International Journal of Innovative Research and Scientific Studies, 8(1) 2025, pages: 191-201

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

Eco-friendly strategic goals and the performance of innovative green processes: The impact of green intellectual capital

Jorge Alberto Esponda Pérez[1], Elizabeth Emperatriz García-Salirrosas[2], Faisal Ejaz[3*], Md Billal Hossain[4], László Vasa[5]

[1] *University of Sciences and Arts, TuxtlaGutiérrez,29000, Chiapas, Mexico.*
[2]*Faculty of Management Science, Universidad Autónoma del Perú, Lima 15842, Peru.*
[3] *Department of Economics, Universiti Tunku Abdul Rahman, Kampar, 31900, Malaysia.*
[3]*University of Okara, Pakistan.*
[4]*Business Management and Marketing Department, School of Business and Economics, Westminster International University in Tashkent, 100047 Tashkent, Uzbekistan.*
[5]*Faculty of Economics, Széchenyi Istvàn University, 9026 Győr, Hungary.*

Corresponding Author: Faisal Ejaz (*Email: faisalejaz8661@gmail.com*)

Abstract

The purpose of this study is to check the intellectual capital's role in shaping green process innovation. This article contends the company's capacity to create, possess, incorporate, and implement environmentally friendly intellectual assets in its activities will result in a higher degree of performance in terms of innovative green processes. This performance serves as an indicator of the company's enduring dedication to an environmentally conscious strategy. The industries chosen for this study comprised textile, chemical, pharmaceutical, and steel based in Mexico. The random sampling technique was used to gather data. Upon analyzing the gathered data, we used only 253 questionnaires for analysis, representing a response rate of 42.7%. Findings indicate green strategic intent significantly influences three components of intellectual capital: human, relational, and organizational capital. Three components of intellectual capital significantly influence green process innovation. A green strategy can be successfully implemented by the implementation of intangible resources. Mere tangible resources are insufficient to gain superior green innovation performance; the interaction of these two resources (tangible and intangible) is complementary. Companies are adopting environmental strategies to mitigate the environment's harmful impact and meet stakeholders' demands. The study's practical implications aim to improve companies' environmental performance, specifically their green performance, through the implementation of green innovation.

Keywords: Green human capital, Green organizational capital, Green process innovation performance, Green relational capital, Green strategic intent.

DOI: 10.53894/ijirss.v8i1.3583
Funding: This study received no specific financial support.
History: Received: 10 May 2024/**Revised:** 6 September 2024/**Accepted:** 30 September 2024/**Published:** 1 January 2025

Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Institutional Review Board Statement: The Ethical Committee of the University of Okara, Pakistan has granted approval for this study on 7 August 2023 (Ref. No. UO-OIRB-77/b).
Publisher: Innovative Research Publishing

1. Introduction

Companies are adopting environmental strategies to mitigate the environment's harmful impact and meet stakeholders' demands [1]. These strategies strive to improve their environmental performance, specifically their green performance, through the implementation of green innovation [2]. Research has shown that companies that effectively implement environmentally friendly strategies experience various advantages [3]. These benefits encompass achieving a superior position in the market over time, enhancing their fundamental skills, cultivating a favourable reputation in the market, capitalizing on emerging market prospects [4] and enhancing financial outcomes [5]. Companies compel their customers to make purchases and enhance their loyalty, and perception value [6, 7]. Consequently, numerous businesses now regard the successful implementation of environmentally friendly strategies as a crucial goal.

The growing body of literature on green strategy has identified the following gaps, which are necessary to fill. Before filling these gaps, it is important to note that there has been a lack of research on the implementation phase of strategies, particularly in comparison to the examination of the factors and outcomes of green strategies [3]. While limited research has been conducted on this subject, it is understood that companies acquire or develop their intangible resources as well as physical resources to implement their strategy [8]. Nevertheless, the methods for developing and leveraging intangible assets to implement an environmentally friendly strategy remain uncertain [9]. As far as we are aware, there are no existing studies on green strategies, necessitating further research in this area [10]. Hence, further investigation is required to explore the effective implementation of a green approach [11]. Numerous companies encounter difficulties in effectively translating their environmentally friendly strategy into successful environmentally friendly innovation, consequently hindering their progress in achieving environmental sustainability. The lack of a clear comprehension regarding the execution of a green strategy may be the reason for this [3]. The company's success depends upon implementing green strategies [12].

Furthermore, prior studies have primarily focused on green product innovation, neglecting the impact of green process innovation on both the economy and the environment [13]. Green process innovation can effectively reduce waste, energy consumption, and pollutants. Consequently, this can significantly improve a company's ecological efficiency [2]. Green process innovation distinguishes itself from green product innovation by having distinct requirements in terms of organizational skills, resources of organization, and traits [14]. Furthermore, it influences the effectiveness of the organization and other various outcomes of the organization [15].

Therefore, the present research aims to increase the understanding of how a company's environmentally friendly strategies lead to superior environmental performance in terms of the green innovation process. Reyes-Rodríguez, et al. [16] assert that companies synchronize their resource development and deployment with their strategic objectives. These resources directly or indirectly influence innovation performance, individually or through their interconnections [17]. As a result, we examine how the enterprises implement green strategies by assessing their resources, specifically their green intellectual capital (GIC) and complementary assets [18]. A company's intellectual capital (IC), refers to its ability to utilize knowledge resources and is linked to its ability to implement strategies and innovate [19]. The main three components of IC are human, organizational, and relational capital, comprised of the multiple methods through which companies obtain and utilize knowledge [20]. The GIC concept was introduced to increase the awareness of environmental issues. Strict environmental regulations force companies to implement environmental policies, satisfy stakeholder demands, and subsequently enhance their financial performance [21]. No doubt the idea of IC has been known worldwide and its discussion is widely discussed, the idea of GIC is a recent development [21] and is rapidly gaining attention as a significant research area [22]. Despite receiving less attention in the literature, the concept of GIC relies on the firm's perspective of complementary resources [23]. According to this perspective, multiple resources could be more beneficial than individual resources [24].

The three main components of GIC are green human capital (GHC), green organizational capital (GOC), and green relational capital (GRC). These dimensions play an important role in determining green strategic goals and their performance in green process innovation. Furthermore, we argue that these three dimensions of IC played a crucial role in increasing the green process innovation performance, as observed through the lens of the firm's complementary assets. This article provides four distinct contributions. Firstly, it contributes to existing knowledge on implementing environmentally friendly strategies by suggesting that businesses enhance their environmental performance through the implementation of GIC. The relationship between a company's environmentally focused strategic objective and its performance in developing innovative green processes is influenced by the presence of GIC. This essay contributes to the current knowledge by offering a fresh viewpoint on the process of implementing strategies, specifically the relationship between strategy, operation, and performance.

Previous works have only briefly mentioned this aspect. Furthermore, this article contributes to the existing body of knowledge on green innovation and IC by analyzing each component of GIC to identify green process innovation. The three components of IC have distinct characteristics that have different roles in disseminating knowledge [10]. This article contributes to the current body of knowledge by explaining how different elements of IC and different resources of companies can interact to influence innovation results. This paper adds to the existing literature on GIC and how its components influence green process innovation.

2. Theoretical Background of the Research Study and Hypotheses

2.1. Green Intellectual Capital

Researchers with a thorough understanding of the resource-based view (RBV) of organizations are ready to put plans into action across businesses [25]. According to this school of thought, for a business to carry out its plan and gain an advantage over its competitors, it must create and make use of unique, scarce, and exceedingly valuable physical and intangible assets [26]. In the present economy that relies heavily on knowledge, intangible resources play a crucial role in determining a company's competitive advantage [18, 27]. The concept of IC was introduced by Bontis [28] which forced companies to use intangible assets rather than physical ones. A company's IC encompasses its knowledge-based and concealed resources, which refer to its employees [29].

The IC strategy has experienced several stages of development in the last two decades [30]. The researchers at IC are keen to create as well as maintain a competitive edge [31]. The Skandia Navigator model [32] provides an explanation for the value of intangible assets. The expansion of IC has been seen in several countries, including Canada, the United Kingdom, the United States of America, and Sweden, which has been influenced by this strategy [33]. Our second attention was directed toward the concepts of IC, comprised of its definition, administration, and documentation. The way Germany reported IC faces significant changes. Germany's IC research introduced a systematic approach to managing a company's unacknowledged knowledge assets. The report aims to outline a methodology for identifying and leveraging the company's IC to generate the value of intangibles. The flow of process establishes the foundation for management to utilize a cost-benefit analysis to ascertain the most crucial actions for the company's IC and how to prioritize them for optimal future profitability. Researchers have developed and implemented a system dynamics reporting approach to enhance our comprehension of the IC component [34]. The Japanese government has allocated funds to commission a report on the topic of IC to emphasize its significance to potential investors [35].

Dumay and Garanina [31] highlighted that the third stage focused on the practical assessment of IC. This study aimed to assess the influence of IC on the generation of value by investigating the connection between management and the utilization of IC Will and Mertins [36]. Guthrie, et al. [33] state that businesses have acknowledged the importance of IC and have implemented it as a management tool. In the fourth stage, our focus is to explore more about IC to encompass a wider ecosystem, which may include various nations, cities, towns, and even individual businesses [30]. The national yearbook related to IC [37] traced a country's intangible assets to build competitiveness. Researchers at this level also study how IC affects people and the environment [30]. Strategy researchers argue that the IC perspective fails to consider the relationship between a corporation and its natural environment. Individuals and groups interested in the matter are becoming increasingly aware of the environment [21]. There is a tacit assumption that IC does not consider the aspect of sustainability and environmental issues. Therefore, researchers include environmental factors to tackle this issue and increase the understanding of IC. The three main constituents of GIC are very similar to conventional IC, which are human, organizational, and relational capital. The collective knowledge, attitude, wisdom, creativity, and competencies of employees about environmental protection are referred to as "GHC" [38]. A company's collection of skills, commitment, procedures, and information management system focused on environmental protection is known as GOC [21]. The magnitude of a company's GRC is directly correlated with the caliber of its connections with its clients, vendors, and other stakeholders in Clean Energy Ministerial (CME) initiatives [38]. According to Chang and Chen [21] the idea of green IC has recently emerged as a prominent field of research. As a result, research has been scarce in this critical area. The literature has only partially explored the impact of GIC on a firm's competitive advantage, green product innovation, and business sustainability. Many researchers have investigated this topic [39, 40]. No previous study has examined the role of GIC in facilitating the alignment between a company's green strategy and its performance in green process innovation.

2.2. Green Strategic Intent and Green Intellectual Capital

Prahalad and Doz [41] define a company's strategic intent as a collection of long-term objectives that reflect the leadership team's vision for the company's future. Strategic intent enables businesses to envision themselves as leaders and establishes the criteria by which they assess their success in achieving their long-term goals [42]. It profoundly influences a company's perception of itself and its ability to outperform its competitors [43]. According to scholars, strategic intent refers to strategic aggression, market leadership, and the establishment and long-lasting nature of competitive advantage [43, 44]. Highly strategic firms are determined to achieve continuous growth, dominate the market, and gain a competitive edge [45]. In our paper on green performance, we introduce the concept of green strategic intent, which draws upon previous research [16] and shares similarities with strategic intent in environmental management. A company's environmentally conscious strategic objectives reflect top-level executives' ecological perspectives, positions, and ambitions. Prior research indicates that a company's strategic objective influences its approach to developing, acquiring, and allocating resources, consequently impacting its overall performance. Without strategic intent, decisions regarding competing resource claims lack a valid basis. Strategic intent provides a target for development processes within a company to aim for Mariadoss, et al. [44]. Johnson and Sohi [45] propose a comparable viewpoint, suggesting that companies utilize all accessible resources to attain their strategic

objectives and outperform their rivals in the market. Effective utilization of resources and capabilities enables firms with robust strategic objectives to achieve a competitive advantage [16]. Therefore, our research posits that a company's cultivation of GIC aligns with its strategic objective.

2.3. Green Strategic Intent and Green Human Capital

An organization should deeply integrate its green strategic objective into its brand and use it as a guiding principle for its staff members. HR policies influenced by environmental concerns significantly affect various aspects, including training, employee development, hiring practices, and job descriptions [46]. Companies are more likely to promote internal candidates when their background, expertise, and experience align with the company's objectives. Employees who embrace the company's environmentally conscious strategic goals will likely gain a deeper understanding and enhance their expertise in environmental preservation. This is because employees will perceive that upper management is attentive to environmental matters and dedicated to achieving long-term sustainability objectives. We argue that managers who are in the position of implementing green strategic intent and environmental policies can foster GHC. The aim is to enhance employees' capabilities related to environmental issues by providing some training and engaging in different work [47]. Additionally, training that is given to employees changes the behavior of employees about the environment [48].

H_1: Green strategic intent has a significant effect on green human capital.

2.3.1. Green Strategic Intent and Green Organizational Capital

Having a clearly defined strategic goal enables senior management to have a specific objective to focus on when planning for the future and evaluating potential investments [43]. We contend that for a company to achieve its environmental protection goals, it must give precedence to the cultivation of its GOC, encompassing its green resources and competencies. To mitigate any negative environmental impact, the upper management will likely implement a robust environmental management system and adopt sustainable practices within the company's operations. Research indicates that the ethical beliefs of top-level executives greatly influence a company's adoption of environmentally friendly technology and practices, as well as shaping the company's overall commitment to sustainability [49]. Environmentally conscious managers play a significant role in supporting the company's decision to implement operational sustainability and environmental management system adoption [50]. Environmentally conscious businesses enhance their ability to operate in an ecologically friendly manner and allocate greater resources toward developing and implementing sustainable technologies [51]. Additionally, the manager's actions contribute to an increase in environmentally conscious organizational resources.

H_2: Green strategic intent has a significant effect on green organizational capital.

2.3.2. Green Strategic Intent and Green Relational Capital

When considering ecological conservation, the well-known saying that "like-minded individuals tend to gather in groups" remains valid. We contend that businesses prioritizing environmental concerns are more inclined to establish connections with consumers, vendors, and business associates who share similar values. This, in turn, enhances the probability of forming relational capital. These companies can achieve their environmentally focused strategic goals with the assistance of this partnership. Businesses interact with customers to understand their demands and create and sell products that meet those needs [52]. Similarly, environmentally conscious businesses will actively communicate with eco-conscious consumers in order to gain insights and address their concerns [49]. Moreover, suppliers provide eco-friendly materials to support the green organizational objectives. Environmentally conscious firms will exclusively purchase from vendors who meet the standards for environmental and operational performance [50]. The only way for company to better perform the environmental operations is to make environmentally strategic objectives [53]. The establishment of these environmentally conscious alliances demonstrates the expansion of GRC.

H_3: Green strategic intent has a significant effect on green relational capital.

2.4. Green Intellectual Capital and Green Process Innovation Performance

Environmental impact can be minimized by using innovative production methods, and in this way, companies can gain green process innovation [54]. Green process innovation can be defined as a set of tools that improve a company's environmental management process. These tools encompass advancements that conserve energy, diminish pollution, repurpose waste, and eradicate toxicity. Green process innovation seeks to minimize energy usage, harmful emissions, raw material consumption, emissions, and waste generated by the company during production. The existing literature has primarily examined the influence of IC on product innovation while overlooking the influence of GIC on green innovation, specifically on the performance of green process innovation.

2.4.1. Green Human Capital and Green Process Innovation Performance

Human capital is the fundamental pillar of any innovative business [17]. This phenomenon occurs because workers' knowledge, skills, and expertise in their respective roles catalyze the generation of novel ideas. Human capital significantly impacts innovation in new technological ventures [55]. Furthermore, human capital is crucial in fostering innovation and facilitating strategic rejuvenation. Academics concur that a company's human resources are crucial in generating innovation. Human capital within a company is responsible for storing its employees' diverse skill sets, knowledge bases, and learning abilities. The concept of Green Human Resources (GHRM) is gaining much attention in the dilemma of environmental management. This, in turn, fosters innovation and sustains a competitive advantage over time [15]. Previous research suggests that businesses must possess a certain level of environmental knowledge and competence among their staff to produce and

adopt green technology [46] effectively. A company's significant investments in GHC demonstrate that its employees have received adequate training and preparation to contribute to environmental preservation, and they are more likely to do so competently and productively. The employees in this department will strive to improve the company's performance in green process innovation by enhancing its operations, manufacturing facilities, and processes to minimize hazards and waste.

H_4: Green human capital significantly affects green process innovation performance.

2.4.2. Green Organizational Capital and Green Process Innovation Performance

Organizational capital influences a company's ability to innovate [56]. This capital includes the documented experience and institutionalized knowledge that is integrated into its management systems, operations, knowledge management, and structures. The different aspects of organizations, like culture, rules, norms, and structure, enhance their innovation-related capabilities, leading to improved innovation activities [57]. Companies enhance their ability to innovate by improving their capacity for organizational learning through capital development. Organizations can enhance their ecological performance by implementing environmental management systems, such as ISO 14001 [58]. Implementing green management practices, facilitating environmental initiatives through investments, and sharing knowledge about the environment among employees help to achieve green process innovation. Firms also utilize knowledge exploitation and transformation to improve their performance in green process innovation further [59]. Companies invest their investment in green initiatives and disseminate the information among different units to enhance awareness about green process innovation [60]. Considering the above arguments, we contend that GOC can enhance the effectiveness of green process innovation within a company.

H_5: Green organizational capital significantly affects green process innovation performance.

2.4.3. Green Relational Capital and Green Process Innovation Performance

Collaboration with different stakeholders can successfully execute the company's innovation [61]. Establishing strong consumer relationships allows firms to access a broader spectrum of ideas, skills, and experiences, leading to potential benefits [52]. Furthermore, many companies are establishing more collaborative ties with their suppliers to harness their knowledge, expertise, and capabilities, thereby bolstering their innovation capabilities [62]. The group members facilitate the exchange and acquisition of expertise among businesses, thereby enhancing their capacity for effective innovation [63]. When a company builds its partnerships sustainably, we expect green innovation to occur. Firms may be rewarded if they implement environmental policies into their production operations, which is only possible by collaborating with stakeholders [64]. Furthermore, a company can acquire green technology by establishing connections with environmentally friendly suppliers, thereby facilitating advancements in eco-friendly process innovation [65]. Engaging in partnerships with environmentally sensitive stakeholders can enhance a company's effectiveness in generating new green processes. This can decrease the amount of energy consumed and the amount of waste produced [66].

H_6: Green relational capital significantly affects green process innovation performance.

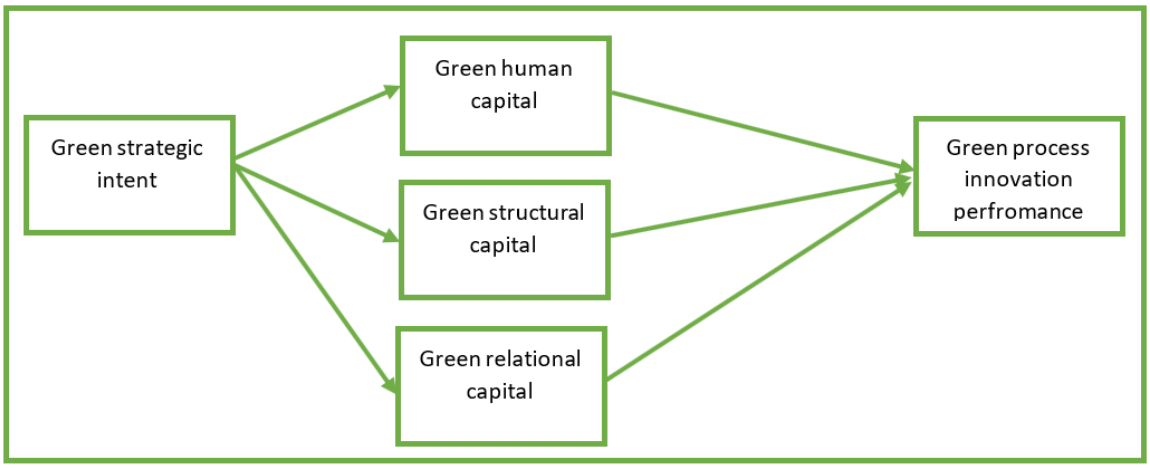

Figure 1.
Research model.
Note: Illustrates the impact of GSI on GPIP. SEM model.

3. Methodology

This study is explanatory, and we constructed a correlational model to investigate the hypotheses. We constructed a survey questionnaire based on the relevant literature in the corresponding field to examine the correlation between the predetermined variables. The survey was composed in the English language. Initially, we consulted five experts in the relevant field and five managers of small and medium-sized manufacturing companies to ensure the questionnaire's clarity and ease of understanding. Subsequently, an updated and conclusive version of the questionnaire was disseminated to four distinct industrial sectors in Mexico. The industries chosen for this study comprised textile, chemical, pharmaceutical, and steel. The compilation of these manufacturing small and medium-sized enterprises (SMEs) in our chosen industrial areas was acquired from Mexico. According to the list, 1,625 registered manufacturing SMEs were in the selected industrial zones of the four sectors. We randomly sampled 550 small and medium-sized enterprises (SMEs) from each of the four manufacturing

sectors. Out of the total number of firms, 250 of them completed the questionnaires, accounting for 45.4% of the total. This response rate was deemed effective. After analyzing the collected data, we discovered that only 253 questionnaires were devoid of errors and suitable for our study, representing a response rate of 42.7%. In this study, we adopted the sampling methodology employed by Zhang, et al. [67] and Ma, et al. [68].

The study questionnaire was primarily distributed to individuals who had firsthand and accurate knowledge of environmental issues and the company's current state. This included CEOs (Chief Executive Officers), operation and production managers, and individuals responsible for environmental safety.

3.1. Measurements

We use a 5-point Likert scale to measure the variables. The measured variable span from strongly strongly disagree to strongly agree. The first variable was the green strategic intent measure through the Likert scale, the scale developed by Johnson and Sohi [45] and the scale of three IC components, human, organizational, and relational, developed by Chen [38]. The questionnaire contained the scale for GPIP, which was measured by adopting a scale developed by Chen and Chang [69].

Table 1.
Reliability analysis.

Variables	No of items	Cronbach alpha
Green strategic intent (GSI)	7	0.948
Green organizational capital (GOC)	6	0.865
Green human capital (GHC)	4	0.855
Green relational capital (GRC)	5	0.786
Green process innovation performance (GPIP)	4	0.912

4. Results

4.1. Reliability Analysis

There was a total of 5 variables that were used in this study. Each variable has a different number of items, as shown in Table 1. All the variables have more than 0.7 reliability, which indicates all variables are getting their threshold value. Green strategic intent has 0.948 reliability, which indicates more than all the remaining variables' reliability, while green relational capital has 0.786 reliability, which indicates low reliability from all the variables.

Table 2.
Correlation matrix.

Variables	1	2	3	4	5
Green strategic intent (GSI)	1				
Green organizational capital (GOC)	0.629**	1			
Green human capital (GHC)	0.501**	0.728**	1		
Green relational capital (GRC)	0.262**	0.199**	0.262**	1	
Green process innovation performance (GPIP)	0.395**	0.337**	0.357**	0.314**	1

Note: ** Correlation is significant at the 0.01 level.

4.2. Correlation Matrix

Table 2 presents a correlation matrix depicting the relationships between Green Strategic Intent (GSI), Green Organizational Capital (GOC), Green Human Capital (GHC), Green Relational Capital (GRC), and Green Process Innovation Performance (GPIP). Each cell in the matrix displays the correlation coefficient between the respective variables. Notably, a positive and statistically significant correlation exists between GOC and GSI (r = 0.629) and GHC and GSI (r = 0.501), suggesting that higher levels of organizational and human capital are associated with stronger green strategic intent. Additionally, GOC exhibits a positive correlation with GHC (r = 0.728), indicating a synergistic relationship between organizational and human capital in the context of green initiatives. Furthermore, GRC shows positive correlations with GOC (r = 0.262) and GHC (r = 0.199), emphasizing the role of relational capital in supporting organizational and human capital for green practices, as mentioned in Table 3.

Table 3 presents the measurement model.

Model	CMIN/DF	CFI	GFI	RMSEA
	2.726	0.916	0.820	0.083

Note: CMIN= Chi-square minimum; CFI: Comparative fit index; GFI: The goodness of fit index; RMSEA: Root mean square error approximation.

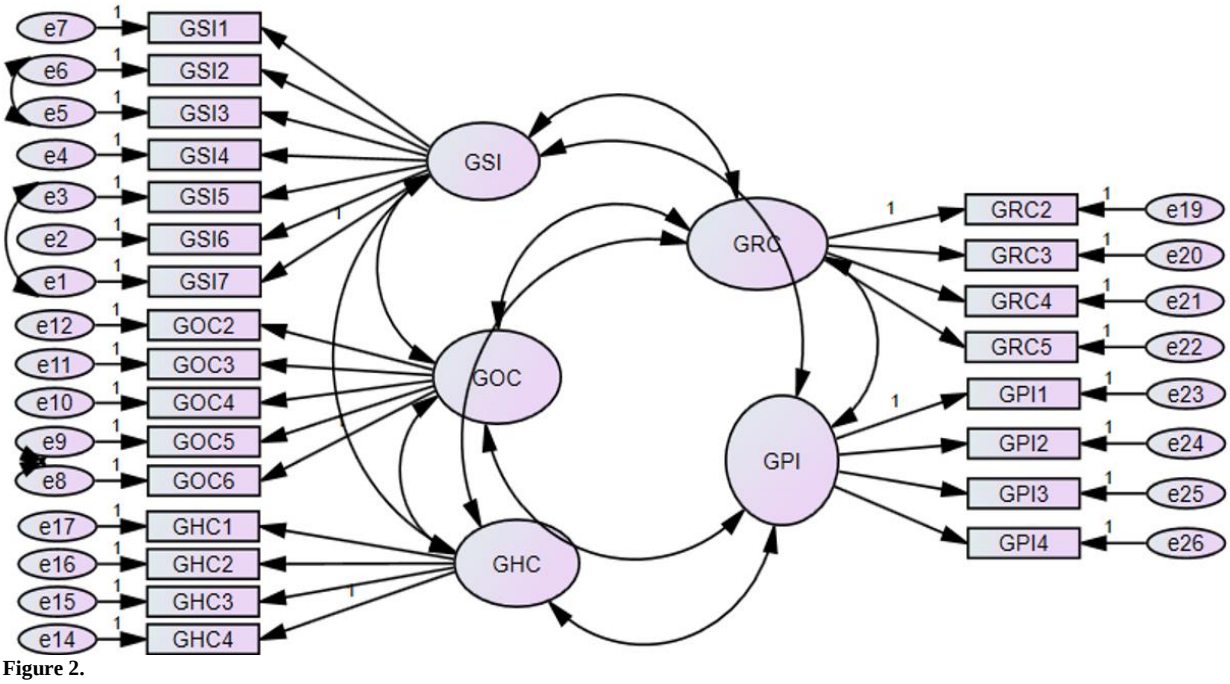

Figure 2.
Measurement model.

4.3. Confirmatory Factor Analysis

Figure 2 demonstrates the measurement model values. The CMIN/DF ratio measures how well the model fits the data while adjusting for the number of parameters in the model. A lower value is generally desirable, and a value close to 2 or below indicates a satisfactory fit. CFI assesses the improvement in the fit of the specified model over a baseline model. A CFI value closer to 1 indicates a better fit. In this case, a CFI of 0.916 suggests a reasonably satisfactory fit, with values above 0.90 generally considered acceptable. GFI represents the proportion of variance and covariance accounted for by the model. A value closer to 1 indicates a better fit. A GFI of 0.820 suggests that the model explains about 82% of the variance in the data, which is considered acceptable. RMSEA estimates the discrepancy per degree of freedom in the model. Lower values of RMSEA indicate better model fit. An RMSEA of 0.083 is considered reasonable, as it falls within the range often considered indicative of an acceptable fit. The model appears to have a reasonably good fit based on the provided values. The CMIN/DF value is not very low, and the CFI, GFI, and RMSEA values are all good. This means that the model given correctly shows the connections in the data, as seen in Table 4.

Table 4. Presents the hypotheses and results.

Hypothesis	Estimates	S.E	C.R	P	Results
H1	0.345	0.033	10.456	***	Supported
H2	0.327	0.035	9.386	***	Supported
H3	0.162	0.043	3.795	***	Supported
H4	0.712	0.100	7.141	***	Supported
H5	0.480	0.102	4.700	***	Supported
H6	0.442	0.094	4.698	***	Supported

Note: ***CR= Composite reliability, S. E= Standard Errors, P= P value.

4.4. Hypotheses Testing

The presented results depict the outcomes of a statistical analysis testing six hypotheses (H1 to H6). Each hypothesis corresponds to an estimated coefficient (estimates) along with its standard error (S.E.), critical ratio (C.R.), and associated p-value (P). The critical ratio values are all notably high, ranging from 3.795 to 10.456, and are accompanied by three asterisks denoting statistical significance. Consequently, the data supports all six hypotheses (H1 to H6) by the data, indicating a robust relationship between the variables under investigation. The results suggest that the estimated coefficients are significantly different from zero, reinforcing the proposed hypotheses' validity in the study context.

5. Discussion

In this article, we build and evaluate a model that shows how, by combining the concepts of GIC and complementary assets, a company's green strategic intent can lead to good Green Process Innovation Performance (GPIP). Finally, our results show that a company's IC, which includes human, relational, and organizational resources, mediates the connection between GPIP and the company's strategic goal. Our research shows that a green strategic intent is beneficial to GIC in all three of its forms. According to Hart and Dowell [26] this study bolsters the natural resources-based view, which contends that companies cannot enhance their environmental performance unless they utilize their resources to align with their green strategy. Ling [70] contends that a firm and unambiguous dedication to sustainability from the highest levels of management

is crucial for effectively implementing environmentally friendly practices aided by the requisite competencies. In addition, our findings build upon those of two related prior studies. Strategic intent has a significant positive influence on IC [71]. Consequently, a business is better able to provide a range of services. In a context unrelated to service provision but about environmental sustainability, we apply this line of reasoning. When a strategic goal is centered on sustainability, employees can reliably take environmental actions [16]. Managers can increase support for green initiatives by effectively communicating company policies regarding the environment [48]. Environmental protection is one of the goals of these policies. Our explanation of how these policies can be utilized to generate tangible innovations, such as the Green Process Innovation Performance, is based on their research.

This study stands out because it examines the relationship between GPIP, GIC, and performance from three different angles. According to our research, GPIP is positively associated with every facet of GIC. Among these factors, a company's GHC is the most crucial for GPIP. In line with these findings, "GHC" was defined by Russo and Fouts [46] as the knowledge and skills of an organization's employees in environmental protection matters. Research also shows that these employees have a major impact on the bottom line of the company's green initiatives. Companies can enhance their environmental performance by incorporating green organizational capital into their structure, processes, operations, and new product development, as measured by metrics like Green Process Innovation Performance (GPIP). Green relational capital included both types of suppliers, primary and secondary, to accomplish significant advancements in environmental management [10]. Our results add to the existing literature by demonstrating that GPIP is even more enhanced for businesses that simultaneously employ various types of GIC. Furthermore, our findings highlight the significance of GHC in this domain. However, this phenomenon may not be as apparent because organizational capital is structured and executed by people through interpersonal connections, and various forms of environmentally conscious IC may even work against each other. But we prove that they don't eat off each other; their effects are independent and unique.

5.1. Implications of the Study, Limitations and Future Research

This research holds many significant implications. It expands upon what is already known in the literature regarding implementing green strategies. By addressing the research questions raised by Kunapatarawong and Martínez-Ros [9] and López-Gamero, et al. [10] we aim to bring attention to the successful adoption of ecofriendly strategies. Green strategy, green operations, and green performance are the three stages that our research shows are necessary for a successful strategy implementation. When it comes to accomplishing environmental objectives, investing in tangible assets such as machinery, operational processes, and facilities is necessary. In addition, in order for businesses to successfully maximize the utilization of their physical assets, they need to possess particular capabilities. These capabilities include the implicit capacities that result from management processes, the dedication and knowledge of employees, and collaborations with third parties. If businesses do not dedicate the resources to developing intangible assets, it may be difficult for them to improve their environmental performance. It is clear from the figures that green corporate practices affect GPIP using investments in environmentally friendly IC. This confirms previous findings that greater investment in IC leads to a wider range of services, which is consistent with strategic intent [71]. Our efforts in environmental management and non-service industries build on previous work.

Our findings have significant implications for managers. According to this finding, polluting industries should prioritize controlling and advancing environmentally friendly knowledge and assets, which has important implications for GPIP. Managers should put a lot of money into teaching their employees about environmental management and conservation if they want to see an uptick in Green Process Innovation Performance (GPIP). We recommend that managers implement ecologically conscious knowledge management systems and allocate sufficient funds to green infrastructure. We can guarantee the continuation of green process innovation by following these steps. The current SOPs, routines, and manual inventory allow employees to execute environmental management. A well-designed knowledge management system can enhance environmentally friendly manufacturing by facilitating the sharing and applying of information and expertise. When choosing a partner for a strategic alliance or other type of inter-firm cooperation, managers should prioritize the partner's environmental performance.

The small net sample size that comes from matching multiple responses per firm is one of the many limitations of this study. The statistical tests are more accurate when the sample size is larger. Nonetheless, the research focused on two main sources within each company: environmental management managers and top-level executives. This approach makes the survey responses more reliable, and any possible bias from a single method is effectively reduced. Collecting data from different levels of a single organization's hierarchy is difficult. Our all-encompassing method of calculating GIC is another limitation. Managers at different levels of an organization may arrive at different conclusions when evaluating GIC because of the inherent subjectivity in the process. Due to their hands-on experience in operations, these middle managers have unique perspectives on GIC, which may give them a leg up compared to executives. We purposefully selected senior executives to assess GIC because they have in-depth knowledge of all the components and can compare them to a standard that aligns with our objective.

The study took place in Mexico. Its results may be helpful to other developing nations, but they may not affect developed nations. The prior studies state that developing countries do not have many resources. Therefore, they need to use knowledge as efficiently as possible. However, our findings suggest that developing-world businesses should focus on enhancing GRC (colloquially called "green relational capital") and GOC (also called "green organizational capital") through increased management engagement. According to Yong, et al. [72] this could be because workers in developing countries may have less generalized knowledge than their counterparts in developed nations.

References

[1] I. M. Herremans, J. A. Nazari, and F. Mahmoudian, "Stakeholder relationships, engagement, and sustainability reporting," *Journal of Business Ethics*, vol. 138, pp. 417-435, 2016.

[2] W. Song and H. Yu, "Green innovation strategy and green innovation: The roles of green creativity and green organizational identity," *Corporate Social Responsibility and Environmental Management*, vol. 25, no. 2, pp. 135-150, 2018.

[3] L. C. Leonidou, P. Christodoulides, L. P. Kyrgidou, and D. Palihawadana, "Internal drivers and performance consequences of small firm green business strategy: The moderating role of external forces," *Journal of Business Ethics*, vol. 140, pp. 585-606, 2017. https://doi.org/10.1007/s10551-015-2670-9

[4] K. Babiak and S. Trendafilova, "CSR and environmental responsibility: Motives and pressures to adopt green management practices," *Corporate Social Responsibility and Environmental Management*, vol. 18, no. 1, pp. 11-24, 2011. https://doi.org/10.1002/csr.229

[5] I. Gallego-Álvarez, L. Segura, and J. Martínez-Ferrero, "Carbon emission reduction: The impact on the financial and operational performance of international companies," *Journal of Cleaner Production*, vol. 103, pp. 149-159, 2015.

[6] B. Frank, "Consumer perceptions of the social and environmental sustainability of robotic vehicles," *Global Environmental Studies*, vol. 13, pp. 113-117, 2018.

[7] T. B. Herbas, B. Frank, and C. Arandia Tavera, "Corporate social responsibility in Bolivia: Meanings and consequences," *International Journal of Corporate Social Responsibility*, vol. 3, pp. 1-13, 2018.

[8] R. Kamasak, "The contribution of tangible and intangible resources, and capabilities to a firm's profitability and market performance," *European Journal of Management and Business Economics*, vol. 26, no. 2, pp. 252-275, 2017.

[9] R. Kunapatarawong and E. Martínez-Ros, "Towards green growth: How does green innovation affect employment?," *Research Policy*, vol. 45, no. 6, pp. 1218-1232, 2016.

[10] M. D. López-Gamero, P. Zaragoza-Sáez, E. Claver-Cortés, and J. F. Molina-Azorín, "Sustainable development and intangibles: Building sustainable intellectual capital," *Business Strategy and the Environment*, vol. 20, no. 1, pp. 18-37, 2011.

[11] N. A. Morgan, D. W. Vorhies, and C. H. Mason, "Market orientation, marketing capabilities, and firm performance," *Strategic Management Journal*, vol. 30, no. 8, pp. 909-920, 2009.

[12] J.-W. Huang and Y.-H. Li, "How resource alignment moderates the relationship between environmental innovation strategy and green innovation performance," *Journal of Business & Industrial Marketing*, vol. 33, no. 3, pp. 316-324, 2018. https://doi.org/10.1108/jbim-10-2016-0253

[13] A. Tariq, Y. Badir, and S. Chonglerttham, "Green innovation and performance: Moderation analyses from Thailand," *European Journal of Innovation Management*, vol. 22, no. 3, pp. 446-467, 2019.

[14] F. Damanpour and S. Gopalakrishnan, "The dynamics of the adoption of product and process innovations in organizations," *Journal of Management Studies*, vol. 38, no. 1, pp. 45-65, 2001.

[15] M. Dost and Y. F. Badir, "Generation or adoption? The role of social capital," *Management Decision*, vol. 57, no. 7, pp. 1457-1471, 2019.

[16] J. F. Reyes-Rodríguez, J. P. Ulhøi, and H. Madsen, "Corporate environmental sustainability in Danish SMEs: A longitudinal study of motivators, initiatives, and strategic effects," *Corporate Social Responsibility and Environmental Management*, vol. 23, no. 4, pp. 193-212, 2016. https://doi.org/10.1002/csr.1359

[17] M. Dost, Y. F. Badir, Z. Ali, and A. Tariq, "The impact of intellectual capital on innovation generation and adoption," *Journal of Intellectual Capital*, vol. 17, no. 4, pp. 675-695, 2016. https://doi.org/10.1108/jic-04-2016-0047

[18] J. Barney, M. Wright, and D. J. Ketchen Jr, "The resource-based view of the firm: Ten years after 1991," *Journal of Management*, vol. 27, no. 6, pp. 625-641, 2001. https://doi.org/10.1016/s0149-2063(01)00114-3

[19] M. Subramaniam and M. A. Youndt, "The influence of intellectual capital on the types of innovative capabilities," *Academy of Management Journal*, vol. 48, no. 3, pp. 450-463, 2005.

[20] J. Nahapiet and S. Ghoshal, "Social capital, intellectual capital, and the organizational advantage," *Academy of Management Review*, vol. 23, no. 2, pp. 242-266, 1998.

[21] C. H. Chang and Y. S. Chen, "The determinants of green intellectual capital," *Management Decision*, vol. 50, no. 1, pp. 74-94, 2012.

[22] J. Y. Yong, M.-Y. Yusliza, T. Ramayah, and O. Fawehinmi, "Nexus between green intellectual capital and green human resource management," *Journal of Cleaner Production*, vol. 215, pp. 364-374, 2019.

[23] D. J. Teece, "Reflections on "profiting from innovation," *Research Policy*, vol. 35, no. 8, pp. 1131-1146, 2006.

[24] J. Galbreath, "When do board and management resources complement each other? A study of effects on corporate social responsibility," *Journal of Business Ethics*, vol. 136, pp. 281-292, 2016. https://doi.org/10.1007/s10551-014-2519-7

[25] J. Galbreath, "To cooperate or compete? Looking at the climate change issue in the wine industry," *International Journal of Wine Business Research*, vol. 27, no. 3, pp. 220-238, 2015. https://doi.org/10.1108/ijwbr-10-2014-0049

[26] S. L. Hart and G. Dowell, "A natural-resource-based view of the firm: Fifteen years after," *Journal of Management*, vol. 37, no. 5, pp. 1464-1479, 2011.

[27] G. Kristandl and N. Bontis, "Constructing a definition for intangibles using the resource based view of the firm," *Management Decision*, vol. 45, no. 9, pp. 1510-1524, 2007. https://doi.org/10.1108/00251740710828744

[28] N. Bontis, "Intellectual capital: An exploratory study that develops measures and models," *Management Decision*, vol. 36, no. 2, pp. 63-76, 1998. https://doi.org/10.1093/oso/9780195138665.003.0036

[29] H. Inkinen, "Review of empirical research on intellectual capital and firm performance," *Journal of Intellectual Capital*, vol. 16, no. 3, pp. 518-565, 2015.

[30] G. Secundo, M. Massaro, J. Dumay, and C. Bagnoli, "Intellectual capital management in the fourth stage of IC research: A critical case study in university settings," *Journal of Intellectual Capital*, vol. 19, no. 1, pp. 157-177, 2018. https://doi.org/10.1108/jic-11-2016-0113

[31] J. Dumay and T. Garanina, "Intellectual capital research: A critical examination of the third stage," *Journal of Intellectual Capital*, vol. 14, no. 1, pp. 10-25, 2013. https://doi.org/10.1108/14691931311288995

[32] L. Edvinsson, "Developing intellectual capital at Skandia," *Long range Planning*, vol. 30, no. 3, pp. 366-373, 1997.

[33] J. Guthrie, F. Ricceri, and J. Dumay, "Reflections and projections: A decade of intellectual capital accounting research," *The british Accounting Review*, vol. 44, no. 2, pp. 68-82, 2012.

[34] J. W. Forrester, *System dynamics and the lessons of 35 years", in Greene, K.B.D. (Ed.), A systems-based approach to policymaking*. Boston, MA: Springer, 1993.
[35] U. Johanson, C. Koga, M. Skoog, and J. Henningsson, "The Japanese Government's intellectual capital reporting guideline: What are the challenges for firms and capital market agents?," *Journal of Intellectual Capital*, vol. 7, no. 4, pp. 474-491, 2006. https://doi.org/10.1108/14691930610709121
[36] M. Will and K. Mertins, "Strategy development based on intangibles in SMEs–an integrated approach," *Knowledge Management Research & Practice*, vol. 11, no. 2, pp. 175-183, 2013.
[37] C. Y. Y. Lin, L. Edvinsson, and M. A. Consunji, *National intellectual capital yearbook 2019*. Taipei: Taiwan Intellectual Capital Research Center, 2019.
[38] Y. S. Chen, "The positive effect of green intellectual capital on competitive advantages of firms," *Journal of Business Ethics*, vol. 77, no. 3, pp. 271-286, 2008.
[39] 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 social capital," *Knowledge Management Research & Practice*, vol. 12, no. 3, pp. 261-275, 2014. https://doi.org/10.1057/kmrp.2014.1
[40] Y. M. Yusoff, M. K. Omar, M. D. K. 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," *Journal of Cleaner Production*, vol. 234, pp. 626-637, 2019.
[41] C. K. Prahalad and Y. L. Doz, *The multinational mission: Balancing local demands and global vision*. New York: Simon and Schuster, 1987.
[42] G. Hamel and C. K. Prahalad, "Strategic intent," *Harvard Business Review*, vol. 67, no. 3, pp. 63-76, 1989.
[43] J. W. Ice, "Strategic intent: A key to business strategy development and culture change," *Organization Development Journal*, vol. 25, no. 4, pp. 169-175, 2007.
[44] B. J. Mariadoss, J. L. Johnson, and K. D. Martin, "Strategic intent and performance: The role of resource allocation decisions," *Journal of Business Research*, vol. 67, no. 11, pp. 2393-2402, 2014.
[45] J. L. Johnson and R. S. Sohi, "The influence of firm predispositions on interfirm relationship formation in business markets," *International Journal of Research in Marketing*, vol. 18, no. 4, pp. 299-318, 2001.
[46] M. V. Russo and P. A. Fouts, "A resource-based perspective on corporate environmental performance and profitability," *Academy of management Journal*, vol. 40, no. 3, pp. 534-559, 1997.
[47] J. Wirtenberg, J. Harmon, W. G. Russell, and K. D. Fairfield, "HR's role in building a sustainable enterprise: Insights from some of the world's best companies," *People and Strategy*, vol. 30, no. 1, pp. 10-20, 2007.
[48] C. A. Ramus and U. Steger, "The roles of supervisory support behaviors and environmental policy in employee "Ecoinitiatives" at leading-edge European companies," *Academy of Management Journal*, vol. 43, no. 4, pp. 605-626, 2000.
[49] B. B. Schlegelmilch, G. M. Bohlen, and A. Diamantopoulos, "The link between green purchasing decisions and measures of environmental consciousness," *European Journal of Marketing*, vol. 30, no. 5, pp. 35-55, 1996. https://doi.org/10.1108/03090569610118740
[50] P. Hong, S. Jagani, J. Kim, and S. H. Youn, "Managing sustainability orientation: An empirical investigation of manufacturing firms," *International Journal of Production Economics*, vol. 211, pp. 71-81, 2019. https://doi.org/10.1016/j.ijpe.2019.01.035
[51] J. L. Greeno, "Rethinking corporate environmental-management," *Columbia Journal of World Business*, vol. 27, no. 3-4, pp. 222-232, 1992.
[52] D. C. Wimalachandra, B. Frank, and T. Enkawa, "Leveraging customer orientation to build customer value in industrial relationships," *The Journal of Japanese Operations Management and Strategy*, vol. 4, no. 2, pp. 46-61, 2014.
[53] J. J. Cronin, J. S. Smith, M. R. Gleim, E. Ramirez, and J. D. Martinez, "Green marketing strategies: An examination of stakeholders and the opportunities they present," *Journal of the Academy of Marketing Science*, vol. 39, pp. 158-174, 2011.
[54] A. Tariq, Y. F. Badir, W. Tariq, and U. S. Bhutta, "Drivers and consequences of green product and process innovation: A systematic review, conceptual framework, and future outlook," *Technology in Society*, vol. 51, pp. 8-23, 2017.
[55] J. C. Hayton, "Competing in the new economy: The effect of intellectual capital on corporate entrepreneurship in high-technology new ventures," *R&D Management*, vol. 35, no. 2, pp. 137-155, 2005.
[56] M. Delgado-Verde, G. Martín-de Castro, and J. Emilio Navas-López, "Organizational knowledge assets and innovation capability: Evidence from Spanish manufacturing firms," *Journal of Intellectual Capital*, vol. 12, no. 1, pp. 5-19, 2011. https://doi.org/10.1108/14691931111097890
[57] N. Aramburu and J. Sáenz, "Structural capital, innovation capability, and size effect: An empirical study," *Journal of Management & Organization*, vol. 17, no. 3, pp. 307-325, 2011. https://doi.org/10.1017/s1833367200001498
[58] P. Paillé, Y. Chen, O. Boiral, and J. Jin, "The impact of human resource management on environmental performance: An employee-level study," *Journal of Business Ethics*, vol. 121, pp. 451-466, 2014.
[59] G. Albort-Morant, A. Leal-Millán, and G. Cepeda-Carrión, "The antecedents of green innovation performance: A model of learning and capabilities," *Journal of Business Research*, vol. 69, no. 11, pp. 4912-4917, 2016.
[60] P. Lanoie, J. Laurent-Lucchetti, N. Johnstone, and S. Ambec, "Environmental policy, innovation and performance: New insights on the Porter hypothesis," *Journal of Economics & Management Strategy*, vol. 20, no. 3, pp. 803-842, 2011.
[61] Y. F. Badir and G. C. O'Connor, "The formation of tie strength in a strategic alliance's first new product development project: The influence of project and partners' characteristics," *Journal of Product Innovation Management*, vol. 32, no. 1, pp. 154-169, 2015. https://doi.org/10.1111/jpim.12222
[62] A. Walter, "Relationship-specific factors influencing supplier involvement in customer new product development," *Journal of Business Research*, vol. 56, no. 9, pp. 721-733, 2003.
[63] S.-H. Wu, L.-Y. Lin, and M.-Y. Hsu, "Intellectual capital, dynamic capabilities and innovative performance of organisations," *International Journal of Technology Management*, vol. 39, no. 3-4, pp. 279-296, 2007.
[64] N. Borin, J. Lindsey-Mullikin, and R. Krishnan, "An analysis of consumer reactions to green strategies," *Journal of Product & Brand Management*, vol. 22, no. 2, pp. 118-128, 2013. https://doi.org/10.1108/10610421311320997
[65] T.-Y. Chiou, H. K. Chan, F. Lettice, and S. H. Chung, "The influence of greening the suppliers and green innovation on environmental performance and competitive advantage in Taiwan," *Transportation Research Part E: Logistics and Transportation Review*, vol. 47, no. 6, pp. 822-836, 2011.

[66] G. C. Wu, "The influence of green supply chain integration and environmental uncertainty on green innovation in Taiwan's IT industry," *Supply Chain Management: An International Journal*, vol. 18, no. 5, pp. 539-552, 2013.

[67] J.-j. Zhang *et al.*, "Clinical characteristics of 140 patients infected with SARS-CoV-2 in Wuhan, China," *Allergy*, vol. 75, no. 7, pp. 1730-1741, 2020. https://doi.org/10.1111/all.14238

[68] L. Ma, M. Li, X. Ma, L. Cheng, P. Du, and Y. Liu, "A review of supervised object-based land-cover image classification," *ISPRS Journal of Photogrammetry and Remote Sensing*, vol. 130, pp. 277-293, 2017. https://doi.org/10.1016/j.isprsjprs.2017.06.001

[69] Y.-S. Chen and K.-C. Chang, "The nonlinear effect of green innovation on the corporate competitive advantage," *Quality & Quantity*, vol. 47, pp. 271-286, 2013. https://doi.org/10.1007/s11135-011-9518-x

[70] Y. H. Ling, "Examining green policy and sustainable development from the perspective of differentiation and strategic alignment," *Business Strategy and the Environment*, vol. 28, no. 6, pp. 1096-1106, 2019. https://doi.org/10.1002/bse.2304

[71] M. Massaro, J. Dumay, and C. Bagnoli, "Where there is a will there is a way: IC, strategic intent, diversification and firm performance," *Journal of Intellectual Capital*, vol. 16, no. 3, pp. 490-517, 2015.

[72] 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," *Journal of Management Development*, vol. 39, no. 1, pp. 31-49, 2019.