Antecedents and Consequences: A Review of Green Intellectual Capital

Setyarini Santosa[1*], Tubagus Ismail[2], Imam Abu Hanifah[3], Munawar Muchlish[4]
{setyarinis@president.ac.id[1], ismailtb@untirta.ac.id[2], imamabuhanifah@untirta.ac.id[3], muchlish_ak@untirta.ac.id[4]}

Universitas Sultan Ageng Tirtayasa, Serang-Banten[1234]
Universitas Presiden – Cikarang Jawa Barat[1]

Abstract. The role of green intellectual capital (GIC) is more and more significant nowadays due to the pressure from the public to integrate environmental sustainability issues in business. Using specific criteria, data for this study were taken from Scopus database, resulted 45 documents for further analysis. This study proposes an integrated model for GIC research in the near future and attempts to analyse the extent to which antecedents and consequences are used to provide future research opportunities.The findings indicates that the impact of GIC on performance are the most prevalent. Two antecedents and contextual variable that are most used are corporate social responsibility, environmental consciousness and green innovation. This study is distinctive as it classifies direct and indirect models between GIC and its consequences based on the mapping of prior research. The inventory of variables that have been applied in prior studies also provides specificity to this study.

Keywords: Green Intellectual Capital, Antecedents, Consequences, Review.

1 Introduction

The most important factor for the company's competitive advantage is intellectual capital [1][3]. Thus, a lot of research on the topic of intellectual capital has been done, especially the ones focusing on the economic value [4] [5]. However research on the intellectual capital in the context of environmental issues is lacking [5][8], while there is growing environmental concern in the global economy nowadays. International regulation on environmental issues and environmental awareness of the society around the world have forced business to find a new solution in order to stay relevant or even win the global market competition [8]. However, adopting environmental issue in the business brings financial consequences, as the company needs to allocate their resource for handling it. Debate around these consequences need to be addressed proportionally. Company might consider that investment in environmental management and protection do not give any benefit. It will reduce company's financial inflow and profit and might obstruct the development of the company in the future [2]. Aligned with it, there is also opinion that pollutant can also be considered as the existence of inefficient uses of resources [9].

However there is contra argument that the negative impact to financial issues later on can be solved because they might impose higher pricing for their new eco-friendly products [9]. Also, higher compliance to environmental standard might bring new initiatives for the companies to be more innovative and efficient [10]. Compliance with environmental regulation will support efficiency and enhance the corporate image and reputation [11] and in turn, it will enhance the competitiveness of the company.

Research on the role of intellectual capital in addressing environment sustainability and its performance will be helpful in providing the discourse. In the effort to prove the link

ICOSTELM 2022, November 04-05, Bandar Lampung, Indonesia

DOI 10.4108/eai.4-11-2022.2329866

between intellectual capital and competitive advantages of firm in the context of environmental issues, Chen (2008) introduced a novel construct, namely green intellectual capital (GIC). GIC originated from intellectual capital which develop because of the environmentalism issue [2][5][12].

Research trend on GIC have been increasing, however the total number of research is still considered rare. Applying Publish or Perish software using criteria on keywords "green intellectual capital" OR "Green IC" with unlimited time period, there are only 71 documents can be found in Scopus database. Ten out of 71 document need to be excluded from the discussion since they come from other disciplines. This data was data taken on June, 2022. In other words, there are only 61 document has been published for the last 14 years since the first time GIC construct was introduced by Chen in 2008. However, on the average, only 4-5 articles published in Scopus database with green intellectual capital as keyword for searching those documents can be considered that this topic is still scarce.

Exploring the GIC research found in Scopus database, this paper aims at finding the antecedents and consequences of GIC to provide the applicable research path in the future. Integrated research model will also be suggested as a recommendation for further empirical research. Next section will describe the data gathering and methodology, then followed by discussion and conclusion.

2 Methodology

To achieve the objective, 71 document that has been populated from PoP Software will be sorted using searching and exclusion criterias as shown in Figure 1. Total document that can be used for further analysis in the future is 45. To find the antecedents and consequences as well as the future research avenue, this study will follow the steps as shown of the analysis panel on Figure 1.

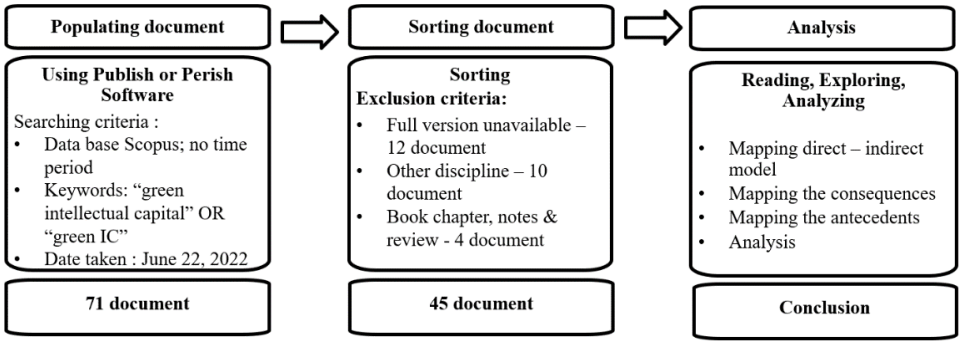

Figure 1. Methodology

3 Discussion

GIC is defined as "the total stock of all kinds of intangible assets, knowledge, capabilities, and relationship, etc. about environmental protection or green innovation of both the individual and organization levels within a company" [1]. GIC has three components which are green human capital (GHC), green structural capital (GSC) and green relational capital (GRC) [1][8][11][13][19]. However, not all researchers agree with these three components. They used another components such as green organizational capital [20][25], green social capital [20] as well as green innovation capital [21].

From articles under study, there are two types of relationship between GIC or its components with its consequences, which are direct and indirect relationship. There are 15 research articles that develop direct model with 11 consequences as revealed on Table 1.

Table 1. Direct Relationship between GIC and Its Consequences

CONSEQUENCES	GIC	GHC	GSC	GRC	AUTHORS
1. Competitive advantage [2]		S (+)	S (+)	S (+)	Chen, 2008
• Competitive advantage [21]		S (+)		S (+)	Yahya et al., 2015*
• Competitive advantage [14]		NS	S (+)	NS	Rezeaei et al., 2016
• Competitive advantage [26]	S (+)				Sidik et al., 2019
• Competitive advantage [27]		S (+)	S (+)	S (+)	Anik et al., 2021
2. Environmental performance [26]	S (+)				Sidik et al., 2019
• Environmental performance[28]	S (+)				Yadiati et al., 2019
• Environmental performance[29]	S (+)				Yusliza et al., 2019
• Environmental performance[30]		S (+)	NS	S(+)	Shah et al., 2021
• Environmental performance [19]		S (+)	S (+)	S (+)	Wang & Juo, 2021
3. Economic performance[29]	S (+)				Yusliza et al., 2019
• Economic performance[19]		S (+)	S (+)	S (+)	Wang & Juo, 2021
4. Social performance [29]	S (+)				Yusliza et al., 2019
5. Sustainable performance[16]		S (+)	S (+)	S (+)	Malik et al., 2020
6. Business sustainability [15]		NS	S (+)	S (+)	Yusoff et al., 2019
7. Social innovation [31]		S (+)	S (+)	NS	Sheikh, 2021
8. Green innovation adoption [32]		S (+)	S (+)	NS	Ali et al., 2021
9. Green HRM [33]		S (+)	NS	S (+)	Yong et al., 2019
10. Organizational learning capability [34]		NS	NS	S (+)	Yusoff et al., 2019
11. Environmental responsibility[30]		S (+)	S (+)	S (+)	Shah et al., 2021

S (+) positively significant ; NS – not significant

**Instead of GHC and GRC, this research also used Green Organizational Capital (NS) and Green Innovation Capital (S+)* [21]

Empirical research with direct relationship between GIC and competitive advantages has already done by five researchers [2][14][21][26][27] Most of them proved that the relationships are significant positive, except research by [14][21]. It means, that Rezaei et al., (2016) failed to prove that knowledge, skill, capability, experience, wisdom, creativity and commitment of employee to protect environment as well as mutual relationship between company with other parties relate with competitive advantage. Green organizational capital also does not relate with competitive advantage. Green organizational capital is the production and management of knowledge about environmental issues effectively in supporting employees‘ productivity [21], meaning that it is part of GSC. GSC consist of green organizational capital and green innovation capital [21]. Thus it is clear that the result of the relationship between GIC and competitive advantage is still ambiguous.

Instead of its link with the competitiveness issue, GIC is also important factor that determine the environmental performance [19][28][30] and economic performance of the firm[19][29]. Economic performance consists of financial and non financial performance.

However, due to environmental and sustainability issues, instead of economic performance, researchers sometimes used GIC and sustainable performance concept [16][29], which consists of economic performance, environmental performance as well as social performance. Sustainable performance was derived from triple bottom line introduced by Elkington (2004), that achieving economic performance must be without social and environmental degradation. Research on the this topic is still infancy too.

Other research explored the relationship between GIC with innovation [31][32], green human resources management [36], and organizational learning capability [34] as well as environmental responsibility [30]. As shown in Table 1, this research is still limited too. Further research is needed to confirm their relationships.

Inconsistency in the direct relationship between GIC and its outcomes might be the result of different statistical techniques, different samples, differnt in how the constructs has been operationalized, present of moderator variables [37], etc or the needs of contextual variable between those two variables [38]. Thus, indirect relationship might provide better research model compare to the direct one.

Table 2. Indirect Relationship between GIC and Its Consequences with Its Contextual Variables

AUTHORS	VARIABLES	CONSEQUENCES
Pan et al, 2021; Mehmood, 2022[p]	Green Innovation*[17][3]	Competitive advantage
Mansoor et al., 2021; Haldorai et al., 2022	GHRM*[39], [40]	Environmental performance
Rehman et al., 2021; Ullah et.al, 2022; Asiaei et al., 2022; Nikolau, 2019[p]	Green innovation* [41]–[44]	
Wang & Juo, 2021	Green innovation**[19]	
Asiaei et al., 2022	environmental management accounting (EMA)*[43]	
Nisar et al., 2021	Pro-environmental behavior*[45]	
Asiaei et al., 2022	Environmental performance measurement systems (EPMS)* & Environmental performance [11]	Economic performance
Nikolaou, 2019[p]	competitive advantage [44]	
Wang & Juo, 2021	Green innovation**[19]	
Muafi & Sulistio, 2022	Supply chain integration*, Digital supply chain*, Supply chain agility* [46]	business performance

**significant mediation relationship -- ** not significant relationship* -- [p] proposition

As shown in Table 2, there are 9 mediating variables appeared in 12 articles under study such as green innovation, GHRM, EPMS, supply chain characteristics, etc. The most used mediator variable is green innovation. It mediates the relationship between GIC and competitive advantages [3][17]; environmental performance [19], [41][44] and economic performance [19]. However, the result is still inconsistent, hence it open research opportunity in the future. Innovation compensation theory stated that green innovation might drive improvement of production process and product quality, might also drive energy saving as well as boosting the productivity that establish barriers to entry for the company's competitor [17].

Table 2 reveals that instead of green innovation, several mediating varibles used in research on the relationship between GIC and environmental perfomance are GHRM or green human resource management [39][40][47] and EMA [48] as well as pro environmental behavior [45]. The result of those research mostly confirmed that GHRM, green innovation or environmental innovation are significantly mediated the relationship between GIC and environmental performance. However, green innovation did not mediate the relationship between all GIC components and green performance, except GRC [19]

As shown on Table 2, relationships between GIC and economic performance are still relatively rare (3 articles) compare to the one between GIC and environmental performance (8 articles). Performance measurement systems have mediation effect environmental [11] while green innovation does not [19]. In supply-chain context, supply chain integration, digital supply chain and supply chain agility have mediating impact in the link of GIC and business performance [46].

Instead of mediating effect, moderating effect has also been explored in the indirect relationship of two variables under study. Positive moderating effect of environmental leadership was confirmed in the relationship between GIC and green innovation, as proxied by green product and process innovation while green innovation identity did not have significant effect [17]. Another variables used as moderating variables were IT capability [49], although the result is insignificant. While most articles under study confirmed that green innovation was significant mediating variable, it did not have moderating effect on the relationship between GHC and business sustainability. However, it moderates the relationship between GSC and business sustainability [18]. Part of articles under study explored the indicators of GIC [50] and building index for green intellectual economy [25]. It also explored GIC and found that the highest existance of GIC component in Malaysian manufacturing sector is GHC and the lowest is GSC [51].

Table 3. GIC's Antecedents of the Articles Under Study

ANTECEDENTS	GIC	GHC	GSC	GRC	AUTHOR
1. Environmental consciousness	S(+)				Huang & Kung, 2011 [13]
		S(+)	S(+)	S(+)	Chang & Chen, 2012 [1]
		S(+)	S(+)	NS	Sudibyo & Sutanto, 2020 [52]
2. Corporate social responsibility		S(+)	S(+)	S(+)	Chang & Chen, 2012 [1]
		S(+)	S(+)	S(+)	Sudibyo & Sutanto, 2020 [52]
	v				Mehmood & Hanaysha, 2022 [3]
3. Top management commitment	v				Yong et al., [33]
4. Environmental regulations		S(+)	NS	S(+)	Trevlopoulos et al., 2021 [53]
5. Green strategic intent		S(+)	S(+)	S(+)	Jirakraisiri et al., 2021 [22]
6. Green HRM practice - green hiring; green training & development; green discipline & management	NS/S/S				Nisar et al., 2021 [45]

7.	Green innovation strategic orientation	S(+)	S(+)	S(+)	Dang & Wang, 2022 [54]

v – qualitative research / proposition

Based on the analysis, there are 9 articles discussed about 7 antecedents for GIC as shown on Table 3. There are 5 antecedents that have been investigated only in one empirical research article, leaving high opportunity for future research avenue. Research on environmental consciousness as antecedent for GIC still bring ambigous result. While for CSR, although the results are consistent, it is needs further investigation since it is confirmed only by 2 research papers.

4 Conclusion and Recommendation

The review and analysis above lead to the conclusion that the majority of GIC research focuses on how GIC affects competitive advantage and business performance, particularly economic and environmental performance. From the perspective of the research method, the direct model is relatively more frequent than the indirect one. It was found that green innovation is typically used as a mediating variable in the indirect model. The study also reveals that environmental consciousness and CSR are the two most frequently used antecedents of GIC. Given the small number of studies and the ambiguous results, the use of these variables in GIC research is still advisable. The direct model oversimplifies reality, making its implications for practice dubious, hence the indirect research model design is considered to be far more appropriate.

Future research can focus on an integrated model that continue to include CSR and environmental consciousness as antecedents of GIC. The model will be more useful in practice if green innovation and/or strategy are used as a mediating or moderating variable on the relationship between GIC and sustainability performance. While "sustainable performance" relates to the triple bottom line approach. Strategic involvement is crucial because green strategy can be exploited as a tool to win the competition. Additionally, rather than focusing just on GIC research at the organizational level, as has been frequently done up to now, future study might be directed at the national or regional level.

Reference

[1] C. Chang and Y. Chen, “The determinants of green intellectual capital,” *Manag. Decis.*, vol. 50, no. 1, pp. 74–94, Feb. 2012, doi: 10.1108/00251741211194886.

[2] Y. S. Chen, “The positive effect of green intellectual capital on competitive advantages of firms,” *J. Bus. Ethics*, vol. 77, no. 3, pp. 271–286, 2008, doi: 10.1007/s10551-006-9349-1.

[3] K. K. Mehmood and J. R. Hanaysha, “Impact of Corporate Social Responsibility, Green Intellectual Capital, and Green Innovation on Competitive Advantage,” *Int. J. Hum. Cap. Inf. Technol. Prof.*, vol. 14, no. 1, pp. 1–14, Jan. 2022, doi: 10.4018/IJHCITP.293232.

[4] C. Nielsen, M. Lund, and P. Thomsen, “Killing the balanced scorecard to improve internal disclosure,” *J. Intellect. Cap.*, vol. 18, no. 1, 2017, doi: 10.1108/JIC-02-2016-0027.

[5] G. Baima, C. Forliano, G. Santoro, and D. Vrontis, “Intellectual capital and business model: a systematic literature review to explore their linkages,” *J. Intellect. Cap.*, vol. 22, no. 3, pp. 653–679, Apr. 2021, doi: 10.1108/JIC-02-2020-0055.

[6] A. Buallay, G. Kukreja, E. Aldhaen, M. Al Mubarak, and A. M. Hamdan, “Corporate social responsibility disclosure and firms’ performance in Mediterranean countries: a stakeholders’ perspective,” *EuroMed J. Bus.*, vol. 15, no. 3, pp. 361–375, Apr. 2020, doi: 10.1108/EMJB-05-

2019-0066.
[7] M. Bellucci, G. Marzi, B. Orlando, and F. Ciampi, “Journal of Intellectual Capital: a review of emerging themes and future trends,” *J. Intellect. Cap.*, vol. 22, no. 4, pp. 744–767, May 2021, doi: 10.1108/JIC-10-2019-0239.
[8] Y. Chen, “The positive effect of green intellectual capital on competitive advantages of firms,” *J. Bus. Ethics*, vol. 77, no. 3, pp. 271–286, 2008, doi: 10.1007/s10551-006-9349-1.
[9] M. E. Porter and C. van der Linde, “Toward a New Conception of the Environment-Competitiveness Relationship,” *J. Econ. Perspect.*, vol. 9, no. 4, pp. 97–118, Nov. 1995, doi: 10.1257/jep.9.4.97.
[10] P. Shrivastava, “Environmental technologies and competitive advantage,” *Strateg. Manag. J.*, vol. 16, no. S1, pp. 183–200, 1995, doi: 10.1002/smj.4250160923.
[11] K. Asiaei, R. Jusoh, O. Barani, and A. Asiaei, “How does Green Intellectual Capital Boost Performance? The Mediating Role of Environmental Performance Measurement Systems,” *Bus. Strateg. Environ.*, vol. 31, no. 4, pp. 1587–1606, 2022, doi: 10.1002/bse.2971.
[12] P. Benevene, I. Buonomo, E. Kong, M. Pansini, and M. L. Farnese, “Management of green intellectual capital: Evidence-based literature review and future directions,” *Sustain.*, vol. 13, no. 15, p. 8349, Jul. 2021, doi: 10.3390/su13158349.
[13] C. Huang and F. Kung, “Environmental consciousness and intellectual capital management,” *Manag. Decis.*, vol. 49, no. 9, pp. 1405–1425, Oct. 2011, doi: 10.1108/00251741111173916.
[14] S. S. Rezaei, M. Izadi, I. Jokar, and S. S. Rezaei, “The relationship between green intellectual capital and competitive advantages,” *Int. Bus. Manag.*, vol. 10, no. 20, pp. 4743–4748, 2016, doi: 10.3923/ibm.2016.4743.4748.
[15] Y. M. Yusoff, M. K. Omar, M. D. Kamarul Zaman, and S. Samad, “Do all elements of green intellectual capital contribute toward business sustainability? Evidence from the Malaysian context using the Partial Least Squares method,” *J. Clean. Prod.*, vol. 234, pp. 626–637, Oct. 2019, doi: 10.1016/j.jclepro.2019.06.153.
[16] S. Y. Malik, Y. Cao, Y. H. Mughal, G. M. Kundi, M. H. Mughal, and T. Ramayah, “Pathways towards sustainability in organizations: empirical evidence on the role of green human resource management practices and green intellectual capital,” *Sustain.*, vol. 12, no. 8, p. 3228, Apr. 2020, doi: 10.3390/SU12083228.
[17] C. Pan, Y. Jiang, M. Wang, S. Xu, M. Xu, and Y. Dong, “How can agricultural corporate build sustainable competitive advantage through green intellectual capital? A new environmental management approach to green agriculture,” *Int. J. Environ. Res. Public Health*, vol. 18, no. 15, p. 7900, Jul. 2021, doi: 10.3390/ijerph18157900.
[18] H. Ullah, Z. Wang, M. Mohsin, W. Jiang, and H. Abbas, “Multidimensional perspective of green financial innovation between green intellectual capital on sustainable business: the case of Pakistan.,” *Environ. Sci. Pollut. Res. Int.*, vol. 29, no. 4, pp. 5552–5568, Jan. 2022, doi: 10.1007/s11356-021-15919-7.
[19] C. H. Wang and W. J. Juo, “An environmental policy of green intellectual capital: Green innovation strategy for performance sustainability,” *Bus. Strateg. Environ.*, vol. 30, no. 7, pp. 3241–3254, Nov. 2021, doi: 10.1002/bse.2800.
[20] M. Delgado-Verde, J. Amores-Salvadó, G. Martín-De Castro, and J. E. Navas-López, “Green Intellectual Capital and Environmental Product Innovation: The Mediating Role of Green SocialCapital,” *Knowl. Manag. Res. Pract.*, vol. 12, no. 3, pp. 261–275, Aug. 2014, doi: 10.1057/kmrp.2014.1.
[21] N. A. Yahya, R. Arshad, and A. Kamaluddin, “Green intellectual capital resources as drivers of firms’ competitive advantage,” *Proc. Int. Conf. Intellect. Capital, Knowl. Manag. Organ. Learn. ICICKM*, vol. 2015, pp. 327–335, 2015, [Online]. Available: https://api.elsevier.com/content/abstract/scopus_id/84994251856
[22] J. Jirakraisiri, Y. F. Badir, and B. Frank, “Translating green strategic intent into green process innovation performance: the role of green intellectual capital,” *J. Intellect. Cap.*, vol. 22, no. 7, pp. 43–67, Dec. 2021, doi: 10.1108/JIC-08-2020-0277.
[23] S. Sharif, H. Q. Yousaf, S. Shaikh, F. Mirza, and U. Gantulga, “Hotels’ experience of green

environment management and innovation performance: stewardship of multiple green drivers," *J. Environ. Plan. Manag.*, pp. 1–28, May 2022, doi: 10.1080/09640568.2022.2070462.
[24] E. Bombiak, "Green Intellectual Capital as a Support for Corporate Environmental Development—Polish Company Experience," *Energies*, vol. 15, no. 9, p. 3004, Apr. 2022, doi: 10.3390/en15093004.
[25] J. Orlovska, K. Dryhola, and A. Khlivitskaya, "Methodological approach to the assessment of the level of intellectualization of the green economy in terms of sustainable development," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 915, no. 1, p. 012011, Nov. 2021, doi: 10.1088/1755-1315/915/1/012011.
[26] M. H. J. Sidik, W. Yadiati, H. Lee, and N. Khalid, "The dynamic association of energy, environmental management accounting and green intellectual capital with corporate environmental performance and competitive advantages," *Int. J. Energy Econ. Policy*, vol. 9, no. 5, pp. 379–386, 2019, doi: 10.32479/ijeep.8283.
[27] S. Anik and H. Sulistyo, "The role of green intellectual capital and green innovation on competitive advantage of SMEs," *Int. J. Learn. Intellect. Cap.*, vol. 18, no. 1, pp. 28–44, 2021, doi: 10.1504/IJLIC.2021.113662.
[28] W. Yadiati, N. Nissa, S. Paulus, H. Suharman, and M. Meiryani, "The Role of Green Intellectual Capital and Organizational Reputation in Influencing Environmental Performance," *Int. J. Energy Econ. Policy*, vol. 9, no. 3, pp. 261–268, May 2019, doi: 10.32479/ijeep.7752.
[29] M.-Y. Yusliza, J. Y. Yong, M. I. Tanveer, T. Ramayah, J. Noor Faezah, and Z. Muhammad, "A structural model of the impact of green intellectual capital on sustainable performance," *J. Clean. Prod.*, vol. 249, p. 119334, Mar. 2019, doi: 10.1016/j.jclepro.2019.119334.
[30] S. M. M. Shah, U. Ahmed, A. I. Ismail, and S. Mozammel, "Going intellectually green: Exploring the nexus between green intellectual capital, environmental responsibility, and environmental concern towards environmental performance," *Sustain.*, vol. 13, no. 11, p. 6257, Jun. 2021, doi: 10.3390/su13116257.
[31] A. M. Sheikh, "Green intellectual capital and social innovation: the nexus," *J. Intellect. Cap.*, Jun. 2021, doi: 10.1108/JIC-11-2020-0361.
[32] W. Ali, J. Wen, H. Hussain, N. A. Khan, M. W. Younas, and I. Jamil, "Does green intellectual capital matter for green innovation adoption? Evidence from the manufacturing SMEs of Pakistan," *J. Intellect. Cap.*, vol. 22, no. 5, pp. 868–888, Oct. 2021, doi: 10.1108/JIC-06-2020-0204.
[33] J. Y. Yong, M.-Y. Yusliza, C. J. C. Jabbour, and N. H. Ahmad, "Exploratory cases on the interplay between green human resource management and advanced green manufacturing in light of the Ability-Motivation-Opportunity theory," *J. Manag. Dev.*, vol. 39, no. 1, pp. 31–49, Dec. 2020, doi: 10.1108/JMD-12-2018-0355.
[34] Y. M. Yusoff, M. K. Omar, and M. D. K. Zaman, "Nexus between Green Intellectual Capital and Organizational Learning Capability. Evidence from Malaysian Manufacturing Sector," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 697, no. 1, p. 012009, Dec. 2019, doi: 10.1088/1757-899X/697/1/012009.
[35] J. Elkington, "Enter the triple bottom line," in *The Triple Bottom Line, Does It All Add Up?: Assessing the Sustainability of Business and CSR*, 1st ed., A. Henriques and J. Richardson, Eds. London, UK: Earthscan, 2004, p. 3.
[36] J. Y. Yong, M.-Y. Yusliza, T. Ramayah, and O. Fawehinmi, "Nexus between green intellectual capital and green human resource management," *J. Clean. Prod.*, vol. 215, pp. 364–374, Apr. 2019, doi: 10.1016/j.jclepro.2018.12.306.
[37] H. L. Tosi, S. Werner, J. P. Katz, and L. R. Gomez-Mejia, "How much does performance matter? A meta-analysis of CEO pay studies," *J. Manage.*, vol. 26, no. 2, pp. 301–339, 2000, doi: 10.1177/014920630002600207.
[38] H. Chaib Lababidi, R. Lababidi, M. Colak, and M. Dayan, "Contingency effects of firm structure and environmental uncertainty on strategic planning process and firm performance: Evidence from UAE enterprises," *Strateg. Chang.*, vol. 29, no. 2, pp. 241–252, Mar. 2020, doi: 10.1002/JSC.2325.

[39] A. Mansoor, S. Jahan, and M. Riaz, “Does green intellectual capital spur corporate environmental performance through green workforce?,” *J. Intellect. Cap.*, vol. 22, no. 5, pp. 823–839, Oct. 2021, doi: 10.1108/JIC-06-2020-0181.

[40] K. Haldorai, W. G. Kim, and R. L. F. Garcia, “Top management green commitment and green intellectual capital as enablers of hotel environmental performance: The mediating role of green human resource management,” *Tour. Manag.*, vol. 88, p. 104431, Feb. 2022, doi: 10.1016/j.tourman.2021.104431.

[41] S. U. Rehman, S. Kraus, S. A. Shah, D. Khanin, and R. V. Mahto, “Analyzing the Relationship between Green Innovation and Environmental Performance in Large Manufacturing Firms,” *Technol. Forecast. Soc. Change*, vol. 163, no. xxxx, p. 120481, Feb. 2021, doi: 10.1016/j.techfore.2020.120481.

[42] S. Ullah, T. Mehmood, and T. Ahmad, “Green intellectual capital and green HRM enabling organizations go green: mediating role of green innovation,” *Int. J. Innov. Sci.*, Apr. 2022, doi: 10.1108/IJIS-12-2021-0222.

[43] K. Asiaei, N. G. O’Connor, O. Barani, and M. Joshi, “Green intellectual capital and ambidextrous green innovation: The impact on environmental performance,” *Bus. Strateg. Environ.*, May 2022, doi: 10.1002/bse.3136.

[44] I. E. Nikolaou, “A Framework to Explicate the Relationship Between CSER and Financial Performance: an Intellectual Capital-Based Approach and Knowledge-Based View of Firm,” *J. Knowl. Econ.*, vol. 10, no. 4, pp. 1427–1446, Dec. 2017, doi: 10.1007/s13132-017-0491-z.

[45] Q. A. Nisar, S. Haider, F. Ali, S. Jamshed, K. Ryu, and S. S. Gill, “Green human resource management practices and environmental performance in Malaysian green hotels: The role of green intellectual capital and pro-environmental behavior,” *J. Clean. Prod.*, vol. 311, p. 127504, Aug. 2021, doi: 10.1016/j.jclepro.2021.127504.

[46] M. Muafi and J. Sulistio, “A nexus between green intelectual capital, supply chain integration, digital supply chain, supply chain agility, and business performance,” *J. Ind. Eng. Manag.*, vol. 15, no. 2, p. 275, Mar. 2022, doi: 10.3926/jiem.3831.

[47] M. Ali, “Green intellectual capital, green HRM and green social identity toward sustainable environment: a new integrated framework for Islamic banks,” *Int. J. Manpow.*, vol. 43, no. 3, pp. 614–638, 2022, doi: 10.1108/IJM-04-2020-0185.

[48] K. Asiaei, N. Bontis, R. Alizadeh, and M. Yaghoubi, “Green intellectual capital and environmental management accounting: Natural resource orchestration in favor of environmental performance,” *Bus. Strateg. Environ.*, vol. 31, no. 1, pp. 76–93, Jan. 2022, doi: 10.1002/bse.2875.

[49] H. Ullah, Z. Wang, S. Bashir, A. R. Khan, M. Riaz, and N. Syed, “Nexus between IT capability and green intellectual capital on sustainable businesses: evidence from emerging economies,” *Environ. Sci. Pollut. Res.*, vol. 28, no. 22, pp. 27825–27843, Jun. 2021, doi: 10.1007/s11356-020-12245-2.

[50] C. Liu, “Developing green intellectual capital in companies by AHP,” *SCMIS 2010 - Proceedings of 2010 8th International Conference on Supply Chain Management and Information Systems: Logistics Systems and Engineering*. 2010. [Online]. Available: https://api.elsevier.com/content/abstract/scopus_id/79551557925

[51] Y. M. Yusoff, M. K. Omar, and M. D. Kamarudin, “Practice of green intellectual capital. Evidence from Malaysian manufacturing sector,” *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 469, no. 1, p. 012008, Jan. 2019, doi: 10.1088/1757-899X/469/1/012008.

[52] Y. A. Sudibyo and K. A. Sutanto, “Environmental consciousness and corporate social responsibility as drivers of green intellectual capital,” *Int. J. Innov. Creat. Chang.*, vol. 13, no. 4, pp. 716–726, 2020, [Online]. Available: https://api.elsevier.com/content/abstract/scopus_id/85087084210

[53] N. S. Trevlopoulos, T. A. Tsalis, K. I. Evangelinos, K. P. Tsagarakis, K. I. Vatalis, and I. E. Nikolaou, “The influence of environmental regulations on business innovation, intellectual capital, environmental and economic performance,” *Environ. Syst. Decis.*, vol. 41, no. 1, pp. 163–178, Mar. 2021, doi: 10.1007/s10669-021-09802-6.

[54] V. T. Dang and J. Wang, “Building competitive advantage for hospitality companies: The roles of green innovation strategic orientation and green intellectual capital,” *Int. J. Hosp. Manag.*, vol. 102, 2022, doi: 10.1016/j.ijhm.2022.103161.