that of education (Mumtaz and Abbas, 2014). However, regarding the industry sector, Hsu and Fang (2009) and Chen *et al.* (2006) revealed that relational capital is the most relevant. As for NIC, the studies by Barro (2001) and Bontis (2004) stand out, showing the importance of human capital as a component contributing to economic growth. The emphasis of human capital allows better understanding of the hidden values of individuals, firms, institutions and communities, which are, at the same time, current and future sources of intellectual wealth (Bontis, 2004).

For Kasztler and Leitner (2002), approaches to IC are similar concerning structure. Therefore, based on a model of differentiation between the various forms of IC, each one is assessed and submitted to descriptive interpretation, which, in turn, is based on indicators.

Although various approaches have been successful in capturing the complexity of the value of IC and the knowledge-based process, they still show some limitations because they have different types of restrictions and only partially fulfil their expectations, as revealed in some empirical and theoretical studies of the time (Caddy, 2001; Fröhlich *et al.*, 2001).

Later studies point out a taxonomy based on three stages (Guthrie *et al.*, 2012; Dumay and Garanina, 2012, 2013; Labra and Sánchez, 2013) and the emergence of a fourth one (Roos and O'Connor, 2015).

The first stage, originating at the end of the 1980s and during the 1990s, helped to develop IC's theoretical framework, focussing on awareness of the importance of IC in creating and managing a sustainable competitive advantage. This first stage is founded on the work of Sveiby (1997a, b), Edvinsson and Malone (1997), Stewart (1997a, b), Stewart and Losee (1994) and Kaplan and Norton (1992, 1996). The objective of this first stage was to make the invisible observable through creating a discourse that could be understood by all (Petty and Guthrie, 2000).

The second stage is based on approaches oriented to measurement, management and communication of IC, using empirical studies (Petty and Guthrie, 2000). Different classifications are created which help to define and group the different methods of assessing IC (Guthrie *et al.*, 2007; Boedker *et al.*, 2008).

The third stage, devoted to the implications arising from the use of IC in an organisation's management (Guthrie *et al.*, 2012), began in 2004, with publication of various articles of reference (Mouritsen, 2006; Mouritsen and Roslender, 2009; Roslender and Stevenson, 2009; Guthrie *et al.*, 2012), which indelibly marked consolidation of the literature on IC.

The fourth stage approaches IC in the context of ecosystems, (Borin and Donato, 2015; Roos and O'Connor, 2015) at the national level (e.g. Edvinsson and Lin, 2009; Salonius and Lönnqvist, 2012), and at the regional level (e.g. Bounfour and Edvinsson, 2005; Borin and Donato, 2015). Studies related to this stage defend a change of approach to understand the drivers of wealth creation, based on a balance of intellectual and financial measures, in order to create a more holistic vision of the national innovation capacity and the renewal of society and politics (Borin and Donato, 2015). This stage corresponds to the current state-of-the-art concerning research into IC, especially considering the most recent scientific production. Nevertheless, all the stages can be considered as being under development. Table I summarises the four stages.

Stage: designation	Period	Focus and line of research	Studies of reference
1st stage: development of a theoretical framework	End of the 1980s and the 1990s	Focus: OIC Line of research: IC as a determinant of competitive advantage	Kaplan and Norton (1992, 1996), Stewart and Losee (1994), Edvinsson and Malone (1997), Stewart (1997a, b), Sveiby (1997a, b)
2nd stage: development supported by empirical proof	2000 to the end of 2003	Focus: OIC Line of research: measurement, management and communication of IC; conceptualization of specific aspects of IC, such as accounting, reports and the very measuring of IC; and creation of different classifications, which helped to define and group the different methods for assessing IC	Mouritsen et al. (2000), Baum et al. (2000), Andriessen and Tiessen (2000), Sullivan (2000), Andersen and McLean (2000), Lev (2001)
3rd stage: development of implications arising from use of IC in an organisation's management	2004 to the present day	Focus: OIC Line of research: practical analyses with deeper implications of IC management, considering different types of organisation	Chatzkel (2004), Marr and Chatzkel (2004), Mouritsen (2006), Mouritsen and Roslender (2009)
4th stage: development focusses on IC ecosystems of cities/regions and nations	2004 to the present day	Focus: NIC and RIC Line of research: IC of regional and national ecosystems	Bontis (2004, 2005), Andriessen (2004), Bounfour and Edvinsson (2005), Edvinsson and Lin (2009), Pasher and Shachar (2005), Schiuma and Lerro (2008), Borin and Donato (2015)

Sources: Elaborated from: Guthrie *et al*. (2012); Dumay and Garanina (2012, 2013); Labra and Sánchez (2013); Borin and Donato (2015); Roos and O'Connor (2015). An own elaboration

Table I.
Temporal stages of IC

The existing literature presents different approaches to the measurement of IC (Sveiby, 1990; Kaplan and Norton, 1992; Sveiby, 1997a, b; Rodov and Leliaert, 2002; Bounfour, 2003) and component classification (Brooking, 1996; Edvinsson and Malone, 1997; Sveiby, 1997b; Stewart, 1997b; Bontis, 1998, 1999; Rodov and Leliaert, 2002). Despite the growing number of activities by academics and professionals, Grasenick and Low (2004) underline the non-existence of a common, homogeneous language. An explanation for this situation may lie in the diverging points of view of different groups of interest or disciplines, or between considerations of strategy and measurement (Ferenhof *et al.*, 2015), which vary from one study to another, making it necessary to systematise the various studies that classify the diferent components of IC, with a view to better understanding, for the different organisational, regional and national MAAs.

The relationship between IC and the performance of organisations, regions and countries
Performance is a conceptualization used to assess the quality of individual and collective efforts (Corvellec, 1997). The concept of performance used in this study takes into consideration the diversity of types of performance used in the literature of reference, such as competitiveness, productivity, profitability, economic growth and other performance measures considered according to different units and dimensions of analysis. Performance is not a unitary concept, as mentioned by Camelia and Luminita (2013). For some, it relates to results, such as financial achievements in given periods. For others, the determinant factors of those results are concentrated on, and on factors such as quality, responsibility, flexibility and innovation, while for a third category, the growing relevance of corporate governance and partnerships is discussed. Therefore, performance management also gains relevance in

improving limited resources, in sustainability and in increasing economic value, causing governments and public policies to be more focused on results (Lampe and Hilgers, 2015).

Organisational performance is at the core of an organisation's survival (Singh *et al.*, 2016) whether it is public or private. In management and economic research, organisational performance is recognised as a fundamental variable of results ranging from diverse areas such as human resources and marketing, to others such as operational management, international business, strategies and information systems (Richard *et al.*, 2009). However, the final aim of all these investigations is centred on explaining how organisational performance can be reinforced sustainably, so as to help firms improve their profitability and long-term survival (Bititci *et al.*, 2012).

In this connection, Brusca and Montesinos (2016) claim there are also greater requirements on regional governments to show accountability, both by national governments and citizens, which, in turn, causes increased demand for information about their performance. The same authors emphasise that systems for measuring performance are a tool inducing better management and more efficient use of resources, increasing the transparency of governance. In addition, providing information about the economic situation, efficiency and effectiveness is taken as an important innovation in regional management, with performance reports emerging as a critical component of accountability and decision making.

Recently some researchers have begun to underline IC's importance in determining the performance of organisations (Marr *et al.*, 2004), regions (Lerro and Carlucci, 2007; Lerro and Schiuma, 2009; Užienė, 2013) and countries (Malhotra, 2001; Bontis, 2004; Bounfour and Edvinsson, 2005; Lin and Edvinsson, 2008, 2011; Ståhle *et al.*, 2015; Ștefănescu-Mihăilă, 2015).

Methodology

Traditional literature reviews often do not have the necessary rigour and, in many cases, are not understood as real contributions to research science (Marr and Moustaghfir, 2005). In addition, Massaro *et al.* (2016) advocate that traditional literature reviews can provide varied results due to a certain lack of rigour that has been criticised as too subjective (Petticrew and Roberts, 2006). To minimise this understanding, SLRs, developed initially in the area of medical science aiming to produce a replicable, scientific and transparent analysis of the literature, have recently been extended to other areas (Boaz *et al.*, 2002), particularly the scientific area of management (Tranfield *et al.*, 2003; Marr and Moustaghfir, 2005; Geraldi *et al.*, 2011; Sirelkhatim *et al.*, 2015). SLRs use a process that, through a set of rules, potentially offers less bias and more transparency of the execution, measures, techniques of validation and reliability than traditional literature reviews (Massaro *et al.*, 2016). Various authors recommend respect for the specific principles of the SLR methodology in order to guarantee greater transparency, high quality and more pertinent comments on management research (Tranfield *et al.*, 2003; Marr and Moustaghfir, 2005; Geraldi *et al.*, 2011; Sirelkhatim *et al.*, 2015).

Underlying SLRs are various steps to be taken by researchers according to a research protocol. That process includes: the way of finding documents; the criteria for including and excluding those documents; definition of the results of interest; confirmation of the statistical significance and robustness of estimators; determination of the quality of studies; and analysis of the statistic used (Sampaio and Mancini, 2007). As mentioned by Higgins and Green (2011), five stages should be included: clear formulation of the question(s) of the SLR and development of criteria for inclusion and exclusion of studies; a search for evidence including all important documents or those which can have some impact on the conclusion of the review; review and selection of studies (articles, texts, etc.) and data collection; analysis of the methodological quality of studies; and presentation of the results. The documents included in the SLR can be presented in a table identifying the main characteristics of the studies, such as authors, year of publication, methodological design, number of subjects, comparison groups, dependent and independent variables, instruments and main results, among others.

Stage 1: research question of the SLR
At this stage, a research plan was drawn up including the research question and a set of criteria for inclusion and exclusion of publications. As this study aims to identify the predominant components of IC and reveal the role played by each of these components in determining performance, according to the MAAs, namely, organisational regional and national, and the studies dealing with the importance of IC for performance which were produced from the emergence of the IC concept in 1960 until the end of 2016, the protocol defines the same research question formulated in the "Introduction".

To help respond to the research question, Table II specifies the criteria for inclusion and exclusion of publications.

In choosing the databases to use in collecting documents, two factors were considered. First, the databases most commonly used by social science researchers in studies of this type were established. Second, the databases of scientific publications indexed with greatest acceptance in the general area of management and economics were identified. Consequently, 24 articles were analysed in this area containing a bibliographical analysis, published in different journals and carried out by various authors aiming to identify the databases with greatest acceptance, for the purpose of data collection by the researchers.

This analysis revealed that the most commonly used database for data-collection purposes is Web of Science (ISI) (15 times), followed by Google Scholar (6 times) and Scopus (5 times). Considering the above, in this study, the following databases were used: Web of Science (or ISI), which is a multidisciplinary database, where the most quoted journals are indexed in their respective fields; Google Scholar, which allows a wide-ranging coverage mining, including more types and categories of products than all other databases (Serenko and Bontis, 2013), with possible complementary use being made of Web of Science (ISI) and Scopu*s*, as a tool to identify leaders in terms of quotations (Dumay and Cai, 2014). In relation to this basis, the Publish or Perish (Harzing, 2007) software is used for the purpose of collecting bibliography; and (c) Scopus, a database of abstracts and quotations from peer-reviewed literature providing a wide-ranging view of scientific production worldwide.

Criteria for inclusion	Criteria for exclusion
Published in the period: 1960-end of June 2015 Presence on the databases: Web of Science (ISI); Scopus; and Google Scholar Social Science domain, scientific areas of Management, Economics and Sociology Peer-reviewed scientific articles published in English Journals with an impact factor equal to or above 0.250. Containing an empirical approach Referring explicitly to the topic of IC or at least one of its components Having at least one section or sub-section related to IC Having as unit of analysis the organisation, and/or the region, and/or the country Including measures of IC, of one or more of its components (human capital, organisational capital, structural capital, relational capital, social capital, among others)	Books, book chapters, grey literature, such as reports and non-academic research, work documents and conference reports or minutes Being classified as: literature review; systematic review; information review (information on IC); bibliometric study; general review; point of view; scientometric analysis; analysis of IC dissemination; analysis of IC discourse; analysis of IC reports; analysis of results; research-action; declarations; meta-analysis; among others Using methods for the purpose of measuring IC classified in the literature as methods of performance assessment (e.g. balanced scorecard, added economic value), of human resources (e.g. human resource accounting), or on a purely accounting basis (e.g. Tobin's Q, market value/book value ratio) (Lopes, 2013)
Source: Own elaboration	

Table II.
Criteria for inclusion and exclusion of publications in the SLR

Considering that these three sources include different domains and cover research in social and human sciences, in general, and a diversified set of management and economic topics in particular, it was decided to use the three databases, integrating all the results so as to obtain crossed, reliable and robust data.

Stage 2: seeking evidence

This stage involves the planned and systematic search for definition of the terms, in research, as well as keywords selected in the three databases used.

Consultation by key words aims to identify all scientific articles published. Therefore, considering a randomly gathered, non-probabilistic, convenience sample of 100 articles published in English and related to IC, the frequency of words was examined using NVivo 10 software.

Based on the results obtained, it was decided to use the following key terms organised by: topic ((IC) OR (intangible assets) OR (intangible capital) OR (intangible resources) OR (knowledge resources)); refined by: languages (English); fields of research (Social Sciences); areas of research (Business Economics OR Operations Research OR Management Science OR Sociology); types of document (article) and time stipulated (1960-2016).

Data collection was carried out in two stages, the first in July 2015 (collection of data from 1960 to the end of June 2015) and the second in February 2017 (collection of data from July 2015 to the end of 2016), giving a total of 6.327 items, as presented in the circular diagram in Figure 1.

Stages 3 and 4: review and selection of studies, data collection and analysis of the methodological quality of studies

The next step was to identify articles corresponding to the inclusion and exclusion criteria defined by the research protocol (see Table I). In a first stage, all articles with an impact factor under 0.250 were eliminated. The impact factor of a journal is a tool allowing assessment of the importance and influence of specific publications (Falagas *et al.*, 2008). This criterion was defined as a guarantee of that importance and influence due to the great number of documents found and the diversity of journals publishing them. On completing
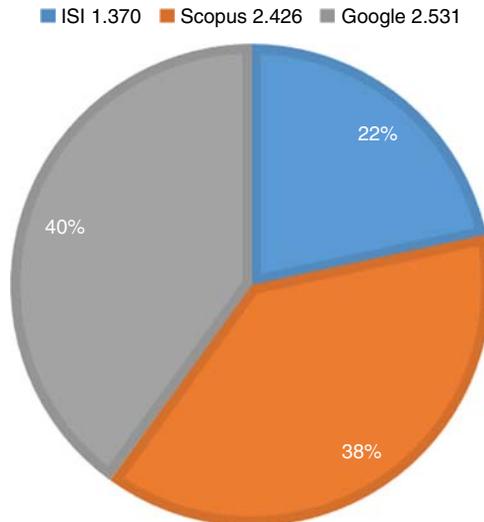

Figure 1.
Distribution of publications obtained by database

Source: Own elaboration

this stage, the number of articles fell to 3.205 documents. Next, the title and abstract of each publication were checked to identify the relevant articles for the study, and all empirical studies were identified. When the title and abstract were not clarifying, the authors made an independent analysis of the paper with final cross-checking. Using the concepts selected as research terms led to identifying and locating 777 articles with empirical approaches, published in various journals with an impact factor equal to or higher than 0.250.

Stage 5: presentation of results
A database was elaborated including the main characteristics of the 777 articles. The characteristics are as follows: number of authors(η); name of the author(s); title of the article; year of publication; methodological design (quantitative and/or qualitative); analysis axis (organisational, regional and national); classification of the analysis axis by sector (regarding organisations) considered the Creditor Reporting System codes and OECD (2016)[1] classification codes; the concept(s) of IC used and respective authors; components of IC; and the main results and limitations mentioned by the authors of the respective articles.

Descriptive statistics. Figure 2 shows an image of the evolution of empirical studies of IC collected for this SLR. The trajectory showed some stagnation until 2001, with major expansion occurring from 2004, which is set in the second stage of IC development, as previously identified by Petty and Guthrie (2000).

The 777 articles were published in 253 different journals. Due to the great number of publications previously identified, only journals with four or more publications represented in this SLR were used. Figure 3 presents the final results, where four journals stand out: *Journal of Intellectual Capital* (23 per cent); *International Journal of Learning and Intellectual Capital* (6.5 per cent); *Knowledge Management Research and Practice* (4.1 per cent); and *Management Decision* (2.4 per cent).

Due to the high number of different author(s)/co-author(s) (729) in the publications analysed and due to their diversity, Figure 4 presents only those with two or more publications represented in this paper, with none of them exceeding three publications.

Conceptual evolution of IC. Figure 5 illustrates the evolutionary path of NIC, RIC and OIC. A first empirical study of NIC appeared in 1972, but only from 2004 do both NIC and RIC show greater expansion. However, a notable difference is found in terms of the total number studies made in the different MAAs, with the organisational axis being clearly predominant.
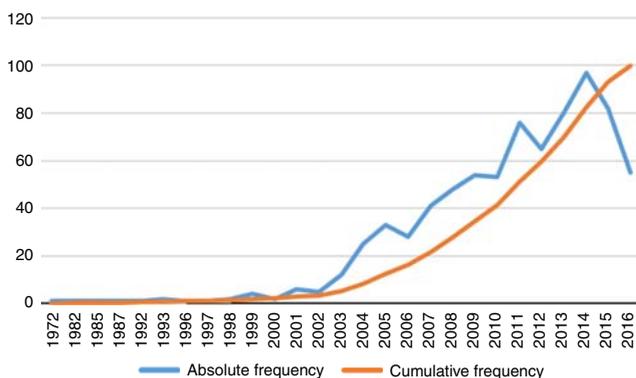
Source: Own elaboration

Figure 2.
Evolution of annual
production of
articles on IC
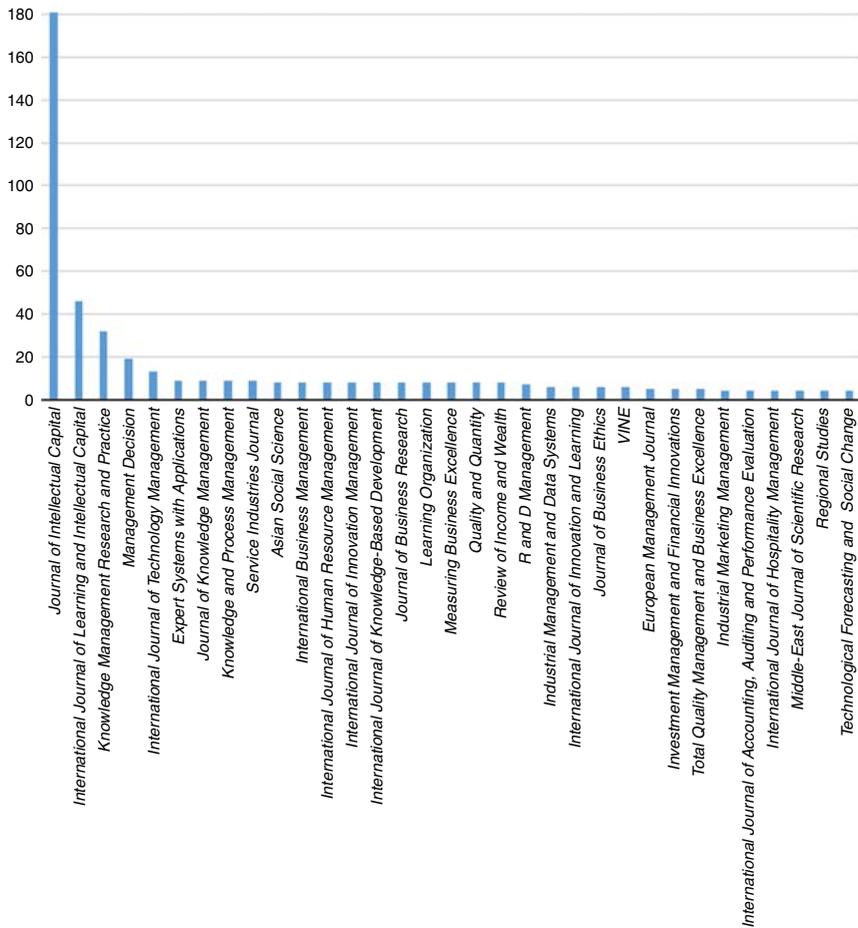
Figure 3.
Journals with four or
more publications

Source: Own elaboration

According to what was found in terms of the evolution of the annual production of articles on IC, the peak of publications was reached in 2014.

Table III identifies the most studied sectors by analysis axis. In relation to OIC, the category of "Unspecified/others/various" shows the highest percentage, 29.4 per cent, which includes samples coming from unspecified organisations in the studies, from various organisations in different sectors at the same time or from sectors that appear only once. Among the sectors identified, that of industry stands out with 27.9 per cent (e.g. pharmaceuticals, R&D, biotechnology, manufacture and high technology), followed by the communications sector with 11.3 per cent (e.g. information and communication technology) and the banking and financial services sector with 9.7 per cent (e.g. banks and insurance companies). We can also point out that studies carried out in the education sector (e.g. higher education) accounted for 5.5 per cent. At the regional level, studies dealing with the region and/or regions were the ones reaching the highest percentage (1.9 per cent). At the national level, the highest percentage corresponded to studies focussing on a block of countries (2.6 per cent).

Source: Own elaboration
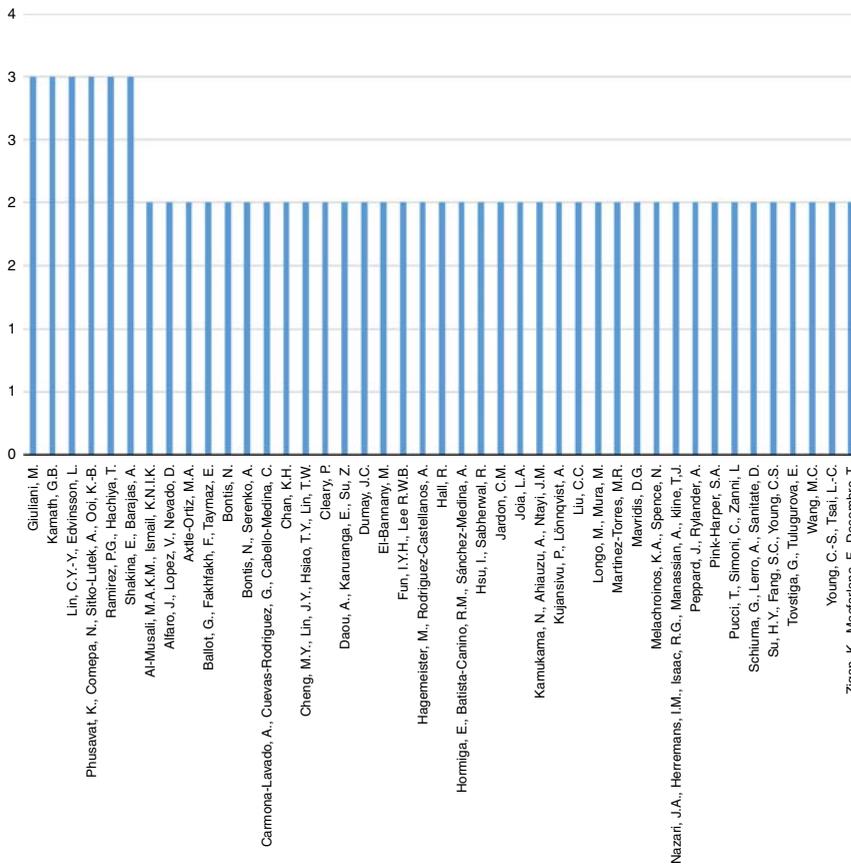
Figure 4.
Author(s)/co-author(s)
with two or more
publications
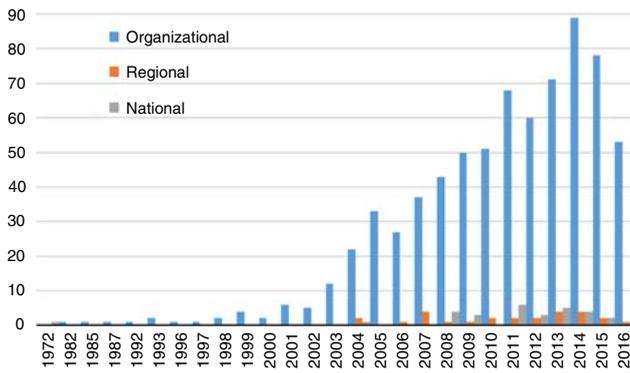
Source: Own elaboration

Figure 5.
Distribution of articles
by year and MAA

Multidimensional analysis axes (MAA)	Articles (n=693)		
	Absolute f	Relative f	
Organizational	720	0.927	
Unspecified/others/various	229		0.294
Industry (321)	217		0.279
Communications (220)	88		0.113
Banking and financial services (240)	75		0.097
Education (110)	43		0.055
Government and civil service (150)	23		0.029
Health (120)	16		0.021
Tourism (332)	13		0.017
Other social infrastructure and services (160)	7		0.009
Construction (323)	3		0.004
Business and other services (250)	2		0.003
Transport and storage (210)	3		0.004
Health (120) and education (110)	1		0.001
Regional	26	0.033	
Region	15		0.019
City	6		0.008
Clusters	3		0.004
Community	2		0.003
National	31	0.04	
Block of countries	20		0.026
Country	11		0.014
Total	777	777	1	1
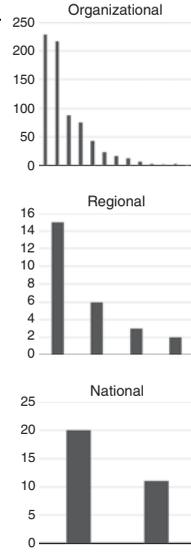
Source: Own elaboration

IC's contribution to organisational, regional and national performance

To respond to *RQ1*, about IC classification, in terms of the components most commonly used in the literature of reference to deal with the relationship between IC and performance by MAA, this began with identification of the articles approaching this topic, among those in the set of 777 in the SLR, with 188 such documents being found.

Observation of Figure 6 reveals the distribution of the 188 articles over time. The first study to deal with this topic is seen to appear only in 2000, with empirical studies intensifying from 2007, recording a high incidence of studies focussing on the influence of OIC on performance. It is also of note that in 2015, a high number of publications are recorded.
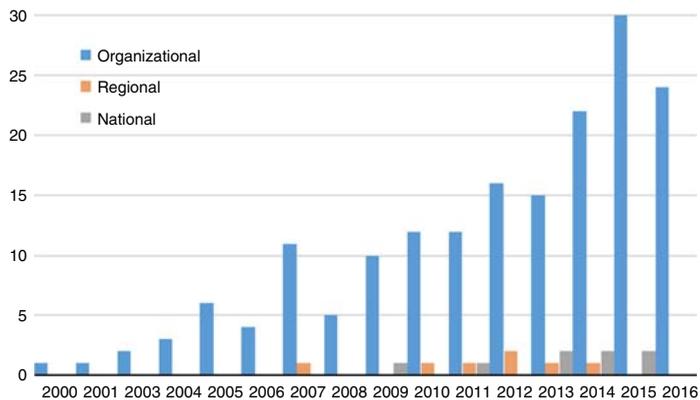
Source: Own elaboration

Table IV defines performance by dimension of analysis, presents the types of performance found and the grouping criteria considered for the subsequent analyses.

Table V presents the type of empirical studies made, as well as the type of performance analysed, by MAA. Apart from "overall performance", which includes studies dealing with performance generally, accounting for the highest number of cases, the type of performance studied is found to be quite heterogeneous. However, research in the area of "organisational/corporate/business/overall performance" and "financial performance" also stands out.

Concerning the most commonly studied components of IC, since authors use identical and/ or very similar measurement indicators in their studies, structural capital, organisational capital and process capital were regrouped in the "Structural Capital" variable, and relational capital, customer capital and social capital in the "Relational Capital" variable.

Table VI shows that the predominant group of components is formed by: human capital; structural capital (organisational or process) and relational capital (social or customer),

| Performance	Organisational	Dimension of analysis Regional	National
Definition	Organisational performance is recognised as a fundamental variable of results ranging from diverse areas such as human resources, marketing, operational management, international business, strategies, information systems (Richard *et al.*, 2009) and others	Four indicators are related to regional performance that highlight a specific aspect of regional development: GDP per capita (economy), life expectancy at birth (demographic structure), educational level (education) and unemployment rate (labour market conditions) (European Parliament, 2007)	National performance needs to take into account multiple indicators related to economy, society, education, sustainability, health and environment (OECD, 2015b)
Types of performance found	Business/corporate/ organisational/overall efficiency Export Financial Human resources Individual Innovative Operational Product sale Productivity Profitability Regional/local development Sustainable Value-based Work	Downtown performance Regional/local development Economic growth	Economic growth Innovative Productivity growth
Grouping criteria	Business/corporate/ organisational/overall – Words used indiscriminately and with the same meaning to measure organisations' general performance including financial and non-financial indicators	–	–

Source: Own elaboration

Table IV.
Types of performance by dimension of analysis, respective definition and grouping criteria

Typology	Organisational	Regional	National	Absolute frequency
Downtown performance	0	1	0	1
Economic and productivity growth performance	0	0	1	1
Economic growth performance	0	4	4	8
Efficiency performance	1	0	0	1
Export performance	2	0	0	2
Financial and operational performance	2	0	0	2
Financial performance	31	0	0	31
Human resources performance	1	0	0	1
Individual performance	2	0	0	2
Innovative performance	10	0	1	11
New product development performance	1	0	0	1
Operational performance	1	0	0	1
Organisational/corporate/business/overall	102	0	0	102
Product sale performance	2	0	0	2
Productivity growth performance	0	0	2	2
Profitability and/or productivity performance	10	0	0	10
Regional/local development performance	1	2	0	3
Sustainable performance	2	0	0	2
Technological performance	1	0	0	1
Value-based performance	2	0	0	2
Work performance	2	0	0	2
Absolute frequency	173	7	8	188

Source: Own elaboration

Table V.
Type of performance studied and distributed by MAA

hereafter designated the triad, which appears 67 times. This is followed by the group of human capital, structural capital and capital employed (of VAIC), with 57 cases.

It is also worth pointing out that human capital, structural capital, relational capital, employed capital and innovation capital, individually or in a group, are the most frequently studied components in this field of research. However, human capital is observed not to be the most relevant in RIC and NIC, unlike the case in OIC.

For better understanding of the studies made, it is also important to investigate relationships between type of study and type of components by MAA. As revealed by analysis of the matrixes presented in Tables V and VI, it is difficult to establish these links, due to the matrix presenting a dimension of a higher order. Social network analysis can help to establish these links. For Borgatti *et al.* (2009), a social network analysis recommends the distinction between different types of dyadic connections, both analytically and theoretically. Therefore, the dyadic relationships can be divided in four basic types: similarities, social relationships, interactions and flows. The same authors conclude that a great amount of the literature in this area can be considered as the operational analysis of how the different types of connections are interlinked and interact at different associated levels of influence. Therefore, aiming to determine the type of networks existing, considering the type of study and the components of IC, in groups or individually, UCINET 6 software was used to make an analysis by MAA. It is of note that UCINET 6 for Windows is a software package for the analysis of social network data (Borgatti *et al.*, 2002), which has been used in the general area of management and economics (Yu *et al.*, 2008; Borgatti *et al.*, 2009). In the social sciences, one of the main understandings underlying the use of this methodology is in using graphic-theoretical properties which characterise dyadic structures, positions and dimensions, in order to explore the network's general form and interconnections (Borgatti *et al.*, 2009). It is based on calculating the intermediation and degree of centrality, and can be used to formulate a structural network analysis, seen through a graphic illustration tool (Yu *et al.*, 2008).
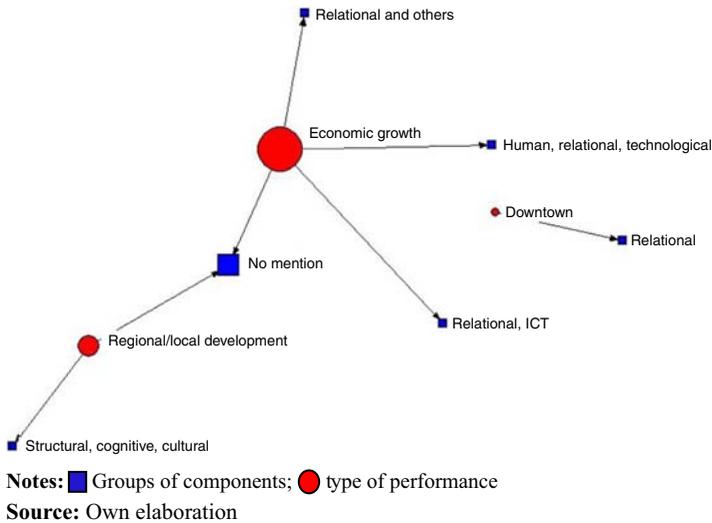
Table VI. Type of study and type of groups of components by MAA

MAA	Study style	Structural	Structural, cognitive, cultural	Structural, intellectual property, reputation	Structural, relational, innovation	Internal, external	Human	Human, structural	Human, structural, employed	Human, structural, employed, innovation	Human, structural, information	Human, structural, market, renovation	Human, innovation, reputation, cultural	Human, internal, external	Human, propriedade intellectual	Human, relational	Human, relational, innovation	Human, relational, intellectual	Human, relational, technological property	Human, relational, technological	Human, technological	Innovation, IT	No mention	Relational	Relational and others	Relational, ICT	Triad	Triad, employed	Triad, informational	Triad, innovation	Triad, innovation, localization	Triad, intellectual property	Triad, technological, spiritual	Triad, technological	Absolut frequency
Organisational	Efficiency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Export	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
	Financial and operational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
	Financial	0	0	0	0	0	0	0	24	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	1	3	0	0	0	0	0	0	31
	Human resources	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Individual	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
	Innovative	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	5	0	0	1	0	0	0	0	10
	New product development	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Operational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
	Organisational/corporate/business/overall	2	1	1	0	0	2	3	24	0	0	0	0	1	1	0	0	1	0	0	0	1	4	1	1	0	48	1	1	6	1	1	1	1	102
	Product sale	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
	Profitability and/or productivity	0	0	0	1	0	0	0	5	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	10
	Regional/local development	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Sustainable	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Technological	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Value-based	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Work	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2
Regional	Downtown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
	Economic growth	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	4
	Regional/local development	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
National	Economic and productivity growth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Economic growth	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	4
	Innovative	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
	Productivity growth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	2
	Absolute frequency	4	1	1	1	1	4	5	57	1	1	1	1	1	1	1	1	1	1	1	1	1	13	2	1	1	67	4	1	8	1	1	1	2	188

Type of capital

Source: Own elaboration

Figure 7 presents the result for OIC. Two nuclei are clearly visible: one in relation to the type of study and another in relation to the IC component group used. Regarding study type, overall performance seems to be subject to most empirical testing. However, we must also point out innovative performance, profitability/productivity and organisational/corporate/ business performance as smaller nuclei. Regarding components groups, the triad is the one most commonly used, with the others being very scattered. Nevertheless, the group of human capital, structural capital and employed capital should also be noted as one of the most used. In the links established, overall performance is directly connected to the triad, which means it is the basis of investigation in these studies.

Regarding RIC, Figure 8 shows there is only one predominant nucleus, where overall performance stands out. Among components, the most prominent capital is relational capital.

In relation to articles dealing with NIC, observation of Figure 9 reveals three distinct nuclei regarding the type of performance studied: economic growth, productivity growth, economic and productivity growth, and innovative performance, with the first two having a greater diversity of components and a higher degree of use. As for the groups of components studied, the triad is predominant. However, the links between components and study type are quite heterogeneous.

Tables VII-IX present the study type distributed by sector and by analysis axis. For the organisational axis (Table VII), distribution is seen to be quite homogeneous. However, there is greater predominance of the group included in the "Unspecified/others/ various" sector, the one showing the largest number of cases (64), followed by "industry" (52), and "banking and financial services"" (29). The regional axis (Table VIII) is divided between the four groups, albeit with greater relevance of the "regions" group. In the national axis (Table IX), with only eight studies, "group of countries" gains relevance with six articles published.

Presentation and discussion of the results
The performance of an organisation/region/country depends on various factors. Therefore, to analyse which components of IC contribute most to performance, and how IC contributes to organisational/regional/national performance, the following qualitative analysis will be

Figure 7.
Relationships between study type and OIC groups of components

Notes: ■ Groups of components; ● type of performance
Source: Own elaboration

Figure 8.
Relationships between
study type and RIC
groups of components

Figure 9.
Relationships between
study type and NIC
groups of components

structured considering the various sectors/groups found and exemplified in Tables X-XII. For this purpose, Tables X-XII were elaborated to present a summary of the qualitative analysis carried out, by MAA.

Finally, and responding to *RQ2*, it is important to underline that the importance and positive impact of IC on the performance of organisations/regions/countries is consensual in the majority of studies; the short-, medium- and long-term implications, arising from good assessment, measuring and management of IC, inasmuch as these are beneficial for the economic and social development of organisations/regions/countries.

Conclusions

The literature on IC is quite vast, but by considering only empirical studies of OIC as the focus of research, the literature basis is still limited, and so additional research efforts are

Sector/group	Study type	Absolute frequency
Banking and financial services (240)	Financial	8
	Organisational/corporate/business/overall	14
	Product sale	1
	Profitability and/or productivity	3
	Value-based	2
	Work	1
	Total	29
Communications (220)	Financial	3
	Individual	1
	Innovative	3
	Operational	1
	Organisational/corporate/business/overall	4
	Overall	3
	Total	15
Education (110)	Efficiency	1
	Organisational/corporate/business/overall	4
	Profitability and/or productivity	1
	Regional/local development	1
	Total	7
Government and civil service (150)	Innovative	1
	Total	1
Industry (321)	Financial	4
	Export	1
	Financial and operational	2
	Innovative	5
	New product development	1
	Organisational/corporate/business/overall	38
	Technological	1
	Total	52
Unspecified/others/various	Export	1
	Financial	15
	Human resources	1
	Innovative	1
	Organisational/corporate/business/overall	35
	product sale	1
	Profitability and/or productivity	6
	Sustainable	2
	Work	1
	Total	63
Health (120)	Individual	1
	Organisational/corporate/business/overall	1
	Total	2
Tourism (332)	Financial	1
	Organisational/corporate/business/overall	2
	Total	3

Table VII.
Type of performance
by sector in
organisational MAA

needed to gain a general view and critically assess what has already been studied and the measuring methods used. The previous studies by Petty and Guthrie (2000) and Labra and Sánchez (2013) do not provide unequivocal identification of the main components of IC, making the dominant typologies of IC components depend not only on the dimensions of analysis selected, but also on the limited nature of the primary data used in different empirical approaches. So this paper fills the gap identified through carrying out an SLR, based on articles published in high impact journals, allowing identification of the main components of IC, by dimension of analysis, as well as the influence of each of those

components on performance. This SLR makes an important contribution to the literature on IC, in that it provides an instrument that can be used by the academic community, political decision makers and managers in order to identify areas of development of IC dimensions and components, as well as the main studies about the relationship between IC components and the performance of organisations, regions and countries.

So as to deepen knowledge about the strategy of using IC as an alternative to traditional strategies for measuring capital, models developed to classify the type of IC applicable to NIC, RIC and OIC are identified through surveying the main empirical studies dealing with the different MAAs.

According to the purposes previously identified, a research question is formulated. To answer this question and to examine the current state of the literature, an SLR is performed based on a random, non-probabilistic sample of convenience of 777 academic articles, and 189 studies are found to deal with the influence of IC on performance, regarding the three analysis axes. The literature is systematised according to the protocol established, formed of five stages, with one research question being identified. Through a qualitative and quantitative analysis, conclusions and implications are drawn regarding the importance and contribution of IC to the economic and social development of organisations/regions/countries.

We can conclude that despite being a relatively recent topic, the results found reveal that IC is indeed a field of research that has taken on special importance for both authors and journals, given the high number of publications found in the first selection. Nevertheless, concerning empirical studies, the total number is considerably less. The difficulty in gathering data about any one of the analysis axes and in various contexts can be one explanation for the limited number of empirical studies. Another reason for the low number of empirical studies could lie in the diversity of components and the multiplicity of indicators measuring IC, whether in the organisational, regional or national context.

Sector/group	Study type	Absolute frequency
Cities	Downtown performance	1
	Total	1
Clusters	Economic growth	1
	Total	1
Communities	Regional/local development	1
	Total	1
Region	Economic growth	3
	Regional/local development	1
	Total	4

Table VIII.
Type of performance by sector in the regional MAA

Sector/group	Study type	Absolute frequency
Countries	Economic and productivity growth	1
	Economic growth	1
	Total	2
Group of countries	Economic growth	3
	Innovative	1
	Productivity growth	2
	Total	6

Sources: Tables VII, III and IX. An own elaboration

Table IX.
Type of performance by sector in the national MAA

Sector	Study/reference	Relevant results	Dominant group(s) of components	Dominant component(s)	Relation between components of IC and performance	Dominant study type	Relevant implications by sector
Banking and financial services	Mavridis (2004), Bontis and Cabrita (2008), Alipour (2012), Khalique et al. (2013), Yalama et al. (2013), Lu et al. (2014a), Alhassan and Asare (2016).	IC has a crucial collective role stimulating inter-relationships towards improved performance in general; it has a positive influence on organisations' efficiency; profitability; productivity growth; and it creates values and brings competitive advantages	Human capital, structural capital, capital employed Triad	Structural capital Human capital Capital employed Relational capital	Direct, positive and significant	Overall performance Financial performance	Financial institutions, like insurers and banks, should invest and fully utilise IC to gain a competitive advantage (Mondal and Ghosh, 2012; Khalique et al., 2013; Lu et al., 2014a), and to develop strategies for their future performance (Yalama and Coskun, 2007; Al-Musali and Ismail, 2016). IC application (capability) is more important than IC creation (Zakery and Afrazeh, 2015) and the future performance of an organisation depends upon its IC efficiency (Soriya and Narwal, 2015; Yalama and Coskun, 2007) Organisations with a small amount of capital can optimise their efficiency and achieve optimal economic value through the accurate manipulation of IC for the creation of optimal operational performance (Wang et al., 2013), and organisations with strong IC may successfully develop new products (Chien and Chao, 2011). The dominant role of human capital also provides insight to managers with respect to business performance levers (Mention and Bontis, 2013), For example, the best performing banks are those that mainly have very good results in the usage of their IC, especially human capital, and less in the usage of their physical capital (Mavridis, 2004) Investments in IC as a means of improving the performance of banks in emerging markets (Alhassan and Asare, 2016). The findings would also provide some information to stakeholders and potential investors to assess the value creation

(continued)

Table X.
Influence of OIC on
performance by sector
and its implications

Sector	Study/reference	Relevant results	Dominant group(s) of components	Dominant component(s)	Relation between components of IC and performance	Dominant study type	Relevant implications by sector
	Al-Musali and Ismail (2016), Sidharta and Affandi (2016) Mention and Bontis (2013), Kweh et al. (2014), Tsao and Hung (2014), Zakery and Afrazeh (2015), Sherif and Elsayed (2016) Joshi et al. (2013), Alhassan and Asare (2016), Sherif and Elsayed (2016)	IC is positively associated with bank financial performance indicators Only some of its components influence (or influence more) performance, for example, human capital When the method used is VAIC, the results vary. For example, Australian banks have greater human capital efficiency; in the banks of Ghana human capital efficiency and capital employed efficiency drive productivity growth equally; in Egyptian insurance companies, the capital's efficiency is the major direct relationship with performance					capabilities of financial sector companies (Joshi et al, 2013) and it may also be deduced that IC is an important factor for investors(Yalama and Coskun, 2007), helping policy makers to formulate and implement policies for establishing a resilient sector performance (Yalama and Coskun, 2007; Al-Musali and Ismail, 2016)
Communications	Zerenler et al. (2008), Saeed et al (2013), Chang (2013)	In general, IC influences types of performance	Triad Triad, innovation capital	Structural capital Human capital Relational capital	Direct, positive and significant	Financial performance Innovative performance Overall performance	IC allows communication sector organisations to maintain their competitive positions and help develop appropriate strategies, maintain competitive advantage (Tseng et al, 2013; Bueno et al., 2010). In this sector, innovation development and generation is an important approach.(Zerenler et al, 2008; Wu et al, 2007; Bueno et al, 2010), for

(*continued*)

Table X.

Sector	Study/reference	Relevant results	Dominant group(s) of components	Dominant component(s)	Relation between components of IC and performance	Dominant study type	Relevant implications by sector
	(Wu et al. (2007)	Structural capital and relational capital completely mediate the effects of human capital on innovative performance		Innovation capital			example, to position the image of an organisation in a market (Zerenler et al., 2008). Managers should build and cultivate the firm's dynamic capabilities because of their significant main and moderating effects. Even though a company has limited stock of IC, it can still integrate and recombine resources to generate innovation if it has dynamic capabilities 1626. Managers should enrich IC investment to acquire the more advanced R&D abilities which are able to lead to better innovation and apply intellectual property rights in order to prevent possible imitation (Wu et al., 2007); Chang, 2013). The role of IT in the creation of business value for corporations can offer guidelines to management as to conditions under which IT investment is likely to enhance shareholder value (Young and Tsai, 2012)
	Chang et al. (2013)	It influences human capital and relational capital more significantly					
	Wang and Chang (2005)	Human capital does not influence performance directly					
	Dženopoljac et al. (2016)	When using firm size and leverage as control variables, only capital-employed efficiency has a significant effect on financial performance					
	Sharabati et al. (2016)	A positive significant relationship between IC and organisations' business performance. Relational capital has the highest impact on organisations' business performance, followed by human capital and finally structural capital. Furthermore, empirical results indicated that there are strong					

Table X.

(*continued*)

Sector	Study/reference	Relevant results	Dominant group(s) of components	Dominant component(s)	Relation between components of IC and performance	Dominant study type	Relevant implications by sector
		inter-relationships and interactions among the three components					
Education	Taleghani et al. (2011), Boj et al. (2014), Mumtaz and Abbas (2014)	IC is a connecting thread in creating value and obtaining competitive advantage; it contributes to educational productivity; and has a significant effect on performance in private HEIs	Triad	Human capital Structural capital Relational capital	Direct, positive and significant	Overall performance	IC is considered one of the key drivers of value creation and competitive advantage generation for education organisations. (Boj et al., 2014). Studying IC could help policy makers in formulating and implementing policy in intellectual capital development, aid investors in modifying investment strategies and allow universities to benchmark themselves in order to improve their value creation capabilities (Lu, 2012). For example, private universities can create a better image for customers and improve their performances through better management of their IC and can compete with public sector universities (Mumtaz and Abbas, 2014). High concentrations of highly educated individuals in a community lead to a positive impact on a region's economic growth and development patterns, particularly in communities without the presence of a research university (Pink-Harper, 2015)
	Lu (2012)	IC's influence on the efficiency of teaching and research is not revealed to be significant, in State HEIs in Taiwan			Direct, positive and non-significant		
	Pink-Harper (2015)	Human capital measured as concentrations of highly educated people and HEIs does lead to positive economic growth and development for countries			Human capital not significant; Institutional capital positive and significant		
Government and civil service	Hsu and Sabherwal (2011)	IC does not directly affect the organisation's innovation or performance since the organisation's knowledge management	Triad	Human capital Structural capital	Indirect	Innovative performance	Future IC research can benefit from similarly incorporating innovation and perhaps efficiency as mediating the effects of IC capabilities on firm performance (Hsu and Sabherwal, 2011)

(*continued*)

Table X.

Table X.

Sector	Study/reference	Relevant results	Dominant group(s) of components	Dominant component(s)	Relation between components of IC and performance	Dominant study type	Relevant implications by sector
		has a mediating effect between IC, innovation and performance		Relational capital			
Industry	Chen et al. (2005), Chen et al. (2006), Zerenler and Gozlu (2008), Sharabati et al. (2010), Pal and Soriya (2012), Wang et al. (2014), Yuqian and Dayuan (2015), Singh and Narwal (2015), Pucci et al. (2015), Andonova and Ruiz-Pava (2016), Ansari et al. (2016)	IC has a positive influence on business performance; operational and financial performance; innovative performance; export performance; profitability; among others. Positive direct relationship between IC components and firm performance was demonstrated. All components are shown and are important depending on the context and industry analysed	Triad; Human capital, structural capital, capital employed Human capital, structural capital Triad, innovation capital	Human capital Structural capital Relational capital Capital employed Innovation capital	Direct, positive and significant	Overall performance Organisational/ corporate/ business performance Financial performance	IC is an important source of an organisation's wealth and should be measured to help organisations formulate, develop, implement and control strategies (Bollen et al., 2005; Wang et al., 2014). Through appropriate use and increased IC, managers can increase organisations' profitability and productivity (Pal and Soriya, 2012) and improve their performance (Wang et al., 2014). Therefore, the organisation's performance depends on its IC and its capacity to detect opportunities and threats, make opportune and correct decisions and facilitate the necessary changes efficiently (Han and Li, 2015). IC is also directly linked to innovation (Cheng et al., 2010; Cabello Medina et al., 2011; Wang et al., 2016). If organisation want to use IC to improve their performance, they should take innovative capacity into consideration. It is therefore important to develop strategies that also promote innovation (Cheng et al., 2010; Cabello Medina et al., 2011; Wang et al., 2016; Pongpearchan, 2016), especially that based on technology (Aramburu et al., 2015). Innovation only occurs after building strong IC, or vice-versa (Wang et al., 2016). If an organisation's innovative performance is low, the quality of human resources or the level of organisational support provided to

Sector	Study/reference	Relevant results	Dominant group(s) of components	Dominant component(s)	Relation between components of IC and performance	Dominant study type	Relevant implications by sector
	Zerenler and Gozlu (2008), Maditinos et al. (2010)	There is a relationship between the various components that can be influenced by, or influence in, a different way one or more of the components making up IC					those resources should be increased (Alpkan et al., 2010; Pongpearchan, 2016). Various studies highlight that human capital and innovation capital should be seen as a set of complementary resources (Aramburu et al., 2015; Scafarto et al., 2016), so that an investment strategy can result in providing distinct resources, which, in turn, can have a positive impact on the organisation's performance (Scafarto et al., 2016). For example, in the study by Ansari et al. (2016), managers suggested trying to improve knowledge and personal skills using IC and dynamic capacity as stimulants of innovation and competitive production in order to face up better to changing environments and stabilise the organisation in the competitive world (Ansari et al., 2016)
	F-Jardón and Martos (2009)	The only component of IC to affect performance directly is structural capital					
	Mehdivand et al. (2012)	Human capital and relational capital have direct and indirect effects on performance, whereas structural capital only produces an indirect effect on this through entrepreneurial orientation					
	Juma (2006)	Human capital is the most critical component of IC, by predicting operational performance					
	Mrazkova et al. (2016)	Intellectual capital is shown to have significant influence on ROE and employees' productivity					
	Khalique and Ordóñez de Pablos (2015)	Customer capital and social capital in the Malaysian context appeared as an			–		

Table X.

Table X.

Sector	Study/reference	Relevant results	Dominant group(s) of components	Dominant component(s)	Relation between components of IC and performance	Dominant study type	Relevant implications by sector
		insignificant predictors of IC. And human capital, structural capital, technological capital and spiritual capital as significant predictors					
	Leitão and Franco (2010)	Different results were found according to dealing with economic or non-economic indicators for human capital and for organisational capital			–		
Unspecified/ others/various	Chen et al. (2005), Tan et al. (2007), Phusavat et al. (2011), Ling (2013), Phusavat et al. (2015), Massaro et al. (2015), Tripathy et al. (2015), Cleary and Quinn (2016), Ettehadi and Seyyedi (2016), Saeed et al. (2016)	IC is positively related to financial performance, organisational performance, business performance, market performance, productivity, corporate performance and overall performance	Human capital, structural capital, capital employed Triad	Human Capital Structural capital Capital employed Relational Capital Innovation capital Technology and IT capital	Direct, positive and significant	Overall performance Financial performance Organisational/ corporate/ business performance	The combination of the right type of knowledge management strategy with the correct form of IC increases an organisation's performance (Ling, 2013). IC should be measured to help organisations develop, implement and control strategies, expand decision making and establish better relationships with their stakeholders, investing in information technology, R&D and human resource management (Hejazi et al., 2016). Nevertheless, these approaches, whether centred on people or on technology, should be adopted with care not to use them excessively (Ling, 2013). Measuring the efficiency of IC results in external benefits for organisations in the form of cost reduction, improved productivity, better strategic positioning and greater client loyalty (Singh and Narwal, 2015). It is possible to use IC as a substitute for measuring

Sector	Study/reference	Relevant results	Dominant group(s) of components	Dominant component(s)	Relation between components of IC and performance	Dominant study type	Relevant implications by sector
	Firer and Williams (2003)	Physical capital continues to be the most significant underlying resource of company performance in South Africa					productivity and therefore productivity analyses for organisations based on knowledge show interesting possibilities regarding implications for both managers and researchers (Phusavat et al., 2015). Considering the positive relationship between human capital and the organisation's performance, managers should pay special attention to their human resources and should invest in increasing their knowledge, skills and capacities, promote their innovation capacities and invest principally in human capital (Hejazi et al., 2016). For example, in the context of Greek business, the results of the study by (Maditinos et al., 2011) demonstrate that the development of human resources seems to be one of the most significant factors of economic success, with human capital being the focus of attention in these organisations. In the Indian context, managers should consider human capital in order to increase productivity and market assessment (Singh and Narwal, 2015); and development joining human capital and structural capital (Tripathy et al., 2015). The influence of IC is no less important for organisations in developing countries, as this creates value and brings sustainable advantages, and so the governments of these countries should balance their resources by investing in both IC and physical capital (Chen et al., 2005)
	Maditinos et al. (2011)	Only the efficiency of human capital has a statistically significant relationship with financial performance					
	Chan (2009).	There is no conclusive evidence to support a definitive association between IC and the four measures of financial performance in the sample firms					
	Razafindrambinina and Anggreni (2011)	IC does not contribute to financial performance, except for income growth in consumer goods companies					
	Morris (2015)	Human capital efficiency was found to have no effect on the market performance of listed companies in South Africa					
	Singh and Narwal (2015)	Human capital efficiency is positively associated with financial performance and			—		

Table X.

Table X.

Sector	Study/reference	Relevant results	Dominant group(s) of components	Dominant component(s)	Relation between components of IC and performance	Dominant study type	Relevant implications by sector
		negatively associated with stock market performance; capital employed efficiency has a significant impact on economic and financial performance of the companies of all the sectors; structural capital efficiency does not play any role in improving the economic, financial and stock market performance of the companies					
	Andreeva and Garanina (2015)	Structural and human capitals positively influence organisational performance, explaining a quarter of its variation, while relational capital does not			–		
	Kehelwalatenna (2016)	The impact of IC on firm performance is inconsistent during financial crises			–		
	Lee and Mohammed (2014)	No significant relationship between IC and economic performance was found			Direct, positive and non-significant		

Sector	Study/reference	Relevant results	Dominant group(s) of components	Dominant component(s)	Relation between components of IC and performance	Dominant study type	Relevant implications by sector
Health	Zigan et al. (2007), Yang and Lin (2009)	Relationships between IC and performance in organisations in the area of health are important for performance	Triad	Human capital Structural capital Relational capital	Direct, positive and significant	Individual performance Organisational/ corporate/ business performance	Due to their limited resources, organisations should create and store key elements of IC together with effective human resource management practices in order to amplify their resources; this human resource management becoming the key facilitating force to help organisations to achieve their objective (Yang and Lin, 2009). Without thorough understanding of why and how organisations should develop their IC, organisations will be unable to provide their customers with services of excellence in the field of health (Zigan et al., 2007)
Tourism	Zeglat and Zigan (2014)	All components of IC have a positive and significant impact on performance in Jordanian hotels	Triad	Human capital Structural capital Relational capital	Direct, positive and significant	Organisational/ corporate/ business performance	Hotel managers need to pay greater attention to intangible aspects or else they risk losing the potential of creating value through IC in both developed and developing economies (Bontis et al. 2015). The hotel industry and its managers should pay greater attention to IC's potential to improve performance, recognise its importance and manage its component parts in order to stimulate its business performance (Kim et al., 2012; Zeglat and Zigan, 2014), not only regarding measurement but above all in management activities within the organisation, in order to manage valuable intangible resources that can help to reach higher business performance (Zeglat and Zigan, 2014). IC plays a complex and multilayered role, and to create value, specific forms of intangible resources should be suitably linked to specific forms of tangible assets that represent explicit and implicit contexts for empowering and developing the hotel industry (Bontis et al., 2015)
	Kim et al. (2012)	Human capital affects performance indirectly through the other two components			Indirect, positive and significant		
	Bontis et al. (2015)	Financial performance is affected mainly by physical and financial capital. The only exceptions are profitability and employee productivity, which are significantly affected by the human capital component and the structural capital component			–		

Table X.

Sector	Study/reference	Relevant results	Dominant group(s) of components	Dominant component(s)	Relation between components of IC and performance	Dominant study type	Relevant implications by sector
Cities, Clusters, Communities and regions	Medina *et al.* (2007), Dettori *et al.* (2012), Hoyos and Diaz (2012), Nitkiewicz *et al.* (2014)	IC makes an important contribution to regional economic development; its assessment is important and contributes to sustainable development; leveraging development; and highlighting the importance of policy strategies aiming to accelerate the accumulation of IC, by creating highly effective future income	–	Relational capital Human capital Technology and IT capital	Direct, positive and significant	Overall performance Regional/local development Economic performance	IC contributes considerably to regional economic development, but IC is not uniformly distributed geographically (Nitkiewicz *et al.*, 2014). In the same way as the efficiency and effectiveness with which regions are able to capitalise on their intellectual and other assets and benefit from their economic development, the potential will vary from one place to another (Nitkiewicz *et al.*, 2014). In general, all the results found have some political implications, since they underline the importance of political strategies destined to accelerate the accumulation of intangible assets that will mean highly effective production in the future (Dettori *et al.*, 2012). Through analysis of IC, regional public policies can find solutions regarding the IC that the territory should possess to achieve sustainable development and determine the current state of these assets (Medina *et al.*, 2007)
	Nitkiewicz *et al.* (2014)	IC is not uniformly distributed in terms of efficiency and different regions present significant differences regarding the use of IC			–		

Sector	Study/reference	Relevant results	Dominant group(s) of components	Dominant component(s)	Relation between components of IC and performance	Dominant study type	Relevant implications by sector
Group of countries and countries	(Wu et al. (20080, Roth and Thum (2013), Lu et al. (2014b)	The majority of studies highlight the importance of IC in determining countries' performance, whether through innovation or productivity and economic growth	Triad	Structural capital Human capital Relational capital Innovation capital Informational capital	Direct, positive and significant	Economic performance	Theories about IC, as sources of long-term benefit and its assessment in terms of indicators can explain national wealth more accurately, and therefore complement gross domestic product (GDP) (Alfaro-Navarro et al., 2014). Investment in IC considerably improves organisations' profitability, given the productivity-salaries difference, and leads to growing returns in countries with intensive IC (Piekkola, 2011). Therefore, the inclusion of IC in the current national accounting framework seems necessary in that developed economies have come to be knowledge societies (Roth and Thum, 2013). By identifying the components of IC, countries will be able to redirect their policies towards attaining long-term sustainable growth (Alfaro-Navarro et al., 2014)
	Stähle et al. (2015)	IC accounts for 45% of GNP worldwide					
	Corrado et al. (2009)	The results suggest that including intangibles, both inputs and outputs, can have a great impact on understanding of economic growth					

Sources: Tables X, XI and XII. An own elaboration

Although the assessment of NIC is pointed out in the literature as a limitation, by being a difficult task to perform, given the clear lack of data available in databases, it is of note that some research has been carried out in this field. In recent years, this has attracted the attention of managers and political decision makers to the importance of IC as a basis of countries' sustainable wealth. Another aspect to highlight is that the data collected may only describe NIC in the past, rather than the current and future situation, the value of the results depending on the quality of existing data on those databases.

As for RIC, limited access to information and data provided on publicly available databases is indicated as a limitation. The conclusions drawn from various studies revealed the need to develop a renewed regional approach to IC in relation to regional development theories, as strategies for regional mobilisation can play a fundamental role in leveraging intangible resource management in regions.

Concerning OIC, this has been studied and tested most often in various contexts, underlining the importance of asset intangibility in strengthening organisations' performance, based on competitive advantages supported by intangible resources and elements of the organisation's transactional structure.

The importance and positive impact of IC on the performance of organisations/regions/countries is confirmed, as well as the advantages of efficient assessment for their development and growth. Some studies demonstrated that the components of OIC influence organisations' performance separately. It is also of note that the components of IC are inter-related, and some may influence others under certain conditions. Several authors also state that some components have greater impact than others. The fact is that they are all important *per se,* depending on contingent approaches, according to the context and sector they belong to. They are also fundamental for the good performance of organisations/regions/countries, and consequently contribute to socio-economic development and to the sustainability of multi-layer ecosystems. Here, the above-mentioned intangible resources and elements of transactional structure are critical factors of differentiation and sustainability, which must be mapped and leveraged so as to strengthen the competitive advantages sustained on the three MAAs. The triad, namely, human capital, structural (organisational or process) capital and relational (social or customer capital) capital, is found to be the one preferred and used most by researchers in this type of study. The use of human capital, structural capital and capital employed in OIC and the use of innovation/renewal capital in NIC is also underlined.

The paper contributes to analysing the scientific production dealing with IC, identifying the main empirical studies applied to the different MAAs. Its originality is ensured by the previous lack of a study clarifying the components of IC, by MAA. It also serves as a guiding element for researchers who wish to carry out studies on IC, in that it presents a taxonomy based on the division, systematisation and classification of articles according to their MAA: NIC, RIC and OIC.

This paper points out the importance of IC for organisations/regions/countries, as well as its positive influence on their performance. Furthermore, from the results found, the special importance of human capital and innovation capital was demonstrated. Through this paper, organisations/regions/countries can learn that concentrating on developing human capital and innovation capital can bring future benefits to their general performance.

Implications and recommendations
This paper provides important implications for policy makers, managers and scholars, presenting empirical evidence about the type of relationship existing between IC components and performance by MAA. In relation to OIC, managers should develop strategies in order to develop, implement and control IC to ensure a competitive advantage

and improve future performance. If organisations develop their IC, especially the human capital component, attracting more qualified and/or more educated people to the region where they are located or promote staff training, they contribute not only to development of the organisation itself, but also improve considerably its profitability, and stimulate the region's development (Piekkola, 2011; Pink-Harper (2015). According to Pink-Harper (2015), human capital measured as a concentration of highly educated people leads to positive economic growth and development of the regions of influence, agreeing with the conclusion of Barro (2001) that human capital's education is a factor with a positive effect on countries' economic growth. Regarding innovation capital, most of the studies analysed highlight the importance of this type of capital in determining organisations and nations' performance. As mentioned by Bontis and Cabrita (2008), IC is a critical discipline in the field of strategic management and an important area of research in the innovation era (Bontis and Cabrita, 2008). Therefore, if organisations are strategically innovative, they will tend to increase innovative capital, not only their own but also that of regions and countries, through knowledge spillover effects. Through analysis of RIC, regional public policies can find solutions in terms of the IC territories should possess to attain sustainable development and determine the current situation of those assets (Medina *et al.*, 2007). IC is also an important factor for investors (Yalama and Coskun, 2007), helping those who devise public policies to formulate and implement policies oriented towards resilient performance by sector (Yalama and Coskun, 2007; Al-Musali and Ismail, 2016).

Finally, in connection with the results presented in this paper, different recommendations for public policy can be made, in order to create a mobilising initiative at the trans-European, as well as national and regional level, promoting the mapping of the main components of IC and absorptive capacity, in terms of territorial units, and the subsequent monitoring of these components' evolutionary paths, in line with policy programmes and European and national goals for growth, sustainability, equality, economic and social progress, and quality of life. Due to the importance found in human capital, another recommendation concerns improving public policies so as to develop human capital and reinforce it through training without this being exclusively via education. Other ways of strengthening human capital would be to join the importance of the moderating effect of organisational capital and the influence of relational capital (mediating or moderating), valuing the training and experience aspects of that human capital, in an improved context of full relational management.

Limitations and directions for future research

This SLR shows the growth in the number of empirical studies related to RIC and NIC, these being the least explored areas. However, due to the difficulty in collecting data, this development is believed not to be as rapid as would be necessary. Despite the large number of publications found, the area of research dealing with IC provides multiple opportunities for future exploration and so researchers can continue to make very significant contributions to advancing theory on IC. In this line of reasoning, this paper emphasises the need to deepen empirical research in the regional and national axes of analysis, given the limited number of empirical studies identified in the SLR.

The research focussed on empirical studies included in articles, which may be an additional limitation of the current paper. Obviously, the remaining literature presents relevant studies, but this SLR could not cope with the inclusion of all publications if we consider that in a first selection, and taking only articles, a total number of 4,839 documents were identified. Another point that may be considered a limitation is the fact of not making a systematic analysis of the measurement indicators used in the sample gathered. Due to its great diversity, even within the same components of IC, this type of research, by its very nature, needs deeper studies within this field which can be used in future investigations.

With the growth in studies on IC, an increasing number of journals seek to report on, and inform about, the IC of organisations, regions and countries helping to give greater assistance to managers, researchers and policy makers in the decision-making process. In order to maximise the advantages for future studies or alternatives to give continuity to the SLR presented here, it is essential that each of the sectors analysed within NIC, RIC and OIC is studied separately, to systematise these indicators by MAA, by IC component and by sector of analysis. This SLR points to the need to continue and extend research efforts on IC, focussing also on the regional and national approach, given the underlying influence on the performance of organisations/regions/countries. Since regional and national growth also involves organisational development, i.e. there is no regional or national growth without organisational growth, this could also be considered as a future line of research. To find out to what extent the development of OIC and what the most important sectors are, in relation to regional and national development, and to try to reconcile the different streams of literature on the theory of IC, a future SLR is also suggested covering both theoretical and applied approaches.

Acknowledgements

Note
1. For more information, consult: www.oecd.org/dac/stats/purposecodessectorclassification.htm (accessed 15 March 2015).

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