Green Intellectual Capital Management as a Source of Business Process Outsourcing Advantage: A Bibliometric Analysis

Andreea-Laura OPREA [1]

Abstract

This literature review examines the development of research on green intellectual capital and its link to competitive advantage, using data from the Web of Science covering the years 2007 to 2025. The findings show that the field emerged slowly but has grown rapidly since 2019, reaching a peak in 2023. Research is concentrated in a small group of journals, including the Journal of Intellectual Capital, the International Journal of Learning and Intellectual Capital, and Sustainability, but is also increasingly present in wider management and environmental outlets. Most authors have contributed only one publication, reflecting the early and fragmented stage of the domain. Highly cited works, such as Chen (2008), established the foundation of the field, while keywords such as performance, innovation, and competitive advantage dominate the thematic structure. Overall, green intellectual capital is becoming a recognized area of study, though its application to outsourcing and the business process outsourcing sector is not yet properly explored.

Keywords: *green intellectual capital, business process outsourcing, BPO, competitive advantage, sustainability, bibliometric analysis, ESG*

JEL classification: M10, M14, O32

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1. Introduction

Sustainability pressures and stakeholder expectations increasingly reshape firms' strategies, pushing them to align profit with ecological responsibility (Porter & Kramer, 2011). In this shift, intellectual capital — long framed through human, structural and relational dimensions (Vătămănescu et. al, 2023) — has evolved toward a sustainability-oriented form known as Green Intellectual Capital (Chen, 2008; Malikah & Nandiroh, 2024; Asiaei et al., 2023). Green intellectual capital captures environmental knowledge (Bratianu, 2025), routines, and relationships that allow firms to embed ecological goals into strategy and still enhance competitiveness, through green human, structural, and relational capital (Jirakraisiri et al., 2021). This orientation aligns with ESG and SDG agendas and has been empirically linked to innovation, legitimacy, and sustainable competitive advantage (Isnaini, 2024; Shahbaz & Malik, 2025).

[1] Andreea-Laura Oprea, SNSPA, Faculty of Management, e-mail: laura.oprea@facultateademanagement.ro

The Business Process Outsourcing (BPO) sector — historically dependent on cost arbitrage and efficiency — now faces commoditization, automation, and rising ESG client requirements (Deloitte, 2023; Willcocks et al., 2027). Integrating green intellectual capital offers BPO firms a new strategic lever: eco-trained employees, energy-efficient digital infrastructures, and ESG-aligned partnerships can differentiate providers in a crowded market while meeting global sustainability imperatives (Shahbaz & Malik, 2025).

2. Literature Review

Classical intellectual capital research shows that human, structural and relational assets are central to the knowledge-based view of the firm and to superior performance (Suparwadi et al., 2024). More recent studies extend this paradigm toward green intellectual capital, integrating environmental responsibility into people, processes, technology and stakeholder relations (Alnaim & Metwally, 2024; Bhatti et al., 2024). Green human capital captures employees' ecological knowledge, values and leadership behaviors; green structural capital refers to eco-efficient procedures, data centers, digital infrastructure and codified practices; while green relational capital reflects ties with clients, suppliers, communities and regulators that enable legitimacy and co-innovation (Jirakraisiri et al., 2021). Empirical findings consistently show that organizations investing in these green intangible assets achieve higher innovation, stronger reputation and legitimacy, improved risk management and distinct competitive advantages (Mulatsih, 2025; Bombiak, 2023).

Strategically, green intellectual capital functions through three mechanisms. First, it reframes environmental responsibility as a source of differentiation, resilience and cost efficiency rather than mere compliance (Porter & Kramer, 2018; Dimakopoulou et al., 2023). Second, it builds environmental capabilities through training, governance and analytics, enabling firms to detect risks, redesign processes and diffuse best practices (Sarwar & Mustafa, 2024; Asiaei et al., 2022). Third, it enhances value capture through ESG-aligned client relationships that improve tender success, financing conditions and switching costs (Bombiak, 2023; Cooper, 2024). This is especially relevant in BPO, where cost arbitrage and scalability are increasingly eroded by automation, AI and global competition (Gambal et al., 2022; Willcocks et al., 2017). In this setting, green intellectual capital enables sustainable advantage via eco-skills and processes (Sun et al., 2024), efficient digital infrastructures and energy-aware architectures (Wang & Shao, 2024; Van Geet & Sickinger, 2024), and contractual alignment with ESG-driven clients (Martínez-Falcó et al., 2025; Cooper, 2024).

The literature also describes clear performance pathways. Cost leadership arises from reduced material use, lower energy consumption and fewer rework cycles (Li et al., 2024; Van Geet & Sickinger, 2024). Differentiation emerges when firms co-design eco-innovations with clients and disclose credible sustainability metrics in tenders (Baquero, 2024). Green intellectual capital also improves talent retention by aligning environmental goals with employees' values and stabilizing delivery teams in knowledge-intensive services (Rutka et al., 2023). Yet outcomes

depend on external and organizational contingencies such as energy mix, regulation, client portfolio, knowledge maturity and leadership (Qamruzzaman & Karim, 2024; Smuts & Van der Merwe, 2025; Alemu, 2025; Akter et al., 2025). Bibliometric studies confirm that performance, innovation and competitive advantage dominate the field, while absorptive capacity and behavior remain under-researched in BPO settings (Becea & Popa, 2025; Khan et al., 2024; Younas et al., 2023; Sohu et al., 2024). Overall, the literature converges that when strategically orchestrated, green intellectual capital converts environmental responsibility into a capability system that produces lasting advantage in outsourcing (Hernandez & Ona, 2018; Wang & Juo, 2025; Leng et al., 2025).

3. Methodology

This study employs a bibliometric analysis to map the intellectual structure and evolution of research on green intellectual capital and its connection to competitive advantage. Bibliometric methods quantify publication patterns, citations, co-authorship networks, and keyword co-occurrence to reveal thematic structure and research dynamics (Aria & Cuccurullo, 2017).

Data were collected from the Web of Science Core Collection, which offers high-quality, peer-reviewed academic sources and metadata (Shamsi et al., 2022). The retrieval took place in August 2025 using systematic search expressions including "green intellectual capital," "competitive advantage," "strategic management," and "outsourcing." Initial combined queries returned no results for outsourcing, confirming a literature gap. The broadened query (TS=(green intellectual capital) AND TS=(competitive advantage)) produced 80 documents (2007–2025), which formed the final dataset.

As per Table 1, green intellectual capital research from 2007 to 2025 spans 80 documents across 50 journals, involving 268 diverse authors. The field is expanding rapidly with a 15.3% annual growth rate and an impressive visibility marked by 33 citations per document. Collaboration is strong, with an average of 3-4 co-authors per paper and 43% of the research involves international co-authorship, reflecting global interest.

Main information

Table 1

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2007:2025
Sources (Journals, Books, etc)	50
Documents	80
Annual Growth Rate %	15.31
Document Average Age	3.11
Average citations per doc	33.91
References	4569

Description	Results
DOCUMENT CONTENTS	
Keywords Plus (ID)	213
Author's Keywords (DE)	266
AUTHORS	
Authors	268
Authors of single-authored docs	12
AUTHORS COLLABORATION	
Single-authored docs	13
Co-Authors per Doc	3.64
International co-authorships %	42.5
DOCUMENT TYPES	
article	62
article; early access	8
article; retracted publication	2
editorial material	3
proceedings paper	4
review	1

Source: Author's creation

Analysis of annual scientific output (Figure 1) shows that research on Green Intellectual Capital and its link to competitive advantage began slowly from 2007 to 2016, with minimal publications. Interest started to rise in 2019, with a notable increase from 2021 onward, peaking at 19 articles in 2024. This growth aligns with the global ESG agenda and greater emphasis on sustainability reporting. Despite a slight dip in 2025, the field is expanding rapidly, with an annual growth rate of 15.31%, reflecting its progression from an emerging to a more established area of study.

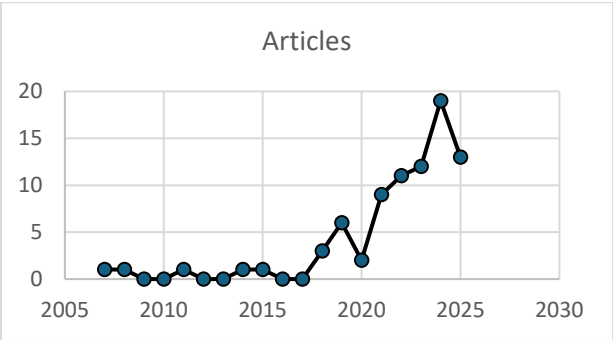

Figure 1. Annual scientific production
Source: Author's creation

Reviewing published sources (Table 2) shows that research on green intellectual capital is concentrated in a few key journals, notably the Journal of Intellectual Capital, which leads with 11 articles. Other important publications include the International Journal of Learning and Intellectual Capital and Sustainability, each with five articles. The topic spans specialized journals and broader sustainability fields, with additional contributions from journals focused on strategy, innovation, and environmental management. This spread reflects growing interest across disciplines but also highlights some fragmentation in the field.

Most relevant sources

Table 2

Sources	Articles
Journal of Intellectual Capital	**11**
International Journal of Learning and Intellectual Capital	**5**
Sustainability	**5**
Business Strategy and the Environment	**3**
Environmental Science and Pollution Research	**3**
International Journal of Innovation Science	**3**
Journal of Cleaner Production	**3**
Economic Research-Ekonomska Istrazivanja	**2**
Journal of the Knowledge Economy	**2**
Quality-Access to Success	**2**
Sage Open	**2**
1ST International Postgraduate Conference on Mechanical Engineering (IPCME2018)	**1**
Belitung Nursing Journal	**1**
Complexity	**1**

Source: Author's creation

According to Bradford's Law, research on green intellectual capital and competitive advantage is mainly concentrated in a few key journals—especially the Journal of Intellectual Capital, the International Journal of Learning and Intellectual Capital, and Sustainability—while other journals provide only limited contributions, confirming that core outlets dominate the field.

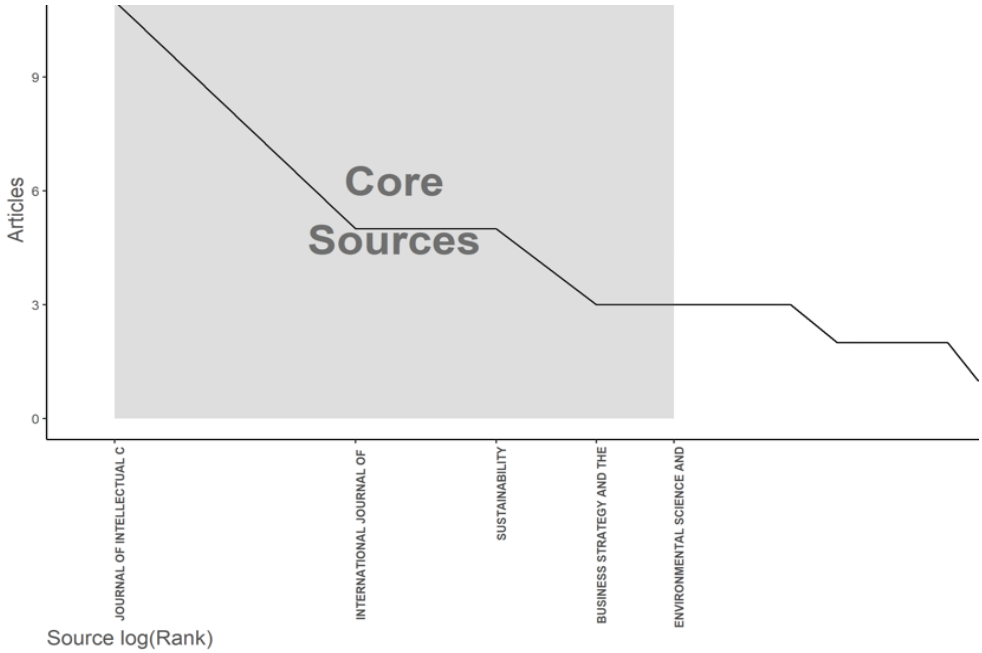

Figure 2. Core Sources (Bradford's Law)
Source: Author's creation

The evolution of sources (Figure 3) shows that green intellectual capital was rarely covered in journals before 2017. Interest began to rise in 2018, with significant growth after 2020—especially in the Journal of Intellectual Capital and Sustainability, which have led the discourse. Other journals show more selective engagement. Since 2021, the topic has shifted from isolated studies to a broader trend, reflecting its growing importance in sustainability and management research.

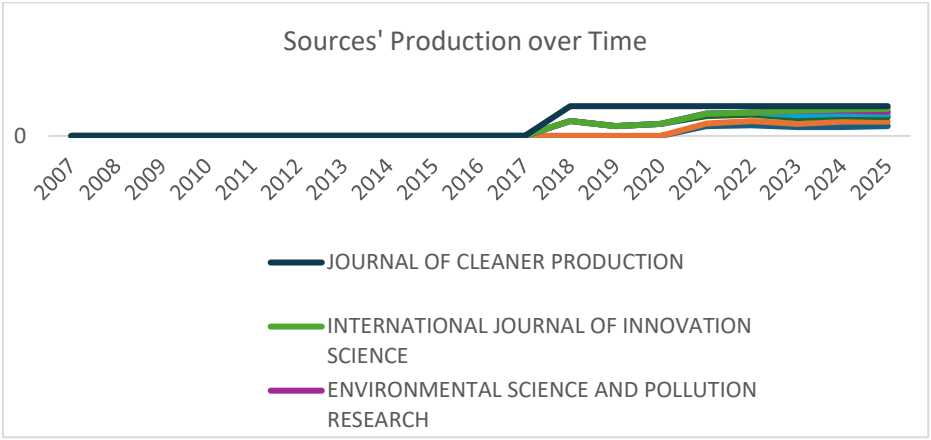

Figure 3. Source production over time
Source: Author's creation

Lotka's Law analysis (Figure 4) shows that green intellectual capital research is fragmented, with over 80% of authors publishing only one article. Only a few, like Shahbaz M.H., Ali A., Battisti E., and De Pablos P.O., have produced more than one paper, highlighting the field's early and dispersed development.

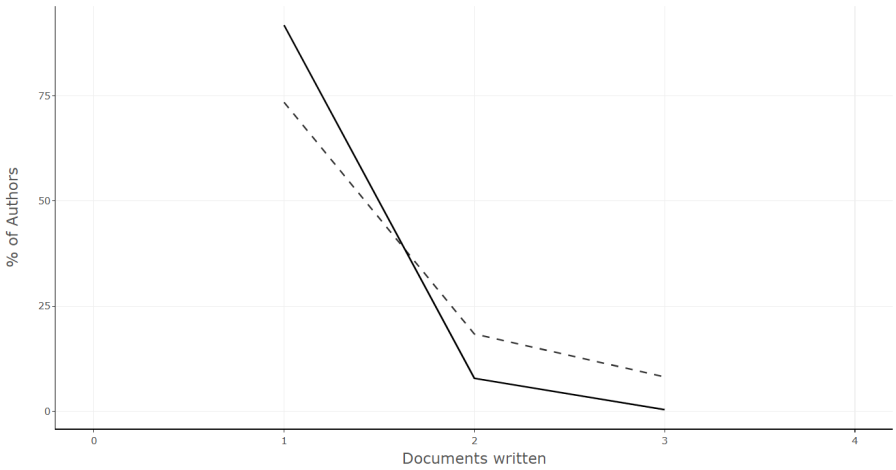

Figure 4. Author Productivity (Lotka's Law)
Source: Author's creation

Figure 5 illustrates that China leads in citations on green intellectual capital with 1,316 citations, followed by Malaysia (518), Spain (166), and Pakistan (150). Thailand (100), Romania (98), and Italy (71) also contribute, indicating that research in this field is becoming more global.

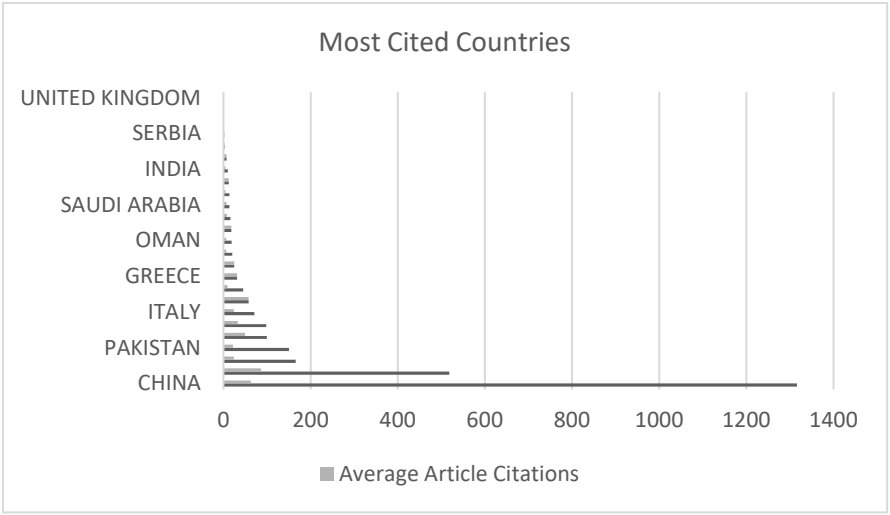

Figure 5. Most Citied Countries
Source: Author's creation

Analysis of predominant keywords (Figures 7 and 8) shows that "performance" is the main focus in green intellectual capital research, closely followed by "innovation" and "competitive advantage." Other frequent terms like "impact," "management," and "strategy" highlight the strategic and sustainability-driven orientation of the field.

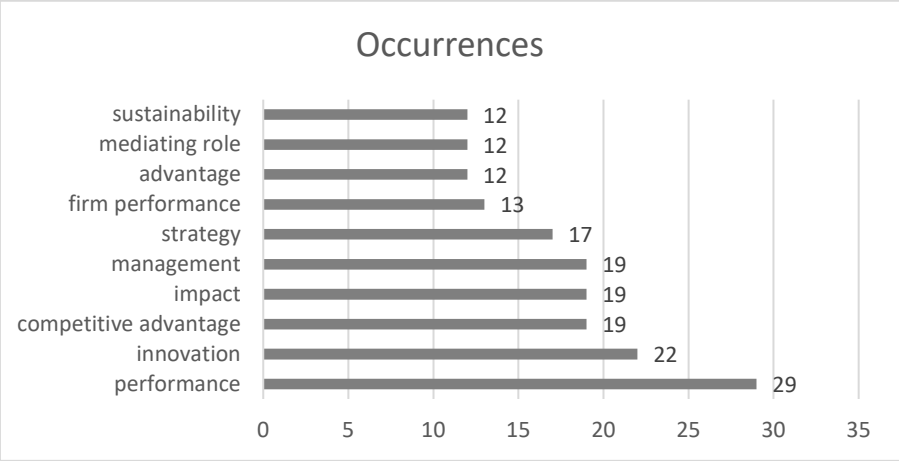

Figure 6. Most frequent words
Source: Author's creation

Figure 7. TreeMap
Source: Author's creation

Figure 9 shows a steady increase over the past decade in research on competitive advantage, innovation, and business performance. Notably, terms like "advantage" and "management" gained momentum after 2020, reflecting a trend of integrating green intellectual capital with performance frameworks. This highlights

the growing focus on how intangible resources drive sustainable competitive advantage, especially in business process outsourcing.

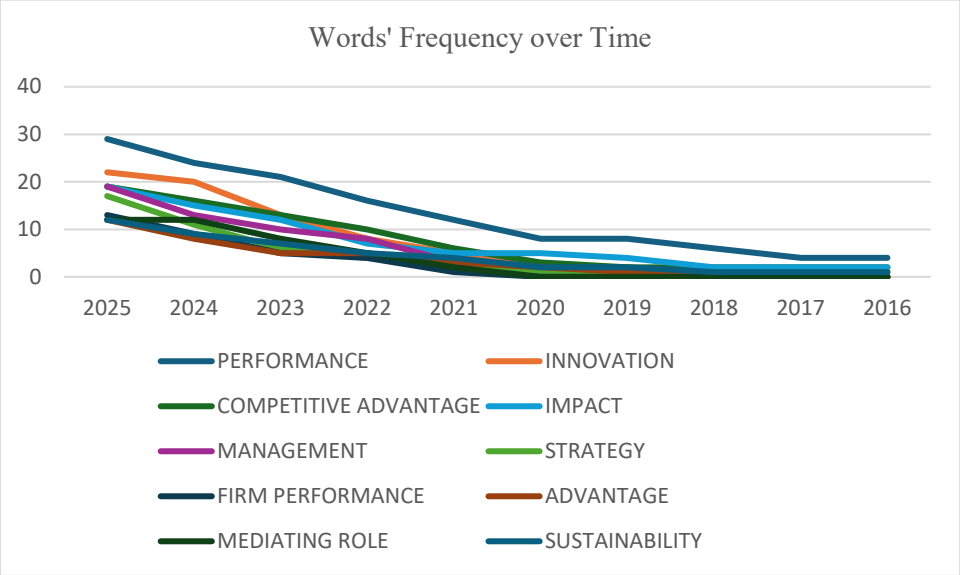

Figure 8. Words' Frequency over Time
Source: Author's creation

The thematic map (Figure 10) highlights green intellectual capital, sustainability, and innovation as key, established research themes. Niche topics like green supply chain and HR management are specialized but less central, while emerging or declining themes include process and environmental performance. Foundational elements such as intellectual capital, knowledge management, and competitive advantage remain core to the field, though links to outsourcing are underexplored and present future research opportunities.

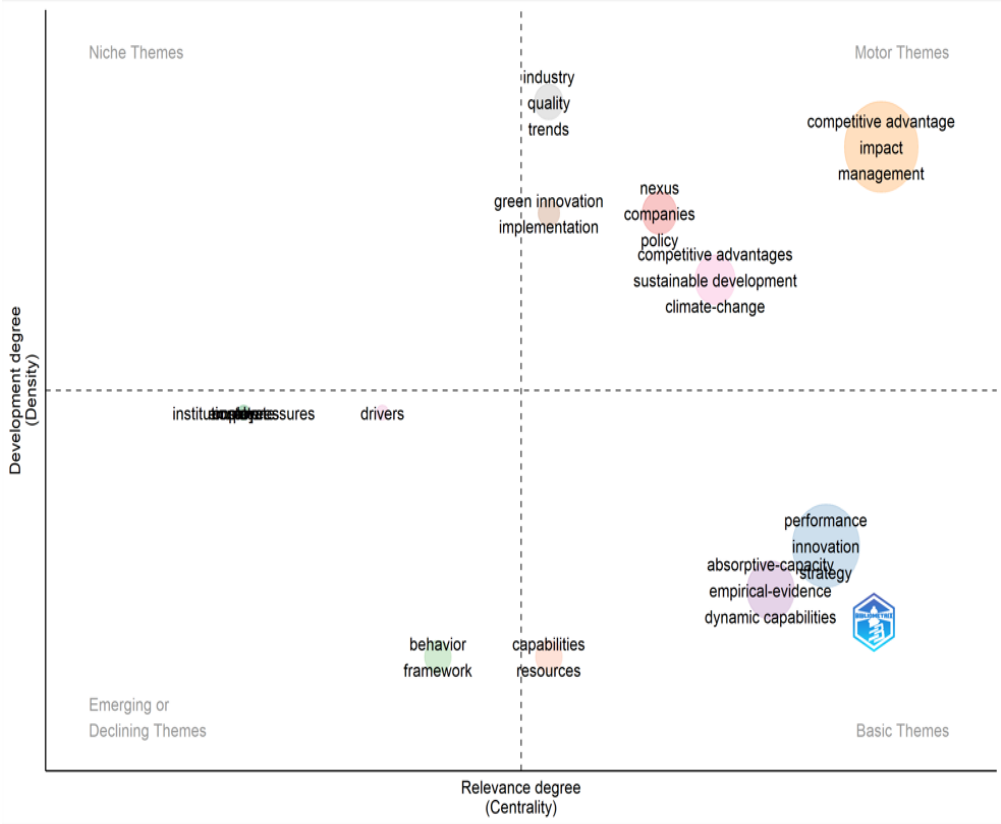

Figure 9. Thematic Map

Source: Author's creation, generated by Bibliometrix

The thematic map generated by Bibliometrix categorizes research clusters based on Callon's centrality and density, identifying motor, basic, specialty, and emerging/declining themes. Performance emerges as a central, cohesive theme, linking intellectual capital, sustainability, and competitive advantage. Competitive advantage is the field's intellectual hub, guiding both theory and practice, while absorptive capacity is an emerging topic focused on how organizations integrate environmental knowledge. Niche themes like green innovation and nexus are well-developed but less connected to broader discourse. Other areas, such as behavior, capabilities, institutional pressures, and personnel, are underexplored, indicating new opportunities for research, particularly in expanding green intellectual capital's application to service sectors like business process outsourcing.

Research themes classified by Callon's Centrality and Density

Table 3

Cluster	Callon Centrality	Callon Density	Rank Centrality	Rank Density	Cluster Frequency
nexus	1.569	62.5	10	11.5	11
performance	6.919	47.588	13	4	139
behavior	0.708	43.75	6	1.5	6
absorptive-capacity	2.159	47.232	12	3	30
competitive advantage	10.916	63.082	14	13	227
green innovation	0.75	62.5	8	11.5	4
competitive advantages	1.592	54.389	11	10	17
industry	0.75	63.889	8	14	7
institutional pressures	0	50	2.5	7	2
capabilities	0.75	43.75	8	1.5	6
corporate	0	50	2.5	7	2
drivers	0.5	50	5	7	2
state	0	50	2.5	7	2
employees	0	50	2.5	7	2

Source: Author's creation

4. Conclusions

In conclusion, the literature indicates that green intellectual capital has emerged as a key extension of traditional intellectual capital, incorporating environmental responsibility into human, structural, and relational resources to augment organizational innovation, legitimacy, and competitiveness (Albort-Morant et. al, 2016). Although research validates its increasing significance in manufacturing and sustainability contexts, the direct use of green intellectual capital within the business process outsourcing sector is lacking.

Considering the sector's dependence on information, processes, and client connections, the strategic management of green intellectual capital presents a potent yet little examined path for achieving sustained competitive advantage. This gap highlights the uniqueness and importance of further research on how outsourcing organizations might utilize intangible, sustainability-focused assets to distinguish themselves in a progressively competitive and environmentally aware global market.

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