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Intellectual Capital as a Driver of Productivity and Competitiveness in Higher Education: A Systematic Review

Capital intelectual como generador de productividad y competitividad en la educación superior: una revisión sistemática

Sandra Valbuena Antolínez[1], **Claudia Milena Pico Bonilla**[2]

[1] Universidad Militar Nueva Granada, Bogotá-Colombia, sandra.valbuena@unimilitar.edu.co
[2] Universidad de la Costa, Barranquilla-Colombia, cpicob@gmail.com

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ABSTRACT

Objective: To review studies about knowledge management and intellectual capital measurement in order to categorize their methodological approaches and findings.
Design/Methodology: Following the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines and integrated design, this literature review was conducted using the Scopus database to analyze how quantitative, qualitative, and mixed methods complement each other in this field.
Findings: Four studies emphasized productivity, focusing on its relationship with information technologies, knowledge management, and strategic management. Six studies centered on competitiveness, examining variables such as social value, sustainability, third mission activities, technology transfer, and economic renewal. Ten other studies addressed both productivity and competitiveness in an integrated manner to explain the impact of knowledge on the environment and stakeholders through variables like image, reputation, sectoral impact, leadership, innovation, and relationships with the business sector. Moreover, the analysis revealed a consensus in the literature: intellectual capital can be divided into human, relational, and structural capital.
Conclusions: Research on knowledge management and intangible capital is in its early stages, but it has made progress and reached consensus primarily using a mixed-methods approach. Most of this research has been cross-sectional and examined different types of capital and the elements that facilitate their management and measurement. Intellectual capital models tailored to the education sector guarantee that institutional capacities are employed to achieve goals (productivity) and impact stakeholders (competitiveness) through sustainability, knowledge transfer, innovation, social commitment, generational shift, and institutional leadership.

Originality: Previous systematic reviews have examined concepts and models of intellectual capital, but none had focused on value creation from the concepts of productivity and competitiveness in education.

Keywords: intellectual capital, economic competitiveness, knowledge management, intellectual capital measurement, higher education.

Highlights

- In higher education, knowledge management is evaluated based on intellectual capital, impacting productivity and competitiveness.
- Productivity is linked to institutional capacity and goal attainment in teaching activities and research outputs.
- Competitiveness focuses on generating value for stakeholders by effectively using resources and capabilities.
- Intellectual capital requires a long-term vision, employing contextualized measurement models with longitudinal designs.
- Although producing knowledge can be costly, it yields significant results in competitiveness and productivity when measured through intellectual capital.

RESUMEN

Objetivo: sistematizar los abordajes metodológicos y los resultados relacionados con la competitividad y la productividad, dentro de la gestión del conocimiento y la medición del capital intelectual.
Diseño/metodología/enfoque: se realizó la revisión de la literatura, utilizando las directrices PRISMA y el *integrated design* en Scopus para analizar cómo se complementan los enfoques cuantitativo, cualitativo y mixto.
Resultados: se encontraron cuatro estudios con énfasis en la productividad medida por la vinculación con las tecnologías de la información, y en los procesos de la gestión estratégica y del conocimiento; seis estudios centrados en la competitividad con la observación de variables como valor social, sostenibilidad, tercera misión, transferencia tecnológica, renovación económica; y, otros diez estudios que se aproximan de forma integrada a los conceptos de productividad y competitividad para explicar el impacto que tiene el conocimiento en el entorno y en los grupos de interés a través de variables como imagen, reputación, impacto sectorial, liderazgo, innovación y relacionamiento con la empresa. Por otra parte, se encuentra un consenso sobre el desagregado del capital intelectual en humano, relacional y estructural.
Conclusiones: la investigación en gestión del conocimiento y capital intangible se encuentra en una etapa temprana con avances y consensos desde un enfoque mixto, en su mayoría desde un abordaje transversal sobre los tipos de capital y los elementos que favorecen la gestión y la medición. Los modelos de capital intelectual contextualizados para el sector garantizan el uso de la capacidad institucional para el cumplimiento de metas (productividad) y el impacto a los grupos de interés (competitividad), desde la sostenibilidad, la transferencia de conocimiento, la innovación y el compromiso con las comunidades, el relevo generacional y el liderazgo institucional.

Originalidad: las revisiones sistemáticas previas estudian los conceptos y modelos de capital intelectual, pero ninguna se enfoca en crear valor a partir de los conceptos de productividad y competitividad en el contexto de la educación.

Palabras clave: capital intelectual, competitividad económica, gestión del conocimiento, medición del capital intelectual, educación superior.

Highlights

- En la educación superior, la gestión del conocimiento se mide a partir del capital intelectual con resultados en productividad y competitividad.
- La productividad se asocia con la capacidad institucional y el cumplimiento de metas en lo relativo a actividad docente y productos de investigación.
- La competitividad se centra en la generación de valor para los grupos de interés a partir de los recursos y las capacidades
- El capital intelectual requiere una visión de largo plazo haciendo uso de modelos de medición contextualizados con diseños longitudinales.
- Producir conocimiento puede ser costoso, pero genera resultados en competitividad y productividad cuando se mide desde el capital intelectual.

1. INTRODUCTION

It is often assumed that education, as a public service, should not be competitive. However, universities, as producers and providers of knowledge, must manage their resources effectively (Ramírez et al., 2019; Zapata Jiménez, 2019) in order to ensure their sustainability and differentiation in an increasingly competitive and dynamic market (Bekele et al., 2024; Supriyanto et al., 2024). Nonetheless, Leask and Jumani (2015) argue that knowledge management is lagging behind in the corporate governance models of higher education institutions.

This shortcoming may stem from the lack of consensus on what value creation entails in the educational context. In contrast, within the context of business, value creation is clearly associated with competitiveness and productivity. In this regard, Porter and Miller (1999) posit that value is generated by a unit of labor or capital. Productivity, for its part, depends on product quality and production efficiency. However, the concept of competitiveness also encompasses aspects such as innovation and differentiation from competitors.

Although productivity and competitiveness are rarely discussed in the field of higher education, their connection to knowledge management has recently gained significance. Nevertheless, there are still no unified criteria on what they mean for the educational sector. This study addresses this gap by investigating such connections and definitions to ascertain the role of knowledge management in the creation of Intellectual Capital (IC) and its contribution to competitive advantage (Kumari et al., 2023; Singh & Verma, 2023; Meher & Mishra, 2022).

Prior research has established a connection between knowledge management and IC in the educational context. However, significant research gaps remain, particularly from a productivity

perspective. Key areas requiring further exploration include understanding how IC impacts institutional performance (Iqbal et al., 2019; Chatterji & Kiran, 2021), examining the effects of IC dissemination on efficiency (Bellucci et al., 2021), and validating the direct relationship between IC and quality in higher education (Handzic & Ozlen, 2011).

Some studies have explored the relationship between IC and competitive advantage (Alghail et al., 2021; Del Castillo, 2019; Gârdan et al., 2018), as well as IC management's role in driving innovation (Ibarra-Cisneros et al., 2023). Additionally, other studies have assessed universities' performance in their "third mission"—engagement with society beyond teaching and research—highlighting its importance as a guarantee of differentiation and knowledge transfer (Secundo et al., 2017).

Previous literature reviews have aimed to develop a conceptual framework for defining a measurement model in the education sector. While these reviews often incorporate the perspectives of students and teachers, their applicability tends to be limited to specific contexts (Handzic & Ozlen, 2011). Following the PRISMA guidelines, Alghail et al. (2021) conducted a review of the determinants of knowledge protection (i.e., technology, organizational structure, behavior, and culture). The study concluded that there has been a predominant focus on knowledge management, rather than safeguarding intangibles, which has implications for reputation and information security.

To address these research needs, this paper aims to contribute to the conceptualization of competitiveness and productivity within the framework of knowledge management and IC measurement. Employing a systematic literature review guided by the PRISMA methodology, this study seeks to answer the following questions: What are the outcomes and methodological approaches to knowledge management and IC measurement in education? From which variables do they explain productivity and competitiveness as value generators in the education sector?

2. METHODOLOGY

The systematic literature review was conducted following the PRISMA guidelines, as outlined by Page et al. (2021). The methodological process is described below.

Eligibility Criteria

The review included papers that focus on activities and strategies for knowledge management, measured through IC, within the context of education. Papers were selected based on the following criteria:

- Examination of the contribution of knowledge to generating competitiveness or productivity in the context of education.
- Inclusion of IC measurement processes.
- Use of *mixed research synthesis*, particularly *integrated design*, to minimize methodological differences between qualitative and quantitative studies (Anguera, 2023).

Conversely, papers were excluded based on the criteria listed below:

- Limited access to the full text.
- Context of application unrelated to education.
- Focus on a specific artifact, system, or process for managing knowledge related to a single type of IC (e.g., human, relational, or structural), without considering the holistic nature of educational institutions.
- Explanation of an event or variable influenced by knowledge management or IC.
- Lack of empirical evidence in their measurement processes or results unrelated to competitiveness and productivity.

Information Sources

The Scopus database was selected for its extensive coverage (Vera-Baceta et al., 2019). The search was conducted on September 30, 2023, and covered publications from 1998 to 2023. Other databases, such as Web of Science, were not included as the review aimed to deepen the methodological analysis of selected cases. This approach aligns with the PRISMA methodology's objective of presenting clear and concise data to support decision-making (Urrútia & Bonfill, 2013).

Search Strategy

The search focused on three analytical categories: knowledge management, intellectual capital, and education. Using the Scopus database, the search was conducted in the title, abstract, and keywords fields with the following search string: TITLE-ABS-KEY ("knowledge management" AND "Intellectual capital" AND education). This query returned 206 documents, of which 81 were articles.

Article Selection Process

The article selection process followed the sequence illustrated in Figure 1 and involved the following steps:

- Retrieval of articles from the Scopus database.
- Review of abstracts to identify potential articles for inclusion. This step involved the use of an Excel matrix to apply the inclusion criteria systematically.
- In-depth review and coding of selected articles using NVivo software.
- Final inclusion of articles that met all established criteria.

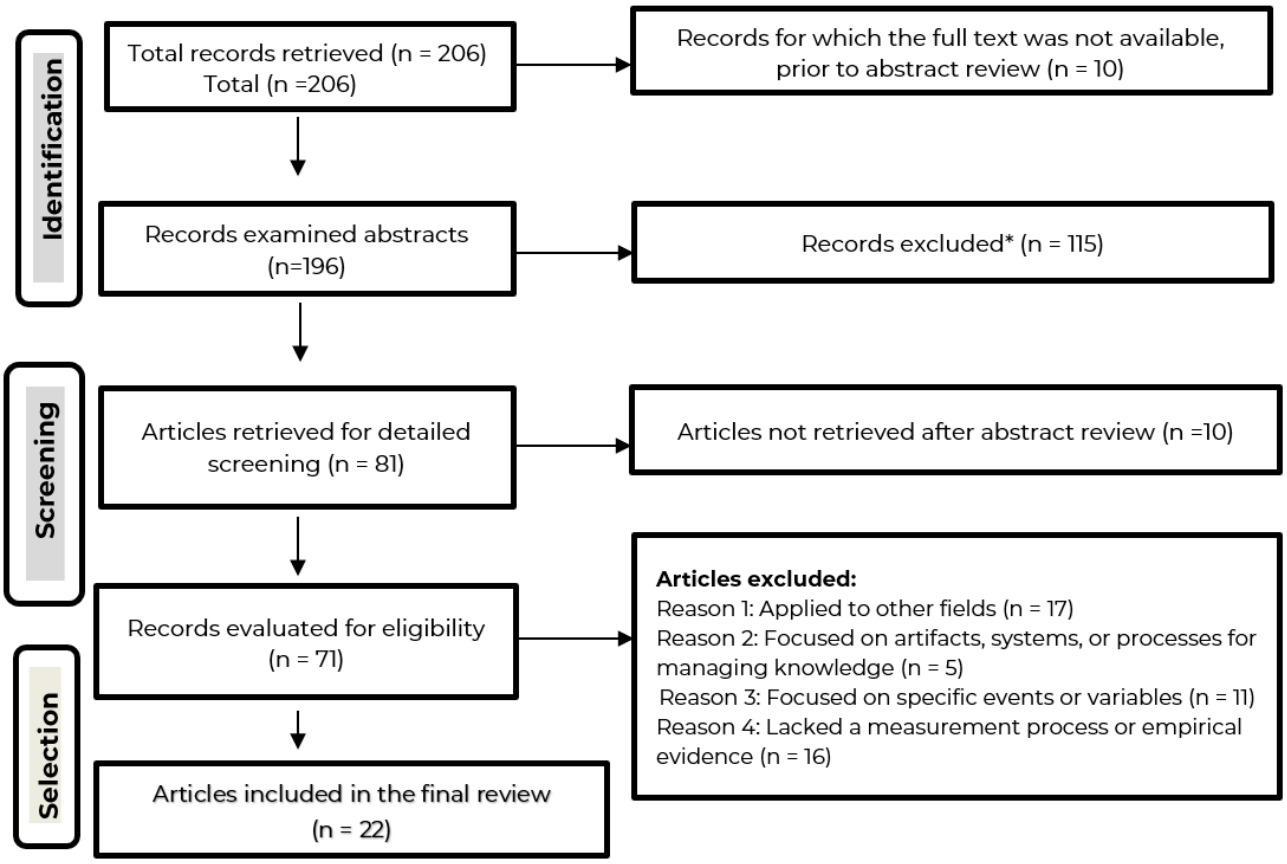

Figure 1. Identification, screening, and selection of papers using the PRISMA methodology. Source: Own work based on Page et al. (2021).

Data Elements

The articles were analyzed from various dimensions, including authorship, sample characteristics, methodology, variables, and results. Particular emphasis was placed on competitiveness and productivity as outcomes of knowledge management and IC measurement in education. Additional factors, such as training levels and institutional type, were also considered.

Risk of Bias Assessment

Abstracts of relevant studies were reviewed to identify advancements in the education sector regarding IC and knowledge management and their relationship with competitiveness and productivity. The findings were reported according to the PRISMA guidelines. NVivo software was employed to code the articles, facilitating the identification of competitiveness and productivity elements and their association with variables such as drivers, constraints, and benefits derived from knowledge management and IC.

Effect Assessment

The context of each study was examined through variables such as authorship, country, sample, methodology, and results derived from managing IC. The relationship between the various types of IC and both internal and external factors affecting educational organizations was also analyzed.

Synthesis Methods

The cases were classified based on their outcomes in productivity (internal capacity) and competitiveness (impact on stakeholders), assessed both separately and jointly. These outcomes were attributed to knowledge management and measured through at least one type of IC: human, structural (organizational and technological), or relational (business and social). Comparative tables were employed to summarize the methodological elements and key findings of each study

Analysis Strategies

The articles were analyzed to contextualize competitiveness and productivity as outcomes of knowledge management and IC measurement in education. This analysis also considered the associated variables and institutional benefits. A triangulation approach was adopted to classify the literature, focusing on the conceptualization of productivity and competitiveness while describing and analyzing the treatment of data in the selected studies.

3. RESULTS

The 22 selected papers discuss outcomes related to competitiveness and productivity stemming from actions, activities, and processes in knowledge management, measured through IC. These results impact individual and collective learning experiences (Sivagami & Umamaheswari, 2019), highlighting a bidirectional relationship. The contributions are categorized as productivity-focused (18.1%), competitiveness-focused (31.9%), and those that integrate both dimensions (50%).

Results Focused on Productivity

The reviewed literature does not explicitly define productivity. Instead, it associates the concept with teaching activities, particularly research output (Santos Ferreira et al., 2019) and its dissemination (Ramírez et al., 2019). Productivity is also linked to the development of basic skills and the improvement of educational services (Marulanda-Grisales & Vera-Acevedo, 2022a). Moreover, the selected studies demonstrate that identifying and measuring IC enhances the efficiency and quality of service delivery (Prokopenko, 1989) (see Table 1).

Productivity has been approached from a variety of perspectives. For instance, Kumar (2020) highlights the complementarity of IC indicator reporting with financial reporting. The author analyzes statistics derived from the achievement of strategic goals in different institutions and measures productivity in terms of the contribution of IC to corporate governance and decision-making in research to enable efficient management and accountability (Rojas & Espejo, 2020).

For their part, Kędzierska and Wnęk-Gozdek (2015), using content analysis and surveys, investigate the role of technology in knowledge management and its impact on the enhancement of IC. Their findings connect this enhancement to sectoral shifts that improve teaching–learning processes. These results contribute to the ongoing discussion on how knowledge management and IC influence academic knowledge production and exchange (Quarchioni et al., 2022), as well as their interplay with information and communication technologies (Gârdan et al., 2018).

Similarly, Guerrero and Monroy (2015), through an exploratory and descriptive study, analyze the relationship between intangible resources and the strategic management of Higher Education Institutions (HEIs). This study reveals the limited attention HEIs allocate to these resources and proposes a framework to strategically integrate them to impact productivity. Such framework includes managing strategies, developing valuation systems, integrating the value chain through intangible resource management, and implementing communication strategies. In addition, this approach aligns with the requirement to link IC with HEI strategic objectives (Marulanda-Grisales & Vera-Acevedo, 2022a).

Moreover, Laoufi et al. (2011) explore productivity improvement through knowledge capitalization by employing e-learning modules based on knowledge management principles. They highlight how new technologies enhance training and learning capabilities and advance systemic knowledge management practices in educational environments (Abu-Rumman, 2018). This approach is deemed essential for managing IC effectively.

All these cases measuring IC in relation to productivity (institutional capacity) are summarized in Table 1. Key findings include the achievement of strategic goals, the fulfillment of teaching–learning objectives in specific modalities, and the use of intangible resources to attain institutional targets. These findings demonstrate that knowledge management transcends the administrative domain and adopts a transversal approach aimed at enhancing teaching, research, and knowledge transfer (the “third mission”).

Table 1. Studies about the concept of productivity in the field of knowledge management and intellectual capital

Tabla 1. Casos identificados vinculados con el concepto de productividad en el marco de la gestión del conocimiento y el capital intelectual

Authors	Country	Methodology	Sample	Variables	Findings
Kumar (2020)	India	Collection, analysis, and reporting of indicators from the three dimensions of IC	Financial and non-financial asset reporting using Pondicherry University statistics (2013–2014)	Human, relational, and structural capital	Institutions individually define strategic objectives for IC management.
Kędzierska and Wnęk-Gozdek (2015)	Poland	Content analysis	Surveys with supervisors	ICT in education, media in education, digital didactics, and modern didactic methods and forms	The evolution of virtual education and student profiles is based on connectivism as well as decisions on the use of resources for teaching and learning.

Authors	Country	Methodology	Sample	Variables	Findings
Guerrero and Monroy (2015)	Spain	Exploratory and descriptive research	247 professors, primarily board members from HEIs across 14 countries	Strategic management, knowledge management, branding, organizational reputation, and social responsibility	A positive correlation exists between intangible resources and strategic management, though their strategic potential is underutilized in HEIs.
Laoufi et al. (2011)	Morocco	Knowledge management experiments	900 students, 45 professors, and 15 administrative and technical staff members	Exploration, capitalization, management, retrieval, and knowledge base development	E-learning fosters collaborative learning, enabling the capture and utilization of IC contributions from stakeholders. This supports knowledge management in both administrative and substantive functions.

Source: Own work based on the studies by Kumar (2020), Kędzierska and Wnęk-Gozdek (2015), Guerrero and Monroy (2015), and Laoufi et al. (2011).

Results Focused on Competitiveness

The selected studies on competitiveness are summarized in Table 2. Effective IC management is considered fundamental to achieving competitive advantage by enabling organizations to create value and differentiate themselves in turbulent markets (Edvinsson, 1997). In the context of education, the concept of *academic competitiveness* emerges as the ability to create value from academic resources and capabilities to create a broader impact on the entire context (Del Castillo, 2019). The results of academic competitiveness are higher student enrollment and improved funding sources, which requires balancing collaboration and competition among universities (Ramírez et al., 2019).

Among the studies that measure knowledge management through IC using a quantitative and longitudinal approach is the work by Rojas and Espejo (2020). Their study analyzes the efficiency of research investment over the period 2003–2015, with findings indicating an increased capacity for collaboration in joint projects and enhanced recognition and reputation (Davey & Tatnall, 2007; Guerrero & Monroy, 2015). The authors utilize Analysis of Covariance (ANCOVA) and panel data methodologies to demonstrate the complementarity among human, relational, and structural capital.

Cheng (2017) and Santos Rodrigues et al. (2015) employ structural equation modeling to explore the effects of knowledge management and IC measurement. Cheng demonstrates the effectiveness of knowledge management strategies such as personalization and codification, with a focus on human and structural IC in the context of elementary schools. This work underscores how competitive advantage in education stems from knowledge derived from employee experience, transferable skills, infrastructure policies, and practices that foster innovation and drive changes through IC management (Yu et al., 2022).

For their part, Santos Rodrigues et al. (2015), investigate the relationship between leadership and IC, emphasizing human capital as a driver of economic renewal while excluding relational and structural capital. Regarding competitiveness, their findings suggest that innovation fuels economic renewal, which arises from University–Business partnerships as a strategic approach to IC management (Gârdan et al., 2018; Iles & Yolles, 2002; Secundo et al., 2017).

Ramírez et al. (2019) assess the quality of IC dissemination in Spain, analyzing the content of institutional websites and conducting surveys to gather stakeholder feedback. Their framework aligns with that of Santos Rodrigues et al. (2015), prioritizing human capital over relational and structural capital. The study recommends allocating resources to staff training and research strengthening, as these are considered the most tangible evidence of IC, given the limited availability of information and tools for effective knowledge management in HEIs (Secundo et al., 2017).

Secundo et al. (2010) examine the role of IC in the third mission of universities, which encompasses managing knowledge production, use, application, and exploitation in collaboration with external actors to create value. Focusing on four representative European universities, the study contributes to the development of IC indicators at both the national and institutional levels. Furthermore, the authors argue that while university rankings effectively assess the first and second missions (education and research), IC is essential for assessing the third mission, which centers on knowledge transfer (Lehmann et al., 2009).

Brusca et al. (2018) illustrate the value of IC reporting in the context of sustainability through a case study. Their findings emphasize the importance of not only documenting the IC generated but also explaining the processes through which value is created. This aligns with the concept of collective intelligence, which connects stakeholders to achieve the third mission of universities (Secundo et al., 2017). The conclusions are based on triangulated data gathered through interviews, secondary sources, and social network analysis.

Lastly, Meissner and Shmatko (2017) highlight the need to fulfill knowledge gatekeeper functions to enhance competitiveness. They identify a rivalry for access to open information and control of communication channels, which is exacerbated by the absence of public policies that account for the specificities of institutions. In addition, these policies must promote modernization and innovation as key enablers for IC management and measurement within the framework of corporate governance (Ramírez et al., 2019).

The findings presented in this section confirm that measuring IC significantly enhances institutional competitiveness (Bontis, 2001). Competitiveness, in this context, is characterized by a positive impact on stakeholders, driven by superior performance leveraging the potential of relational capital. Relational capital, in turn, facilitates outcomes in critical areas such as sustainability, knowledge transfer, innovation, and community engagement. Furthermore, generational transition is supported through strong institutional leadership, fostered by the strategic implementation of knowledge management practices.

Table 2. Studies about the concept of competitiveness in the field of knowledge management and intellectual capital

Tabla 2. Casos identificados vinculados con el concepto de competitividad en el sector educativo en la gestión del conocimiento y el capital intelectual

Authors	Country	Methodology	Sample	Variables	Findings
Rojas and Espejo (2020)	Colombia	ANCOVA regression model with panel data	39 records and observations between January 2003 and December 2015	Variables related to IC, including human capital, structural capital (organizational, technological, and relational aspects with business and social dimensions), and scientific research	As a result of IC management, by combining the investment of the components of intellectual capital, some are likely to reverse their investment or maintain a higher ROI than invested, as a result of IC management.
Ramírez et al. (2019)	Spain	IC measurement based on website content analysis	Websites of 50 Spanish public universities in 2016 and surveys among social committees	Structural capital, relational capital, and human capital	Universities disclose more about human capital than relational or structural capital, but the quality of structural capital disclosures surpasses the others.
Brusca et al. (2018)	Spain	Case study	Semi-structured interviews and documentary analysis	Social value and sustainability	Universities are required to inform stakeholders about their progress regarding IC, intangible resources, and efforts addressing social dimensions, sustainability, and stakeholder concerns.
Secundo et al. (2010)	Europe	Conceptual framework and proposed indicators in exploratory research	15 experts from eight European countries (Austria, Greece, Italy, Latvia, Lithuania, Poland, Romania, and Spain)	Third mission (continuing education, technology transfer and innovation, and social commitment) based on human, organizational, and social IC	The strategic dimension involves the development of university policies and strategies for medium- and long-term planning. The operational dimension addresses data management for the development of programs and initiatives.
Meissner and Shmatko (2017)	Russia	Surveys and interviews	Mixed	Relationship between *gatekeepers* and *gate openers* as regulators of technological innovations for transfer to industry	Management of IC faces challenges from regulatory framework differences, communication structure gaps, and issues in scientific integrity standards and generational transitions.
Cheng (2017)	Hong Kong	Two-phase experimental design: surveys and interviews supported by structural equation modeling	445 teachers from 13 elementary schools in Hong Kong	Exogenous variables: personalization and codification; Endogenous variables: human capital and structural capital	The strategy for knowledge capitalization involves personalization and codification. Personalization is a predictor of human capital, while knowledge codification supports problem-solving.
Santos Rodrigues et al. (2015)	Portugal	Structural equation modeling using partial least squares	195 academics from 52 countries	Leadership, human capital, relational capital, structural capital, and economic renewal	Leadership has a direct and positive impact on human, structural, and relational capital. Human capital positively influences structural and relational capital, fostering responses to academic, research, and industry demands.

Source: Own work based on the studies by Brusca et al. (2018), Cheng (2017), Meissner and Shmatko (2017), Ramírez et al. (2019), Rojas and Espejo (2020), Santos Rodrigues et al. (2015), and Secundo et al. (2010).

Results Focused on Productivity and Competitiveness

Approximately 50% of the identified cases report results related to productivity and competitiveness (see Table 3). According to Marulanda-Grisales and Vera-Acevedo (2022a), structural equations and Likert-type questionnaires are among the most important methods for assessing human, relational, and structural capital within a faculty. These studies analyze the development of core competencies, including research, technology management, financial support for human resources, and interdepartmental initiatives. They also consider factors such as rewards, staff retention, and institutional image and branding (Muneeb et al., 2020, p. 900). This approach demonstrates that competitiveness is driven by stakeholder needs, while productivity is linked to the enhancement of core competencies and academic quality. Additionally, it explains the relationship between IC and coherent assurance systems (Handzic & Ozlen, 2011; Sánchez & Elena, 2006).

Similarly, Iqbal et al. (2019) used structural equation modeling to examine the mediating role of IC and innovation in university performance. Their study identified enablers such as leadership, senior management support, human resource practices, organizational culture, structure, climate, and technology (Iqbal et al., 2019). These enablers facilitate knowledge management by leveraging organizational and cultural elements (Rivera & Rivera, 2016). Furthermore, effective IC and knowledge management has been shown to foster competitive advantages to commercialize the innovations. In contrast, productivity is not solely influenced by investments; it is the result of efficiency, performance, and the ability to drive change and achieve organizational goals. This perspective positions universities as entrepreneurial entities capable of transferring knowledge (Marulanda-Grisales & Vera-Acevedo, 2022b).

Ibarra-Cisneros et al. (2023) contribute to this discussion by focusing on the role of leadership, culture, and organizational incentives in shaping knowledge management. Their study examines how knowledge management, IC, and innovation collectively influence the performance of HEIs. To this end, it targets faculty and administrative support staff and excludes managers, who may offer a different perspective. In addition, the study links competitiveness to knowledge management for product and service innovation and productivity to IC management. However, it faces challenges due to the limited evidence on the actual implementation of knowledge management strategies (Chau et al., 2017; Quarchioni et al., 2022).

For his part, Abu-Rumman (2018) explores both facilitators and inhibitors of knowledge management, identifying factors that drive success and those that hinder implementation. The study emphasizes that technology is influenced by sociocultural factors, including organizational culture, national culture, collective programming, monetary and implicit reward systems, reputation, personal development and status, organizational structure, and leadership. Conducted at three Jordanian universities using judgment sampling and Likert-scale surveys, the study finds that competitiveness stems from knowledge assets that promote specialization and differentiation. Productivity, on the other hand, depends on continuous improvements and performance optimization, enhancing knowledge-sharing efficiency.

Roy et al. (2019) use structural equation modeling to present a framework that examines the interplay and impact of Research and Development (R&D) practices on the success of new Product Innovation (PI), alongside technology (information and collaboration) and learning. The study

demonstrates that learning is positively associated with IC. Competitive advantage arises from learning, while productivity fosters the improvement of practices and the creation of incentives to encourage innovative behaviors—key drivers of IC (Zhang and Lv, 2015).

Moreover, Franco-López et al. (2019) propose a methodology to measure human and structural capital within a research center, utilizing the Intellectus model developed by Bueno et al. (2011). Through type-2 fuzzy logic techniques and the MATLAB toolbox, the authors simulate IC generation, revealing that knowledge management acts as a competitive advantage by enhancing productivity. The key factors that generate IC include fostering values and attitudes, specialized human capital training, organizational patterns aligned with IC policies, and effective knowledge capture and transfer. These factod are further supported by the development of soft skills.

Santos Ferreira et al. (2019) present a model for measuring IC as a mechanism to promote meritocracy. Their approach, grounded in descriptive methods involving interviews and surveys, defines IC as a combination of explicit knowledge (e.g., manuals, formulas, procedures) and tacit knowledge (e.g., experiences, know-how, motivations, insights, worldviews). The model incorporates pedagogical dimensions, engagement, mentoring, and performance, emphasizing the real-world value of teaching productivity and competitiveness. This value extends beyond academic degrees to include actions across various dimensions that drive performance-based compensation, which is considered a key IC benefit (Bocean, 2010).

In another line of research, Handzic and Ozlen (2011) contrast faculty and student perceptions, building on previous conceptual frameworks and measurement models to underscore the importance of knowledge management and IC in universities. The authors highlight the value of competitiveness in attracting international students, citing a positive image created by quality research, cutting-edge technologies, and strategic and inclusive management. Additionally, the study emphasizes strategic deployment, financial sustainability, and productivity in fulfilling institutional missions, ultimately contributing to improved quality of life (Guerrero & Monroy, 2015).

Del Castillo (2019) develops a descriptive framework for competitiveness indicators in education, dividing them into the following categories: teaching, research, employability, graduate studies, internationalization, and accreditation. In teaching, competitiveness is based on teaching staff size and distribution; in research, it focuses on academic productivity through patents, publications, and researcher classification; in employability, it measures the level of acceptance and credibility of human resources in the labor market; in graduate studies, it considers the range and quality of programs offered; in internationalization, it assesses visibility in rankings and international agreements; lastly, in accreditation, it is gauged by the number of accredited programs. Furthermore, the study underscores that IC comprises intangible assets essential for institutional and student performance (Szathmary-Miclea, 2013).

Kaplan and Norton (2016), for their part, link intangible resources to organizational performance using the balanced scorecards applied by Chau et al. (2017). Their study highlights the conditions for efficient knowledge transfer, focusing on productivity and competitiveness measures. However, they identify a lack of a holistic perspective, emphasizing the need for better coordination and complementary activities to improve these conditions.

Finally, a case study by Akhavan and Khosravian (2016), employing a descriptive correlational approach, focuses exclusively on students and is grounded in a literature review. The paper examines the impact of knowledge exchange on knowledge management and its influence on competitiveness. In this context, competitiveness is understood as the ability to use knowledge effectively to enhance productivity. Indeed, the creation, accumulation, exchange, and integration of knowledge are seen as key drivers of organizational value.

Several findings indicate that measuring IC leads to an improvement in productivity (internal capacity) and competitiveness (impact on stakeholders) by leveraging knowledge to develop core organizational functions. Moreover, studies that analyze both concepts together highlight the importance of a balance between achieving institutional goals and responding to stakeholders' needs, particularly in terms of the relevance of organizational processes. This balance is largely attributed to the organization's capacity to learn through the strategic use of knowledge.

The above suggests that management in educational institutions effectively employs knowledge management to enhance organizational performance. This process is supported by a organizational culture, the creation of incentives, and leadership that encourages the exchange and application of knowledge for innovation. Collectively, these factors contribute to the development of competitive advantages, as shown in Table 3.

Table 3. Studies linking competitiveness and productivity to knowledge management and intellectual capital

Tabla 3. Casos identificados vinculados con los conceptos de la competitividad y la productividad en la gestión del conocimiento y el capital intelectual

Authors	Country	Methodology	Sample	Variables	Findings
Marulanda-Grisales and Vera-Acevedo (2022a)	Colombia	Multivariate analysis using Structural Equation Modeling (SEM)	335 professors from two faculties of a public HEI	Research, financial support, knowledge transfer, human resources, information systems, interdepartmental initiatives, and image	Relationships between intangible IC resources and core activities become core competencies of HEIs.
Santos Ferreira et al. (2019)	Brazil	Descriptive case study from the Program of Recognition of Faculty Body Merit	Interviews with senior management and questionnaires for professors	Indicators at multiple levels, including general, sectoral, specific, relationship, and inter-course levels, as well as dimensions such as pedagogy, engagement, mentoring, and performance	IC measurement takes into account institutional goals and stakeholders' expectations and needs.
Franco-López et al. (2019)	Colombia	Type-2 fuzzy logic techniques and the MATLAB toolbox to validate indicators	16 researchers responding to a 54-question Likert-scale questionnaire	Relationship between knowledge management and IC, in addition to human, relational, and structural capital (organizational and technological) with organizational learning capacity	A shift in IC measurement is needed, focusing on belonging commitment, and organizational guidelines.

Authors	Country	Methodology	Sample	Variables	Findings
Iqbal et al. (2019)	Pakistan, Spain, China	Structural Equation Modeling (SEM), the Preacher and Hayes (2008) approach	217 academic and administrative staff from research universities in Pakistan	Knowledge management enablers: leadership, culture, and incentives. Knowledge management processes: acquisition, exchange, and usage. Innovation: speed and quality. Intellectual capital: human, relational, and structural. Organizational performance	Knowledge management processes and their enablers (leadership, culture, and incentives) significantly and positively affect IC in university performance.
Roy et al. (2019)	India	Structural Equation Modeling (SEM)	380 entrepreneurs from Indian manufacturing firms	Focus on product innovation: technology, IC, research and development, learning, improvisation, and entrepreneurship	There is a positive relationship between IC and learning.
Del Castillo (2019)	Mexico	Case study	Analysis of the ranking information published by the *América Economía* journal	Dependent variables: competitiveness in teaching, research, employability, graduate studies, internationalization, and accreditation. Independent variables: human, relational, and structural capital	The proposal prioritizes nine indicators within human capital (researchers, full-time professors, PhDs, National System of Researchers, and professors with graduate studies), relational capital (scholarship recipients, graduates, conferences attended), and structural capital (graduate programs).
Abu-Rumman (2018)	Jordan	Quantitative study based on a theoretical pragmatic approach	3 universities selected through judgment sampling	Structural, human, and relational factors	There are inhibitors and enablers of IC and knowledge management aimed at enhancing future competitive advantage.
Chau et al. (2017)	United Kingdom	Instrumental case	Interviews	Organizational alignment and university–industry interaction	The study highlights the lack of a holistic view of the functions and how they complement and coordinate actions in IC.

Authors	Country	Methodology	Sample	Variables	Findings
Akhavan and Khosravian (2016)	Not specified	Descriptive and correlational study: literature review	352 students	Knowledge exchange: motivation, easiness, and behavior; intellectual capital: human, relational, and structural	Knowledge exchange among students facilitates the generation of human capital due to what it entails.
Handzic and Ozlen (2011)	Bosnia-Herzegovina	Literature review: contrast with primary and secondary sources	32 professors and 34 students (economics, engineering, education)	Human, structural, and relational capital	The study highlights some conceptual and methodological issues related to IC by presenting a model specifically adapted for universities.
Ibarra-Cisneros et al. (2023)	Mexico-Spain	Structural Equation Modeling	435 academics	IC, organizational culture, incentives, leadership, knowledge management, and innovation	Organizational culture and leadership significantly influence knowledge management and innovation.

Source: Own work based on the studies by Abu-Rumman (2018), Akhavan and Khosravian (2016), Chau et al. (2017), Del Castillo (2019), Santos Ferreira et al. (2019), Franco-López et al. (2019), Handzic and Ozlen (2011), Ibarra-Cisneros et al. (2023), Iqbal et al. (2019), Marulanda-Grisales and Vera-Acevedo (2022a), and Roy et al. (2019).

4. DISCUSSION

The research agenda on value creation through IC in the educational sector faces methodological challenges. Given the contextual nature of knowledge management, studies often focus on varying topics in response to ongoing developments in the IC landscape (Bellucci et al., 2021). For instance, it is essential to examine how IC differs across different types of institutions (Del Castillo, 2019), with a focus on the impact of reports on productivity and efficiency. These reports function not only as a dissemination tool but also as a management instrument (Bellucci et al., 20211; Rojas & Espejo, 2020). Also, the mediating role of knowledge management and IC in fostering innovation should be further investigated (Gârdan et al., 2018, p. 650; Iqbal et al., 2019, p. 39), as well as the impact of managing different types of capital on the third mission of universities (Secundo et al., 2017).

Research in the field of knowledge management highlights the long-term benefits of IC in generating value (Brusca et al., 2018), both internally and externally. Internally, it increases productivity, driving continuous improvement and ensuring the fulfillment of quality commitments. Externally, it strengthens competitiveness by leveraging collective intelligence to improve stakeholder relationships, facilitate knowledge transfer, create networks, and foster innovation. All of these elements support the third mission of universities through social interaction mechanisms and networks (Birtchnell et al., 2017).

Although the study of IC and knowledge management requires a long-term perspective on value creation, there is currently only one longitudinal study available (Rojas & Espejo, 2020), which highlights the need for further research in this area (Santos-Rodrigues et al., 2015). Additionally, the lack of theories and measurement models specifically tailored to the educational sector (Alghail et al., 2021) represents a significant gap, as these models are crucial for complementing quality assurance systems and financial information (Ramírez et al., 2019). Moreover, these models are fundamental for the implementation of policies that promote organizational learning (Egbu, 2004), and therefore play a key role in the modernization of HEIs.

Regarding the focus of this study, quantitative research has explored the relationship between knowledge management and IC (Santos Ferreira et al., 2019), examining external variables such as knowledge enablers and strategies for strengthening core competencies (Marulanda-Grisales & Vera-Acevedo, 2022a). This body of research has identified key factors that promote knowledge management and IC. Such factors include alignment with institutional goals (Santos Ferreira et al., 2019), as well as management support and leadership to promote knowledge through innovative practices (Kumari et al., 2023). They also involve cultural changes driven by the creation of incentives (Ibarra-Cisneros et al., 2023), among other aspects.

Mixed-method approaches have also emerged as a solution to address research gaps in the field (Bellucci et al., 2021). Such approaches incorporate different indicators, statistical analyses, institutional self-reports, content analysis, and stakeholders' perceptions gathered through surveys and interviews. Two main models have been developed for measuring IC and knowledge management. The first, Intellectus, is a business-oriented model that focuses on two types of intellectual capital (human and structural) but is not specifically adapted to the educational sector (Bueno et al., 2008). The second is the balanced scorecard model, which monitors objectives based on intangible assets. This model could be effectively applied to the educational sector if it is appropriately contextualized. To achieve this, it is essential to recognize the different types of capital—human, relational, and structural—and the factors that influence knowledge management (Sánchez & Elena, 2006). This, indeed, presents a valuable opportunity for advancing research in this area.

The articles reviewed can be grouped into two categories. The first group, on the one hand, provides contextualized results that explain the specific characteristics of institutions (Kędzierska & Wnęk-Gozdek, 2015; Kumar, 2020). The second group, on the other hand, presents findings that can be generalized to the educational systems of countries such as Spain and Morocco (Guerrero & Monroy, 2015; Laoufi et al., 2011). These studies highlight the underutilization of intangible assets from a strategic perspective of IC (Szathmary-Miclea, 2013), emphasizing the balanced use of technology (Alghail et al., 2021). Such phenomenon is recognized as both a research trend and as a driver of IC generation.

In comparing private and public research contexts, there is a need for multi-group analysis to evaluate the effectiveness of knowledge management and derive meaningful practical implications (Iqbal et al., 2019). The private sector is characterized by its responsiveness and managerial reorientation to implement knowledge-based corporate governance (Kumar, 2020). In contrast, the public sector prioritizes accountability, primarily from a financial perspective, often overlooking IC generation (Secundo, 2017).

Research on IC demonstrates impacts on productivity, such as improving academic and financial performance (Battaglia et al., 2022; Santos Ferreira et al., 2019; Gârdan et al., 2018; Iacuzzi et al., 2021), promoting growth and sustainable development (Alghail et al., 2021), and enhancing collaborative learning capabilities (Yu et al., 2022). In addition, IC helps institutions achieve its goals, ensures operational efficiency, and strengthens expertise in key performance areas (Tjahjadi et al., 2019). These outcomes extend beyond teaching productivity, thereby promoting institutional comprehensiveness through the use of knowledge to drive continuous improvement and transparency in management.

The benefits of IC are not limited to increasing productivity (internal performance). It boosts competitiveness as well through innovation (Egbu, 2004; Yu et al., 2022), differentiation, and the generation of future added value (Battaglia et al., 2022). Additionally, it supports the development of competitive advantages, entrepreneurship, and knowledge transfer (Marulanda-Grisales & Vera-Acevedo, 2022a). Also, it enhances credibility in society and reputation (Tjahjadi et al., 2019), along with improved academic competitiveness in areas such as accreditation, internationalization, graduate offerings, employability, and research (Del Castillo, 2019), which positions institutions as benchmarks for best practices in the sector (Almuayqil et al., 2015).

To overcome existing limitations, future research should focus on defining metrics (Chau et al., 2017; Secundo et al., 2017), standardizing indicators (Bellucci et al., 2021), and employing statistical methods (Santos-Rodrigues et al., 2015), including correlation models to explain cause–effect relationships (Secundo et al., 2017). This requires methodologies that redefine the role of universities as both knowledge providers and producers (Chau et al., 2017), especially in the public sector (Secundo et al., 2017). These methodologies should also be linked to performance outcomes (Iqbal et al., 2019), the achievement of learning outcomes (Bellucci et al., 2021), and the fulfillment of the third mission of universities (Secundo et al., 2017). In addition, it is essential to adopt measurement models tailored to the educational sector, such as the Intellectus model (Bueno et al., 2011), the Intellect model (Euroforum Escorial, 1998), and the Intellectual Capital Maturity Model (ICMM) (Leitner et al., 2014).

5. CONCLUSIONS

Research on knowledge management and IC is still in its early stages, with progress and consensus largely through a mixed-method approach. Most studies take a transversal perspective, examining different types of capital, key elements, enablers (drivers), inhibitors (barriers), and actors and participants (administrators, faculty, and students). These efforts play an important role in advancing the third mission of universities, which ensures the transfer of knowledge to drive institutional change, modernization, and renewal. This approach is based on principles of productivity aimed at improving practices, ultimately enhancing institutional performance.

Future research should focus on developing models to measure IC and creating guidelines for corporate governance specifically in the educational field. These frameworks should strategically integrate knowledge management and be framed within the broader objectives of education quality and internationalization to enhance competitiveness. Furthermore, it is essential to explore the social mechanisms that promote knowledge exchange. These mechanisms must go beyond mere data repositories, enabling the use and transformation of both tacit and explicit knowledge to drive

continuous improvement. Additionally, since one of the limitations of this study is its reliance on a single database (Scopus), there exist opportunities for replication using other databases.

Finally, the potential of IC measurement tools to report on value creation is evident. These tools should align with quality assurance systems and science and technology frameworks, harmonizing the different types of capital—human, relational, and structural. This alignment can not only improve the understanding of organizational performance (productivity) but also have an impact on stakeholders (competitiveness).

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CONFLICTS OF INTEREST

The authors declare that they have no financial, professional, or personal conflicts of interest that may inappropriately influence the results achieved or the interpretations proposed.

AUTHORS' CONTRIBUTIONS

All authors contributed equally to the conceptualization, research, methodological design, and writing of the final version of this article.

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