

Intellectual Capital Management and ESG in SMEs: An Exploratory Analysis

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Abstract: With the speedy development of the business environment, companies are forced to adapt their strategies, in order to stand out in the market and become more competitive. This has generated a great focus on their intangible assets, which play a fundamental role in strategic value creation and competitiveness. In this sense, Intellectual Capital, as a set of resources based on knowledge, methodologies and relationships, as well as Environmental, Social and Governance (ESG) practices, are recognized as strategic factors for increasing the competitiveness of organizations. In this context, the main objective of this study is to analyse the association between Intellectual Capital management and ESG indicators at the organizational level. To draw conclusions about this premise, a mixed methodology (qualitative and quantitative) was adopted, based on the application of a structured questionnaire aimed at employees in management positions in small and medium enterprises (SMEs) belonging the PME Inovação COTEC - Associação Empresarial para a Inovação network, to obtain a clear view of their perception of Intellectual Capital and ESG strategies in their firms. From this universe, 20 responses were obtained, which were then analysed using the MAXQDA and IBM SPSS Statistics. It was concluded that there is a positive correlation between these indicators. However, due to the limited number of respondents, it was not possible to reach a statistically significant conclusion regarding the association between Intellectual Capital and ESG indicators. Despite this, the present research contributes to the literature on both topics by empirically exploring the articulation between two organizational components that are deeply relevant to current business, paving the way for future studies.

Keywords: Intellectual capital management, Human capital, Structural capital, Relational capital, Knowledge, ESG, Environmental, Social and governance

1. Introduction

The business world is changing quickly and becoming more challenging to navigate. Consequently, companies that desire to improve their competitiveness are focused in adjusting their strategies to the complex circumstances emerging.

In order to adapt to these challenging conditions, and as examined in subsequent sections of this paper, numerous researchers believe that firms must acknowledge the relevancy of their non-financial properties. From this standpoint, intangible assets play a greater role in the success of corporations (Kaufman & Schneider, 2004), and companies that implement progressive Human Resource strategies are more likely to identify changes in the market and quickly adapt to them.

Within the context of the crucial role of intangible assets in surviving the modern economic landscape, Matos & Lopes (2009) defend that globalization, and rapidly evolving economies have made knowledge a critical element for attaining competitive advantage. This opinion is shared by Bataineh & Zoabi (2011), who defend that proper Intellectual Capital management increases companies' efficiency.

Intellectual Capital refers to the intangible assets and knowledge that generate value by encompassing human, structural, and Relational Capital that drives an organization's success (Edvinsson & Malone, 1997) by leveraging knowledge, skills, and relationships that allow organizations to innovate and improve their efficiency and competitiveness.

Furthermore, in today's business landscape, where it is no longer sufficient for firms to focus on financial prosperity, stakeholders are increasingly looking at broader set of factors when determining the real long-term value and sustainability of a firm (Flammer, 2021). It is in this sense that ESG enters this relevant discussion.

ESG refers to three components used to understand firms' sustainability and societal impact. It measures their effect on the environment, interactions with their community, fairness and organizational transparency and standards (Raghavan, 2022).

Given the relevancy of both constructs, this paper investigates the interplay between Intellectual Capital management and ESG strategies.

The relationship between Intellectual Capital and ESG is multifaceted and still a considerably unexplored area in corporate strategy, with a small number of studies conducted on the topic.

The adoption of strong Intellectual Capital management strategies is linked to adjustments to resource management and operational efficiency, which can have a direct impact on ESG results (Popova, 2023). Thereby, the development of skills, knowledge and company culture fosters an innovative environment that should improve ESG results. Consequently, the main goal of this dissertation is to understand whether companies that foster and improve their Intellectual Capital management present better ESG indicators.

To achieve the primary objective of the dissertation, the following secondary goals have been defined:

- Understand to which degree companies incorporate Intellectual Capital and ESG practices into their organizational approaches
- Assess how each component of Intellectual Capital is correlated to each ESG element, determining where the strongest and weaker relationships are established

Ultimately, the research question guiding this study is: do companies that develop their Intellectual Capital management exhibit strong ESG indicators?

2. Theoretical Considerations

2.1 Intellectual Capital

According to vast literature, the real potential of modern-day organizations is embedded in their knowledge-based assets. Knowledge is a resource characterized by its intangibility, rarity and difficulty to replicate, serving as the foundation of sustained competitive advantage (Edvinsson & Malone, 1997).

In this context, researchers investigate the concept of Intellectual Capital from the perspective of how knowledge management impacts the development of companies. In fact, throughout most empirical studies, authors recognize the role of Intellectual Capital as a key player in an organization's productivity and competitive advantage, leaving behind traditional factors such as capital and labour (Matos & Lopes, 2009).

There is currently no universally accepted metric that recognizes and evaluates this asset (Matos 2013). Edvinsson & Malone (1997) further assert this by stating that the worth of Intellectual Capital cannot be quantified because there are insufficient instruments to correctly measure it, thus not being included in companies' financial statements.

Much like its definition, the components of Intellectual Capital are not unanimously recognized, however, Edvinsson & Malone (1997) introduced a widely established model that brings the most consensus among researchers. They split Intellectual Capital into three fundamental categories: Human Capital, Structural Capital, and Relational Capital.

Human Capital is strongly connected to human characteristics, ones that cannot be replicated. It is through Human Capital that companies generate the potential to innovate, create and sustain their own expertise. Edvinsson and Malone (1997) conclude that it is this component that integrates qualifications, capabilities, innovative potential and agility.

Structural Capital is characterized by the employees' knowledge and practices, even when they leave the firm (Matos & Lopes, 2009), meaning that, unlike Human Capital, Structural Capital is a company's property.

Finally, Relational Capital, often known as customer capital, is a market-based asset that is attained through the relationship with the external environment (Brown & Eisenhardt, 1997). While some authors downplay it and consider it the connection companies have only with their consumers, Bontis (1998) amplifies it by describing it as the relationship with clients, suppliers and shareholders.

2.2 Environmental, Social and Governance

Over the past decade, a great importance has been placed on responsible corporate practices and organizations are now expected to align their strategies with sustainability, transparency and ethics' expectations (Landier & Lovo, 2020). According to Sachs et. al (2025), the heighten pressure to comply with sustainability practices surges not only from resource scarcity and the impact of natural calamities, but also from the rising public and governmental expectations that organizations must comply with sustainability practices (Elkington, 2018).

In this sense, the acronym ESG – Environmental, Social and Governance, was created to capture firms' actions and performance in the areas of environmental impact (Environmental), social values and business relationships

(Social), and corporate governance (Governance), by measuring their performance against risks and opportunities through qualitative and quantitative indicators (Raghavan, 2022). Each of these metrics allows an assessment of long-term value creation of organizations (Friede et. al, 2015), creating an incentive for a greater investment in ESG-oriented practices.

The Environmental component of ESG considers how organisations manage their environmental impact through strategic sustainability practices. Modern approaches regarding this component typically focus on resource efficiency, emissions reduction and waste minimization and how companies aim to improve them.

The Social aspect, often regarded as the most important dimension for organizations, encompasses firms' relationships with their employees, communities and stakeholders and is often associated with the concept of corporate social responsibility (CSR) (Kim & Yang, 2025).

At last, the Governance component includes reporting standards, internal controls, oversight mechanisms and ethical conducts; therefore, structures that prioritize transparency and accountability are linked to long-term performance increases and reduced risk (Sarkis, 2009).

2.3 Conceptualization of the Intellectual Capital and ESG Relationship

As mentioned previously in this paper, growing stakeholder pressure and an overall more competitive market forces companies to concentrate on increasing their productivity and innovation potential regarding all business aspects. In this sense, intangible assets and sustainability-oriented procedures are considered indispensable in the pursuit of long-term competitiveness and sustainability (Barney, 1991). Intellectual Capital and ESG cannot therefore be treated as independent value drivers, but as consolidated ventures that incorporate organizations' long-term strategic plans.

Pham et al. (2024) offer comprehensive international evidence demonstrating the existence of a deep structural synergy between both constructs, establishing that a firm's internal intellectual resources serve as the core engine powering corporate sustainability initiatives and long-term ESG integration. Additionally, Yan et al. (2025) also establish this connection when stating that firms do not achieve strong ESG milestones by only using financial resources, but by leveraging their internal collective skills, intelligence and processes to generate sustainable solutions. In this sense, Intellectual Capital management acts as a base to mobilize intangible resources that allow for a stronger ESG performance.

A key connection between both elements presented frequently in literature is the innovation capability of firms. Knowledge-based management serves as a leading engine of innovation in firms (Kianto et al., 2017) which strongly aligns with strategic ESG goals, which require innovative capabilities that allow stronger market presence and distinguishment. Broadstock et al. (2020) builds on this premise by corroborating that companies with strong innovative capacity are better equipped to integrate ESG goals into their core strategy, as they possess the dynamic capabilities required to adapt to evolving sustainability regulations.

Furthermore, the exploitation of Intellectual Capital to drive ESG results fundamentally influences how external markets perceive a firm's qualitative value. Beretta et al. (2019) observe that the strategic management of Intellectual Capital directly shapes the presentation and communicative tone of integrated reports, suggesting that management relies on Intellectual Capital capabilities to faithfully formulate and report their ESG narrative to stakeholders.

In short, by aligning Intellectual Capital development with ESG priorities, companies can simultaneously boost their innovative capability, enhance risk management and bolster stakeholders' trust, leading to a stronger and more adaptable business model (Barney, 1991).

3. Methodology

Despite the growing volume of international literature exploring the relationship between Intellectual Capital and ESG metrics (e.g., Pham et al.), existing research remains heavily skewed toward large-cap, publicly listed corporations within major economic ecosystems like China or the United States. A pronounced theoretical and empirical gap persists regarding how this relationship functions within highly innovative, localized business network, particularly within southern European economies like Portugal. While global metrics for tracking Intellectual Capital efficiency are widely debated and often lack a universally accepted standard, there is a lack of survey-based research capturing the real-time, managerial perceptions of IC and ESG alignment. This study directly addresses this omission by focusing on firms associated with COTEC Portugal (Associação Empresarial para a Inovação). COTEC firms are explicitly benchmarked for their innovation capacity and technology-driven

intangible assets, representing a unique ecosystem, where human, structural, and relational capital are highly concentrated. Investigating how these innovation-driven entities translate their intellectual capital into tangible ESG outcomes provides a necessary counterpoint to existing macro-level studies, revealing how the IC-ESG dynamic operates at the intersection of innovation culture and corporate sustainability.

To address research objectives, a mixed methodology was selected to conduct the analysis. Mixed methodology is an investigation approach where quantitative and qualitative data is collected and analysed (Bowers et al., 2013), allowing researchers to capitalize on the capabilities of both quantitative and qualitative methods and retain a more comprehensive perspective on the studied topic (Greene et al., 1989). The data was analysed using the software packages MAXQDA and IBM SPSS Statistics.

4. Data Analysis

4.1 Data Collection

Table 1: Questionnaire items organized in sections (elaborated by author)

HC	The company values and encourages employees to acquire new knowledge.
	The company provides continuous training opportunities to employees.
	Employees are incentivized to share their knowledge with colleagues.
	There is a compensation system that values knowledge and motivation.
	The company provides a stimulating environment for creativity and innovation.
	There is an organized career progression system.
SC	The company has policies that promote motivation and satisfaction among employees.
	The company invests in the improvement of their internal processes.
	There are organized and accessible documents regarding internal processes.
	Knowledge about each position is clearly transmitted to new-joiners.
	The company holds certifications that ensure standards of quality and management.
	New technologies are used to improve organization methods and efficiency.
RC	Ethical concerns are part of the company's norms and procedures.
	The company encourages employees to work collaboratively as a network.
	Partnerships established improve innovation and growth potential.
	The company prioritizes relationships with clients and suppliers.
	The company develops initiatives focused on market potential.
	The company received an award in the last two years.
E	The company has a strong social-media presence.
	The company establishes strategic partnerships with other organizations.
	The company adopts a resource-management system aimed at preventing waste.
	The company implements energy-efficiency procedures.
	Knowledge about sustainable practices is transmitted to employees and their practice is incentivized.
	The company invests in new technologies and innovative procedures that reduce their environmental impact.
S	The company's strategy is aligned with market environmental demands.
	The company fosters well-being and equity among all employees.
	Equality, inclusion and diversity standards are applied during recruitment.
	The company practices a fair payroll system that promotes pay equity.
G	Secure working conditions are ensured.
	The company develops impactful social and community initiatives.
	The company has an ethical conduct that is available for consultation by employees, partners and suppliers.
	There are processes implemented aimed at preventing, identifying and treating corruption, fraud or bribery situations.
	The company adopts a transparent management position.
	The company shares their corporate governance and sustainability practices.

The data collection method utilized was an anonymous-answer questionnaire composed by 34 close-ended questions. The questionnaire encompassed two sections: one addressing Intellectual Capital, where all three dimensions were covered; and a second focused on ESG indicators, also including its three main scopes. As observed in Figure 1, the Intellectual Capital management segment (IC) included items related to the three main empirical components: Human Capital (HC), Structural Capital (SC) and Relational Capital (RC). Similarly, the ESG section (ESG) was organized around its three core components: environmental (E), social (S) and governance (G).

All questions were measured using a four-point Linkert scale, where respondents were asked to indicate how each question applied to their organization. This scale was selected in alignment with the methodology used by Matos (2013). The answers range from “never applies” to “applies very much” for respondents to indicate to what extent the statement was applicable to their organization. This allowed for a broader assessment, rather than obtaining elementary binary replies.

4.2 Sample Characterisation

As mentioned, the present analysis is based on a sample of innovative Portuguese SMEs certified by COTEC - Associação Empresarial para a Inovação. The selection of this sample is justified by their structural and economic relevance in the corporate setting. SMEs represent the majority of the European and Portuguese businesses and play a critical part in developing the economy through innovation and employment generation (European Commission, 2024).

An initial sample of 20 responses were obtained, representing a response rate of 8,97%. Given the specialized nature of the COTEC network, which comprises entities explicitly recognized for high-intensity innovation environments, this sample size represents a targeted cross-section of Portugal's innovation leaders. Due to the exploratory nature of this working paper, the N = 20 sample serves as a foundational pilot study to map primary directional trends. However, it should be acknowledged that the small sample size inherently limits statistical power and increase the margin of error, restricting the generalizability of the findings.

Nonetheless, the results still provide valuable conclusions that aid in the establishment of patterns and tendencies within the sample.

The responses to the study were provided by individuals in management roles. Managers were selected as respondents due to their intervention in strategic decision-making and their overall knowledge of organizational practices within those firms, providing informed perspectives and allowing for an enhanced comprehension of Intellectual Capital management and ESG-related practices.

Despite occupying diverse positions, as observed the majority of questionnaire respondents were Department Coordinators or Partner-Managers, with a weight of 40% and 35% respectively.

4.3 Analysis of Results

Intellectual Capital and ESG questions were numerically coded to enable a quantitative analysis of the results. As mentioned, each item was measured on a four-point Linkert scale, where higher values represented a more significant degree of applicability of the corresponding organizational practice within the firm. Responses of 4 can be interpreted as reflecting a strong presence of the practice ("always applies"), 3 as a neutral presence ("moderately applies"), 2 indicates a lower presence ("sometimes applies") and 1 the absence of practices ("never applies").

SPSS enabled a descriptive analysis of collected data and was utilized to obtain means and standard deviations and to generate composite variables representing the different dimensions of Intellectual Capital and ESG, which permitted the production of assumptions regarding the relationship of both constructs through a correlation analysis.

A descriptive statistical analysis was elaborated to condense data, assess overall applicability of intellectual property and ESG practices within the sampled data and compare indicators with one another. Results can be observed in Table 2.

From this analysis, it is apparent that respondents predominantly selected higher values in all items, indicating that both Intellectual Capital and ESG-related practices are perceived as being well established within their companies. In fact, overall Intellectual Capital indicators presented a high average result ($M = 3,75$), closely followed by ESG ($M = 3,67$).

Additionally, when thoroughly examined, it is observed that, within Intellectual Capital, Structural Capital practices show the highest average score ($M = 3,86$), indicating this component as the strongest, followed by Human Capital ($M = 3,82$) and Relational Capital ($M = 3,54$). This suggests an overall greater development of Structural Capital within respondent firms, when compared to Human Capital and Relational Capital. However, results do not present significant statistical difference to indicate a relevant discrepancy between Intellectual Capital components.

Table 2: Descriptive statistics of obtained data (elaborated by author)

	N	Minimum	Maximum	Mean	Std. Deviation
HC_mean	20	3.43	4.00	3.8214	.15285
SC_mean	20	3.57	4.00	3.8643	.14267
RC_mean	20	2.83	4.00	3.5417	.40420
IC_mean	20	3.40	4.00	3.7525	.16973
E_mean	20	3.20	4.00	3.7000	.25547
S_mean	20	3.40	4.00	3.7600	.19029
G_mean	20	2.75	4.00	3.5125	.44776
ESG_mean	20	3.21	4.00	3.6679	.22620
Valid N (listwise)	20				

Regarding ESG, a similar situation arises. The social construct revealed to be the most developed ($M = 3,76$), with environmental practices coming second ($M = 3,70$), followed by governmental elements ($M = 3,51$).

Furthermore, Relational Capital and Governance indicators present the most variability across the sampled organisations, with standard deviations of 0,40 and 0,44, respectively. This indicates a higher heterogeneity regarding these elements' responses. These contrasting reports may relate to strategic focus or market exposure.

Thereafter, an inferential statistical analysis was executed to investigate the connection between Intellectual Capital and ESG practices. Pearson correlation coefficients were calculated using the computed variables and their means, however, given the small sample size ($n = 20$), results should be interpreted with caution due to limited statistical relevance. Overall, the correlation between Intellectual Capital and ESG is positive ($r = 0.302$), indicating that higher levels of Intellectual Capital management indeed aid in creating strong ESG practices. However, this relationship is not statistically significant ($p = 0.196$), as this metric does not reach the conventional level of 5%, probably due to the small sample size of only 20 respondents. Therefore, these results do not allow for a generalization of conclusion regarding corporations beyond the sample.

Nonetheless, a more detailed correlation between individual dimensions was conducted, as shown in Table 3.

Table 3: Correlation between IC and ESG indicators (elaborated by author)

		HC_mean	SC_mean	RC_mean	E_mean	S_mean	G_mean
HC_mean	Pearson Correlation	1	.160	.553*	.289	.155	.364
	Sig. (2-tailed)		.500	.011	.217	.514	.115
	N	20	20	20	20	20	20
SC_mean	Pearson Correlation	.160	1	.060	.186	-.266	-.355
	Sig. (2-tailed)	.500		.802	.433	.257	.125
	N	20	20	20	20	20	20
RC_mean	Pearson Correlation	.553*	.060	1	.229	.228	.324
	Sig. (2-tailed)	.011	.802		.331	.333	.163
	N	20	20	20	20	20	20
E_mean	Pearson Correlation	.289	.186	.229	1	.303	.380
	Sig. (2-tailed)	.217	.433	.331		.194	.099
	N	20	20	20	20	20	20
S_mean	Pearson Correlation	.155	-.266	.228	.303	1	.531*
	Sig. (2-tailed)	.514	.257	.333	.194		.016
	N	20	20	20	20	20	20
G_mean	Pearson Correlation	.364	-.355	.324	.380	.531*	1
	Sig. (2-tailed)	.115	.125	.163	.099	.016	
	N	20	20	20	20	20	20

Despite a strong presence of all components, the relationship between Intellectual Capital and ESG practices in the sampled enterprises can only be considered a developing strategic incline, as individual relationships lack statistical relevance. In fact, the correlation established to reach statistical significance is the one between Human Capital and Relational Capital ($p = 0,011$), showcasing Edvinsson & Malone (1997)'s positioning on how firms' partnerships are primarily driven by knowledge and skill.

It is worth observing that a distinguished result obtain from the sample was the negative correlation between Structural Capital and Social and Governance strategies, point to a misalignment between the Intellectual Capital component and ESG practices. According to Popova (2023), Structural Capital can only contribute to strong ESG results when that drive is embedded in the company's culture and processes. Thereby, when misaligned with corporate organizational structure, the effect of Structural Capital on ESG may be irrelevant or even adverse, as showcased in these results.

Nonetheless, regarding the remaining elements, the observed patterns indicate an alignment with the conceptual framework established, demonstrating a tendency of positive correlation between most Intellectual Capital and ESG components. According to Yan et al. (2025), and as mentioned during the revision of literature, modern corporations seek to establish strong and lasting ESG results by mobilizing their inner collective skills, intelligence and procedures. In this sense, an interplay between Human Capital, Structural Capital and Relational Capital must occur, to ensure the establishment of relevant Environmental, Social and Governance results.

5. Conclusion and Research Limitations

While the relationship between of Intellectual Capital management and ESG performance has gained significance in corporate governance research, it remains a fairly unexplored association in empirical studies. Therefore, the present dissertation seeks to contribute to both academic theory and corporate practice by shifting the narrative away from accounting-based metrics toward a primary, perception-based assessment of how innovation frontrunners actively use their knowledge-based intangible assets for sustainability purposes.

This preliminary analysis reveals an overall positive association between Intellectual Capital indicators and ESG practices. And, although the statistical significance of these findings is currently limited by their small sample size ($N = 20$), the obtained patterns suggest that human expertise, structural workflows, and relational networks act as sturdy operational tools that drive robust ESG strategies.

This initial lack of statistical significance must be explicitly acknowledged and interpreted within the context of the study's exploratory nature. Thus, rather than invalidating the underlying conceptual framework, these results demonstrate the clear necessity of a scaled sample to statistically validate these strategic relationships.

Firstly, because the current dataset captures a highly specialized innovation ecosystem through the COTEC network, future research should expand data collection to a broader, more diverse, multi-industry sample to enhance statistical power and generalizability. Then, because strategic investments in intangible assets require time to mature, transitioning from this cross-sectional approach to a longitudinal panel design would allow future studies to track the long-term, lagged effects of dynamic intellectual capital development on subsequent corporate ESG outcomes.

Data Availability Statement: The interview script can be made available by the paper's authors upon request.

Ethics Declaration: This study did not require ethical clearance, as it ensured the anonymity of all participants and obtained their informed consent prior to conducting the interviews.

Declaration of AI Tools: In this article, the authors utilised an AI tool to assist with language refinement and grammar checks. The authors reviewed and verified all AI-generated content to ensure its accuracy and integrity and take full responsibility for the final manuscript.

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