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University management based on intellectual capital: a study case with three Colombian universities

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Abstract

Purpose – This study aims to enhance the understanding of university management as a crucial aspect for ensuring the continuous improvement and quality assurance of institutions, considering that universities are knowledge-based institutions and proposing a framework based on intellectual capital and specific university management activities based on its components and measuring these activities in three Colombian universities. The study presents the main activities requiring improvement and identifies common patterns among universities with diverse characteristics in this country.

Design/methodology/approach – This study employs a multiple-case study design, examining three Colombian universities and utilises Likert-scale surveys to assess management activities in relation to intellectual capital components. A Kruskal–Wallis test reveals significant differences among institutions; however, the data indicate convergence in the main activities that require improvement.

Findings – The findings reveal convergent results across three Colombian institutions regarding management activities with higher and lower compliance, indicating that these activities require improvement in universities with diverse characteristics. Otherwise, the Kruskal–Wallis test identified significant differences across the universities' measures, showing that the results are not standardised values across the institutions.

Originality/value – The innovative aspect of this study lies in identifying management activities based on intellectual capital components to enhance university management and measuring them across three Colombian institutions as well as identifying common patterns that require improvement within these institutions. Unlike most studies, which focus on measuring intangible resources, this research identifies management activities that drive institutional improvement.

Keywords University management, University administration, Intellectual capital, Human capital, Structural capital, Relational capital

Paper type Research paper

1. Introduction

To guarantee continuous improvement and ensure quality, universities must establish effective management mechanisms, paying attention not only to aspects related to the quality of teaching and learning processes but also to the improvement of organisational aspects and related processes, to thrive in more dynamic environments and achieve more sustainable results. According to Camilleri (2021) Universities' performance requires the development of capabilities to generate innovation and learning processes, optimise internal processes, and involve their stakeholders.

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Thus, educational institutions must prioritise, in addition to academic aspects, issues related to university management to increase organisational capacities for quality assurance. In this sense, it is necessary to develop effective mechanisms to advance in such management, especially in the context of a constantly changing environment, diverse global demands, and recurring budget cuts for government support of educational institutions. For this reason, universities must implement mechanisms that contribute to their development, improving their internal organisation, diversifying, innovating, and transforming themselves into high-performance organisations (de Waal and Kerklaan, 2015).

In this context, fostering a culture of innovation becomes essential, enabling universities to respond effectively to these challenges by integrating innovative practices across all areas of their operations. This includes strengthening collaboration among academia, industry, and government to drive knowledge transfer, enhance research impact, and align institutional goals with societal needs (Monticelli *et al*., 2024).

At the same time, it should be considered that university management is complex due to the tripartite nature of the mission functions of these organisations, which include teaching, research, and outreach, their foundational objective of quality assurance, their complex organisational structures, including academic and administrative units, the diversity of actors such as professors, students, administrative staff and managers, and the stakeholders involved, including national and international partners and governmental agents.

Universities are characterised by their nature and mission as knowledge-based organisations, and knowledge is an intangible element that forms the central axis of the universities' mission through their substantive functions. That is why developing mechanisms for generating and sharing knowledge must address the fact that it is typically measured and managed through intellectual capital models (Stewart, 2010). In this way, institutions should establish management mechanisms that leverage intellectual capital, considering that intellectual capital enables the identification, measurement, and valuation of intangibles from a global perspective, thereby facilitating informed managerial decision-making (Secundo *et al*., 2015).

In the Colombian context, a new model of university management is needed to contribute to achieving better results and recognising its institutions internationally for their impact and quality, which is primarily measured by international rankings. Regarding Gabalán-Coello *et al*. (2022). Although approximately 40 universities are accredited by the Colombian government, their performance is heterogeneous, with significant differences in visibility and recognition at both national and international levels.

This article proposes activities that should be considered in university management for each intellectual capital component and presents a multiple-case study of three institutions in Colombia. It identifies the primary needs that must be addressed to improve organisational results and, therefore, the institutions' academic activities.

2. University management and intellectual capital

Within the scope of university management, it is essential to differentiate between two concepts, governance and management, even though some authors refer to both as management. University governance focuses on the structures and processes related to strategic decision-making, defining, and pursuing its goals and objectives (Lemaitre, 2016). It is also concerned with institutional organisation and how it relates to its educational community and external stakeholders, ensuring adequate structures and appropriate processes to respond to the changes and needs of the environment (Brunner, 2011). On the other hand, university management refers to a principle of effectiveness that facilitates the daily implementation of strategic decisions.

In this way, the definitions of university governance must be implemented through university management mechanisms, which include the processes and practices necessary to ensure the operation and development of the institutions and guarantee compliance with

organisational objectives. At the same time, it is crucial to strengthen effective decision-making processes, facilitating clear and decisive resolutions on the issues defined in institutional agendas. This approach ensures that the methods of discussion and analysis yield tangible outcomes that advance the institution's goals (Hill and Husband, 2023).

Both the governance and the university management should focus on the quality assurance of the institutions (Cifuentes Madrid, 2016) which is defined as the capacity of universities to organise their resources, processes, and results for the achievement of their internal objectives, given their identity, mission, and vision, responding to the needs and demands of stakeholders (Lemaitre, 2016). Similarly, Monticelli *et al*. (2024) present the objective of university academic management as making the best use of the institution's human, physical, and financial resources to achieve its strategic goals and fulfil its mission effectively, and contemplate aspects related to planning, organisation, leading, and controlling the work and behaviour of the people in the organisation.

Intellectual capital refers to the total intangible resources and non-financial assets an organisation possesses, which contribute directly to its capacity to generate value, innovate, and maintain a competitive advantage. Intellectual capital also focuses on managing and using intangible resources, such as tacit and explicit knowledge, organisational culture, intellectual property, and learning capacity. One of the most important aspects of understanding intellectual capital and its management is its relationship with tacit knowledge (Bontis, 1998), which enables individuals to develop the skills necessary to perform their organisational functions.

Studies on intellectual capital have largely focused on the definition of its components, finding that there is a great convergence in the definition of three components of intellectual capital: human capital, relational capital, and structural capital (Edvinsson and Malone, 1997; Stewart, 2010; Sveiby, 2018). In general terms, human capital encompasses the knowledge, skills, and experiences of the individuals that make up the organisation. Bontis (1998) adopts the four factors that define human capital at the individual level, as proposed by Hudson (1993): genetic inheritance, education, experience, and individuals' attitudes about life and business (or personal and professional development). For Inkinen (2015), human capital includes employees' intelligence, as well as their values, attitudes, aptitudes, skills, knowledge, abilities, capabilities, creativity, education, experience, motivation, commitment, loyalty, proactivity, leadership, flexibility, and learning capacity. In turn, Edvinsson and Sullivan (1996, p. 358) define human capital as "the collective capabilities of employees to solve customer problems," with the know-how and institutional memory of the organisation as its foundation.

Structural capital refers to the processes and structures that facilitate the optimal intellectual performance of people in the organisation through adequate systems and procedures that allow them to develop high-performance (Bontis, 1998). Structural capital provides an environment that encourages people to create and utilise their knowledge by fostering creative thinking. Inkinen (2015) includes employee support, structures, organisational knowledge, routines, procedures, processes, and development plans, as well as technological systems, databases, and intellectual property.

According to Saint-Onge (1996), structural capital is composed of four elements: strategy (the institutional objectives and the way to achieve them), structure (the grouping of activities and the relationships between the organisation's members), systems (how information, communication, and decision-making processes are articulated in the organisation), and culture (sharing opinion, values, and norms).

Additionally, it is important to mention that this capital includes aspects of explicit knowledge that can be documented and kept in writing, making this knowledge accessible and usable by all members (Hansen *et al*., 1999). This dimension is equivalent to what Huber (1991) calls organisational memory, referring to organisational knowledge about how to do things, operating procedures, and routines. For its part, Beltramino *et al*. (2020) defined as components of structural capital, including the acquisition of information and knowledge

management, organisational culture, communication, and cohesion, as well as structure, systems, and processes.

Relational capital is understood as the collaborative networks and relationships with customers, suppliers, and strategic partners that influence the organisation's position in its ecosystem, as well as the knowledge derived from the organisation's relationships with its stakeholders (Inkinen, 2015). The result of collaboration and interaction, through the sharing of ideas, allows new knowledge to be incorporated, made available, and utilised among individuals and their networks of interrelationships (Subramaniam and Youndt, 2012). Although most authors refer to relationships with external stakeholders, such as customers, competitors, allies, community members, and government entities, some authors, like Yang and Lin (2009), also include relationships with the organisation's internal stakeholders.

According to Carmona-Lavado *et al*. (2010), relational capital impacts strategic stakeholder relationships by managing information and developing cooperation and solidarity ties. Likewise, knowledge of strategic stakeholders and their needs is information that can create value for the benefit of the organisation and its stakeholders themselves (Joshi and Sharma, 2004).

Intangible assets are another important concept that should be addressed in understanding intellectual capital. According to Bontis' (1996, p. 2), "are those things that we cannot normally put a price on, such as experience, knowledge, and the organisational learning capacity of a company". According to Stewart (2010), for an asset to be considered intellectual capital, it must be able to be used to create wealth, so universities seek that through the knowledge possessed by people, which constitutes the intellectual capital available, it is possible to contribute to organisational development.

In this sense, Edvinsson (1997, p. 372) points out that "the challenge is to manage the process of intellectual capital development so that value-creating capabilities can be enhanced", and Bontis (1996, p. 1) affirms that "competitive success will be based less on how physical and financial resources are strategically allocated, and more on how intellectual capital is strategically managed". Inkinen (2015) states that the value-creation capability of organisations has shifted from tangible factors of production to intangible resources.

It is important to consider that research on intellectual capital can be focused on four main objectives:

(1) Conceptualisation and definition of intellectual capital and its components. Edvinsson (1997) has made some of the main contributions, as well as Bontis (1998) and Stewart (2003, 2010).

(2) Measurement of intellectual capital, which includes the Skandia Navigator by Edvinsson and Malone (1997), the Balanced Scorecard by Kaplan and Norton (1992), and other studies that propose financial or non-financial measures, including the works of Nazari and Herremans (2007), Sveiby (2018), Morady (2013), Ficco (2020), and Brusca *et al*. (2020).

(3) Management of intellectual capital. Authors such as Edvinsson and Sullivan (1996), Nonaka and Takeuchi (1995), Brooking (1997), Dinu (2022) have proposed mechanisms to improve intellectual capital management in organisations.

(4) Study of the relationship of intellectual capital with company performance or integration of intellectual capital into competitive strategies, including works proposed by Kamukama *et al*. (2010), Inkinen (2015), Hariyati *et al*. (2019), Lentjušenkova and Lapiņa (2020), and Bombiak (2023).

The study of intellectual capital in universities has been developed since the 2000s, and there are limited studies on the subject. One of the first to advance was Leitner *et al*. (2014), who proposed a conceptual framework for reporting intellectual capital in universities, highlighting the importance of the human, structural and relational components in generating and

transferring knowledge. Later, Sánchez and Elena (2006) developed specific indicators to measure intellectual capital in universities, highlighting its relevance in terms of transparency, internal management and contribution to mission functions (teaching, research and extension). For their part, Secundo *et al*. (2015) introduced a collective approach to managing intellectual capital, emphasising the strategic alignment of these resources with institutional competitive advantages.

In the Latin American context, Ramírez Corcoles (2011) analysed how universities manage intellectual capital to improve their sustainability and academic quality, identifying specific challenges for this type of institution. However, no work has been found that advances university management proposals based on management activities defined for each component of intellectual capital, which is the objective of this work. The studies on universities in Colombia are also limited, and as international works, have focused on measuring or managing intellectual capital, and many have linked it to knowledge-generation processes through research and innovation activities (Arrieta-Reales *et al*., 2017; Martinez Moreno, 2017; Ramírez and Gordillo, 2014; Reales and Ortega, 2020; Salinas-Ávila *et al*., 2020; Marulanda-Grisales and Vera-Acevedo, 2023).

To advance, we consider the document "Guidelines for Intangible Assets Management and Reporting" (Meritum Project, 2002), which states that intangible assets are classified into intangible resources and intangible activities according to their dynamic or static nature. Intangible resources are considered static, meaning they can be measured at any time and are broadly regarded as assets, including intellectual property rights, trademarks, technologies, and databases. On the other hand, intangible activities are those aimed at generating new intangible resources, enhancing the value of existing ones, and evaluating or monitoring the intangible activities that have been developed. These activities can be oriented towards the qualification of individuals within the organisation, improving the capacity for cooperation among actors, or establishing mechanisms for evaluation and monitoring.

The primary motivation for developing this work was that although some studies in the literature address intellectual capital for universities, no work has been found that aims to contribute to university management by identifying intangible activities based on the components of intellectual capital. The literature study for this work found on the one hand, some works have been developed regarding university management, university administration and higher education administration (Almohtaseb *et al*., 2019; Brunner, 2011; Camilleri, 2021; Centro Interuniversitario de Desarrollo, 1992; de Waal and Kerklaan, 2015; Goonen and Blechman, 1999; Hadzhikoleva *et al*., 2020; Hill and Husband, 2023; Monticelli *et al*., 2024; Rodríguez, 2022; Sporn, 2003; Stukalina, 2014), and on the other hand, we found some works regarding intellectual capital measurement and management in universities (Axtle-Ortiz and Acosta-Prado, 2017; de Matos Pedro *et al*., 2022; Hariyati *et al*., 2019; Leitner *et al*., 2014; Ramírez Corcoles, 2011; Secundo *et al*., 2015), however, no work has been developed on international or Colombian studies of university management based on intellectual capital, especially to enhance institutional performance by identifying and measuring intangible activities and to achieve an impact on the quality of academic activities.

In this sense, another aspect that must be considered is that, in general terms, quality in universities has been measured by national and international rankings that measure mainly intangible resources such as academic personnel, research outputs, academic reputation or PhD students, included in rankings such as Times Higher Education or QS (Ganga-Contreras *et al*., 2020), and it is not common to find mechanisms to measure intangible activities. In the case of Colombia, the National Ministry of Education defined a mechanism to obtain high-quality accreditation. Although this accreditation is not focused on intangible activities, it considers institutional factors that include processes, products, and impacts present in the achievement of an institution's objectives and its academic programs (Consejo Nacional de Educación Superior – CESU, 2020).

Since little progress has been made in the literature in defining the activities that should be subject to management in the case of universities, this study seeks to advance with the

identification of management activities for each component of intellectual capital and their measurement in three Colombian universities, through a multiple case study, by quantitative and qualitative study.

3. Methodology

The study employs a multiple case study design to analyse university management practices across three higher education institutions. The survey was sent to the population of professors and administrative staff of the universities, and the answers obtained represent 7% of the population for U1, and 9% of the population for U2 and U3.

A descriptive analysis is conducted to identify patterns in the implementation of key management activities, using frequency distributions and measures of central tendency to summarise the collected data. Given the ordinal nature of the responses, which were gathered through Likert-scale surveys, a Kruskal-Wallis test is applied to determine whether statistically significant differences exist among the universities in terms of management performance. This non-parametric test is chosen because it does not assume normality and is suitable for comparing independent groups with different distributions.

The Kruskal-Wallis test was chosen for this study as a robust nonparametric method to compare differences in university management practices across the three selected institutions. This test is particularly suitable for analysing Likert-scale survey data, as it does not assume normality or homogeneity of variances. The test procedure involves ranking all observations across the three university groups and then analysing the distribution of these ranks rather than the raw data values. If the universities exhibit similar management practices, the ranks should be evenly distributed across the groups. However, significant deviations in rank distributions indicate that at least one university differs from the others in its implementation of key management activities (Salkind, 2010).

Given that the study aims to assess institutional differences in management practices rather than specific numerical values, the Kruskal-Wallis test provides a rigorous yet flexible approach to identifying disparities while accounting for the ordinal nature of the data.

Considering the objectives of this study, it is an inductive research study that explores the intangible activities that universities should consider based on the definitions of the Meritum Project (2002). As this is a work with few previous advances, the qualitative approach of the study provides valuable information that not only facilitates the identification of key activities for university management based on the components of intellectual capital but also the structuring of categories, which contributes to laying the foundations for future studies and proposals for improvement in the area.

The quantitative approach will provide information on the level of management compliance for each intellectual capital component among the three Colombian Universities with diverse characteristics, selected to form a sample that can reveal common patterns and differences in institutional management. The sample comprises 524 university participants, including faculty, administrative staff, and management personnel and the information was collected through an online survey. This selected sample ensures the representation of key stakeholder groups within each institution, allowing for an in-depth analysis of organisational patterns and dynamics.

Regarding the universities that participated in the study, it is essential to highlight that the Colombian Ministry of Education has accredited all three. However, they are at different stages of development, as evidenced by their results presented in international rankings in 2024:

(1) A private university with no ranking in the Times Higher Education rankings and ranked in the +1,400 range of the QS, i.e. not in the top 1,400 institutions worldwide. This university has been noted as U1.

(2) A public university ranked +1,501 by Times Higher Education and +1,400 by QS. This university has been noted as U2.

(3) A private university ranked between 1,200 and 1,500 in Times Higher Education and 377th in QS. This university has been noted as U3.

The qualitative analysis provided an in-depth understanding of the main needs and strengths related to the proposed management activities, thereby making progress towards improving university management. On the other hand, the quantitative analysis helps to understand the level of compliance of each proposed management activity. Qualitative and quantitative information was grouped into management areas for each component of intellectual capital, which are presented below.

3.1 Human capital

(1) Leadership: Universities should have a leadership model and develop a structured program to train managers, teachers, and administrative staff. It would also develop mechanisms for strengthening the engagement and empowerment of people in the organisation.

(2) Professional development: It should include several key elements, including defining clear career development paths to guide professional growth. It should also define a detailed outline of roles and responsibilities, offer a comprehensive training plan that aligns with the organisation's goals, and implement a well-structured incentive system to motivate employee performance, as well as provide specific incentives for innovation. Ultimately, the program should prioritise talent selection and retention to sustain a skilled and motivated workforce.

(3) Communication: Effective top-down communication ensures that leadership conveys the organisation's goals, expectations, and decisions. Bottom-up communication allows employees to provide feedback, share ideas, and express concerns. Dialogic constructions, where open and reciprocal dialogue is encouraged, are essential for collaborative problem-solving and continuous improvement, promoting mutual understanding and engagement between all organisational levels.

3.2 Structural capital

(1) Organisational design and structure: This includes aligning the organisation's structure with its practices and institutional policies. This involves creating a coherent framework that supports the organisation's goals, fosters efficient decision-making, and promotes accountability at all levels.

(2) Organisational culture: Institutions should consider in their culture the value of human character and the critical role people play within the organisation. They should also include a culture of change and innovation, encouraging employees to embrace innovative ideas and adapt to evolving challenges. A culture of competitiveness and results orientation that drives individuals and teams to achieve high performance while maintaining a solid ethical foundation and social responsibility.

(3) Strategic management: It should include mechanisms to foster articulation between academic units to promote interdisciplinarity and ensure seamless coordination between administrative units to optimise operations. Strategic and participatory planning is essential for aligning goals across the institution, supported by a structured process for strategy deployment and continuous monitoring. The program should also include regular reflection and evaluation mechanisms to assess progress and adjust as

needed. Lastly, innovation management must be integrated to drive continuous improvement and adaptability in achieving institutional objectives.

(4) Organisational learning: It should prioritise identifying and managing best practices to ensure continuous improvement. It should foster cooperation by creating communities of practice where members can share knowledge, experiences, and innovations. Benchmarking is essential to compare the organisation's performance against best practices, while external consultancy can provide valuable insights and guidance for addressing specific challenges and enhancing overall organisational learning capabilities.

(5) Digital transformation: It should integrate new technologies into academic and administrative activities to enhance efficiency and innovation. It must ensure that administrative processes are streamlined through digital tools while information is effectively stored and processed within secure systems. Adequate infrastructure is critical to support these technologies and ensure reliability. Additionally, the program should promote data-driven decision-making, enabling leaders to base strategies and operations on accurate information.

3.3 Relational capital

(1) Relations with internal actors: It should prioritise building solid and collaborative relationships with teachers and administrative staff to foster a cohesive and supportive working environment. Equally important are relationships with students and graduates, which support long-term institutional loyalty, enhance the learning experience, and promote alumni involvement.

(2) Articulation between academic units to promote interdisciplinarity, facilitating knowledge integration from different disciplines to address global problems, achieve institutional impact, and contribute to developing holistic solutions to societal problems.

(3) Relationships with national and local organisations: It should incorporate mechanisms to strengthen ties with allies and other HEIs, engage with communities and NGOs, and build effective connections with government and public administrations. It should also offer incentives to foster strategic alliances that enhance institutional collaboration and societal impact.

(4) Internationalization should encompass a comprehensive strategy that promotes global engagement across all institutional levels. The internationalisation of the curriculum and "internationalisation at home" are crucial to fostering global perspectives locally. Additionally, the program should support student and professor mobility to facilitate exchange and learning. The internationalisation of research is crucial for enhancing academic collaboration and innovation, while efforts to strengthen institutional capacities through global partnerships should be prioritised. Finally, a robust international marketing strategy is essential for enhansing the institution's global visibility and reputation.

(5) Image, positioning, and reputation: To enhance the institution's credibility and competitiveness, it should prioritise achieving high rankings, certifications, and accreditations. Effective engagement with media and press is essential for building a robust public presence, while strategic use of social networks ensures broader outreach and interaction with diverse audiences. These elements strengthen the institution's visibility and reputation nationally and internationally.

Qualitative information was collected through open-ended questions on the survey, and quantitative information was collected through Likert scale questions, with response options of "widely met", "moderately met", "minimally met", and "not met" Furthermore, qualitative information was collected through open-ended questions for each intellectual capital component.

Regarding research ethics, it is important to highlight that no personal data was collected, and confidential information was not requested from the institutions. Otherwise, the study was approved by the ethics committee of one of the participating universities, and the other two institutions accepted this approval.

4. Research findings

The study measured the level of compliance of management axes proposed for each component of intellectual capital. The analysis included, in the first stage, a descriptive analysis of the variables. This analysis enabled us to identify the primary areas that require improvement for universities with the lowest scores.

The data analysis included calculating the mean for each proposed management activity, along with its respective percentage and standard deviation. Below, we present the quantitative information for each component of intellectual capital, collected through Likert questions.

4.1 Human capital

The qualitative information collected reveals the following needs regarding human capital, as presented in Table 1, which provides quantitative information on the level of compliance with proposed management activities for human capital, highlighting scores below 75%.

Analysing the information for each category, the study identifies that, even when universities have a leadership program, capacities regarding managerial positions need to be strengthened. Regarding professional development, it is essential to acknowledge that even when professional development achieved an 80% compliance rate, the study identified a need to develop mechanisms for administrative staff and professors.

Table 1. Measurement of the level of compliance with management areas and activities for human capital

Management activities	Mean	Mean (%)	Est. Desv
Leadership			
Leadership model	3.11	78%	0.81
Leadership training for managers	2.92	*73%*	0.88
Leadership training for teachers and administ. staff	2.83	*71%*	0.93
Engagement	2.92	*73%*	0.86
Empowerment	2.97	*74%*	0.87
Professional development			
Professional development routes	3.19	80%	0.92
Definition of roles, responsibilities	3.50	86%	0.74
Training program	3.21	79%	0.85
Applying learning to the workplace	3.08	77%	0.85
Incentive system	2.68	*67%*	0.97
Incentives for innovation	2.90	*72%*	0.88
Selection and retention	2.93	*73%*	0.94
Communication			
Top-down communication	3.42	85%	0.70
Bottom-up communication	3.03	76%	0.87
Dialogic constructions	3.03	76%	0.89

Source(s): Authors' own work

This study highlights that while universities have established leadership models, there is a need to enhance activities that strengthen managerial leadership, mainly through improved leadership programs for professors and administrative staff. Effective leadership training should emphasise its role in fostering cohesion through shared values and common goals, enhancing organisational culture, and improving overall performance and efficiency. It also impacts team performance by fostering constructive relationships, promoting a culture of excellence, and enhancing productivity, efficiency, and quality (Pedraja-Rejas *et al*., 2020). Leadership fosters creativity, innovation, and the creation of learning environments (Hannon, 2017).

One of the main findings regarding human capital is the need for an adequate incentive system for professors and administrative staff. This was a critical need identified by the three universities, and it had the lowest compliance score in the quantitative study.

4.2 Structural capital

In Table 2, we present quantitative information regarding the level of compliance with proposed management activities for structural capital, underscoring the scores obtained below 75%.

Regarding structural capital, we found that activities related to innovation management had one of the lowest scores in terms of compliance, with 69%. This could be related to the need for a more agile, less bureaucratic, and hierarchical structure and processes, the need to enhance

Table 2. Measurement of the level of compliance with management areas and activities for structural capital

Management activities	Mean	Mean (%)	Est. Desv
Organisational design and structure			
Adequate organisational structure and units	3.33	83%	0.69
Appropriate positions and functions in the unit	3.20	80%	0.77
Institutional policies	3.37	84%	0.71
Strategic management			
Strategic and participatory planning	3.11	78%	0.86
Definition of objectives and activities	3.25	81%	0.81
Definition of measurable goals and indicators	3.14	79%	0.82
Strategy deployment and monitoring	3.17	79%	0.81
Reflection and evaluation	3.02	75%	0.93
Innovation management	2.77	*69%*	0.93
Organisational culture			
Human character and the importance of people	3.31	83%	0.84
Identifying opportunities for improvement	2.98	75%	0.89
Culture of change and innovation	3.03	76%	0.82
Competitiveness and results orientation	3.28	82%	0.72
Ethics and social responsibility	3.48	87%	0.69
Organisational learning			
Identification and management of good practices	3.00	75%	0.83
Cooperation and communities of practice	2.91	*73%*	0.85
Benchmarking and external consultancy	2.68	*67%*	0.95
Digital transformation			
New technologies in academic activities	3.20	80%	0.76
New technologies in administrative activities	3.07	77%	0.80
Process information stored in systems	3.19	80%	0.80
Adequate infrastructure	3.08	77%	0.86
Data-driven decision making	3.05	76%	0.85

Source(s): Authors' own work

and expand decision-making capabilities, and the need to develop a culture of innovation, learning, and continuous improvement, all of which were identified in the qualitative study.

The lowest score regarding benchmarking and external consultancy (with 67% compliance) concerns strengthening organisational learning and knowledge management, as well as developing spaces to identify and share experiences that address needs identified in the qualitative study.

4.3 Relational capital

In Table 3, we present quantitative information regarding the level of compliance with proposed management activities for relational capital, highlighting scores below 75%.

Activities related to relational capital that achieved scores below 75% compliance included articulation between academic units (72%) and interdisciplinarity, as well as articulation between administrative units (74%).

To validate the information obtained through the means of the variables and considering that the Likert scale used ordinal categorical data, we analysed the variables that obtained a level of compliance lower than 75%:

For human capital: incentive system, leadership training for managers, leadership training for teachers and administrative staff, engagement and empowerment.

For structural capital: innovation management, cooperation, communities of practice, benchmarking, and external consultancy.

For relational capital: articulation between academic units and interdisciplinarity, and articulation with administrative units.

Table 3. Measurement of the level of compliance with management areas and activities for relational capital

Management activities	Mean	Mean (%)	Est. Desv
Relations with internal actors			
Relations with teachers and administrative staff	3.37	84%	0.70
Relations with students and graduates	3.52	88%	0.61
Articulation between academic units and interdisciplinarity	2.86	*72%*	0.83
Articulation with administrative units	2.95	*74%*	0.82
Relations with national actors			
Relations with allies and other HEIs	3.60	90%	0.59
Relations with communities and NGOs	3.39	85%	0.69
Relations with the government and public administrations	3.38	85%	0.72
Incentives for the establishment of alliances	3.05	76%	0.85
Internationalisation			
Internationalisation strategy	3.35	84%	0.76
Promotion and incentive mechanisms	3.19	80%	0.83
Internationalisation of the curriculum	3.24	81%	0.76
Internationalisation at home	3.20	80%	0.82
Student mobility	3.39	85%	0.72
Professor mobility	3.11	78%	0.83
Internationalisation of research	3.12	78%	0.83
Internationalisation to strengthen institutional capacities	3.14	79%	0.81
International marketing strategy	3.17	79%	0.84
Image, positioning, and reputation	3.43	86%	
Rankings, certifications and accreditations	3.53	88%	0.66
Media and press	3.36	84%	0.76
Social networks	3.41	85%	0.72

Source(s): Authors' own work

Those variables were analysed per quartile, which presents the information for each option of responses on the Likert scale: "widely met," "moderately met," "minimally met," and "not met."

To complement the descriptive analyses and to prioritise the management activities that universities need to improve, the study continued to analyse the variables that obtained a level of compliance lower than 75% in the previous analysis. The analysis was based on the sum of the responses obtained on "minimally met" and "not met," and selected those activities that obtained scores above 30% on average for at least two of the three universities participating in the study.

The results are presented in Table 4. The information allowed us to prioritise the following activities:

(1) Incentives system

(2) Innovation management

(3) Benchmarking and external consultancy

(4) Articulation between academic units and interdisciplinarity.

The results reveal a consistent pattern regarding the activities that require improvement across the three universities. Incentive systems, benchmarking, and external consultancy were included in the two lowest scores in the three universities.

From these results, we proceeded with a deeper analysis using a Kruskal-Wallis test to gain a deeper understanding of common patterns and differences between the three universities, considering their diverse characteristics. This test enabled us to identify significant differences in the level of compliance with management activities among the three universities, considering the ordinal scale of the data, which does not assume normality in the distribution. This test was applied to the four variables prioritised for their low level of compliance in the previous analysis.

Table 5 presents the results of the Kruskal-Wallis test. Those results show that Universities have significant differences in the compliance levels of the incentive system, innovation program, benchmarking, and external consultancy, but no significant differences were found

Table 4. Level of compliance on the categories "minimally met" and "not met"

Management activities	U1	U2	U3	Total
Human Capital				
Incentive system*	32%	37%	45%	40%
Incentives for innovation	29%	26%	35%	31%
Selection and retention	20%	33%	31%	29%
Leadership training for managers	22%	25%	33%	28%
Leadership training for teachers and administrative staff	26%	27%	41%	34%
Engagement	21%	21%	37%	28%
Empowerment	23%	19%	36%	28%
Structural capital				
Innovation management*	32%	26%	42%	35%
Cooperation and communities of practice	28%	19%	39%	31%
Benchmarking and external consultancy*	31%	33%	51%	41%
Relational capital				
Articulation between academic units and interdisciplinarity*	30%	29%	34%	31%
Articulation with administrative units	27%	22%	29%	27%

Note(s): *Activities that obtained scores above 30% on the sum in the categories "minimally met" and "not met" on at least two of the three universities participating in the study, and on average

Source(s): Authors' own work

Table 5. Kruskal-Wallis test

	Incentive system	Articulation and interdisciplinarity	Innovation program	Benchmarking and external consultancy
Test statistics[a,b]				
H de Kruskal-Wallis	7,377	2,810	14,093	23,680
gl	2	2	2	2
Sig. asin.	0.025	0.245	0.001	0.000

Note(s): [a]Kruskal Wallis test; [b]Grouping variable: University
Source(s): Authors' own work

in articulation and interdisciplinarity. For the three variables that show significant differences, a post hoc analysis is necessary to determine which universities differ significantly in the identified areas.

A Dunn post hoc test was conducted to complete the analysis, and the result shows that U3 obtained different values.

A comprehensive analysis of the data revealed that, although there is convergence regarding the variables prioritised by universities for obtaining the lowest values, as well as the variables that obtained the highest levels of compliance, it is important to highlight that the results assigned by the U3 participants are lower than the values assigned at the other universities.

5. Discussion and conclusion

This study identified the key axes and activities that universities must address to enhance their management and performance, focusing on the components of intellectual capital, improving institutional capacities for value creation, and adapting to rapid environmental changes.

As well, the levels of compliance of university management activities for each component of intellectual capital and proposes an instrument that other institutions can use to identify the main aspects of university management that require improvement to achieve better results.

Regarding the activities prioritised by the three institutions, one of the main findings related to human capital is that establishing an adequate incentive system is the aspect with the lowest level of compliance in all three universities. In this context, it is essential to recognise incentive systems as a critical component of organisational management. Their primary purpose is to align employees' interests with the organisation's, thereby enhancing productivity. According to Sormani *et al*. (2022), these systems are intricately linked to individual motivations. Therefore, it is essential to establish mechanisms to understand employees' motivations and identify incentives that would effectively enhance their professional commitment. The authors propose four categories of incentives: monetary rewards, career advancement opportunities, recognition, and research support. Those incentives should be integrated into the institutional policies of universities and evaluated by the responsible bodies of high-quality accreditation at the national level.

Related to structural capital, the study identified critical low-scoring activities, including benchmarking, engaging external consultants, and establishing communities of practice. These findings underscore the need to enhance organisational learning processes and highlight the importance of creating, capturing, organising, accessing, and utilising knowledge for long-term sustainability (Escorcia Guzmán and Barros Arrieta, 2020). In addition, innovation management obtained the lowest score for structural capital, showing the importance of having more agile and efficient processes, reducing bureaucracy, and enhancing institutional decision-making capacity.

Finally, regarding relational capital, the study identified the lowest score as the articulation between academic units and interdisciplinarity, highlighting its importance in addressing complex global challenges and fostering innovation in research and teaching. Those activities related to internal articulation should consider the diverse and complex organisational structures when establishing strategies and mechanisms for transversal projects. Promoting interdisciplinarity often requires significant changes in the management systems and structures of higher education institutions (Braβler, 2020). Coordinating with administrative units poses a significant challenge, as they must understand, facilitate, and support academic activities while also reducing administrative burdens.

To validate those findings, the study includes the analysis of the scores obtained in the categories "minimally met", and "not met" for each university. The results show consistency between the descriptive analysis of management activities with the lowest means and those with the highest levels in the categories "minimally met" and "not met".

The study also advanced with a comparative analysis, which shows two main aspects. On the one hand, there is a convergence in management activities evaluated at both higher and lower levels of compliance across the three universities, as shown in Figures 1, 2 and 3, which represent the scatter plots for human, structural, and relational capital, respectively.

On the other hand, through the scatter plots, it can be observed that for both human and structural capital, U3 obtained the lowest scores among the three universities, despite having the highest international ranking position among them. This finding suggests that the instrument facilitates an ordinal scale of management activities that needs improvement, rather than presenting an estimated value of compliance, and the scales can vary from one university to another.

The activities identified in this study will facilitate progress in future studies, enabling institutions to develop targeted strategies to enhance their performance in mission activities and achieve ongoing quality improvement. Identifying management activities based on intellectual capital can significantly contribute to the improvement of higher education institutions by optimising the use of their intangible resources, such as knowledge, innovation, and collaborative networks.

Intellectual capital, comprising human, structural, and relational capital, enhances academic quality, administrative efficiency, and the ability to respond to environmental challenges. Its integration into university management facilitates strategic decision-making

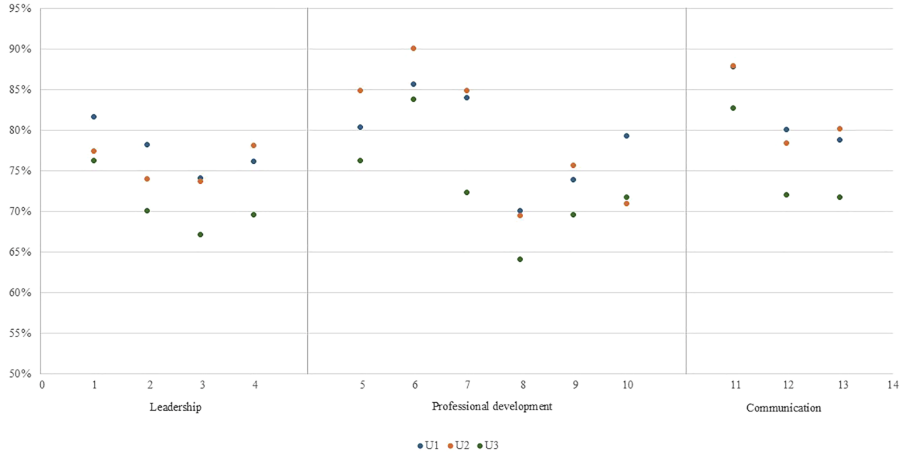

Figure 1. Scatter plot for human capital for the three universities included in the study. The figure presents the level of compliance for each management activity, presented on the horizontal axis. Source: Authors' own work

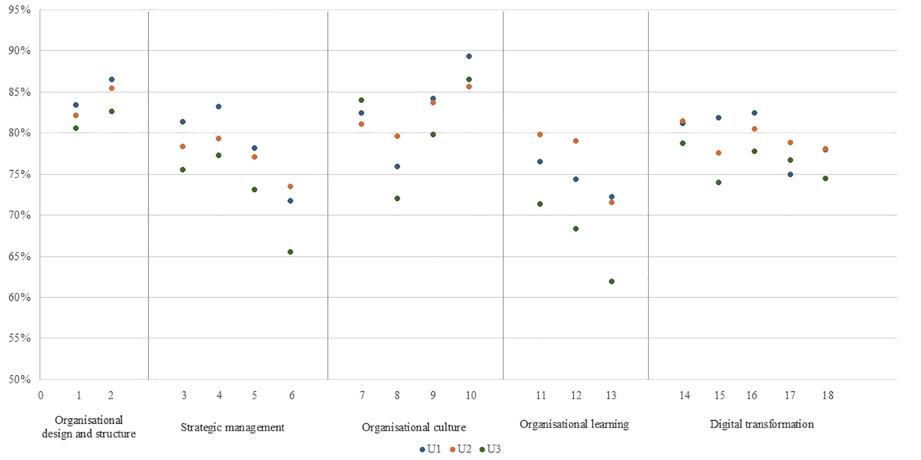

Figure 2. Scatter plot for structural capital for the three universities included in the study. The figure presents the level of compliance for each management activity, presented on the horizontal axis. Source: Authors' own work

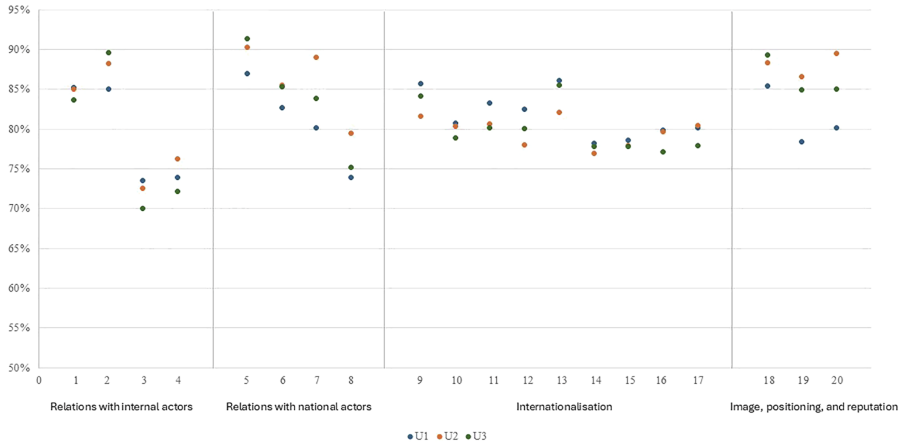

Figure 3. Scatter plot for relational capital for the three universities included in the study. The figure presents the level of compliance for each management activity, presented on the horizontal axis. Source: Authors' own work

based on talent development, the consolidation of institutional processes, and the generation of social impact.

Specifically, within the Colombian context, the mechanisms defined by the National Ministry of Education in the high-quality accreditation process could consider management activities based on intellectual capital as institutional factors that encompass the processes, products, and impacts of institutions to ensure the quality of academic programs, contributing to strengthening the quality and sustainability of the higher education system in Colombia.

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