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Do Green Dynamic Capabilities and Absorptive Capacity Affect Green Innovation Performance? A Study on Companies in Indonesia

Reni Amaranti*, Rajesri Govindaraju, Dradjad Irianto

Bandung Institute of Technology (Indonesia)

**Corresponding author: amarantireni@gmail.com*
rajesri@itb.ac.id, dradjad@itb.ac.id

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Abstract:

Purpose: This study aims to empirically analyze the effect of absorptive capacity, green dynamic capability, and green manufacturing practices (GMP) on green innovation performance (GIP).

Design/methodology/approach: A quantitative approach was employed in this study, with data collected through a questionnaire and analyzed for hypothesis using the partial least squares structural equation model. We conducted in-depth interviews with experienced professionals from three selected companies that have implemented innovative green practices to enhance the depth of the research.

Findings: Empirical findings showed that reconfiguring capabilities positively affect GIP. Realized absorptive capacity positively affects GMP but does not affect GIP. Then, realized absorptive capacity positively impacts sensing and reconfiguration capabilities. GMP mediates the relationship between realized absorptive capacity and GIP. This study reveals the two pathways through which green dynamic capabilities affect realized absorptive capacity and GIP.

Research limitations/implications: This study has yet to consider potential variations in company ownership, applied technology, and industry type that could lead to differences in green innovation characteristics. This study employed a small sample size and a Likert-scale questionnaire, possibly leading to respondent perception bias (although this is unlikely).

Practical implications: The results of this study offered valuable insights into how companies developed dynamic capabilities to address essential green requirements in their product and processes. Thus, companies can prepare all available resources to adapt to various environment-related changes.

Social implications: Companies with high green innovation performance will produce environmentally friendly products, conduct industrial activities without damaging the environment, and ultimately create a sustainable industry.

Originality/value: This study differs from previous research in decomposing green dynamic capabilities into three distinct capabilities: Sensing, Seizing, and Reconfiguring. In previous research, these capabilities were described as a single capability. Additionally, this study highlights the position of GMP between absorptive capacity and green dynamic capabilities with GIP.

Keywords: green innovation performance, green dynamic capabilities, absorptive capacity, green manufacturing practices

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1. Introduction

Manufacturing companies are critical drivers of economic growth, but they have a significant environmental impact due to resource consumption and waste production. Energy consumption in such companies has surged by 61%, accounting for nearly one-third of global usage. Manufacturing activities contribute to 36% of global carbon dioxide (CO_2) emissions, with a 25% increase in CO_2 emissions by 2030 (IEA, 2007). Consequently, pressure is being mounted on manufacturing companies to reduce their environmental footprint. Compliance with international environmental regulations is necessary to mitigate the adverse effects of companies' activities on the environment, while consumers' awareness regarding ecological issues significantly influences businesses worldwide (Chen, Lai & Wen, 2006). Environmental concerns are reshaping the business environment, making effective environmental management increasingly crucial for organizations to maintain competitiveness.

Indonesia has implemented various programs and regulations to address environmental degradation. These include the Green Industry initiative stated in Law of Industry No. 3 of 2014, the establishment of Green Industry standards, and the Corporate Performance Rating Assessment Program (PROPER) organized by the Indonesian Ministry of Environment and Forestry (MoE). The Indonesian government has committed to reducing greenhouse gas emissions by 29%, below the projected levels by 2030. Moreover, through the Green Industry Awards, the government recognizes and rewards companies that adhere to the outlined principles in their production processes.

Environmental damage, stringent regulations, and growing consumer awareness have catalyzed companies to embrace environmentally friendly practices, thereby triggering innovation. Green innovation serves as a means for businesses to align with consumer demands and adhere to government regulations concerning environmental protection. It emphasizes energy efficiency, preventing pollution, waste management, and reducing resource consumption to minimize the adverse environmental effects of companies' activities (Cai & Li, 2018; Chen, 2008; Tariq, Badir, Tariq & Bhutta, 2017). By altering product and process designs, green innovation enables the development of environmentally friendly products and processes that minimize negative environmental impacts in their life cycle (Chen, 2008; Huang & Li, 2017).

Extensive studies have been conducted on green innovation, analyzing it from diverse perspectives, such as studies on the drivers of green innovation (Cai & Li, 2018; Díaz-García, González-Moreno & Sáez-Martínez, 2015; Tariq et al., 2017). Additionally, the impact of green innovation on companies' performance has been investigated by Cai and Li (2018), Chen et al. (2006), and Zhang, Rong and Ji (2019). External factors influencing green innovation have been explored by Du, Zhang and Feng (2018) and Huang, Hu, Liu, Yu and Yu (2016), while the internal ones have been examined by Albort-Morant, Leal-Millán and Cepeda-Carrión (2016); Albort-Morant, Henseler, Cepeda-Carrión and Leal-Rodríguez (2018); Amaranti, Govindaraju and Irianto (2019); Chen, Chang, and Lin (2014); Dangelico, Pujari and Pontrandolfo (2017); Huang and Li (2017); Salim, Ab-Rahman and Abd-Wahab (2019); Yousaf (2021); and Yusr, Salimon, Mokhtar, Abaid, Shaari, Perumal et al. (2020).

As explained by previous studies, companies must possess robust internal capabilities to navigate and adapt to the changing environment for successful green innovation. Green innovation requires dynamic capabilities and high commitment from all parties in the company regarding green practices and the implementation of green values (Yousaf, 2021). It is essential to thoroughly examine and comprehensively develop these internal capabilities, enabling effective implementation of green innovation. Ultimately, companies undertaking green innovations can gain sustainable competitive advantages (Huang et al., 2016; Salim et al., 2019).

Dynamic capabilities are recognized as a critical aspect of green innovation (Salim et al., 2019). To develop these capabilities, many companies need more experience and skills in shaping the business environment. Therefore, it is critical to give special attention to its development to ensure the success of green innovations. In addition to dynamic capabilities, knowledge, especially external knowledge, is considered essential and closely related to green innovation. The capability of companies to effectively absorb and utilize external knowledge becomes a determining factor in the success of their green innovation endeavors. Several studies, both empirical and literature-based, examined the relationship between dynamic capabilities or absorptive capacity and green innovation performance (GIP) (Albort-Morant et al., 2016; Albort-Morant et al., 2018; Arranz, Arroyabe, Li & Fernandez-de-Arroyabe, 2020; Ben-Arfi, Hikkerova & Sahut, 2018; Huang & Li, 2017; Yousaf, 2021). However, only some studies have investigated how the company's internal capabilities are interrelated and how they affect green innovation performance.

Therefore, this study discusses how the company's internal factors affect the performance of green innovation. This study investigates the influence of green dynamic capabilities, specifically Sensing, Seizing, and Reconfiguring, on firms' green practices and innovation performance. In addition, this study also explores how the capacity to absorb external knowledge impacts green dynamic capabilities and GIP.

2. Theoretical Background and Hypothesis

2.1. Green Innovation and Green Innovation Performance (GIP)

Green innovation, also called eco or environmental innovation, encompasses a range of ideas discussed in the literature. The green concept comprises manufacturing processes that use fewer raw materials, have fewer adverse effects on the environment, conserve natural resources and energy, ensure the safety of employees, society, and consumers, and remain economically competitive (Dornfeld, 2014). Therefore, green innovation includes all innovations that contribute to creating environmentally friendly products, services, or processes while maximizing natural resource use (Albort-Morant et al., 2018). Green innovation encompasses a broad spectrum of advancements in processes and products, such as energy-saving initiatives, pollution prevention measures, waste recycling practices, environmentally friendly product designs, and companies' environmental management. Its primary objective is to reduce negative environmental impacts (Albort-Morant et al., 2016; Chen et al., 2006) across the entire product life cycle (Huang & Li, 2017). By effectively embracing green innovation, organizations can achieve sustainable competitive advantages (Huang et al., 2016) and comply with environmental protection requirements (Albort-Morant et al., 2018).

GIP refers to a company's ability to produce new products, services, processes, or technologies that reduce environmental impact and optimize resource utilization. GIP assesses the effectiveness of companies in creating innovative solutions to address environmental and sustainability challenges while promoting viable business practices. This encompasses developing environmentally friendly products, enhancing production processes that minimize waste and emissions, and utilizing renewable energy sources and recyclable raw materials.

GIP is assessed based on green product and process innovation (Albort-Morant et al., 2016; Huang & Li, 2017). Green product innovation performance (GprodInov) focuses on energy conservation, pollution prevention, waste recycling, and green product design. Companies strive to select materials that produce minimal pollution, consume the fewest energy and resources, and develop easily recyclable, reusable, or biodegradable products. Green process innovation performance (GprocInov) pertains to a company's efforts to implement and improve green processes that reduce emissions of hazardous substances or waste. These processes include recycling waste, optimizing the treatment and reuse of emissions from manufacturing processes, reducing water, electricity, coal, or oil consumption, and optimizing raw material utilization.

2.2. Green Manufacturing Practices (GMP)

Green manufacturing has received attention from practitioners and academics for a long time, and it is in line with the increasing demands of all stakeholders regarding sustainable issues (Rehman, Seth & Shrivastava, 2016). GMP encompasses various initiatives to minimize pollution and the presence of hazardous compounds. These practices involve waste reduction and treatment, recycling processes, pollution prevention, reducing toxic substances, enhancing energy and water efficiency, and implementing green design principles.

Various studies investigated the driving factors behind the adoption of GMP. One important factor is the influence of future environmental regulations and policies, along with the pressure exerted by lawmakers (Joo, Seo & Min, 2018; Ramanathan, He, Black, Ghobadian & Gallear, 2017). Additionally, a comprehensive study categorized the drivers into six groups, including market determinants, technology, collaboration and networking, stakeholder pressure, organizational-level elements, and attributes related to social, cultural, and ethical considerations (Tariq et al., 2017).

The Indonesian government has implemented various laws and standards to facilitate GMP. For instance, Law No. 3 of 2014, concerning industry, includes regulations about green companies, while Waste Quality Standards regulate the proper disposal of waste in the environment. Therefore, companies' compliance with these regulations and requirements shows their commitment to practicing green manufacturing. GMP encourages companies to improve efficiency and savings in their products and processes to be more environmentally friendly while maintaining economic benefits. Furthermore, GMPs enable companies to comply with environmental regulations while fulfilling their social responsibilities and improving their image. Companies can learn by doing GMPs to identify green ideas in products and processes that could increase GIP. Green manufacturing strategies allow companies to balance environmental, economic, and social performance. Therefore, GMP significantly affects all three performances (Afum, Osei-Ahenkan, Agyabeng-Mensah, Amponsah-Owusu, Kusi & Ankomah, 2020).

Hypothesis 1: GMP has a positive effect on GIP.

2.3. Green Dynamic Capabilities

Green innovation involves the development of capabilities to enhance the environmental friendliness of their business operations and products. These innovations necessitate the capacity of companies to undergo fundamental changes, starting with a shift in their business perspective. These change-oriented capabilities are called dynamic capabilities (Eisenhardt & Martin, 2000). According to Teece, Pisano and Shuen (1997), dynamic capabilities encompass an organization's capability to combine, enhance, and reorganize competencies (internal and external) in response to rapid environmental changes. It enables companies to adapt effectively to market shifts by integrating or transferring organizational positions, processes, knowledge, or skills (Pai & Chang, 2013).

Dynamic capability is comprised of three interdependent capabilities, namely a company's ability to 1) sense and create opportunities (sensing capability/SenCap), 2) seize opportunities (seizing capability/SeiCap), and 3) relocate and reconfigure company resources (reconfiguring capability/Reconf) (Fainshmidt & Frazier, 2017; Teece, 2018). Teece (2007) has described the micro-foundations of dynamic capabilities and outlined the nature of the three capabilities. SenCap refers to the company's capacity to observe, analyze, and investigate market and technological trends to identify opportunities and threats. It involves maintaining interactions with customers, vendors, and R&D colleagues while adhering to companies' best practices. SeiCap encompasses taking advantage of recognized opportunities by assessing present circumstances, predicting future needs, and allocating resources toward design, technology, or market needs. Reconf pertains to the ability to reallocate and recombine companies' resources and operational capabilities as they grow, markets shift, and technology advances. Resource reconfiguration is often preceded by sensing and seizing, which can be detected to create opportunities (SenCap) needed to generate new information flows. Additionally, resource reconfiguration enhances the benefits derived from SenCap (Teece, 2007). In this study, we employ green dynamic capabilities, defined as companies' ability to consciously create, improve, or modify their resources to develop new environmentally friendly products and manufacturing processes.

Based on Teece (2007, 2018), Fainshmidt and Frazier (2017) and Khan, Daddi and Iraldo (2021) conducted research that describes dynamic capabilities into three constructs in the study model. Khan et al. (2021) describe these three capabilities as distinct and unconnected in the context of circular economy implementation. Still, Fainshmidt and Frazier (2017) describe the three capabilities as distinct and interconnected. This study explains sensing, seizing, and reconfiguring as Fainshmidt and Frazier (2017) propose.

Hypothesis 2: SenCap positively affects SeiCap.

Hypothesis 3: SeiCap positively affects Reconf.

Hypothesis 4: SenCap positively affects Reconf.

Several studies explored the connection between dynamic capabilities and GIP and reported that dynamic capabilities directly or indirectly affect GIP (Albort-Morant et al., 2016; Huang & Li, 2017). Changes in dynamic capabilities can impact innovation performance because more robust capacities are associated with higher innovative performance. The dynamic capabilities influence the speed companies introduce green products and processes. Based on these discussions, this study formulated four hypotheses that describe the relationship between SenCap, SeiCap, and Reconf and its impact on GIP.

Hypothesis 5: Reconf positively affects the GIP.

As with green innovation, adopting GMP in a company to mitigate environmental impact necessitates the knowledge and capability to enact transformative changes in its business activities. As discussed earlier, green manufacturing entails implementing various strategies to reduce adverse environmental impacts throughout the product life cycle, from design and production to delivery and consumers' usage (Dornfeld, 2013). These practices include green design, process optimization, green packaging, and internal environmental management (Alayón, Säfsten & Johansson, 2017; Chuang & Yang, 2014). For instance, integrating green design into practice requires a sound understanding of environmental considerations, analyzing products and processes, and utilizing appropriate synthesis methods to transform conventional designs and processes into environmentally-friendly alternatives (Zhou, Hong, Zhu, Yang & Zhao, 2018). Therefore, the company's capacity to reconfigure its resources and competencies plays an important role in implementing GMP effectively.

Hypothesis 6: Reconf positively affects GMP.

2.4. Absorptive Capacity

Innovation is related to information and knowledge. Creating and managing organizational knowledge is crucial to creating something new (Nonaka & Takeuchi, 1996). Meanwhile, companies can easily access relevant information and knowledge in the business environment and use the information and knowledge to generate novel ideas and solutions. Therefore, companies must be able to identify external knowledge that must be absorbed and utilized and manage existing knowledge within the organization. Absorptive capacity is the company's ability to acquire external knowledge, combine it with existing knowledge, and use it to build new knowledge and competencies (Flatten, Engelen, Zahra & Brettel, 2011).

Zahra and George (2002) introduced four dimensions of absorptive capacity, which contributed to understanding how it affects innovation performance. The four dimensions are acquisition (ACQ), assimilation (ASIM), transformation (TRANS), and exploitation (EKS). The first two dimensions, i.e., ACQ and ASIM, describe potential absorptive capacity (PACap). The remaining two dimensions, i.e., TRANS and EKS, represent realized absorptive capacity (RACap). PACap and RACap are distinct concepts that play complementary roles and involve different organizational strategies and structures. PACap primarily involves internal processes such as reflection, intuition, and interpretation, while RACap focuses on effectively using externally absorbed knowledge. PACap is described by the various routines and procedures in the company that discover, analyze, interpret, and make sense of external knowledge. RACap is described as a variety of activities that enable absorbed knowledge to be transformed and utilized by companies to renew or create new competencies (Zahra & George, 2002).

PACap and RACap have different characteristics and peculiarities regarding how external knowledge can benefit organizations or companies. PACap tends to affect the abilities of individuals within the organization. At the same time, RACap reflects the company's ability to use absorbed knowledge and integrate it into its processes to improve performance. Managers and select employees can internalize PACap through interaction by developing relational trust, a common language, and self-confidence. Rules, procedures, and problem-solving routines may represent RACap. High potential absorption capacity does not sufficiently improve performance without the realized absorptive capacity. Companies cannot utilize external knowledge unless they first acquire and integrate it; thus, PACAP precedes RACAP (Albort-Morant et al., 2018). If a company can better understand emerging knowledge (PACAP), it will be more likely to take advantage of new opportunities in its environment (RACAP).

Hypothesis 7: PACap positively affects RACap

Regarding green practices, absorptive capacity is the company's ability to find and acquire external environmental knowledge that is important for green practices. This knowledge is then translated, converted into the company's green knowledge, and adapted to the company's existing green knowledge. Meanwhile, dynamic capabilities play a vital role in enhancing innovation performance by enabling the reconfiguration of internal and external resources, including knowledge possessed by companies. Increased capability to transform and exploit knowledge strengthens the dynamic capabilities (SenCap, SeiCap, and Reconf). According to Pai and Chang (2013), the absorptive capacity of companies directly influences their dynamic capabilities.

Hypothesis 8: RACap positively affects SenCap.

Hypothesis 9: RACap positively affects Seicap.

Hypothesis 10: RACap positively affects Reconf.

Companies often adopt GMP to meet external demands, such as consumer preferences or compliance with environmental regulations. Companies need access to up-to-date information on environmental issues to implement green manufacturing. The capability to acquire and assimilate relevant information and knowledge is crucial for companies to determine which practices to adopt and how to modify their existing processes. Absorptive capacity significantly influences GMP by enabling companies to identify and incorporate relevant knowledge into their operations.

Hypothesis 11: RACap positively affects GMP.

According to Chen, Lin, Lin and Chang (2015), an increase in the capability of companies to absorb environmental knowledge positively influences their green dynamic capabilities. Dynamic capabilities also positively affect green service innovation and mediate the positive relationship between absorptive capacity and firm performance. The research findings of Chen et al. (2015) are used to describe the relationship between absorptive capacity, green dynamic capabilities, and GIP discussed in this study.

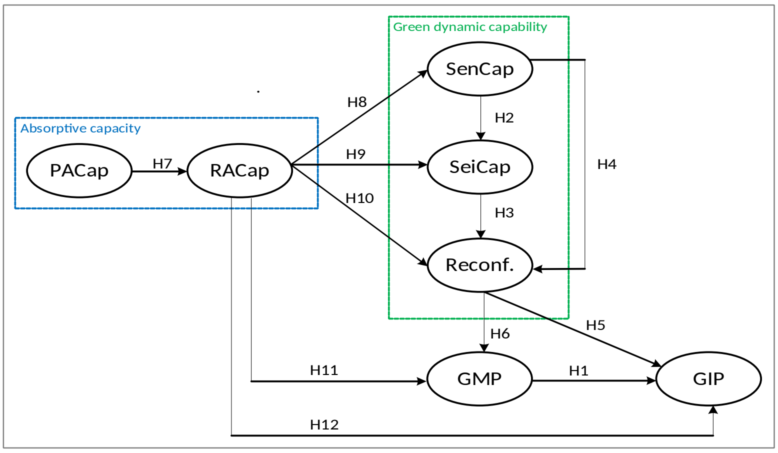

Figure 1. The conceptual model

Green knowledge is one of the keys to achieving sustainable innovation (Liao, Fei & Chen, 2007). Regardless of the organizational level at which the invention is defined, external knowledge is often crucial to innovation. Innovation requires the ability to utilize external knowledge effectively. Prior knowledge enhances a company's ability to generate innovation (Albort-Morant et al., 2018). Prior knowledge determines the capacity to evaluate and utilize external knowledge. The capability to absorb knowledge significantly impacts innovation performance (Aboelmaged & Hashem, 2019; Chen et al., 2014; Liao et al., 2007; Song, Hossin, Yin & Hosain, 2021), emphasizing the importance of enhancing absorptive capacity for better innovation outcomes. PACap and RACap have positively influenced the performance of green products and process innovations (Albort-Morant et al., 2018). The absorption of external knowledge is crucial in facilitating green innovation activities.

Hypothesis 12: RACap positively affects GIP.

All hypotheses formulated in the previous section are described in the research model, as shown in Figure 1.

3. Methodology

3.1. Data Collection

The study was conducted at manufacturing companies in Indonesia that have implemented green manufacturing or are participants in the Environmental Management Compliance Rating Assessment Program (known as PROPER) organized by the Indonesian Ministry of Environment (MoE). This study does not define a specific type of manufacturing company, so the industrial sectors of the surveyed companies vary. The survey respondents are company employees with various positions involved in environmental management and have sufficient experience implementing green practices in their respective companies. Therefore, the respondents are considered appropriate and have adequate knowledge and experience to answer all the indicators asked in the questionnaire.

Furthermore, to enhance and refine the analysis of the model test results, in-depth interviews were conducted with experienced practitioners from three companies representing diverse industrial sectors, namely petrochemicals, textiles, and food and beverages. These companies were selected to provide a comprehensive perspective on implementing green practices across different manufacturing companies.

3.2. Measurement Variable

The study utilized a questionnaire as the main data collection tool, consisting of three parts: 1) personal data inquiries, 2) company-related questions, and 3) model variables inquiries. In the third part, respondents were asked to rate each question on a Likert scale of 1 to 7, with 1 indicating strong disagreement and 7 indicating strong agreement.

GIP includes the performance of both processes and products to reduce negative environmental effects by prioritizing environmental considerations, including energy conservation, pollution prevention, waste recycling, green product design, and effective environmental management (Albort-Morant et al., 2016; Albor-Morant et al., 2018; Chen et al., 2006; Huang & Li, 2017). This study defines GIP as a second-order construct consisting of two first-order constructs: green product innovation performance (GProdInov) and green process innovation performance (GProcInov). GProdInov represents companies' performance in product innovation activities related to energy saving, pollution prevention, product recycling, and green product design. The GprodInov measurement employs six indicators based on Albort-Morant et al. (2016), Chen et al. (2006), Huang and Li (2017), and Tseng, Wang, Chiu, Geng and Lin (2013). Thus, GProcInov represents the performance of process innovations in energy and water savings, pollution prevention, waste recycling, material reuse, emission reduction, and consumption of raw and auxiliary materials. GProcInov was evaluated using six indicators based on Chen et al. (2006), Huang and Li (2017), Huang et al. (2016), and Tseng et al. (2013) (shown in Table 1).

Green dynamic capabilities encompass a company's ability to effectively respond to changing market dynamics by leveraging their existing resources and knowledge to update and develop their organization (Chen et al., 2015). This study classifies the capability into three constructs: SenCap, SeiCap, and Reconf (Teece, 2007; Teece et al., 1997). SenCap refers to a company's capacity to perceive, interpret, and actively pursue opportunities related to the green aspects of its environment (Albort-Morant et al., 2016). It is assessed using six indicators that measure the level of company activity, including opportunity scanning, search and exploration activities, and observation of best practices in other companies (Pavlou & El-Sawy, 2011; Wilden, Gudergan, Nielsen & Lings, 2013). SeiCap represents a company's ability to respond effectively to green opportunities by introducing green products, processes, or services. This capability is measured using four indicators proposed by Wilden et al. (2013). Reconf denotes a company's ability to continuously realign, reorganize, and safeguard its tangible and intangible assets to adapt to environmental changes. This study measured Reconf using four indicators derived from Wilden et al. (2013) and Lin and Chen (2017). The indicators to measure SenCap, SeiCap, and Reconf are shown in Table 2.

Variable	Indicators	Reference
Green Innovation Performance (GIP)*		
Green product innovation performance (GprodInov)**	1. Produce products with environmentally friendly raw materials and additives.	Huang & Li (2017)
	2. Using non-polluting raw materials.	Chen et al. (2006); Albort-Morant et al. (2018)
	3. Reduction in the consumption of additives and raw materials.	
	4. Use of environmentally friendly product packaging.	Huang and Li (2017)
	5. Produce products that can be recycled, reused, and decomposed.	Chen et al. (2006)
	6. Competitiveness of new green products	Tseng et al. (2013)
Green Process Innovation Performance (GProcInov)**	1. Production process with less energy consumption.	Chen et al. (2006); Huang & Li (2017)
	2. Production process with less water consumption.	Chen et al. (2006); Albort-Morant et al. (2018)
	3. Minimal use of raw and auxiliary materials in production.	
	4. Reduce the emission of hazardous materials from production.	Chen et al. (2006)
	5. Recycle production waste.	Chen et al. (2006); Albort-Morant et al. (2018)
	6. Reusing and recycling materials introduction.	Huang & Li (2017)

Note: *=second order construct; **=first order construct

Table 1. Indicators of GIP

Variable	Indicators	Reference
Sensing Capability (SenCap)	1. Observation of the impact of green issues on consumers.	Pavlou and El-Sawy (2011); Tseng & Lee (2012)
	2. Identifying new green implementation opportunities.	
	3. Participation in professional organizations/ associations.	Wilden et al. (2013)
	4. Establishing relationships with consumers, suppliers, partners, and government.	
	5. Observation of best practices in green manufacturing.	
	6. Reviewing product and service development efforts.	
Seizing Capability (SeiCap)	1. Investing in finding green solutions for consumers.	Wilden et al. (2013)
	2. Investing in green design and technology	
	3. Implementing green manufacturing best practices.	
	4. Changing companies' practices to meet customer needs.	
Reconfiguring capability (Reconf)	1. New management methods incorporate green issues.	Wilden et al. (2013)
	2. Substantial renewal of business processes.	
	3. Companies coordinate their employees to develop green technology.	Lin and Chen (2017)
	4. Companies are allocating resources to create green innovation.	

Table 2. Indicators of SenCap, SeiCap, and Reconf

This study described absorptive capacity as consisting of two second-order constructs, i.e., PACap and RACap. PACap is represented by two first-order constructs, namely ACQ and ASIM, which reflect the efforts of companies to capture and assimilate information from the external environment. ACQ is assessed using six indicators adapted from previous studies (Albort-Morant et al., 2018; Camisón & Forés, 2010; Flatten et al., 2011; Kang & Lee, 2016), while ASIM is measured using five indicators adapted from other sources (Andrawina, Govindaraju, Samadhi & Sudirman, 2008; Camisón & Forés, 2010; Flatten et al., 2011; Kang & Lee, 2016). RACap is described by two first-order constructs, namely TRANS and EKS, which pertain to the capability of companies to change and integrate knowledge (Andrawina et al., 2008; Zahra & George, 2002). TRANS is evaluated using five indicators that measure the capacity of companies to consider new knowledge, recognize its usefulness, and connect it with existing knowledge (Albort-Morant et al., 2018; Andrawina et al., 2008; Flatten et al., 2011). EKS is measured using four indicators adopted from Flatten et al. (2011). All indicators of PACap and RACap are described in Table 3.

Variable	Indicators	Reference
Potential Absorptive Capacity (PACap)*		
Acquisition (ACQ)**	1. Companies meet with clients, suppliers, or third parties to acquire new knowledge.	Albort-Morant et al. (2018)
	2. Companies carry out activities to gather knowledge informally.	
	3. Facilities/activities provided by companies for employees to exchange knowledge with other company employees.	Kang and Lee (2016)
	4. Companies engage in joint research.	Camison and Fores (2010)
Assimilation (ASIM)**	1. Study the desires and expectations of customers.	Andrawina et al. (2008); Kang and Lee (2016)
	2. Employees are facilitated to participate in discussion forums.	Andrawina et al. (2008); Camison and Fores (2010); Flatten et al. (2011)
	3. Cross-departmental problem-solving.	Flatten et al. (2011)
	4. Problem-solving based on experience.	
	5. Regular meetings with external professionals or other parties.	Albort-Morant et al. (2018)
Realized Absorptive Capacity (RACap)*		
Transformation (TRANS)**	1. Retention of new knowledge.	Flatten et al. (2011); Albort-Morant et al. (2018)
	2. Evaluate existing business processes based on new knowledge.	Andrawina et al. (2008)
	3. Companies can recognize the usefulness of new knowledge.	Albort-Morant et al. (2018)
	4. Discussion of the consequences of market trends on developing new products and services.	
	5. Employees can link existing knowledge with new knowledge.	Flatten et al. (2011)
Exploitation (EKS)**	1. Clear division of roles and responsibilities.	Flatten et al. (2011)
	2. Ability to adopt new technology.	
	3. Management to support prototyping.	
	4. Companies adjust to the technology used with new knowledge.	

Note: *=second order construct; **=first order construct

Table 3. Indicators of PACap and RACap

GMP is described as second-order constructs, encompassing four first-order constructs, namely green design (GDes), green packaging (GPack), green process (GPro), and internal environmental management (IEM). GDes focuses on developing environmentally friendly products that minimize waste and optimize material utilization. Six indicators from the works by Chuang and Yang (2014) and Alayón et al. (2017) are used to measure GDes. GPack is evaluated using five indicators based on the work of Chuang and Yang (2014). GPro entails reducing the environmental impact across all manufacturing aspects, including resource inputs, chemicals, and energy consumption. The measurement of GPro employs eight indicators adapted from Chuang and Yang (2014) and Alayón et al. (2017). IEM refers to the environmental management practices conducted within companies, and it is assessed using six indicators (Zhu, Sarkis & Geng, 2005). The indicators to measure GMP are outlined in Table 4.

Variable	Indicators	Reference
Green Manufacturing Practices (GMP)*		
Green Process (GPro)**	1. Use of production facilities that minimize pollution	Chuang and Yang (2014); Alayón et al. (2017); Rusinko (2007)
	2. Waste management by regulations	Chuang and Yang (2014); Alayón et al. (2017)
	3. The use of purification equipment to reduce the negative impact of waste	Chuang and Yang (2014); Zhu et al. (2005)
	4. Production technology that minimizes pollution	Chuang and Yang (2014); Alayón et al. (2017)
	5. The production process that generates little waste	
	6. Production processes that require the least energy	
	7. Water-saving program in the production process	
	8. Establishing a system that promotes green practices in the product life cycle	
Green Design (GDes)**	1. Designing products with the selection of environmentally friendly raw materials	Chuang and Yang (2014); Alayón et al. (2017)
	2. Consider energy efficiency when designing products and processes.	
	3. Consider consuming raw and auxiliary materials when creating products and processes.	
	4. Consider the ease of recycling the designed product.	
	5. Consider the ease of reuse of the designed product.	
	6. Consideration of ease of remanufacturing	
Green Packaging (GPack)**	1. Packaging raw materials that are easy to recycle	Chuang and Yang (2014)
	2. Environmentally friendly packaging of raw materials	
	3. Simpler packaging design	
	4. Less consumption of packaging raw materials	
	5. The more straightforward packaging manufacturing process	
Internal Environmental Management (IEM)**	1. Commitment to the green implementation	Zhu et al. (2005)
	2. Management support for green implementation	
	3. Cooperation for environmental improvement	
	4. Implementation of environmental management	
	5. Conducting environmental programs	
	6. Implementing green purchasing	

Note: *=second order construct; **=first order construct

Table 4. Indicators of GMP

4. Result

The questionnaires for this study were distributed to companies participating in the annual PROPER conducted by the Indonesian MoE. Questionnaires were distributed through various methods, including in-person, online, and postal mail/email. One hundred fifteen questionnaire responses were compiled and utilized for data processing. The majority of respondents came from the food and beverage sector (17.39%), followed by textile and garment companies (16.52%) and automotive and auto parts companies (15.65%). Further analysis revealed that most of the observed companies held PROPER predicates (approximately 76.52%), indicating their compliance with the environmental requirements set by the Indonesian government. Among companies with PROPER predicates, around 65.22% were rated as blue, indicating full compliance with the environmental regulations. A total of 73.9% of the respondents who were involved in this study had positions as managers or supervisors. Most respondents (78.2%) also had more than five years of work experience. Therefore, respondents possessed significant knowledge and expertise in green practices, rendering them suitable for answering the study model-related questions in the questionnaire. Complete profiles of companies and respondents are described in Table 5.

Criteria		Percentage (%)
Respondents' Profile		
Position	Staff/Officers	21,74
	Supervisors	35,65
	Manager	38,26
	Director	4,35
Working Period	< 5 years	21,74
	5-10 years	43,48
	>10 years	34,78
Company Profile		
Industrial sector	Food and Drink	17,39
	Automotive and automotive components	15,65
	Textiles and textile products, garment	16,52
	Electronics and electronic components	10,43
	Metals, metal processing, metal products	9,57
	Chemicals and chemicals goods	7,83
	Rubber, rubber goods, plastics	4,35
	Leather, leather goods, and footwear	4,35
	Consumer good	2,61
	Pharmacy and medicine	2,61
	Other processing	8,70
Company Age	< 10 years	10,44
	10- 20 years	13,91
	>20 years	75,65
PROPER predicate	No predicate/Red/ black	23,48
	Blue	65,22
	Green/Gold	11,30

Table 5. Company profile and respondent

The partial least squares structural equation model (PLS-SEM) technique using SmartPLS Version 3.0 software was employed to test the study model. PLS-SEM was selected for several reasons, namely 1) the relatively small dataset size (115 data points with seven constructs), 2) the complexity of the model, and 3) its suitability for exploring the study objectives (Hair, Hult, Ringle & Sarstedt, 2017). The data analysis was conducted by evaluating measurement models and structural models (Hair et al., 2017). The study model comprises seven interconnected reflective constructs, four of which are second-order constructs with reflective-reflective relationships. Hence, model analysis was conducted using a disjoint two-stage approach.

4.1. Measurement Model Evaluation

The measurement model describes the relationship between constructs or variables and their indicators (Hair et al., 2017). We evaluate the measurement model by testing indicator reliability, internal consistency reliability, convergent validity, and discriminant validity.

Indicator reliability is determined by evaluating the outer loading value of each indicator. High outer loading shows a close relationship between the indicator and the variables. The recommended threshold for outer loading is greater than 0.707 (Hair et al., 2017). The first-order construct test revealed that five indicators had outer loadings below 0.7. These indicators are Gpro2 (loading = 0.694), GProd1 (loading = 0.673), GProd3 (loading = 0.660), IEM6 (loading = 0.669), and Senca1 (loading = 0.634). Consequently, these indicators were removed from the research model, and indicator reliability testing was repeated. The results show that all constructs in the research model have met the indicator reliability requirements (shown in Table 6).

Composite reliability (CR) is a measure used to evaluate the internal consistency reliability of constructs (Hair et al., 2017). The standard criterion for internal consistency reliability is a CR value greater than 0.70. However, in an exploratory study, the value of 0.6 can still be considered acceptable. The internal consistency testing results indicate that all constructs exhibited values above 0.7. These findings showed that they met the reliability requirements for internal consistency. The subsequent step involves conducting a convergent validity test to assess the positive relationship between indicators within the same construct. This test examines the AVE value. The results of the indicator reliability, construct reliability (internal consistency reliability), and convergent validity tests are summarized in Table 6.

Furthermore, a discriminant validity test was conducted during the measurement model testing phase to ensure that distinct constructs showed adequate differences. The Fornel-Larcker criterion was employed for the discriminant validity test. The logic underlying the Fornell-Larcker method is that a construct shares more significant variance with its affiliated indicators than any other construct. The test results show that all constructs meet the discriminant validity requirements. The results of the discriminant validity test are shown in Table 7.

Construct	Indicator	Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
PACap	ACQ	0,918	0,833	0,923	0,857
	ASIM	0,933			
RACap	EKS	0,925	0,851	0,931	0,870
	TRANS	0,941			
GMP	GDes	0,909	0,913	0,939	0,793
	GPack	0,903			
	GPro	0,859			
	IEM	0,889			
GIP	GProcInov	0,944	0,860	0,935	0,877
	GProdInov	0,929			

Construct	Indicator	Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Reconf	RECON1	0,835	0,868	0,910	0,717
	RECON2	0,811			
	RECON3	0,884			
	RECON4	0,856			
SeiCap	SEICA1	0,873	0,910	0,937	0,788
	SEICA2	0,887			
	SEICA3	0,905			
	SEICA4	0,885			
SenCap	SENCA2	0,760	0,806	0,866	0,563
	SENCA3	0,756			
	SENCA4	0,738			
	SENCA5	0,713			
	SENCA6	0,783			

Table 6. Indicator reliability, internal consistency, and convergent validity

	GIP	GMP	PACap	RACap	Reconf	SeiCap	SenCap
GIP	**0,937**						
GMP	0,730	**0,890**					
PACap	0,625	0,743	**0,910**				
RACap	0,629	0,808	0,802	**0,920**			
Reconf	0,693	0,745	0,701	0,662	**0,881**		
SeiCap	0,696	0,735	0,674	0,616	0,803	**0,905**	
SenCap	0,696	0,713	0,710	0,683	0,669	0,751	**0,781**

Table 7. Discriminant validity: Fornell-Larcker Criterion

4.2. Structural Model Evaluation

The structural model examines the relationships between constructs in the model. The structural model was evaluated by examining the importance of the path coefficient, the R^2 value, the effect size (f^2), and the predictive relevance of Q^2 (Hair et al., 2017). A collinearity test on the exogenous variables was conducted earlier to assess inner collinearity. Examining multicollinearity is crucial because it can lead to biased parameter estimates, increased standard error values, wider 95% confidence intervals for path coefficient parameter estimates, and even impact the hypothesis testing result. Assessing potential collinearity between constructs ensures that collinearity does not adversely impact the model's predictive capability. The collinearity test involves examining the variance inflation factor (VIF). The results of the collinearity evaluations indicate that all constructs satisfy the collinearity requirements with VIF values between 0.2 and 5 (Table 8).

The hypothesis was tested by evaluating the path coefficient using the Bias Corrected and Accelerated Method (BCa) bootstrapping procedure with 5000 sub-samples. The significance level was set at 0.05, and a two-tailed test was conducted. The path coefficients presented in Table 9 show a significant and positive relationship between nine constructs (nine hypotheses), so the acceptance of the hypotheses is confirmed based on the empirical data. Three further hypotheses, specifically SenCap-Reconf (hypothesis 4), RACap-SeiCap (hypothesis 9), and RACap-GIP (hypothesis 12), were determined to be statistically insignificant.

Furthermore, the next essential step is to evaluate the path coefficient with a confidence level of 95%, as indicated in Table 10. As the study model indicates, this assessment demonstrates prospective modifications in specific direct correlations. Table 10 illustrates that the greatest range of variance is in the impact of green manufacturing practices (GMP) on green innovation performance (GIP), with values ranging from 0.154 to 0.722. This value indicates that any attempt or intervention to enhance GMP can potentially lead to a growth in GIP of up to 0.722.

Subsequently, it is necessary to quantify the magnitude of the effect size (f^2). Effect size measurements can quantify the size of changes in the coefficient of determination when a predictor construct is removed from the model. They can also evaluate the effect of a construct on endogenous components. The effect size (f^2) values of 0.02, 0.15, and 0.35 show that the exogenous latent construct has minor, medium, and significant effects. A f^2 value below 0.02 indicates a lack of effect (Hair et al., 2017). The findings of the f^2 value test (Table 11) indicate that nearly all exogenous constructs have a f^2 value larger than 0.02, indicating a significant influence on the endogenous variables according to the model. Two f^2 values below 0.02 imply no effect: RACap-GIP (0.003) and SenCap-Reconf (0.000).

Hypothesis	Relationship	Path Coefficients	t-value	p-value	Result
H1	GMP → GIP	0,438	3,079	0,002*	s
H2	SenCap → SeiCap	0,619	7,529	0,000*	s
H3	SeiCap → Reconf	0,627	6,321	0,000*	s
H4	SenCap → Reconf	0,018	0,161	0,872	ns
H5	Reconf → GMP	0,375	5,110	0,000*	s
H6	Reconf → GIP	0,328	3,430	0,001*	s
H7	PACap → RACap	0,802	21,586	0,000*	s
H8	RACap → SenCap	0,683	12,420	0,000*	s
H9	RACap → SeiCap	0,193	1,813	0,070	ns
H10	RACap → Reconf	0,264	2,822	0,005*	s
H11	RACap → GMP	0,560	8,701	0,000*	s
H12	RACap → GIP	0,057	0,581	0,561	ns

Note: ns=not supported; s=supported; *p<0,01; **p<0,05

Table 9. Path coefficient evaluation

Relationship	Original Sample (O)	Sample Mean (M)	2.5%	97.5%
GMP → GIP	0,438	0,446	0,154	0,722
PACap → RACap	0,802	0,803	0,725	0,870
RACap → GIP	**0,057**	**0,054**	**-0,140**	**0,246**
RACap → GMP	0,560	0,562	0,434	0,683
RACap → Reconf	0,264	0,266	0,083	0,452
RACap → SeiCap	**0,193**	**0,190**	**-0,030**	**0,386**
RACap → SenCap	0,683	0,683	0,565	0,779
Reconf → GIP	0,328	0,326	0,135	0,508
Reconf → GMP	0,375	0,372	0,223	0,511
SeiCap → Reconf	0,627	0,619	0,402	0,794
SenCap → Reconf	**0,018**	**0,026**	**-0,182**	**0,249**
SenCap → SeiCap	0,619	0,624	0,464	0,786

Table 10. Confidence intervals path coefficient

This study used the determination coefficient (R^2) to measure the sample's prediction potential (Hair et al., 2017; Sarstedt, Ringle & Hair, 2014). The R^2 represents the overall impact of an exogenous construct on an endogenous construct or the effect of one endogenous construct on another. The reverse of R^2 values is 0.75 (substantial impact), 0.50 (moderate impact), and 0.25 (weak impact) (Hair et al., 2017). The results show a moderate relationship for five constructs (GIP, GMP, RACap, Reconf, and SeiCap), with R^2 values between 0.584 and 0.732. One construct, SenCap, has a weak impact with an R^2 of 0.467 (see Table 12).

	GIP	GMP	PACap	RACap	Reconf	SeiCap	SenCap
GIP							
GMP	0,124						
PACap				1,798			
RACap	0,003	0,656			0,115	0,048	0,875
Reconf	0,112	0,294					
SeiCap					0,527		
SenCap					0,000	0,492	

Table 11. The effect size measurement (f^2)

	R2	R2 adj.	Relationship
GIP	0,584	0,572	Moderate
GMP	0,732	0,727	Moderate
RACap	0,643	0,639	Moderate
Reconf	0,690	0,682	Moderate
SeiCap	0,584	0,577	Moderate
SenCap	0,467	0,462	Weak

Table 12. Determinant coefficient (R^2)

An assessment of the Q^2 is conducted to determine the level at which the exogenous construct can predict the endogenous construct. This value is derived from a process known as a blindfolding procedure. If Q^2 equals 0, 0.25, or 0.50, then Q^2 signifies low, moderate, and high predictive accuracy. The Q^2 value of the study model in Table 13 shows that GMP, RACAP, and Reconf exhibit high predictive relevance. On the other hand, the GIP, SeiCap, and SenCap demonstrate moderate predictive relevance. Finally, this study uses SRMR to see how well the empirical data fits the model. Overall, the SRMR of the study model is 0.086 (SRMR $<$ 0.10), indicating that the study model fits the empirical data (see Table 14). Furthermore, the NFI value of a study model greater than 0,5 (NFI = 0,720) exhibited a good model match.

	SSO	SSE	Q^2 =(1-SSE/SSO)	Predictive Relevance
GIP	230,000	118,772	0,484	moderate
GMP	460,000	196,944	0,572	high
PACap	230,000	230,000		
RACap	230,000	107,359	0,533	high
Reconf	345,000	166,550	0,517	high
SeiCap	345,000	184,021	0,467	moderate
SenCap	460,000	335,725	0,270	moderate

Table 13. Predictive Relevance evaluation

Criteria	Saturated Model	Estimated Model
SRMR	0,064	0,086
NFI	0,737	0,720

Table 14. SRMR and NFI of study model

5. Discussion

The results of the structural model testing indicate that the GMP-GIP path coefficient exhibits a positive and statistically significant direct effect; thus, the empirical data support hypothesis 1. Companies that have implemented green practices are better equipped to learn how to modify their products and processes to be more environmentally friendly. New green knowledge acquired through the implementation of green practices enhances a company's capacity to identify new green ideas for improving their green products and processes, thereby influencing their green innovation performance according to both green product and green process innovation. The finding is consistent with previous research discussing the impact of green practices on green innovation (Afum et al., 2020; Al-Hakimi, Al-Swidi, Gelaidan & Mohammed, 2022; Yousaf, 2021). Although the three studies for small and medium-sized enterprises (SMEs) have distinct characteristics from those of the companies in this study, the pattern of how green practices influence green innovation is viewed as relatively similar, particularly regarding the desired outcomes. Green practices enhance the company's capacity to implement changes with an environmentally conscious mindset and aim to reduce adverse effects on the environment.

The study model comprises three constructs representing the green dynamic capability dimensions: SenCap, SeiCap, and Reconf (Hypotheses 2, 3, and 4). The testing of this construct yields varying results. The path coefficient between SenCap and SeiCap demonstrates a positive and statistically significant relationship. These results confirm the second hypothesis that SenCap significantly influences SeiCap. Similarly, the path coefficient between SeiCap and Reconf shows that SeiCap significantly impacts reconfiguration ability, thereby supporting hypothesis 3.

Path coefficient study results indicate that the SenCap-Reconf path is insignificant or refute hypothesis 4. There is no direct correlation between the company's ability to sense and identify environmental problem-related opportunities (SenCap) and its capacity to reconfigure its resources (Reconf). This finding contradicts Fainshmidt and Frazier's (2017) explanation that sensing affects reconfiguration. The contradiction is understandable due to differences in the study's context. This research is conducted in a green context, whereas Fainshmidt and Frazier's (2017) is not. The rejection of hypothesis 4 indicates that the sensing-seizing-reconfiguring relationship is empirically valid in a green context and consistent with Teece (2007, 2018). Therefore, based on empirical evidence, the capability to reconfigure resources and competencies to implement environmental aspects in companies would be excellent when preceded by suitable SenCap and SeiCap.

Hypothesis 5 proposes a positive relationship between reconfiguring capability and GIP. The path coefficient test showed that hypothesis 5 was supported. These results align with the findings of Albort-Morant et al. (2016), which also highlight the direct influence of dynamic capabilities on GIP. However, this study differs from Albort-Morant et al. (2016) in describing dynamic capabilities. This study utilizes the term "green dynamic capabilities" and breaks down green dynamic capabilities into three related constructs (SenCap, SeiCap, and Reconf) in the study model.

The study's model separates absorptive capacity into PACap and RACap. The results of the structural model testing reveal a significant path coefficient between PACap and RACap (supporting hypothesis 7). This finding is consistent with the arguments by Albort-Morant et al. (2018), Pai and Chang (2013), and Zahra and George (2002). Even though all dimensions (acquisition, assimilation, transformation, and exploitation) are identical, most studies discussing absorptive capacity do not describe it as two distinct constructs in their research model. Consequently, the findings of this study complete this gap, especially when describing the relationship between absorptive capacity and green dynamic capability, GMP, and GIP.

Empirical evidence supports only two hypotheses (8 and 10) regarding the relationship between absorptive capacity and green dynamic capability. RACap facilitates transforming and utilizing external knowledge into new knowledge, including new environmental knowledge. Therefore, RACap is essential for companies to identify threats and opportunities to green issues. The stronger the RACap, the better the sensing capability because all external information and knowledge about environmental issues have been modified and available. The same argument regarding the relationship between RACap and Reconf. If the allocation basis is apparent, integrating and reconfiguring resources and competencies will be easier. RACap is its basis for enhancing reconfiguration capabilities.

However, path coefficient analysis shows that the RACap-GIP pathway is insignificant, meaning that RACap does not directly impact GIP, so hypothesis 12 is rejected. RACap cannot directly influence GIP but must act through mediation by other constructs. This finding is inconsistent with Albort-Morant et al. (2018), who confirmed that RACap directly and positively influences the performance of green processes and product innovations.

Furthermore, the study model was validated through in-depth interviews conducted with practitioners from three distinct companies: a petrochemical company, a food and beverage company, and a textile company. These interviews confirmed the variations in green dynamic capabilities among the three companies. The petrochemical company has superior green dynamic capabilities to the other two companies, encompassing all three capabilities, i.e., SenCap, SeiCap, and Reconf. A skilled workforce with adequate education and training supports this capital-intensive company. Accordingly, the company can possess resources to facilitate changes in its processes and products. In terms of innovation, this petrochemical company focused on process improvements, specifically targeting energy-saving initiatives and material reuse in the production process.

The food and beverage company emphasized dynamic capabilities to seize and reconfigure its capabilities effectively. As a food and beverage manufacturer, the company focused most of its green innovation efforts on green product development, specifically raw materials and packaging, to enhance its environmental friendliness. However, the company's emphasis on green product innovation was relatively limited due to a perceived lack of awareness regarding the demands of Indonesian consumers for food and beverage products. Regarding innovation, the company focused on process modifications to reduce water consumption and capture and reuse steam from the boiler.

The textile company firmly focused on SenCap and Reconf to drive their green dynamic capabilities. This company is labor-intensive, so the green innovation process within the company was primarily driven by the high commitment of its leadership, with a top-down approach being predominant. The company prioritized process innovation by investing in environmentally friendly production facilities and technologies. Notable green innovations included water reuse, material recycling, reduction of gas emissions, and energy consumption.

Most hypotheses in the study model are confirmed based on the findings across all three companies. The GIP of the three companies was not directly influenced by their capacity to absorb external knowledge. However, the absorption capacity of the company became impactful when combined with green dynamic capabilities or the implementation of GMP. These green practices allowed companies to learn through experience and subsequently influence GIP.

6. Conclusion

This study evaluated the relationship between absorptive capacity, green dynamic capabilities, GMP, and GIP. The findings show that green dynamic capabilities, especially SenCap, SeiCap, and Reconf, directly improve GIP. Absorptive capacity does not have a direct and positive effect on GIP. However, the company's adoption of GMP has a beneficial effect on GIP. GMP is a mediating variable in the relationship between absorptive capacity and GIP.

Of the three company cases described, petrochemical companies prioritize green innovation by utilizing their dynamic capability components. Food and beverage companies innovate by taking different paths between creating new products and processes or developing and perfecting them. Textile companies prioritize green manufacturing practices with a top-down approach, which can ultimately improve their green innovation performance. The three company cases could explain the research model, so the model was in line with empirical data for manufacturing companies in Indonesia.

This study has neglected to consider some crucial variables, namely company ownership (government or private), company size, technology characteristics, the government's role, and the influence of cultural factors. Therefore, future studies should incorporate these variables to enhance the analysis.

The objective of this study is to pinpoint the unique characteristics of Indonesia's manufacturing industry that are associated with green innovation. Although the results of this research show that the study model has a fairly high match with empirical data, the results of this study are not necessarily suitable for cases in other countries, especially for countries whose implementation of environmental aspects is much more advanced than Indonesia.

Declaration of Conflicting Interests

Concerning this study, authorship, and publication, the authors declared no potential conflicts of interest.

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