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A CONTEXTUAL MODEL FOR ASSESSING THE NEXUS BETWEEN GREEN INNOVATION PRACTICES AND ENTERPRISE PERFORMANCE

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Abstract. The pursuit of green innovation and sustainable practices is increasingly growing currently because of the alarming environmental concerns and the coexistence of economic expansions. But the strategies employed by companies in exploring green innovation activities have gained little or no attention in literature. This study proposes a conceptual model that outlines green innovation strategies, corporate performance, and the moderating effect of green dynamic capacity. Based on the perspective of the Resource Based viewpoint and the notion of dynamic capabilities, this study addresses a) what is the relationship between green innovation practices and enterprise performance? and b) to what extent do green dynamic capabilities moderate the connection between green innovation practices and enterprise performance? We used a cross-sectional data from SMEs in Ghanaian manufacturing firms, analysed utilizing the advanced PLS-SEM systematic procedures. Our findings revealed a significant relationship between green product innovation, green process innovation, and green service innovation on financial performance and that green dynamic capacity moderate these relationships. Our research contributes to expanding the knowledge of green innovative practices among SMEs in the manufacturing sector. These findings have both theoretical and practical implications, opening numerous options for further research.

Keywords: green product innovation, green process innovation, green service innovation, green dynamic capacity, small and medium-sized enterprises, enterprise performance.

JEL Classification: M53, L21, O33, L25, L86, O53.

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1. Introduction

Rapid technological growth has enhanced the lives of individuals in several ways, but it has also generated new obstacles to human progress, for instance, climate change, ecological degradation, and resource depletion (Fareed & Paata, 2022; Qiu et al., 2020). Current studies have established that several practices can improve ecological quality (renewable energy, natural resource rent, patent application, carbon taxes). Owing to this, green innovation, which incorporates ecological principles into the production process to mitigate environmental impact has emerged as a crucial strategy for organizations seeking to achieve a competitive edge (Zhan, 2023). Comparatively, green innovation doubles as a technology to reduce pollution and ecological damage while accelerating the rate of resource utilization, all guided by a new development philosophy (Qiu et al., 2020). Existing literature suggests that eco-friendly innovation, which incorporates ecological principles into the production process, can have a positive impact on a firm's performance (FINP) (Hao et al., 2021; Wang & Liu, 2022). The manufacturing sector in Ghana has seen an increase in the Small and Medium Enterprise (henceforth referred to as SMEs) through the IMF project recommendation of One-District One-Factory (1D1F) to boost the Ghanaian economy. According to the Ghana Statistical Service report 2022, SMEs in the manufacturing sector accounted for about ninety per cent of the economic progress and eighty per cent through employment. However, these enterprises are not regulated properly and as a result account for the most polluting practices and misused natural resources. This study is grounded on the development of green innovative practices for SMEs to reduce their environmental damage. A recent study by Afum et al. (2020) in Ghana identify that green manufacturing favourably impact the performance efficiency of SMEs. Likewise, Issau et al. (2021) examined the influence of innovation on Ghanaian SMEs. The outcome of the investigation established that manufacturing firms in Ghana are gradually integrating innovation practices into their operation.

Encouraging green innovation is critical to achieving sustainable social and economic progress, a better living for people, and the peaceful coexistence of humans and the environment (Hussain et al., 2022). In the context of green innovation, scholarly articles have emphasized the impact of environmental legislation, environmental supervision, and green development policies on company green innovation from perspective of the Natural Resource Based View (NRBV). From the resource base view theory, empirical studies have evaluated how environmental regulation, environmental supervision, and green development policies affect enterprise green innovation (Abdullah et al., 2016). It is worth mentioning that prominent researchers have approached the subject of green innovation from several angles with favourable outcomes (Ma et al., 2022). Also, the literature has identified that when consumers are becoming more healthy and ecologically deliberate, they require businesses to adopt methods that better suit their requirements (Qiu et al., 2020). But dedication from an organization's leadership is required for green innovation in the areas of agility and political capital (Chen et al., 2015), absorptive capacity Lin and Chen (2018), corporate environmental ethics (Begum et al., 2022), green organizational identity (Tu & Wu, 2021), and green management (Liboni et al., 2022). Moreover, adaptability capabilities are foundational to comprehending green innovation in SMEs (Teece, 2019). An organization's competence to respond quickly and successfully to the needs of its stakeholders in the external environment is represented as its dynamic capacity. The advancement of green innovation depends on a firms' capacity to rapidly react to significant breakthroughs in environmental management (Sharif et al., 2023; Sun et al., 2020) in acknowledgement of the growing body of knowledge regarding environmental sustainability and green innovation. According to Qiu et al. (2020) dynamic capable firms have the chance to implement creative and sustainable approaches for their clients, resulting in a rise in green innovation.

However, the relationship between green innovation and enterprise performance is complex, with various moderating factors influencing the potential outcomes. One of such factors that has garnered increasing attention is the role of green dynamic capabilities, which refers to the firm's ability to adapt and reconfigure its resource base to address changing environmental demands. Green practices and green dynamic capacities (GDC) are, thus, the most significant and persuasive characteristics that might provide solid foundations for green innovation. This current study which examined the significant relationships between green practices and GDC fills up these research gaps. The literature's conclusions indicate that GDC significantly affects financial performance (Ali et al., 2020; Ma et al., 2022). The research carried out by Hussain et al. (2022) validates the strong correlation between green innovation, company performance, and green dynamic capability. But green innovation approaches were not the focus of their study, howbeit, Begum et al. (2022) investigated middle and lower-level managers in high-tech Chinese firms. Employing data from 291 questionnaires, the findings demonstrated that product and process improvement is influenced by transformational management. The significant effect of GDC was considered in their research. Mazon et al. (2023) explored the nexus been green service innovation (GSER) and GDC among Brazilian companies. The findings of their study confirmed that GSER is directly influenced by GDC. Moreover, the factors influencing green innovation, dynamic capability and knowledge sharing through the perspective of natural resource-based view (NRBV) theory was investigated by Ma et al. (2022). The results of their study indicated that factors such as mimetic pressure had a supportive effect on the nexus involving GDC and green innovation. Furthermore, prior studies have evaluated the affiliation between green innovation and enterprise efficiency and sustainability (Xing et al., 2020), green innovation and environmental performance with the interaction effect of environmental strategy (Rehman et al., 2021), green innovation and environmental performance (Nsiah et al., 2022), green customer integration and green innovation (Chen & Liu, 2022), GSER, green product innovation (GP), and inward and outward capability (Lin & Chen, 2017), and intellectual capital and green innovation (Dwiputri et al., 2023).

The empirical research has established that GP, GPR, and GSER have received recognition in recent years. However, there is limited investigation into the underlying affiliation with FINP and its nexus with GDC. Previous studies have explored the affiliation between green innovation and firm performance, but the findings have been mixed, with some studies suggesting positive effects and others finding limited or even negative impacts. This study aims to address several key limitations in existing literature. Many studies have focused on the direct relationship between green innovation and performance, without considering the green innovation practices separately with manufacturing firms in an emerging economy. Likewise, drawing on the existing literature, we propose that GDC can serve as a crucial moderating factor, influencing the nexus between GP, GPR, GSER, and enterprise performance. There is little investigation in the developing communities, as such exploring the Ghanaian manufacturing sector SMEs with the country's new initiatives like the 1D1F will provide new policy suggestions for other emerging nations with similar cultures. The investigation employed the survey approach to provide a holistic understanding of the affiliations. The Ghanaian government's 1D1F initiative has garnered significant attention for its potential to drive green innovation and sustainable manufacturing practices among the country's manufacturing firms (Issau et al., 2021). There exist various kinds of green innovation in prior studies – product, process, and service innovation. However, these factors have been investigated separately. According to Scuotto et al. (2017) external networks, government subsidiaries, and entrepreneur capability are needed to develop innovation with SMEs. Again, the NRBV approach is employed to model the conceptual affiliation between service, product, process innovation and enterprise performance. The dynamic capability theory has been established in prior literature to have a connection with the innovation processes and enterprise performance. Therefore, our article utilizes the dynamic capability theory to moderate the influence of innovation practices on SMEs performance (Adomako & Nguyen, 2023; Begum et al., 2022; Tu & Wu, 2021; Xing et al., 2020). To examine these relationships, the study surveyed Ghanaian manufacturing SMEs to assess the extent of their adoption of green products, green processes, and green service innovation practices, and their corresponding financial performance. The findings provide valuable insights for managers of manufacturing firms in Ghana and other sub-Saharan African countries, highlighting the importance of investing in green innovation and establishing strong eco-oriented supply chain partnerships to achieve sustainable performance goals. The robust Smart PLS3 empirical model was utilized to test the direct and indirect affiliation between the variables to address the gaps through econometric evaluation.

The article subsections are presented as follows; literature reviews with theoretical and empirical hypotheses developed from a conceptual framework. Next is the method of data collection and analytical procedure. The next step covers the results and discussions and finally, ends with the conclusion, policy and further research.

2. Theoretical review and hypothesis development

2.1. Natural resource base view (NRBV)

Given the importance of resources, this theory of competitive advantage is predicated on how the business interacts with its surroundings (Hart, 1995). Additionally, the NRBV investigates the potential contributions of organisational resources to strategic and environmental advantages. Environmentalists and ecologists have suggested that by limiting the NRBV method, green innovation may boost corporate profitability and long-term success (Ma et al., 2022). However, it depends on having the necessary skills and organizational resources available (Abdullah et al., 2016). Enhancing and streamlining industrial processes will reduce costs and emissions (Brenner & Hartl, 2021). Moreover, an expertise in tactical proactivity increases first-mover benefits and practical environmental preservation (Anderson et al., 2023). With an enterprise investment in dynamic capability, such firms will be able to develop green innovation approaches to appreciate efficiency. An NRBV is a framework that supports the notion that a company with a better dynamic capability is more equipped to generate green and sustainable goods, processes, and services. In addition, the current study contends that dynamic capabilities, through the green process, green product, and green service, would reduce harmful environmental and social impact, hence enhancing the efficacy of SMEs.

According to Chen and Liu (2022), green innovation is the introduction of ecologically friendly goods and industrial procedures that lower pollution, recycle trash, and preserve energy. To mitigate their adverse effects on the environment, companies have recently started integrating environmental initiatives into the development of new products and processes. For instance, by reducing the negative environmental consequences, firms may obtain a competitive advantage through green innovation (Awan et al., 2023; Begum et al., 2022). Consequently, it may open the way for more eco-friendly manufacturing techniques and materials (Khan et al., 2022). Green innovation is defined as "any unique product, service, method, organizational structure, management, or economic approach that decreases environmental risk" (Ma et al., 2022). The moderating role of GDC on the affiliation between green innovation practices and enterprise performance is an important consideration that has not been adequately explored in the existing literature (Ali et al., 2020; Ma et al., 2022). The sphere of green innovation practices can directly impact the financial performance of manufacturing firms in Ghana through the implementation of green product, process, and service innovations. These innovations can lead to cost savings, improved efficiency, and enhanced market competitiveness, ultimately resulting in better financial outcomes for the firm (Issau et al., 2021; Khan et al., 2022). Based on the theoretical framework outlined above, we propose a conceptual model and develop a hypothesis to explore the relationship between green innovation practices and enterprise performance, with the moderating role of GDC.

The next section details the empirical literature related to the study and and the conceptual framework which is illustrated in the Figure 1.

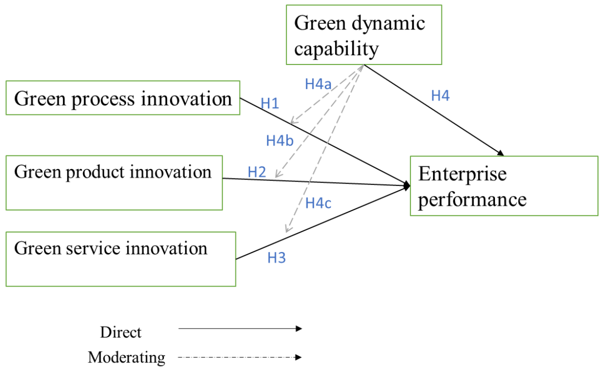

Figure 1. Framework development

2.2. Green process innovation and performance nexus

In recent years, environmental protection has become a generally recognized idea, and governments throughout the world are urging businesses to count environmental concerns as a vital aspect of corporate management (Ali et al., 2020). Poor resource management in the manufacturing and production sector is leading to catastrophic increases in pollution, greenhouse gas emissions, industrial chemicals, and resource depletion, all of which are having a devastating effect on biodiversity (Chang et al., 2021; Li et al., 2020).

Enterprises employ green processes to reduce cost and efficiency in operations. Development of green processes helps companies to reduce waste and make efficient use of the firm's resources which translate into performance. Nsiah et al. (2022) investigated the nexus been green process innovation and the performance of enterprises in the manufacturing sector. Data for the period 2011–2018 was gathered with a content analysis approach. The findings depicted that green process innovation had a satisfactory link with enterprise efficiency. Again, green process innovation serves as an approach to compliance with environmental regulation. Green process innovation put firms on a measure to avoid regulatory punishments as these companies developed into the future. For example, firms in the government 1D1F program are monitored to use renewable energies and not discharging waste into water bodies. Companies that can follow these requirements avoid legal panties, improve in reputation, and fines. Rehman et al. (2021) demonstrated that environmentally friendly initiatives boost a company's image, save expenses, and successfully address environmental challenges. Institutions are increasingly prioritizing ecosystem issues when making investment decisions. Implementing sustainable practices demonstrates a company's dedication to sustainability, hence enhancing the probability of receiving financial backing from investors and lenders. These investments come in the form of green credit, green loans, and green bonds which boost the financial working capital. On the role that green finance plays in innovation processes, Zheng et al. (2024) explored China A-Shares registered forms between 2010–2020. The findings from the empirical investigation illustrated that green finance serves as a significant component in firm's green innovation. In addition, enterprises can preserve their competitive advantage in a market where sustainability is highly esteemed by customers, investors, and business partners, using environmentally friendly practices. Businesses that have already adopted sustainable practices will be well-positioned to meet the increasing demand for environmentally conscious products and services. With regards to green innovation strategies and performance in South Africa, Wang and Liu (2022) empirical research on manufacturing companies implied that green process innovation had a direct connection with enterprise efficiency. In China, Wang et al. (2021) empirically experimented on the 642 enterprises. The findings show that green process innovation had a significant impact on economic performance. The article suggested that green process innovation can have a direct influence on environmental sustainability. Likewise, Xie et al. (2019) researched 209 registered companies in China employing content analysis in data collecting and analysis through a regression model. The inference from the analysis demonstrated that green process innovation had a direct substantive link to financial performance. Begum et al. (2022) assesses green process innovation in Beijing, Shanghai, and Shenzhen High-Tech enterprises. They identify that green process innovation had a promising connection with companies. Based on this discourse, we hypothesized that:

H1: GPR has a positive effect on enterprise performance.

2.3. Green product innovation and performance nexus

GP is an enterprise strategic means of reducing waste and cost to improve firms' efficiency. As described by Bocken et al. (2014), green products offer firms the opportunity to reduce environmental problems associated with products. Likewise, Weng et al. (2015) recommended that to promote the reputation of an enterprise, such institutions should consider the development of products to have a green component. For an enterprise to have a sustainable green product, such firm must develop a long-term strategic plan (Tu & Wu, 2021). Wang and Liu (2022) in their research on the strategies of green innovation of 337 firms in China denoted that GP had a positive impact on enterprise performance. Similarly, within the Chinese manufacturing sector, Qiu et al. (2020) empirical research on GP and GDC. According to the investigation, green dynamic capability and green product innovation are positively correlated. We proposed that green products influence enterprise performance. First, as the market expands, development of green products helps an enterprise to penetrate new markets. As sustainable consciousness appreciates globally, more opportunities for green products emerge. Enterprises that are ecologically smart with green products will lead the market and improve their financial efficiency. Second, green products are an improved compliance with environmental regulations. As institutions and governments initiate strict ecological laws and regulations, green products have become the means to avoid fines and penalties (Ha et al., 2024; Mustafa et al., 2024). Additionally, green products improve a company's brand reputation and consumers loyalty. Enterprises that invest in green products are favorable to consumers, employees, and investors. Lavuri et al. (2024) indicated in their literary work that green product purchase is influenced by green attitude. A strong brand image serves as a financial flow for firms that keep a green products image to its investors and customers. Empirical review of Lee (2023) used the hierarchical multiple models' approach to examine GP and GDC employing survey data from Chinese institutions. The findings illustrated that both internal and external integration had a favorable connection with the GP of the enterprises. Building on the dynamic capability base view of enterprises, Ahmad et al. (2022) through empirical observation examined the green product and green process through the lens of green transformational leadership. Employing data from SMEs in Pakistan, the findings demonstrated that dynamic capability had a direct affiliation with product and process innovation. In recent times, prior investigations have shown the significance of GP in enterprise performance (economically, financially, and environmentally) (Khan et al., 2022; Wang & Liu, 2022). Hence, we hypothesized that:

H2: Green product innovation has a positive effect on enterprise performance.

2.4. Green service innovation and performance nexus

With firms developing green products and processes to reduce their adverse impact on the environment to achieve a sustainable community, the aspect of green service innovation (GSER) is properly monitored. GSER is a technique for attracting consumers by enhancing the environmental protection of products and services, giving customers green involvement and assisting businesses in increasing their market share (Chen et al., 2015). GSER can be a particularly effective avenue for improving enterprise performance as it allows firms to differentiate themselves in the market and enhance their value proposition to customers. Innovative green services, such as providing energy-efficient maintenance, waste management, or recycling solutions, cannot only reduce the adverse consequences on the firm's environment, but also generate new revenue streams and improve customer satisfaction (Nuryakin & Maryati, 2020). Moreover, the adoption of GSER may also lead to operational efficiency gains, as the firm optimizes its service delivery processes to minimize resource consumption and waste. However, the realization of these performance benefits is contingent on the firm's ability to effectively integrate its green service innovation efforts with its broader sustainability and dynamic capability-building initiatives. Lin and Chen (2018) suggested that firms seeking to break into the international market must include green service innovation in their strategic decision to be unique to consumers. Additionally, green service leads to the establishment of novel business techniques that focus on ecological sustainable approach. This may include circular economy and service-based economy which offers companies a financial reward. Enterprises that are grounded in green service are not impacted or will easily adapt to changes from the consumers taste because of environmental regulation. Building on the assumption of the resource base view and dynamic capability theories, Kumar et al. (2023) investigated the service innovation in the healthcare sector with CRM capabilities. The results depicted a direct affiliation between service innovation of the AI CRM capability employing the analytical approach of PLS-SEM. In Japan, Tajeddini and Martin (2020) collected data on 201 industries in the service sector. The findings of their study revealed that service innovation is crucial to the completion of firms' performance. Additionally, using data from 337 Chinese institutions, the results of Wang and Liu (2022) study on green innovation strategies and its influence on performance indicated GSER had a direct connection with enterprise performance. Therefore, the study hypothesized that:

H3: GSER has a positive effect on enterprise performance.

2.5. Moderating of green dynamic capability

GDC refers to the firm's ability to effectively integrate, build, and reconfigure internal and external resources to address the rapid change in environmental demands and opportunities (Liboni et al., 2022). The growth of green innovation is largely reliant on enterprises' green dynamic skills, and their capacity to swiftly adapt to necessary changes in environmental management (Sun et al., 2020). Since it focuses corporate efforts on adopting environmentally friendly practices, environmental sustainability is a crucial aspect of business (Javeed et al., 2022). In reaction to this increased awareness of green innovation and environmental sustainability, it is necessary to strengthen GDC. For instance, a firm with strong GDC may be enhanced and equipped to effectively implement and influence green products, processes, and service innovations to improve its financial, operational, and environmental performance. According to Teece (2019), a company's capacity to recognize greening prospects as well as act rapidly on environmental safety issues is vital. GDC needs to be adjusted to reflect the growing understanding of GI and environmental sustainability. GDC provides innovations related to products or processes, such as improvements in energy-saving, waste-recycling, pollution-avoidance technology, green product design, and environmental management (Hussain et al., 2022). Green dynamic capabilities are considered a significant asset for an enterprise that wants to develop in a rapidly competitive market. Enterprises that want to develop green products, processes, and services employed green dynamic capabilities technique to conduct survey and market research to understand the demand of their customers (Huang et al., 2024). Green dynamic capabilities can be a first step to map and implement green products, green processes, and green service innovation by an enterprise. Additionally, enterprises that developed robust green dynamic capabilities have a strong approach to reorganize their resources to meet with environmental sustainability. Companies that are faced with market opportunities for green products and green processes can reconfigure their terms and conditions to current technologies of competition. Again, when it comes to finding and pursuing possibilities for green products, process, and service innovation, companies with strong green dynamic capability can make the most of their capital, talent, and intelligence. Mubeen et al. (2024) highlighted that green dynamic capability and green innovation are the turning point for green co-creation for manufacturing companies. A large amount of external technology, patents, and knowledge can be obtained by companies with strong capabilities for ecologically sustainable operations. Although there is always some degree of unpredictability when it comes to changes in technological circumstances, businesses can improve their capacity to take in green information to spur green innovation in the dynamic green technology sector (Alkaraan et al., 2024). In Pakistan, Yousaf (2021) investigated the dynamic capability and green innovation of SMEs in the eight big cities. The analysis of 457 data demonstrated that dynamic capability had a positive relationship on green innovation development by SMEs. Likewise, Ma et al. (2022) explored green innovation with the ramification of dynamic capabilities in Pakistani manufacturing enterprises with a data sample of 232 respondents. Through the SmartPLS SEM approach, the empirical results demonstrated that green dynamic capability had a favorable connection with green innovation. In the Chinese construction industry, Zhang et al. (2020) analyzed a data set of 202 managers with the structural equation approach. The findings from the business model developed illustrated that green production had direct and indirect associations with green dynamic capability. GP, GDC, and competitive advantage across Chinese manufacturing institutions were evaluated by Qiu et al. (2020). The result of their investigation demonstrated that GDC and competitive advantage were positively correlated with GP. As outlined in the research findings of Yuan and Cao (2022) green product and process innovation had a positive influence on GDC. Consequently, the following hypothesis is supported by the previous discourse:

H4: Green dynamic capability improves enterprise performance.

H4a: Green dynamic capability positively moderates the nexus between green product innovation and enterprise performance.

H4b: Green dynamic capability positively moderates the nexus between green process innovation and enterprise performance.

H4c: Green dynamic capability positively moderates the nexus between green service innovation and enterprise performance.

3. Methodology

Ghana is currently in a transitional phase regarding green innovation. Hence, it is an interesting setting to examine the contribution of green innovation towards firm performance. With an explanatory-predictive aim, this cross-sectional study of SME performance employs a quantitative methodology. The study evaluated the structural and measurement models (Hair et al., 2022) as well as the overall goodness of fit.

3.1. Data collection

To test the study model, a sample of manufacturing-related companies in the Greater Accra Region, Ghana, were surveyed. According to the Ghana Statistical Service (GSS), SME businesses in Ghana are "defined as an enterprise or business entity that hires less than 10 employees for small enterprise and any firm with more than 10 employees is classified as medium and large enterprise." Moreover, enterprises with fewer than 6 employees are classified as micro, and very small have employees less than 10, small enterprises consist of employees less than 30 and medium enterprises have less than 50 employees. In Ghana's economy, SMEs are quite important, representing about 90 per cent of all business enterprises in the nation. Furthermore, they contribute generally 60 per cent to the country's gross domestic product (GDP) in addition to making up 80 per cent of all employment in the nation (Aphu & Adator, 2018). Ghana's SMEs are broadly categorized into seven – agricultural, construction, manufacturing, retail, service, information and communication technology (ICT), and tourism. The manufacturing SMEs which is the focus of this study are small and medium-sized businesses that produce commodities like pharmaceuticals, textiles, food processing, and plastics.

The quantitative research approach was used for data collecting and analysis in this study. Considering the sample size, the utilised the inverse square root (Kock & Hadaya, 2018) and the statistical power analysis (G* power) with 0.95 statistical power and 0.03 effect size (Faul et al., 2009). With an expectation of a medium-sized effect of 0.15, and a 0.95 statistical power, 74 data points were required. Additionally, 618 data points were enough to achieve a statistical power of 0.80 and a minimal path coefficient of 0.10 to realise a significant effect of 0.05 (Kock & Hadaya, 2018) using the inverse square root and 386 sample size is appropriate for an unknown population. An average sample size of 360 was deemed fit for the data analysis. 275 usable responses, representing 76 per cent of the sample size seems appropriate for this study.

Due to its versatility as a data collection tool, the questionnaire method is ideal for quantitative studies requiring both closed and open-ended responses. To improve the validity of the data, a pretest was conducted in two stages; a) ten Ph.D. candidates with in-depth knowledge of the field were contacted to respond to the questionnaires. b) In the second round of the pretest, 10 additional senior managers with three years or more of experience were consulted for input. The survey, which used a Likert scale with responses ranging from "strongly disagree" to "strongly agree," was then sent to 485 manufacturers that were purposefully selected using Google forms. However, only 275 final responses were analyzed for statistical purposes.

3.2. Measurement

Every question on the questionnaire was modified from earlier research. With regards to GDC, the study focused on resource-seizing capability, environmental sensing capability, and resource reconfiguration capability as identified by Teece (2019). The indicators were adopted from Stanovcic et al. (2015) and Lin and Chen (2017). Similarly, emphasizing how the process improves the environment, the Frondel et al. (2007) and Klassen and Whybark (1999) indicators were employed in the study to measure GPR. On the other hand, this study relied upon the study of Song and Yu (2018), Amores-Salvadó et al. (2014), and Kam-Sing Wong (2012) to measure GP. Also, GSER focuses on how organizations can improve the image of their environment based on the services delivered and products produced. The indicators are adopted from Chen et al. (2015) and Chen and Tsou (2007). Lastly, FINP was assessed using indicators from Chen et al. (2015).

Table 1. Participants demographics

	Frequency = 275	Percentage = 100
Gender		
Male	183	66.6
Female	92	33.4
Age		
26–35	64	23.3
36–45	104	37.8
46–55	81	29.4
Above 55	26	9.5
Qualification		
HND Certificate	26	9.5
Bachelor's degree	147	53.5
Post-graduate degree	102	37.0
Working experience		
Less than 5 years	34	12.4
5–10	78	28.4
11–15	71	25.8
16–20	69	25.0
Above 20 years	23	8.4
Business size (no of employees)		
Less than 6	22	8
6–9	67	24.4
10–29	128	46.5
30–49	58	21.1
Role		
Chief Executive Office	12	4.4
Senior manager	67	23.3
Middle manager	90	32.7
Junior manager	106	38.6

The research questionnaire used to gather data on respondents' perceptions of each model construct and their demographic characteristics was divided into two sections. In the second section of the survey, respondents were asked to rate their agreement or disagreement, on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree), with statements on each of the research model's dimensions. Section A contained the respondents' demographic profile – age, gender, participants' education, participant experience, business size and role (see Table 1). Approximately 183 of the 275 respondents were male, whereas the remaining respondents were women. More than 50 per cent of the participants surveyed ranged between 36 and 55 years old. Ninety per cent of the participants had bachelor's degrees and had working experience of 10–20 years. Among the participants, more than 60 per cent were working in small and medium-sized enterprises and most of them are junior managers.

3.3. Data analysis

Partial Least Squares Structural Equation Modelling (PLS-SEM) was used for the statistical analysis because of its advantages over other statistical tools. For instance, when the goal of the research is theory construction and explanation of variance (prediction of the constructs), PLS-SEM is the recommended approach (Hair et al., 2017). Also, PLS-SEM nearly never makes any assumptions about the underlying data and performs well with complex models and small sample numbers. Furthermore, if the missing data is kept below a tolerable threshold, it is quite robust. Additionally, endogenous factors that account for the greatest variation are estimated and investigated using SEM (Roldán & Sanchez-Franco, 2012). PLS-SEM is a superior option because it does not require data to follow a normal distribution. Lastly, PLS-SEM was deemed more appropriate for developing a theoretical model and confirming the postulated causalities because the study's main objective was to evaluate the hypotheses.

The measurement model and the structural model are the two models that makeup PLS-SEM. According to Hair et al. (2017), to produce accurate results, the structural and measurement models should be assessed independently to obtain reliable outcomes. Therefore, the measurement model was examined first in this study. Both the reliability and validity – convergent and discriminant – tests were carried out. Next, the bootstrapping approach (5000 iterations) was used to calculate the structural model's path coefficients. A 95 per cent confidence interval was used to determine the study's significance level with regard to the significant paths. The fit indices were also obtained. All these analyses were carried out utilizing the SmartPLS software version 3.2.8 (Ringle et al., 2022).

4. Empirical results

4.1. Measurement model

Using the measurement model, it is now possible to evaluate the validity and dependability of the variables. In accordance with the plan, we assessed the data (Hair et al., 2020). The item loadings of each indication are used to quantify its reliability, whilst Cronbach's alpha and the indicator's composite reliability are utilized to estimate the dependability of its construction. Examining convergent validity using an average variance extract. Utilizing factor loading and the Fornell-Larcker principle, the discriminant validity was examined. Indicator loadings were greater than 0.700, as shown in Table 2 and Figure 2 of the measurement model's outcomes.

Table 2. Composite reliability, Cronbach's alpha, and average variance value

Constructs	CA	Rho-a	CR	AVE
FINP	0.852	0.864	0.902	0.700
GPR	0.872	0.874	0.907	0.662
GP	0.833	0.862	0.889	0.668
GSER	0.869	0.883	0.903	0.651
GDC	0.883	0.884	0.916	0.686

Note: GDC – Green dynamic capability; GP – Green product innovation; GPR – Green process innovation; GSER – Green service innovation; FINP – Financial performance; CA – Cronbach Alpha; CR – composite reliability; and AVE – average variance extract.

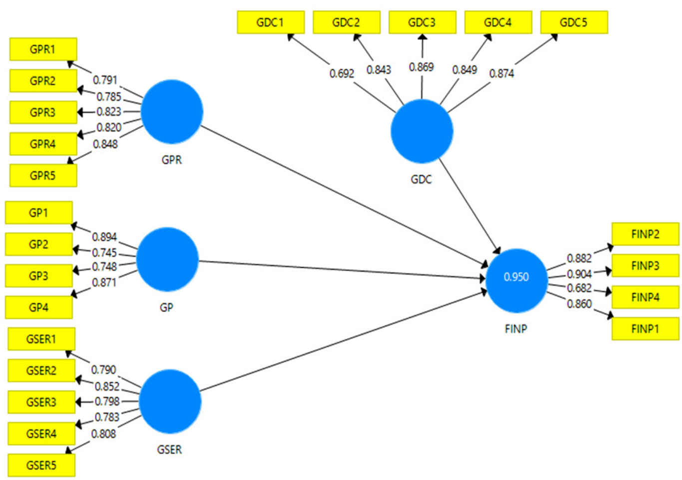

Figure 2. Measurement model

Reliability standards are satisfied when Cronbach Alpha (CA) and composite reliability (CR) values are higher than 0.708. All mean values for average variance extracted (AVE) were more than the cut off value of 0.5, demonstrating convergent validity at the level of constructions. The fact that the square root of the AVE for each construct is larger than the correlation between any duos of underlying constructs indicates that no latent construct shares more variance with another construct than with its own indicators, per the Fornell-Larcker principle (see Table 3). It was thus demonstrated that the notion was discriminately valid (Hair et al., 2020).

Table 3. Discriminant validity

	FINP	GDC	GP	GPR	GSER	F^2
FINP	0.836					
GDC	0.706	0.828				0.127
GP	0.654	0.421	0.817			0.284
GPR	0.783	0.557	0.563	0.814		0.536
GSER	0.641	0.312	0.600	0.755	0.807	0.185

Note: GDC – Green dynamic capability; GP – Green product innovation; GPR – Green process innovation; GSER – Green service innovation; FINP – Financial performance.

4.2. The model fitness

Model fitness is measured by comparing several fitness metrics. As illustrated in Table 4, the estimates were all within the threshold limits. Consequently, it was predicted that the SEM estimation would also be favourable after the measurement model was determined to be acceptable. Goodness-of-fit can be determined by comparing the R-squared and Adjusted R-squared values; the following are the values obtained for the variable enterprise performance. Both the raw and adjusted R-squared values come in at 0.94. The degree to which the independent construct in the model explains the variance in the dependent construct is shown by an R-squared value. Approximately 95% of the variation in financial performance can be explained by the independent construct in the model, according to an R-squared value of 0.95. This indicates that the included independent variables have strong explanatory power in predicting financial success (e.g., green service innovation, green dynamic capability, green product innovation, and green process innovation) as demonstrated in Table 5.

Table 4. Model fitness

	CMIN/DF	RMSEA	IFI	CFI	GFI
Threshold	≤ 3	≤ 0.08	≥ 0.90	≥ 0.90	≥0.80
Obtained value	1.675	0.052	0.960	0.912	0.845

Table 5. Assessment of R2 and Adjusted R2

	R^2	Adjusted R^2
Financial performance	0.95	0.947

4.3. Structural model

Green innovation indicators were found to have a direct correlation to financial performance, as shown in Table 6 and Figure 3 of the structural model outcomes. A connection between GPR and FINP is hypothesized in H1. GPR and FINP have a positive connection (beta = 0.655). Variation in the numbers was calculated to be 0.102 standard deviations. The statistical significance of the correlation between GPR and FINP, as indicated by the t-value of 6.425, suggests that it is most likely not a coincidence. Furthermore, the considerable evidence against the null hypothesis is shown by the p-value of 0.000. As a result, the association between GPR and FINP is statistically significant. In H2, we probe the connection between GP and FINP. Compared to H1, the beta value of 0.351 shows a lower positive association. With a standard deviation of 0.074, it appears that there is less variation than with H1.

Table 6. Testing hypotheses

Hypothesis	Path	Beta value	Std dev.	T value	P value	Decision
H1	GPR->FINP	0.655	0.102	6.425	0.000	Supported
H2	GP->FINP	0.351	0.074	4.743	0.000	Supported
H3	GSER->FINP	0.960	0.059	16.279	0.000	Supported
H4	GDC->FINP	0.382	0.113	3.380	0.000	Supported

Note: GDC – Green dynamic capability; GP – Green product innovation; GPR – Green process innovation; GSER – Green service innovation; FINP – Financial performance.

The t-value of 4.743 indicates that the correlation between GP and FINP is not randomly occurring. The p-value of 0.000 offers proof against the null hypothesis. We consequently conclude that the link between GP and FINP is significant, albeit weaker than the association in H1.

The hypothesis H3 focuses on the relationship between GSER and FINP. The beta value of 0.960 indicates a strong positive association. The standard deviation of 0.059 suggests low variability in the data. With a high t-value of 16.279, which is highly significant, GSER and FINP have a strong association. The conclusion that there is a significant and strong connection between GSER and FINP is supported by the p-value of 0.000, which shows strong evidence against the null hypothesis. Hypothesis H4 examines the relationship between GDC and FINP. The beta value of 0.382 indicates a positive association, but it is the weakest among all the hypotheses presented. The standard deviation of 0.113 suggests moderate variability. The t-value of 3.380 is significant, indicating that the relationship between GDC and FINP is unlikely to be due to chance. The p-value of 0.000 provides evidence that there is a substantial affiliation between GDC and FINP, although it is weaker compared to the other hypotheses. Based on the analysis of the beta values, standard deviations, and t-values. It can be concluded that there are considerable links connecting each of the independent variables (GPR, GP, GSER, GDC) and the dependent variable (FINP). GSER exhibits the strongest association, with GPR, GP, and GDC following in decreasing order of strength.

4.4. Moderating analysis

When a third variable, the intermediary variable, affects the strength of the link between the two constructs, it implies that the nexus is moderated (Anjum et al., 2020). The approach of an intervening variable determines the strength/direction of the interaction between the two variables. This article incorporated a moderating variable of green dynamic capability in the research model. Thus, we explored the moderating role of green dynamic capability on the affiliation between green product innovation, green process innovation and GSER. A positive correlation between the interaction of GDC and GPR (GDC * GPR) and FINP is proposed by the beta value of 0.240. This means that when both GDC and GPR increase, FINP is likely to increase as well. The t-value of 6.014 illustrated that the affiliation is statistically significant, and the p-value of 0.000 further supports this, indicating a very minimal likelihood of achieving these outcomes by chance. Therefore, we can assume that the interaction between GDC and GPR has a favourable impact on FINP.

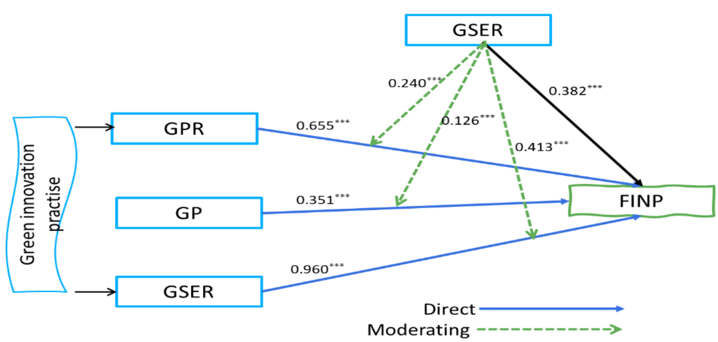

Figure 3. Bootstrapping output

With a beta value of 0.126, the interaction between GDC * GP still shows a positive relationship with FINP (H4b), but the effect size is smaller compared to H4a. The t-value of 2.146 illustrated that the relationship is favourably significant, although the p-value of 0.032 is relatively close to the significance level. Therefore, while the relationship is significant, it may be weaker than in H4a. This implies that the joint influence of GDC and GP has a smaller impact on FINP compared to the interaction of GDC and GPR. The beta value of 0.413 illustrated a strong positive affiliation between the interaction of H4c: GDC * GSER -> FINP. This suggests that when both GDC and GSER increase, there is a substantial increase in FINP. The t-value of 7.246 and the very low p-value of 0.000 provide strong evidence of the significance of this relationship. Therefore, we can conclude that the interaction between GDC and GSER has a significant impact on FINP (see Table 7 and Figure 3).

Table 7. Moderating hypothesis testing

Hypothesis	Path	Beta	Std dev.	T-value	P-value	Result
H4a	GDC*GPR->FINP	0.240	0.040	6.014	0.000	Supported
H4b	GDC*GP->FINP	0.126	0.059	2.146	0.032	Supported
H4c	GDC*GSER->FINP	0.413	0.057	7.246	0.000	Supported

Note: GDC – Green dynamic capability; GP – Green product innovation; GPR – Green process innovation; GSER – Green service innovation; FINP – Financial performance.

Overall, the analysis suggests that all three interaction effects (GDC * GPR, GDC * GP, and GDC * GSER) have significant relationship with FINP. However, the strength of the relationships varies. The strongest relationship is observed in H4c (GDC * GSER), followed by H4a (GDC * GPR), and then H4b (GDC * GP). These findings indicate that the joint influence of GDC with GSER has the greatest impact on FINP, while the joint influence of GDC with GPR has a moderately strong effect. The joint influence of GDC with GP has a relatively weaker effect on FINP compared to the other two interactions.

5. Discussions for theory and practice

The management and efficient use of an enterprise resource is grounded in the natural resource base view theory. Bushe (2019) reports that between seventy per cent of SMEs fail during the first five to seven years of operation. SMEs have a poor survival rate because their lack of innovation limits their ability to compete and develop. Kijkasiwat and Phuensane (2020) argue that in times of economic downturn, innovation is particularly important for SMEs.

Extant research indicates a positive relationship between green innovation methods (product, process, and service) and financial performance. However, few or no empirical study has investigated these relationships within the framework of a holistic model. By assessing the implications of the moderating role of green dynamic capacity on green innovation strategies for the first time, this study had a significant influence on the literature. Taking into consideration H1, this research shows that implementing environmentally friendly process innovations may boost profits for businesses. Green process innovation has been greatly acclaimed in the past for its potential to mitigate ecological impacts during manufacturing, and enhance the durability of goods (Wang et al., 2021). This research goes beyond and expands upon what has already been discovered. Given the beneficial impacts of green process innovation on enterprise performance, it is recommended that businesses implement eco-friendly practices such as eliminating the use of toxic chemicals during the manufacturing process. Also, improving the quality of water used in production, and installing pollution controls to ensure that wastewater and waste products are recycled for reuse are significant. The efficiency and productivity of businesses can greatly increase because of these green process innovations. From H2, introducing new eco-friendly products puts the firm's image high for stakeholders. Previous research has shown that green product innovation may aid businesses in being more competitive in their respective markets (Nsiah et al., 2022). The present research builds on previous study in this area. Companies should avoid utilizing substances that degrade the environment in product design given the favourable influence green product innovation has on firm performance. Product packaging that is less harmful to the environment must be designed. Moreover, this research shows that eco-friendly service innovations may have a material impact on profitability (H3). This finding corresponds with those of prior studies. Previous research has shown that competitors may encounter a hard time replicating and benefiting from green service innovations (Lin & Chen, 2017). As a bonus, it may be used to aid businesses in their pursuit of sustainable development (Chen et al., 2015). The outcomes of this research emphasize the magnitude of eco-friendly concerns for businesses. To improve their bottom lines while also helping the environment, businesses can rethink their product lines, provide clients with eco-friendly protection services, and encourage the use of environmentally friendly sales techniques and follow-up care. Ultimately, the findings showed a significant correlation between enterprise performance and green dynamic capability. The growth of green innovation depends on an enterprise's capacity for green dynamic capability, or its capacity to quickly adapt to modifications in environmental management (Sun et al., 2020). The results of this investigation support the literary works of Yousaf (2021) examined the eight major cities' SMEs' innovative capacity as well as green technology. Based on the findings from the study of 457 data sets, it was shown that dynamic capacity had a constructive nexus in conjunction with the growth of green innovation by SMEs. In hypotheses 4a, 4b, and 4c, green dynamic capability moderating effects were found to have a positive and significant impact on the interplay between green process innovation, green product innovation, and green service innovation to enterprise performance. Yuan and Cao (2022) investigated green dynamic capability influence on green product and process innovation. The findings demonstrated a positive affiliation between the variables. Previous studies that provide similar findings to the article were conducted by Qiu et al. (2020) evaluated China's industrial institutions for their innovative green products, green dynamic capabilities, and competitive advantages. Their research found that innovative green products had a favourable affiliation with green dynamic capability and competitive advantage. To address the public's rising consciousness of environmentally friendly concerns and the need for green innovation, green dynamic capability must be strengthened. The use of energy and fuel may be a source of green innovation for companies that have the necessary expertise in green dynamics.

6. Conclusions

The research explored the affiliation between green innovation practices and the performance of SMEs in the emerging region, focusing on the context of Ghana manufacturing firms. The research addresses the existing research gap by developing and testing a comprehensive model that examines the variables of green product innovation, green process innovation, green service innovation and firms' performance. Empirical literary assessment has emphasis the need to integrate green dynamic capability into a firm's green transition strategies.

Therefore, we moderated the effect of green dynamic capability on the variables examined. As the research was cross-sectional, the quantitative research approach was employed for data collecting and analysis in this study. Quantitative analysis gives a larger perspective, the handling of large samples, increased generalizability of results, and reliable outcomes. A final 275 data set was considered fit after data cleaning and editing. When an investigation of a construct requires predictive and theory explanation, the use of Structural equation seems fit. As a result, the PLS-SEM was employed to examine the affiliation between the variables. The effects of the experimental evaluation demonstrated that green innovation strategies (product, process, and service) had a significant positive nexus with the financial performance of the enterprises. Similarly, green dynamic capability demonstrated a favourable nexus with financial performance. On the part of the moderating effect of green dynamic capability, the results illustrated a material influence of green dynamic capability on green process innovation, green product innovation, green service innovation, and enterprise performance.

This study contributes to the literature on green innovation and enterprise performance in several important ways. First, we developed and empirically tested a comprehensive model that examines the direct and indirect relationships between green innovation practices, green dynamic capability, and enterprise performance. By incorporating the moderating role of green dynamic capability, the investigation provides a more nuanced understanding of the conditions under which green innovation can lead to improved enterprise performance of firms. Second, the study extends the natural resource-based view and the dynamic capabilities perspective by examining how firms can employ their green innovation and dynamic capabilities to achieve competitive advantage and superior performance in the context of environmental sustainability. From a practical standpoint, this study offers valuable insights for managers and business leaders seeking to harness the potential of green innovation to enhance their enterprise performance. The findings highlight the importance of developing and nurturing green dynamic capability, which can enable firms to effectively implement and leverage their green innovation efforts to achieve desired financial, operational, and environmental efficiency. Moreover, the inspection underscores the need for a holistic approach to sustainable business practices, where green innovation is integrated with broader strategic initiatives and organizational capabilities. By aligning their green innovation initiatives with the development of green dynamic capabilities, firms can enhance their ability to adapt to evolving environmental demands, address stakeholder concerns, and capitalize on emerging green business opportunities. The results have ramifications for policymakers in emerging nations such as those in Sub-Saharan Africa. As the findings show, the launch of new goods will increase business efficiency, thus policymakers should foster an atmosphere encouraging advances in processes. SMEs in developing nations are seen as the engines that would accelerate the economies toward productivity, employment, GDP, and the eradication of social problems like poverty and inequality. Smaller enterprises with slower sales growth should get greater assistance due to the high expense of research and development.

7. Limitation and further investigation

Like prior studies, this investigation includes significant weaknesses that should be considered when doing similar research in the future. For instance, end consumers are likely uninformed of how SMEs incorporate green technologies. In addition, it was impossible to ascertain whether clients used the products of SMEs and whether their environmental consciousness was related to these products. Future studies should involve two tests in a single investigation, one from employees and the other from consumers. Since this research was conducted using just data from SMEs, it cannot be extrapolated to bigger businesses or the service industries. Many issues may be clarified if researchers compare small and big businesses. Second, a longitudinal study design may have been more appropriate for establishing a causal relationship, however, the data were obtained in a cross-sectional fashion instead. Since the adoption of green innovation methods is crucial for businesses, it may be possible to isolate its benefits by controlling intermediary factors such as stakeholder pressure, CSR, green expertise, and government legislation. The ability to gather massive amounts of data for study in future studies bodes well for producing reliable findings. Green innovation strategy, GDC, and business success may vary significantly between developing and industrialized nations. Further research is required to explore different emerging regions with different cultural, and technological intensity, environmental regulations, and pressure from stakeholders. Finally, the investigation concentration on the moderating role of GDC, however, contextual factors, such as organizational culture, leadership, and regulatory environments, could also influence the affiliation between green innovation and enterprise performance. Incorporating these additional moderating variables in future research could provide a more comprehensive understanding of the complex interplay between green innovation, contextual factors, and firm performance.

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The authors declare that they have no conflict of interest.

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