

GREEN INTELLECTUAL CAPITAL, PERFORMANCE, AND RESEARCH AGENDA

Sigit Hermawan*

Universitas Muhammadiyah Sidoarjo, Indonesia
Email: sigithermawan@umsida.ac.id

Wiwit Hariyanto

Universitas Muhammadiyah Sidoarjo, Indonesia
Email: wiwitbagaskara@umsida.ac.id

Sriyono

Universitas Muhammadiyah Sidoarjo, Indonesia
E-mail: sriyono@umsida.ac.id

Abstract

Researchers are recognizing the importance of organizations leveraging knowledge, skills, and capabilities to achieve their goals beyond traditional financial and operational metrics. By analyzing the intellectual capital embedded in a practice-friendly environment, organizations can develop more effective strategies for improving performance. Study This aim For explore the relationship between Green Intellectual Capital and financial, non-financial performance and opportunities research coming through approach bibliometrics . Countries such as China, Pakistan and Malaysia are becoming center study main . Journal Journal of Intellectual Capital be the most productive in publish study related to GIC. Keyword analysis show that concepts like sustainability , green innovation , and knowledge management are closely related with GIC. Additionally , research this also identifies writers , articles , and networks the most influential collaboration in field This . Research result This give more understanding comprehensive about development GIC research , identify gap research , and highlighting opportunity For study more carry on . Findings This can become guide for researchers , practitioners , and makers policy in develop more strategies effective For reach sustainability . It is important to note that this study has several limitations. First, the data used comes only from the Scopus database, so it may not include all research papers on green intellectual capital, especially those published in journals or other platforms. In addition, bibliometric analysis is limited in some aspects, such as the number of publications, citation trends, and dominant keywords. This approach does not provide a deeper understanding of the concept of GIC and its dynamics in institutional and industrial contexts.

Keywords : green intellectual capital; bibliometrics; sustainability; innovation green; performance; research agenda.

Introduction

The modal intellectual topic is relevant for the development of the economy (Hendrix et al., 2021). Modal intellectual impairment (IIC) is a big deal in the second year (Fitri et al., 2022). Green intellectual capital has become an important

concept in ongoing research, emphasizing its role in promoting a practice-conscious organizational environment (Ades et al., 2022). Green intellectual capital refers to the knowledge, skills, and capabilities possessed by an organization that fosters friendly practices and an environment for innovation (Yusliza et al., 2020). GIC has

many aspects that stem from various fields such as intellectual capital, green management, and sustainability. Researchers are recognizing the importance of organizations leveraging knowledge, skills, and capabilities to achieve their goals beyond traditional financial and operational metrics. By analyzing the intellectual capital embedded in a practice-friendly environment, organizations can develop more effective strategies for improving performance.

This concept has gained increasing attention in recent years, with organizations striving to reduce environmental impacts and contribute to a more sustainable future. GIC has many implications, including increasing awareness of environmental issues, the need for organizations to adopt environmentally friendly strategies, and the recognition that intellectual capital can be a valuable asset in fostering an environmentally friendly environment (Shah et al., 2021). Existing research has explored various aspects of GIC, including its definition, measurement, and factors influencing the development and implementation of GIC (Liu et al., 2022). However, a more comprehensive analysis of the existing literature is needed to identify research gaps in this area and inform future research directions.

According to the literature review, some studies have previously shown the relationship between green intellectual capital and organizational performance. For example, Sohu et al. investigated how components of green intellectual capital, such as green human capital, green structural capital, and green relational capital, affect the financial and environmental performance of a firm's manufacturing activities (Sohu et al., 2024).

Similarly, Fitri et al. study the impact of Green Intellectual Capital on sustainability and innovation performance in the renewable energy sector (Fitri et al., 2022). Mehmood and Hanaysha et al. focus on the role of green intellectual capital for innovation (Mehmood and Hanaysha,

2022). Novitasari and Agustia Explore How Green Intellectual Capital Can Improve a Firm's Competitiveness and Performance (2023). Finally, Lastanti & Augustine et al. develop a framework for measuring and managing Green Intellectual Capital to support sustainable business operations (Lastanti & Augustine, 2022). Research Previous This is important to learn more about the strategic green intellectual capital and its relationship with cross-sectoral performance organizations that support this trajectory. Research Previous This is a study that highlights the importance of Green Intellectual Capital in strategic and needs to better understand the underlying mechanisms and outcomes for organizations in various industries and contexts. Previous studies have explored various aspects of GIC, conceptualizing, measuring, and their relationships with the resulting organization. However, the current literature remains fragmented and needs to be further developed to better understand the GIC landscape. Analytical bibliometrics This aims to synthesize existing knowledge, uncover trends and patterns, identify areas for future study, and use prior GIC research. Analysis This will provide a comprehensive and detailed description of GIC research.

Next, it is important to build a solid foundation for Green Intellectual Capital research capabilities and processes. Green intellectual capital refers to the environmentally focused knowledge, skills, and capabilities that organizations need to improve their environmental practices and performance (A'yuni & Muafi, 2020). Analyzing the performance outcomes of Green Intellectual Capital can explain how effectively an organization manages and uses its intangible assets related to the environment. This can include metrics such as the impact on the environment, innovation in environmentally friendly products and services, and the organization's overall competitiveness in the sustainable market (Nadirah, 2020). In addition, studying the research agenda

around Green Intellectual Capital can identify current trends in development, improvement methodologies, and gaps in knowledge. Exploring the fundamental concepts, empirical findings, and future research directions in this domain can help scholars and practitioners advance their understanding of Green Intellectual Capital (Shah et al., 2021). By building a comprehensive background on performance and research agendas, researchers and practitioners can gain valuable insights to guide the development and effective use of Green Intellectual Capital in organizations.

This study aims to provide a comprehensive background for future research on the relationship between Green Intellectual Capital and financial, non-financial, and opportunity performance. Specifically, this study will examine the impact of GIC on key financial metrics such as profitability, growth revenue, and market valuation (Lestari et al., 2020). In addition, this research will also examine the influence of GIC on non-financial indicators, sustainability environment, socially responsible company and stakeholder engagement (Shazali et al., 2023). With these side-by-side exploratory connections, this research will identify potential areas for future research on the implications of GIC strategy and its role in continuously supporting successful organizations and development. This study will provide insights for researchers, practitioners, It provides useful insights for managers and manufacturers policies and provides insights into the role of an intellectual capital-friendly environment in terms of superior competitiveness, management resource power, human resource-friendly environment, supply chain-friendly environment, sustainability, etc.

The results of this study suggest that the financial efficiency of a competitive intellectual capital capital can be managed effectively, which will help to improve the social support. Performance organization.

The organization must implement new strategies, tactics and guidelines to effectively manage all GIC dimensions. Manufacturers' policies must streamline their GIC potential by organizing training and maintenance environments. The novelty of this research is that it examines intellectual capital and performance using the research agenda method, which is still rare in this type of research.

Research Methods

a. Research Design

In this research, we will use bibliometric analysis methods to investigate and analyze the concept of green intellectual capital in depth. Bibliometric analysis is a quantitative approach that studies scientific literature, such as the number of articles, citation frequency, and emerging trends and topics in a field (Mohammad et al., 2021). By applying this method, we can map the structure, dynamics, and evolution of the literature related to green intellectual capital. The bibliometric analysis that will be carried out will include the main journals that publish relevant articles, influential authors in this field, the frequent occurrence of keywords, as well as the relationship between relevant concepts (Benevene et al., 2021).

In addition, a comprehensive literature review will be conducted to gain a deeper understanding of the concept, theory, and application of green intellectual capital. The results of the combination of bibliometric analysis and literature review will be detailed to provide a comprehensive picture of the status, development, and research in the field of green intellectual capital. (A'yuni & Muafi, 2020). By using this dual approach, we were able to gain deeper insights into the research developments and opportunities for further research in the future.

The formulation of the problem in this study is how is the relationship between Green Intellectual Capital and financial and non-financial performance and

opportunities that emerge through a bibliometric approach?

b. Research Data

This study focuses on the analysis of 122 journals collected from leading journal databases such as Scopus. These publications were selected based on the specified keywords “green intellectual capital”. The main objective of this study is to identify and comprehensively investigate the concept of green intellectual capital. Using the Scopus journal database, we systematically searched for publications containing these keywords. The findings from the in-depth analysis of these publications can be used to gain a broader and more detailed understanding of the concept of green intellectual capital.

c. Indicator Research Analysis

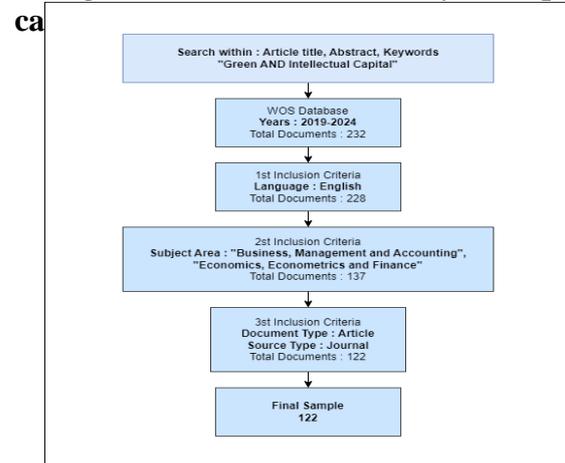
The study used data from articles published in journals indexed in the Scopus database (www.scopus.com) during a 5-year period (2019–2024). This research uses network, overlay, and density mapping using the VOSviewer app. The analyzed indicators include the number of publications per year, the 10 countries with the most publications, the 10 journals with the most production in the last 5 years, the subject areas related to "green intellectual capital", the 10 researchers with the highest productivity, the 10 most popular keywords, the 10 most cited articles, the 10 researchers with the highest future research plans.

d. Research Procedures

Data were collected from Scopus database in CSV file format and analyzed using VOSviewer application. With VOSviewer application, researchers can analyze network bibliometrics to see the relationship between relevant research topics, identify research trends, and identify patterns. In addition, researchers can also view the resulting analysis in the network map, which shows the relationship between publishers and researchers in the field. This analysis can help researchers understand

the research trends, related topics, and green intellectual capital. According to previous studies (Ahlawat et al., 2023), there are several steps of bibliometric analysis as follows:

Figure 1: Bibliometric analysis steps



Source: Summarized by the author (2024)

e. Technical Analysis

Bibliometric analysis of green intellectual capital can be performed in detail by examining several aspects. In the descriptive analysis you can see the annual number of published articles, the list of 10 countries with the highest number of scientific publications and 10 most productive journals in the last 5 years, the thematic area related to "green intellectual capital". In addition, bibliometric analysis can identify the 10 researchers with the most scientific publications, the 10 most popular keywords and their development, the 10 most cited articles, and the researchers with the most co-citations. Finally, clustering can be performed using visualization methods such as network visualization, overlay visualization, and density visualization. The reason for using bibliometric analysis in research is because this method provides a quantitative and objective picture of the development of scientific literature, research trends, and the

contributions of authors, institutions, or countries in a particular field of study.

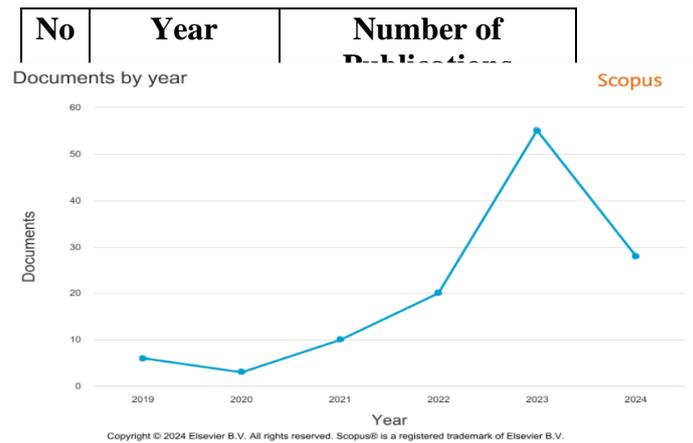
Results and Discussion

1. Number of Article Publications Each Year

Publication analysis focuses on tracking the number of publications per year based on published documents. This analysis is very useful for researchers who want to identify patterns and trends in the popularity of green intellectual capital research topics over time. According to the analysis findings, the total number of publications from 2019 to 2024 has reached 122 papers. The strong interest in this topic can be seen from the highest number of publications in 2023, out of 55 papers. In addition, 2024 had the second highest number of publications with 28 papers, followed by 20 papers in 2022. The details of the number of publications per year from 2019 to 2024 are given in Table 1.

No	Country	Number of Publications
1	China	31
2	Pakistan	30
3	Malaysia	24
4	Indonesia	19
5	India	9
6	Saudi Arabia	9
7	Italy	8
8	Australia	5
9	Spain	5
10	United States	5

Table 1: Number of Publications Each Year



Source: Summarized by the author (2024)

Figure 2: Documents by Year

Source: Document By Scopus (2024)

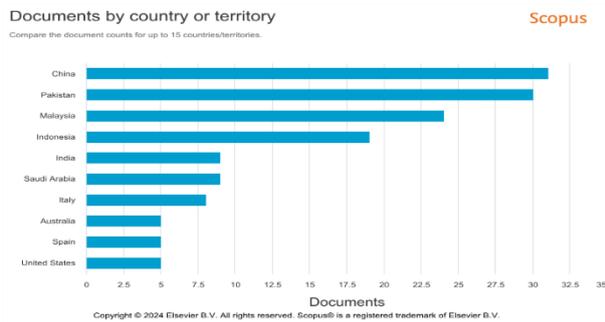
2. 10 Countries With the Most Publications

Bibliometric analysis of green intellectual capital provides important insights. This analysis can identify global centers of research excellence in this topic and help scholars and researchers understand its development. International cooperation is crucial for the development of science. 145 papers from the 10 most active countries were analyzed. China and Pakistan emerged as the two most active countries in publications related to the topic of green intellectual capital, indicating their important role in the development of this topic.

Table 2: Number of Publications Each Year

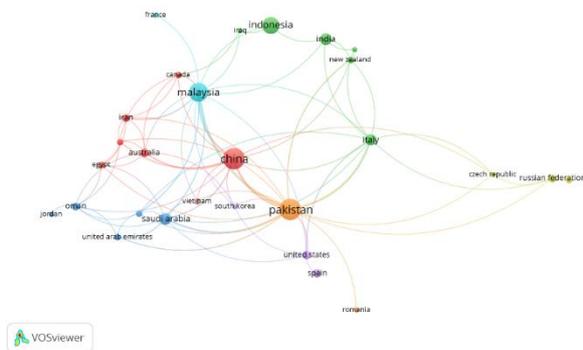
Source: Summarized by the author (2024)

Figure 3: Documents by Country



Source: Document by sqopus (2024)

Figure 4: Network Visualization of Various Countries



Source: Summarized by the author (2024)

The co-author bibliometric map in Figure 4 shows the distribution of green intellectual capital research collaborations across countries. Countries with spatial proximity on the VOSviewer map have stronger collaborations. The analysis revealed that the most active countries are China, Pakistan, Malaysia, Indonesia, India, Saudi Arabia, Italy, Australia, Spain, and the United States, which are connected in a complex network of collaborations. However, some countries, such as Romania, Jordan and Spain, have only 1 collaboration, which may be due to the lack of collaboration between institutions, language barriers, low funding or differences in research focus. The strength of links between countries reflects the intensity of

collaboration. Overall, collaboration between countries in green intellectual capital research varies greatly and is influenced by many factors that need to be taken into account to increase cross-border collaboration.

3. 10 Most Productive Journals

Bibliometric analysis of green intellectual capital research shows that the top 10 journals have made significant contributions over the past 5 years. The most influential journal is the journal Intellectual Capital published by Emerald, followed by Business Strategy and The Environment (John Wiley and Sons) and Journal of Cleaner Production (Elsevier) with 7 citations each. Publisher analysis shows Emerald and Springer as the most influential publishers in green intellectual capital journals. This analysis plays an important role in identifying trends and directions of research developments, measuring the contribution of journals, assessing quality and impact, and supporting researchers' decisions about publication and source selection.

Table 3: Most Productive Journals

No	Journal Name	Publisher	Number of Publications
1	Journal of Intellectual Capital	Emerald	21
2	Business Strategy and The Environment	John Wiley and Sons	7
3	Journal of Cleaner Production	Elsevier	7
4	International Journal of Energy Economics and Policy	EconJournals	5
5	Cogent Business and Management	Taylor & Francis	3
6	Environment Development and Sustainability	Springer	3
7	International Journal of Innovation Science	Emerald	3
8	International Journal of Learning and Intellectual Capital	Inderscience Enterprises	3
9	Journal of The Knowledge Economy	Springer	3
10	Quality Access to Success	SRAC - Societatea Romana Pentru Asigurarea Calitatii	3

Source: Document by sqopus (2024)

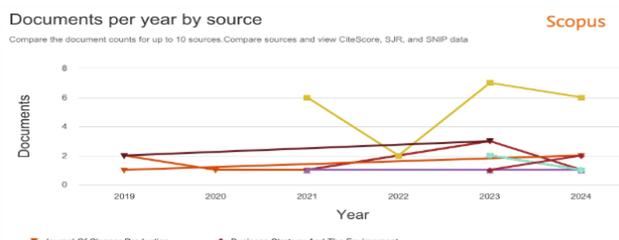
4. 10 Researchers with the Highest Productivity in Scientific Publications

Bibliometric analysis identified the top 10 most productive authors in the field of green intellectual capital in the past 5 years, with a total of 33 published articles. Yong, Jin Yi is one of the most influential authors with 4 publications and 587 citations. The study of collaboration between authors shows that Yong, Jin yi; Asiaei, Kaveh; Feng, Taiwan; Ramayah are the most collaborating authors. These results indicate the existence of a strong and integrated collaboration between authors, which is likely to make significant contributions to the development of the field of green intellectual capital.

Table 4. Most Productive Researchers

Source: Summarized by the author (2024)

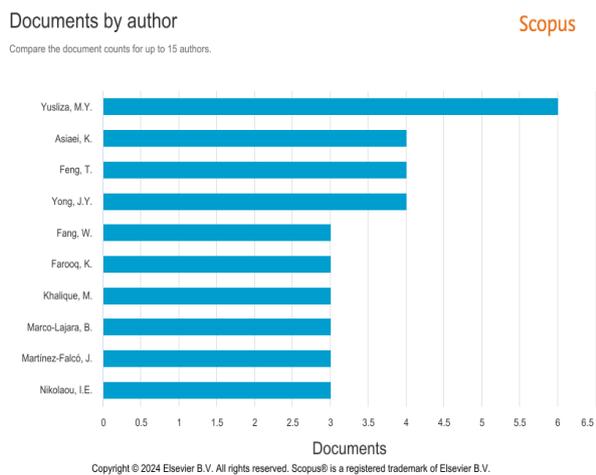
Figure 5: Documents Per Year by Source



No	Researcher Name	Number of Publications	Number of Citations
1	Yong, Jin Yi	4	587
2	Asiaei, Kaveh	4	202
3	Feng, Taiwan	4	44
4	Ramayah, t	3	537
5	Marco-lajara, Bartolome	3	55
6	Martinez-falco, Javier	3	55
7	Farooq, Khalid	3	44
8	Yusliza, Mohd Yusoff	3	44
9	Fang, wei	3	44
10	Xi, Mengjie	3	44

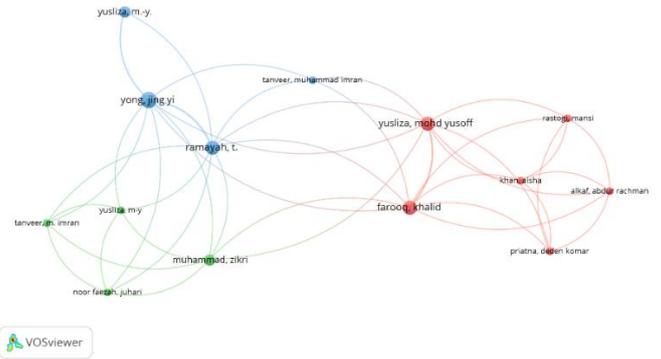
Source: Summarized by the author (2024)

Figure 6: Document By Author



Source: Document by sqopus (2024)

Figure 7: Productive Researcher Network Visualization

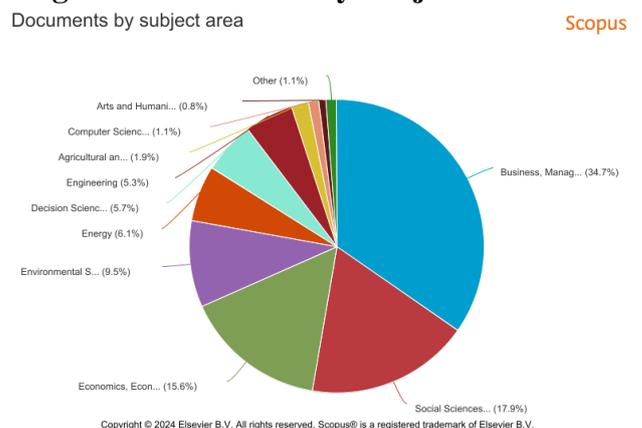


Source: Summarized by the author (2024)

5. Most Productive Subject Areas

Based on the results of the analysis, the most productive topics in green intellectual capital research in the past 5 years have been identified. From the analysis, it can be concluded that the most productive topic is business, management and accounting with 91 articles, followed by social sciences with 47 articles and business, economics and finance with 41 articles. It can be seen that the number of articles published in each topic area is much higher than in other topic areas. It can also be concluded that this topic area plays an important role in green intellectual capital research. According to this data, it can be seen that the percentage of articles related to green intellectual capital varies significantly in each topic area. This shows that it is important to continue to improve the productivity and quality of green intellectual capital research in each relevant topic area in the future.

Figure 8: Documents by Subject Area



Source: Document By Sqopus (2024)

6. 10 Most Popular Keywords Over the Last 5 Years

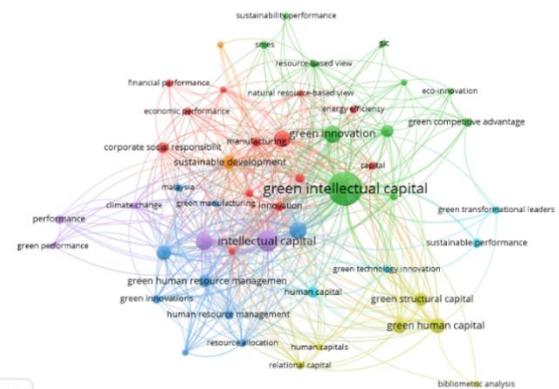
The results of the bibliometric analysis of 53 key words in the scientific literature related to this research topic show a wide map of distribution and connectivity. The most prominent key words are “Green Intellectual Capital”, “Intellectual Capital” and “Knowledge Management”, confirming that the concepts of green intellectual capital and knowledge management are at the heart of the research on this topic. In addition, the analysis revealed seven distinct keyword clusters. The first cluster is centered on "sustainability" as a key concept that is widely connected to many other keywords. Meanwhile, the second cluster is dominated by "Green Intellectual Capital" and "Green Innovation", indicating that green innovation and green intellectual capital are important focuses for research. Other clusters are also described, including environmental performance, green human capital, green structural capital, green intellectual capital and other related topics such as sustainable development. Each cluster shows different theoretical directions according to the keyword connections it has. Overall, this bibliometric analysis provides a comprehensive overview of research topics related to green intellectual capital, key concepts, dominant themes, and the relationships between these concepts. These insights can serve as a basis for informing research and practice directions.

Table 5: Most Productive Keywords

No	Keywords	Number of Citations
1	Green Intellectual capital	198
2	Intellectual capital	132
3	Knowledge management	121
4	Environmental Performance	97
5	Environmental Management	86
6	Sustainable Development	71
7	Sustainability	67
8	Green Innovation	62
9	Green Human Resource Management	50
10	Green Human Capital	49

Source: Summarized by the author (2024)

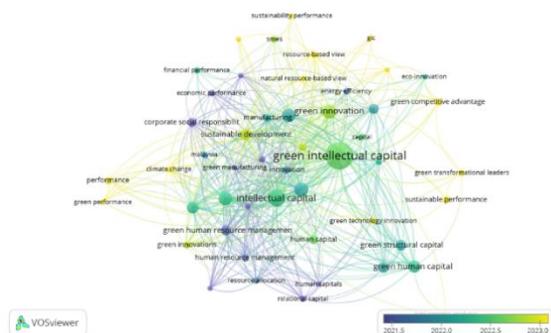
Figure 9: Network Visualization Based on Keywords



VOSviewer

Source: Summarized by the author (2024)

Figure 10 : Overlay Visualization Based on Keywords



Source: Summarized by the author (2024)

After visualizing the map in Figure 10, we can see that there are many emerging research lines under the headings of "Intellectual Capital", "Green Innovation", "Sustainability", "Environmental Performance" and "Knowledge Management". A deeper analysis shows that there has been a significant development in the keyword "Green Intellectual Capital" between 2021 and 2023. This finding indicates that research on this topic is recent, as green and yellow colors dominate the network visuals. Furthermore, the clusters of keywords with more yellow colors indicate that research on "Green Intellectual Capital" is more developed and there is a new focus in this area. Given these results, it is very important to conduct a deeper analysis on keywords that are still new and have not been widely studied. This not only indicates opportunities for research development, but also highlights the potential for an increase in the number of research related to the topic in the future. Therefore, it is expected that new keywords will emerge that can make a significant contribution to "Green Intellectual Capital" research in the future. More comprehensive bibliometric analyses can help identify trends, gaps, and research opportunities that could drive faster progress in this topic.

After reviewing the most cited articles on green intellectual capital, this analysis clearly shows the popularity and influence of these articles in the scientific field. Table 6 shows the top 10 most cited articles. The top two articles are from different journals: the first article was written by Rehman with 365 citations and was published in *Technological Forecasting and Social Change*, and the second article was written by Yong with 292 citations and was published in the *Journal of Cleaner Production*. This citation analysis helps us understand the contribution of each article to this research area and how they are related to each other. This analysis provides valuable insights into the development and direction of research on green intellectual capital.

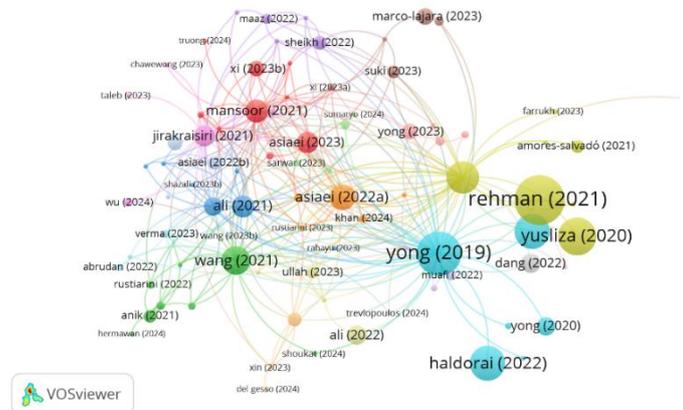
Table 6: Articles with the Most Citations

7. 10 Articles With the Most Quotes

No	Writer	Year	Journal Source	Number of Quotes
1	Rehman	2021	Technological Forecasting and Social Change	365
2	Yong	2019	Journal of Cleaner Production	292
3	Yusliza	2020	Journal of Cleaner Production	208
4	Haldora i	2022	Tourism Management	184
5	Nisar	2021	Journal of Cleaner Production	183
6	Yusoff	2019	Journal of Cleaner Production	156
7	Wang	2021	Business Strategy and The Environment	125
8	Asiaei	2022	Business Strategy and The Environment	96
9	Mansoor	2021	Journal of Intellectual Capital	78
10	Jirakraisiri	2021	Journal of Intellectual Capital	66

Source: Summarized by the author (2024)

Figure 11: Network Visualization



Based on Most Document Citations

Source: Summarized by the author (2024)

Based on a bibliometric citation map analysis of articles on green intellectual capital, the relationship between cited articles is presented in a more visual form in Figure 11. In this figure, we can see the relative importance of the 10 cited articles, which is shown through the largest circles. With this analysis, we can gain a deeper understanding of the relationship between the key concepts in these articles related to green intellectual capital (Lastanti & Augustine, 2022). After reviewing various research on green intellectual capital, there are many references that provide deep insights into how this concept works. Many previous studies have examined the role of green intellectual capital in various aspects such as environmental performance, organizational competitiveness, and sustainable innovation. For example, Previous research has examined the influence of green intellectual capital on firm performance in the manufacturing industry (Novitasari & Agustia, 2023). Green intellectual capital components,

such as green human capital, green structural capital, and green relational capital, have been shown to significantly improve a firm's operational performance and green innovation (Shazali et al., 2023).

Meanwhile, (Mohd Yusoff et al., 2019) investigated the role of green intellectual capital in promoting the adoption of green technology in the renewable energy sector. The results of the study showed that investing in green human capital and green structural capital helps firms absorb more environmentally friendly technological innovations. Furthermore, a recent study (Mehmood & Hanaysha, 2022) investigated the impact of green intellectual capital on green innovation. It is found that investments in green human capital, green structural capital, and green-related capital increase a firm's green innovation potential. In addition, this study (A'yuni & Muafi, 2020) focused on the impact of green intellectual capital on an organization's ability to manage environmental risks. The results of the study showed that investments in green human capital and green structural capital increase a firm's ability to effectively identify, assess, and mitigate environmental risks. A recent study (Fitri et al., 2022) further investigated the impact of green intellectual capital on the financial performance of sustainability-focused firms. Overall, green intellectual capital can help organizations become more environmentally friendly. We can conclude that innovation and competitiveness are key elements of a green economy.

8. Researchers With the Most Co-Citations

By analyzing the co-citation and citation bibliometric maps, it can be concluded that this analysis provides a deep understanding of green intellectual capital. Through Table 8, we can see that

the 10 most widely cited articles are closely related to other articles, and the relationship between the literature is clearly illustrated. Each circle in the bibliometric map represents a single citation, and the size of the circle indicates the number of citations for each document and the importance level of each citation. The relationships between different circles in the bibliometric map, represented by co-citation lines, indicate the connections between articles. Five clusters can be identified in the bibliometric map, representing a group of related articles. Red, green, blue, yellow, and purple clusters each contain articles that discuss green intellectual capital issues. In this analysis, the red cluster can be identified as the most important group with 46 article topics, followed by the green cluster (38), blue cluster (34), yellow cluster (10), and purple cluster (2). This information provides a deeper understanding of the articles that jointly discuss this topic. Therefore, it can be concluded that co-citation analysis and bibliometric citation map can provide deeper insight into the relevant articles to understand green intellectual capital issues according to the corresponding disciplines, methods, theories, and topics.

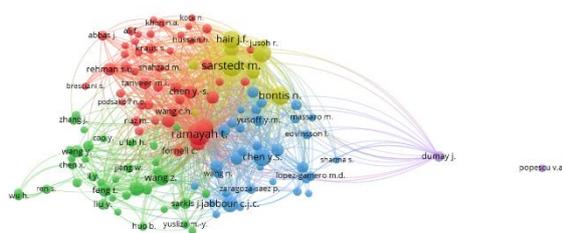
Table 7: Researchers with the Most Co-Citations

No	Writer	Citations	Total Link Strength
1	Ramayah t.	179	19444
2	Sarstedt m.	165	9168
3	Bontis n.	126	6807
4	Ringle cm	125	7670
5	Hair jf	116	6894
6	Chen ys	114	5395
7	Yong jy	111	6624
8	Jabbour cjc	92	4618
9	Yusliza my	84	4970
10	Asiaei k.	79	5086

Source: Summarized by the author (2024)

Figure 12: Network Visualization Based on Co-Citation

Source: Summarized by the author (2024)



Literature Review

This table provides a broad overview of the research focus, methodology used, main findings, and managerial implications of previous studies related to the research topic. With a more detailed explanation, readers will gain a clearer understanding of the scope of the literature review presented in Table 9.

Table 8: Literature Review Analysis

No	Document Title	Authors	Journal	DataT ype	Publisher	Relevant Courses	Results	Year	Citations
----	----------------	---------	---------	--------------	-----------	---------------------	---------	------	-----------

1	Analyzing the relationship between green innovation and environmental performance in large manufacturing firms	Rehman, Shafique Ur; Kraus, Sascha; Shah, Syed Asim; Khanin, Dmitry ; Mahto, Raj V.	Technological Forecasting and Social Change	Quantitative	Elsevier	Cost Accounting and Management Accounting	The current results show that green intellectual capital (GIC), green human resource management (GHRM), and green innovation (GI) have an impact on a firm's environmental performance.	2021	369
2	Nexus between green intellectual capital and green human resource management	Yong, Jing Yi; Yuzliza M.-Y; Ramayah T; Fawehinmi, Olawole	Journal of Cleaner Production	Quantitative	Elsevier	Management Accounting	The results show that green human capital and green relational capital affect green human resource management.	2019	292
3	A structural model of the impact of green intellectual capital on sustainable performance	Yuzliza M.-Y.;Yong, Jing Yi; Tanveer, M. Imran MI; Ramayah T.; Noor Faezah, Juhari; Muhammad, Zikri	Journal of Cleaner Production	Quantitative	Elsevier	Management Accounting	The novelty of this study is to highlight the role of green intellectual capital as an invisible resource that enables organizations to gain sustainable performance and competitive advantage for future researchers.	2020	206
4	Green human resource management practices and environmental performance in Malaysian green hotels: The role of green intellectual capital and pro-environmental behavior	Nisar, Qasim Ali; Haider, Shahbaz; Ali, Faizan; Jamshed, Samia; Ryu, Kisang; Gill, Sonaina Saif	Journal of Cleaner Production	Quantitative	Elsevier	Management Accounting	The results show that employee environmental behavior plays a significant role in improving hotel environmental performance. In addition, green human resource management practices have been shown to contribute indirectly to environmental performance through green intellectual capital and pro-environmentalism.	2021	186
5	Top management green commitment and green intellectual capital as enablers of hotel environmental performance: The mediating role of green human resource management	Haldorai, Kavitha; Kim, Woo Gon; Garcia, R.L. Fernando	Tourism Management	Quantitative	Elsevier	Management Accounting	The results show that management team environmental commitments and environmental intellectual capital have a direct impact on human resource environmental management and hotel environmental performance.	2022	183
6	Do all elements of green intellectual capital contribute	Yusoff, Yusmazida Mohd; Omar, Muhamma	Journal of Cleaner Production	Quantitative	Elsevier	Management Accounting	This study examines the relationship between green intellectual capital	2019	157

	toward business sustainability? Evidence from the Malaysian context using the Partial Least Squares method	d Khalil; Kamarul Zaman, Maliza Delima; Samad, Sarminah					(green human capital, green structural capital, and green relational capital) and business sustainability. Green structural capital and green relational capital have been shown to be positively related to business sustainability, while green human capital is not.		
7	An environmental policy of green intellectual capital: Green innovation strategy for performance sustainability	Wang, Chao Hung; Juo, Wei-Jr	Business Strategy and the Environment	Quantitative	John Wiley and Sons	Management Accounting	Results from a study of 138 high-tech firms show that all three GICs are positively associated with economic performance, environmental performance, and green innovation. Further analysis shows that green innovation fully mediated the GIC-economic performance and GSC-environmental performance relationships and partially mediated the GRC-economic performance and GRC-environmental performance relationships.	2021	127
8	Green intellectual capital and environmental management accounting: Natural resource orchestration in favor of environmental performance	Asiaei, Kaveh; Bontis, Nick; Alizadeh, Raziye; Yaghoubi, Mehdi	Business Strategy and the Environment	Quantitative	John Wiley and Sons	Management Accounting	The results show that the components of green intellectual capital (green human capital, green structural capital, and green relational capital) show a positive relationship with environmental management accounting and environmental performance.	2022	96
9	Does green intellectual capital spur corporate environmental performance through green workforce?	Mansoor, Adil; Jahan, Sarwat; Riaz, Madiha	Business Strategy and the Environment	Quantitative	Emerald	Management Accounting	The results show the mediating effect of GHRM on the relationship between green human capital and organizational EP. Two dimensions of green CI (green human capital, green relational capital) were also found to be	2021	79

							positively related to firms' EP.		
10	Does green intellectual capital matter for green innovation adoption? Evidence from the manufacturing SMEs of Pakistan	Ali, Waheed; Wen, Jun; Hussain, Hadi; Khan, Nadeem Akhtar; Younas, Muhammad Waleed; Jamil, Ihsan	Journal of Intellectual Capital	Quantitative	Emerald	Management Accounting	The empirical results of this study show that green human capital and green structural capital significantly increase the adoption of green innovations.	2021	74

Source: Summarized by the author (2024)

DISCUSSION

In this study, bibliometric analysis is used to identify patterns and trends in the scientific literature related to the research topic of green intellectual capital. The analysis was performed using 122 articles obtained from the Scopus database, with selected data criteria including article title, abstract, keywords, and author. The timeframe is from 2019 to 2024, focusing on topics in business, management and accounting. Economics, economics and finance. The document type selected is the article, and the source type used is simply an English-language journal, sorted by the highest number of citations. Popular keywords are “Green intellectual capital,” “Intellectual capital,” and “Knowledge management,” and search trends show a significant increase in the topic of green intellectual capital in recent years. The most cited papers demonstrate significant contributions to understanding the relationship between green intellectual capital and environmental performance, organizational competitiveness, and sustainable innovation.

After analyzing the keywords and creating a bibliometric map, it can be concluded that this analysis provides a deeper understanding of the subject of green intellectual capital. The research results indicate that green intellectual capital plays a significant role in improving environmental performance, organizational competitiveness, and sustainable innovation. However, there are several

shortcomings that need to be considered for future research. One of the main shortcomings identified in green intellectual capital research using bibliometric analysis is the limited understanding of the role and extent of environmentally friendly intellectual capital in overcoming environmental or social problems. These results indicate the need for broader and deeper theoretical development and research on this topic. In addition, green human capital, Further research is needed to explore how components of green intellectual capital, such as green structural capital and green relational capital, can contribute to environmental performance, organizational competitiveness, and sustainable innovation. Therefore, the use of bibliometric analysis allows us to better understand the dynamics and complexity of green intellectual capital.

Global Impact Competency (GIC) can have a significant impact on business sustainability or corporate policies in a variety of ways. In general, GIC refers to an organization or company’s ability to manage and mitigate the social, economic, and environmental impacts of their operations on a global scale. Here are some concrete impacts of GIC on business sustainability or corporate policies:

1. Improved Corporate Reputation
 - Positive Impact: Companies that adopt GIC well can build a positive image in the eyes of consumers, partners, and the community. For example, if a company demonstrates a commitment to sustainability by minimizing its carbon

footprint or implementing effective waste management policies, this can increase customer loyalty and the company's appeal in the market.

- Negative Impact: If a company fails to meet standards or is not transparent in its social and environmental policies, this can damage its reputation and lead to financial losses.
2. Regulatory Compliance
 - Positive Impact: By understanding and implementing GIC-based policies, companies will be better prepared to face increasingly stringent regulations or laws related to sustainability and corporate social responsibility. This helps companies avoid fines or legal problems in the future.
 - Negative Impact: On the other hand, companies that do not pay attention to GIC may face the risk of violating regulations that can be financially and reputationally detrimental.
 3. Resource Efficiency and Cost Reduction
 - Positive Impact: Effective GIC can encourage companies to optimize the use of resources, such as energy, water, and raw materials, thereby reducing waste and operating costs. Companies that focus on efficiency can often increase long-term profitability.
 - Negative Impact: The process of implementing GIC requires a significant initial investment in technology and training. However, if done well, it often results in long-term savings.
 4. Innovation and Competitive Advantage
 - Positive Impact: The implementation of GIC can encourage innovation in products and services that are more environmentally or socially friendly. Companies that adopt sustainability principles tend to create new products that can meet the demands of a market that is increasingly concerned with social and environmental issues. This gives them a competitive advantage.
 - Negative Impact: Developing new products or services based on GIC can

require more intensive research and a longer development process. For companies that are less prepared, this can be a challenge.

5. Risk Management and Business Resilience
 - Positive Impact: By considering GIC factors, companies can identify and manage risks related to climate change, social instability, and other global challenges. This increases the company's resilience to external disruptions and improves business viability.
 - Negative Impact: If companies do not consider GIC in their risk planning and management, they may be more vulnerable to market fluctuations or external events that can disrupt operations.
6. Attractiveness to Investors and Stakeholders
 - Positive Impact: Many investors are now paying more attention to sustainability and corporate social responsibility as part of their investment decisions. Companies that have strong GIC policies tend to attract more investment from ESG (Environmental, Social, and Governance) investors.
 - Negative Impact: Conversely, companies that do not demonstrate a commitment to GIC may have difficulty attracting funds or cooperation with investors who prioritize sustainability.

Overall, the concrete impact of GIC on business sustainability or corporate policies depends largely on how companies plan, implement, and assess these policies. Good implementation of GIC can result in increased efficiency, a better reputation, and attractiveness in a global market that is increasingly concerned about social and environmental issues. Conversely, failure to implement it can be detrimental to the company in the long run.

Non-financial factors that contribute to the success of management

strategies are very important because they affect internal and external aspects of the organization that are not always visible in the financial statements, but have a major impact on the sustainability and effectiveness of the company's strategy. Here are some of the main non-financial factors that often contribute to the success of management strategies: 1. Quality of Human Resources (HR), 2. Internal Communication, 3. Organizational Culture, 4. Customer Satisfaction and Loyalty, 5. Innovation and Technology, 6. Internal Systems and Processes, 7. Stakeholder Relationships, and 8. Organizational Learning

Conclusion

This research uses bibliometric analysis to investigate the concept of green intellectual capital in depth. This research includes research design, data collection, analysis indicators, procedures, as well as research results and discussion. Using bibliometric analysis methods, this research maps the structure, dynamics, and evolution of the literature related to green intellectual capital. Data were retrieved from 122 publications in leading journal databases such as Scopus with the keyword "green intellectual capital" during the period 2019-2024. The indicators analyzed include the number of publications per year, the most publishing countries, the most producing journals, the most productive researchers, the most productive subject areas, the most popular keywords, the most cited articles, and the most co-cited researchers. The analysis was performed using the VOSviewer application for network visualization, overlay visualization, and density mapping. The results show that the interest in green intellectual capital is growing, especially considering that the number of publications will increase annually in 2023. China and Pakistan became the countries with the highest number of publications, and the Journal of Intellectual Capital was the most influential journal. Yong, Jin Yi are the most prolific

authors, and the keywords "Green Intellectual Capital", "Intellectual Capital" and "Knowledge Management" dominate. The most cited articles come from journals such as Technological Forecasting and Journal of Social Change and Cleaner Production. The bibliometric mapping analysis shows the close connections between key concepts in green intellectual capital, identifying trends and research gaps. This study draws on environmental performance research. It highlights the importance of green intellectual capital in enhancing organizational competitiveness and sustainable innovation, and identifies opportunities for further deeper research.

It is important to note that this study has several limitations. First, the data used comes only from the Scopus database, so it may not include all research papers on green intellectual capital, especially those published in journals or other platforms. In addition, bibliometric analysis is limited in some aspects, such as the number of publications, citation trends, and dominant keywords. This approach does not provide a deeper understanding of the concept of GIC and its dynamics in institutional and industrial contexts. Another limitation is that the research focuses on English-language publications, which may not reflect the perspectives and findings of studies in other countries where the local language is spoken. However, this research provides a valuable initial overview of the GIC research landscape and can serve as a basis for more comprehensive future studies using more diverse data sources and qualitative and contextual approaches that can complement bibliometric analysis. Overall, the results of this study provide valuable insights into the development and directions of GIC research, but there is room for further exploration in the future.

References

- A'yuni, Q., & Muafi, M. (2020). Pengaruh Green Intellectual Capital Terhadap Keunggulan Kompetitif Dengan

- Pemediasi Green Human Resource Management. *JBTI: Jurnal Bisnis Teori Dan Implementasi*, 11(2), 81–97. <https://doi.org/10.18196/bti.112133>
- Ades, R., Sukrisno, & Widiatmaka, F. P. (2022). Green Growth, Green Practice, Green Business Antecedent And Conclusion To Drive Firm Value : A Conceptual Model Lecturer of Indonesian College of Tourism Economic. *Jurnal Ekombis Review*, 10(2), 889–902. <https://jurnal.unived.ac.id/index.php/er/indexDOI:https://doi.org/10.37676/ekombis.v10i2>
- Ahlawat, D., Sharma, P., & Kumar, S. (2023). A systematic literature review of current understanding and future scope on Green Intellectual Capital. *Intangible Capital*, 19(2), 165–188. <https://doi.org/10.3926/IC.2191>
- Benevene, P., Buonomo, I., Kong, E., Pansini, M., & Farnese, M. L. (2021). Management of green intellectual capital: Evidence-based literature review and future directions. *Sustainability (Switzerland)*, 13(15), 1–22. <https://doi.org/10.3390/su13158349>
- Fitri, A., Diamastuti, E., Romadhon, F., & Maharani, H. (2022). The Effect of Green Intellectual Capital on SMEs' Business Sustainability. *Jurnal Bisnis Dan Manajemen*, 9(1), 55–64. <https://doi.org/10.26905/jbm.v9i1.7476>
- Hendrix, T., Isnasari, Y., Berliandaldo, M., & Kholiyah, S. (n.d.). *Implementasi Kebijakan Perlindungan Kekayaan Intelektual Terhadap Efektivitas Produk Penelitian dan Pengembangan*. 17(1), 41–64. <https://doi.org/https://doi.org/10.24258/jba.v17i1.754>
- Lastanti, H. S., & Augustine, Y. (2022). the Strength of Good Corporate Governance in Moderating the Effects of Green Intellectual Capital on Green Competitive Advantage and Firm Performance. *Jurnal Akuntansi Trisakti*, 9(1), 85–98. <https://doi.org/10.25105/jat.v9i1.13353>
- Lestari, R., Nadira, F. A., Nurleli, N., & Helliana, H. (n.d.). *Pengaruh Penerapan Green Accounting Terhadap Tingkat Profitabilitas Perusahaan*. 20(2), 124–131. <https://doi.org/https://doi.org/10.29313/ka.v20i2.5990>
- Liu, D., Yu, X., Huang, M., Yang, S., Isa, S. M., & Hu, M. (2022). The Effects of Green Intellectual Capital on Green Innovation: A Green Supply Chain Integration Perspective. *Frontiers in Psychology*, 13(June), 1–14. <https://doi.org/10.3389/fpsyg.2022.830716>
- Mehmood, K. K., & Hanaysha, J. R. (2022). Impact of Corporate Social Responsibility, Green Intellectual Capital, and Green Innovation on Competitive Advantage: Building Contingency Model. *International Journal of Human Capital and Information Technology Professionals*, 14(1), 1–14. <https://doi.org/10.4018/IJHCITP.293232>
- Mohammad, H. S., Lajuni, N., & Yeng, S. K. (2021). Current Trend and Development on Intellectual Capital and Performance: A Bibliometric Analysis. *International Journal of Academic Research in Business and Social Sciences*, 11(7). <https://doi.org/10.6007/ijarbss/v11-i7/10449>
- Mohd Yusoff, Y., Omar, M. K., & Zaman, M. D. K. (2019). Nexus between Green Intellectual Capital and Organizational Learning Capability. Evidence from Malaysian Manufacturing Sector. *IOP Conference Series: Materials Science and Engineering*, 697(1). <https://doi.org/10.1088/1757-899X/697/1/012009>
- Nadirah, I. (2020). Pelaksanaan Corporate Social Responsibility (CSR) Terhadap

- Masyarakat Sekitar Wilayah Perusahaan Perkebunan. *Iuris Studia: Jurnal Kajian Hukum*, 1(1), 7–13. <https://doi.org/10.55357/is.v1i1.15>
- Novitasari, M., & Agustia, D. (2023). Competitive advantage as a mediating effect in the impact of green innovation and firm performance. *Business: Theory and Practice*, 24(1), 216–226. <https://doi.org/10.3846/btp.2023.15865>
- Shah, S. M. M., Ahmed, U., Ismail, A. I., & Mozammel, S. (2021). Going intellectually green: Exploring the nexus between green intellectual capital, environmental responsibility, and environmental concern towards environmental performance. *Sustainability (Switzerland)*, 13(11). <https://doi.org/10.3390/su13116257>
- Shazali, R. A., Kamaluddin, A., Sa'ad, S., & Khalique, M. (2023). Green Intellectual Capital Measurement in the Hotel Industry: the Developing Country Study. *Corporate Governance and Organizational Behavior Review*, 7(3), 80–89. <https://doi.org/10.22495/cgobrv7i3p7>
- Sohu, J. M., Hongyun, T., Junejo, I., Akhtar, S., Ejaz, F., Dunay, A., & Hossain, M. B. (2024). Driving sustainable competitiveness: unveiling the nexus of green intellectual capital and environmental regulations on greening SME performance. *Frontiers in Environmental Science*, 12(February), 1–13. <https://doi.org/10.3389/fenvs.2024.1348994>
- Yusliza, M. Y., Yong, J. Y., Tanveer, M. I., Ramayah, T., Noor Faezah, J., & Muhammad, Z. (2020). A structural model of the impact of green intellectual capital on sustainable performance. *Journal of Cleaner Production*, 249, 119334. <https://doi.org/10.1016/j.jclepro.2019.119334>