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Green Transformational Leadership, Green Creativity, and Green Product Development Performance Moderated by Green Dynamic Capabilities

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ABSTRACT

This research paper investigates how the relationship between Green Transformation Leadership (GTL), Green Creativity (GC), and Green Product Development (GPD) performance is moderated by Green Dynamic Capabilities (GDC). The research used a quantitative methodology and questionnaires to gather data, and it was based on the natural resource-based view of the firm. This study sampled 166 private manufacturing companies in Ghana. Structural Equation Modeling was used to analyse the data with the aid of Amos and SPSS software. The empirical findings from the study shows that the performance of green product creation and GTL are mediated by GDC. The study also showed that GTL affects the efficiency of GPD through green innovation. Additionally, it was found that GDC, via GC, regulates the association between GTL and green product creation. The study's results advance our understanding of how GDC mediate the link between GTL and GPD in firms.

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1.   Introduction

The need to safeguard the natural environment cannot be overstated; many scholars (Ramadhan, Sukma, & Indriyani, 2019) show that not only plant and animal life but also human lives, will be jeopardized if the ecosystem is not protected. The natural environment, according to Buonocore, Appolloni, Russo, and Franzese (2020) is what homes and helps the ecosystem grow and prosper; consequently, there are significant dangers if adequate measures aren't taken to protect it. Due to the serious consequences of pollution and climate change, environmentalists have gained popularity as a result of this concept, and more companies are keen to produce green products proactively.

Similarly, consumer environmentalism has also gained popularity because consumers are starting to have an interest in environmentalism and their role as consumers (Rehbein et al., 2020). According to Ouyang, Wei, and Chi (2019), businesses all over the world are turning to environmental management and eco-friendly practices to improve their green reputations, goodwill, and competitive advantage. Consumers, on the other side, have become more concerned about the environment, resulting in the prevalence of green products (Bakos, Siu, Orengo, & Kasiri, 2020). It suggests that businesses are implementing numerous techniques to draw in as many customers as possible and that green innovation is emerging as a potent weapon in the marketplace. According to Ashraf, Saleem, Chohan, Aslam, and Raza (2020), many multinational companies have committed

resources to undertake green innovation to a higher level and as a differentiation strategy to satisfy the market's environmental needs.

Companies require the right leadership approach to make their green objectives a reality (Singh, Del Giudice, Chierici, & Graziano, 2020). Leadership is regarded as a key factor for most organizations' success and competitive advantages (Pham, Pham, Truong Quang, & Dang, 2023). Among the various leadership styles, Çop, Olorunsola, and Alola (2021) argued that Green Transformation Leadership (GTL) has become a useful tool for providing an inspirational vision and motivation for followers to accomplish organizational objectives and goals proactively. Zhang, Sun, and Xu (2020) posit that creative ideas are generated by transformational leaders within their organizations, and their activities can foster creativity. As a result, transformational leadership becomes vital for the creation of creative ideas and products. A transformational leadership can bring about a much-needed green turnaround and a significant practical contribution. As customers are becoming environmentally conscious, the industry can translate the green practices and motivate their dependents by exhibiting the environmentally conscious behaviour and exhibit the same in their actions at work (Srivastava, Pathak, Soni, & Dixit, 2024).

However, for a more environmentally oriented leadership, GTL significantly influences behavioural change in a leader and among followers (Bahzar, 2019). A GTL is described by Peng, Yin, Hou, Zou, and Nie (2020) as someone who exhibits behaviours that motivate and inspire their followers to accomplish environmental goals and go beyond expected levels of ecological performance. Since the effects of industrial activities on the environment have become a global problem, these qualities are essential. Businesses need these leadership talents for innovation, product creation, and general performance (Ahmeda, Mozammelb, & Zamanc, 2010).

Companies are increasingly focusing on GC and GPD and production as green products and green management become more accepted and profitable (Ayandibu, 2019). As a result, fresh concepts for eco-friendly goods, procedures, or activities are regarded as valuable, creative, and innovative. According to Singh et al. (2020), combining a green management mentality with GPD activities is crucial if organizations want to design and produce green products successfully. These traits are crucial since the detrimental impacts of industrial operations on the environment have become a global issue; thus, firms demand such leadership skills for creativity, product development and general performance (Ahmeda et al., 2010).

Green products will become increasingly popular as companies and scholars alike recognize the advantages of green leadership and Green Creativity (GC) (Al-Ghazali & Afsar, 2021). Previous research has addressed the need to study the relationship between GTL and product development performance in the context of environmental sustainability, although major gaps exist regarding the influence of proactive and reactive green innovations on sustainable product creation performance (Guo, Choi, & Shen, 2020). This is in line with Zhang, Sun, et al. (2020) assertion that there is a growing literature on the subject matter, however, significant gaps exist in terms of how Green Creativity (GC) mediate the relationship between Green Transformation Leadership (GTL) and Green Product Development (GPD).

Other researchers (Alabdali, Yaqub, Agarwal, Alofaysan, & Mohapatra, 2024; Awan, Sroufe, & Kraslawski, 2019; Dost, Pahi, Magsi, & Umrani, 2019) argued that causality between GTL and GPD had focused too much on capabilities with less consideration on how to change these capabilities as part of the transformation processes. For these reasons, experts on the environment and green innovation have argued that researchers and companies consider the role of dynamic capability. The concept of dynamic capability provides a theoretical framework to examine innovation management practices at the organizational level (Lou, Lai, Ma, & Fan, 2020). Companies can use such a framework to combine and rearrange resources to adapt to environmental challenges (Jin, Peng, & Song, 2019). GTL can use the dynamic capability to establish procedures within the organization to integrate and reconfigure resources, allowing firms to retain better performance over time (Hong & Guo, 2019). To bridge the literature gap on the link between GTL, GC and GPD processes, this study sought to examine the moderating role of GDC.

2.   Materials and Methods

The research outlined follows a quantitative approach within the positivist paradigm, aiming to identify causal relationships within Ghana's manufacturing sector, particularly in Greater Accra. The study employs an explanatory design, utilizing survey methods to collect data from a subset of the population consisting of members of the Association of Ghana Industries. The sample size is determined using Krejcie and Morgan's formula, resulting in a sample of 169 out of 300 potential firms. It's fascinating to see how these established and emerging manufacturing businesses improve their GTL, GC, and GPD, through GDC. To ensure representation across economic sectors, a stratified sampling technique was used. Data collection will primarily involve semi-structured questionnaires administered to management personnel of the selected manufacturing companies. Following data collection, SPSS version 24 was utilized for data processing and analysis. This includes generating descriptive statistics, factor analysis, and assessing reliability and validity through measures such as Cronbach's alpha and Fornell and Larcker's Average Variance Extracted (AVE). Ethical considerations are paramount throughout the research, with emphasis placed on voluntary participation, privacy, anonymity, and confidentiality of respondents' information, as outlined by Patten (2016). These ethical principles are woven into the study's design and implementation to ensure the rights and privacy of participants are upheld.

3.   Results
3.1   Descriptive Statistics of Respondents

The majority of the responses were received from males comprising 45% of the responses, while females comprised 45% of the respondents engaged. In addition, the majority of the respondents held first-degree qualifications (51%), followed by pre-tertiary qualifications (27%), post-graduate qualifications (12%), and professional qualifications (10%). In terms of years of working experience, 24% of the respondents have worked in the industry for below 5 years, 58% of the respondents have worked in the industry between 5 to 10 years, and 18% of the respondents have worked in the industry for more than 10 years. 75% of the respondents were either leaders or members of the GPD Team, while 25% of them were not leaders nor members.

3.2   Effect of Green Transformational Leadership on Green Product Development Performance

We used a linear regression model called the Ordinary Least Squares (OLS) to examine the effect of GTL on the performance of GPD. The main goal of our study was to determine whether the null hypothesis—that GTL favourably influences the performance of GPD —is true. The dependent variable in this study was the performance of GPD, with GTL acting as the predictor.

Null hypothesis: There is no significant influence of GTL on GPD Performance.
Alternative hypothesis: GTL does have a significant impact on GPD Performance.

Table 1
OLS Linear Regression Output

Model	R	R Square	Adjusted R Square	Standard error	Slope	Intercept	F	P-value
1	.882	.779	.602	.375	1.203	2.128	121.726	.000

a. Predictors: (Constant), Green Transformational Leadership
b. Dependent variable: Green Product Development Performance

The model summary showed an R square value of .779 and an adjusted R square value of .602. In percentage terms, the R square value and adjusted R square values are 77.9% and 60.2%. By implication, changes in GTL explain 60.2% of the variance in GPD Performance. Since Adjusted R Square is greater than 50%, the model is well-fitted. The intercept value is 2.128.

Indicating the baseline level of GPD performance, the computed intercept for the model is 2.128. Furthermore, the GTL coefficient is 1.203, indicating that a one-unit

increase in GTL corresponds to a 1.203-unit increase in GPD Performance. As a result, the projected regression model is written as GPD Performance = 2.128 + 1.203 * GTL. The model's p-value, which is less than the specified significance level of 0.05, is 0.000. This demonstrates that there is a statistically significant interaction between GTL and the performance of GPD. We therefore reject the null hypothesis that GTL has no impact on GPD performance and come to the opposite conclusion that GTL positively affects GPD performance.

3.3. Green Dynamic Capabilities as a Moderator between Green Transformational Leadership and Green Product Development Performance

We used the Andrew F. Haynes process macro version 3.5 in SPSS version 26 to investigate how the influence of GDC affects the relationship between GTL and performance in GPD. GTL served as the independent variable in our study, and GPD Performance served as the dependent variable. Our research's main objective was to investigate the moderating effect of green dynamic capabilities. According to the null hypothesis, there is no moderating influence of GDC on the correlation between GTL and performance in GPD. The alternative theory, on the other hand, contends that GDC does modify the aforementioned link.

Table 2
Green Dynamic Capabilities Moderation Analysis Output

Model	Coeff	Se	t	p
Constant	1.405	.044	4.384	.004
Green Product Development Performance	.626	.220	2.722	.031
Green Dynamic Capabilities	.080	.173	3.444	.012
Int_Green Dynamic Capabilities	.009	.012	5.107	.003

The results on the influence of GDC on the relationship between GTL and GPD performance are illustrated in the table provided. With a coefficient of 0.009, a standard error of 0.012, and a p-value that is less than the specified significance level of 0.05, the results show that the interaction term (Int Green Dynamic Capabilities) is statistically significant. Therefore, the null hypothesis is rejected, and we may conclude that GDC does indeed influence the association between GTL and GPD Performance.

3.4. Green Creativity as a Mediator Between Green Transformation Leadership on Green Product Development Performance

The researcher evaluated GC in this part as a mediator between GTL and the effectiveness of GPD. This section evaluated whether GC explains the association between GTL and Performance in GPD. For this session, the research methods from Zhao, Yang, and Zhou (2010) and Hair Jr, Matthews, Matthews, and Sarstedt (2017) were used. The OLS regression model was first used to assess the relationship between GTL and GC.

The null hypothesis: GTL does not impact GC.
The alternate hypothesis: GTL impacts GC.

Table 3
Effect of Green Transformational Leadership on Green Creativity

Model	Coeff	Se	t	p
Constant	2.431	.024	4.364	.002
Green Transformational Leadership	.416	.210	2.762	.034

From Table 3, it is observed that the coefficient of GTL is .416 with a p-value of .034 which is less than .05. This suggests that we reject the null hypothesis. Therefore, we conclude that there is an effect of GTL on GC. Next, using the OLS regression model, the impact of GC on the performance of GPD was evaluated, following the methods of Hair Jr et al. (2017) and Zhao et al. (2010).

The performance of GPD is unaffected by GC.
The alternative idea is that GC affects the effectiveness of GPD.

From Table 4, it is observed that the coefficient of GC is .512 with a p-value of .028 which is less than .05. This suggests that we reject the null hypothesis. Therefore, we conclude that there is an effect of GC on GPD Performance.

Table 4
Effect of Green Creativity on Green Product Development Performance

Model	Coeff	se	t	P
Constant	1.631	.810	.384	.439
Green Creativity	.512	.373	3.212	.028

It is clear from the results shown in Table 4.10 that GTL significantly affects GC. Additionally, Table 4.11 shows that GC has a sizable impact on the performance of GPD. A strong impact of GTL on the development of green products is also seen in Table 4.8. As a result, it can be said that GC partially mediates the relationship between GTL and Performance in GPD, according to Hair Jr et al. (2017). Additionally, as seen in Figure 1 below, the multivariate regression model produces the findings shown below.
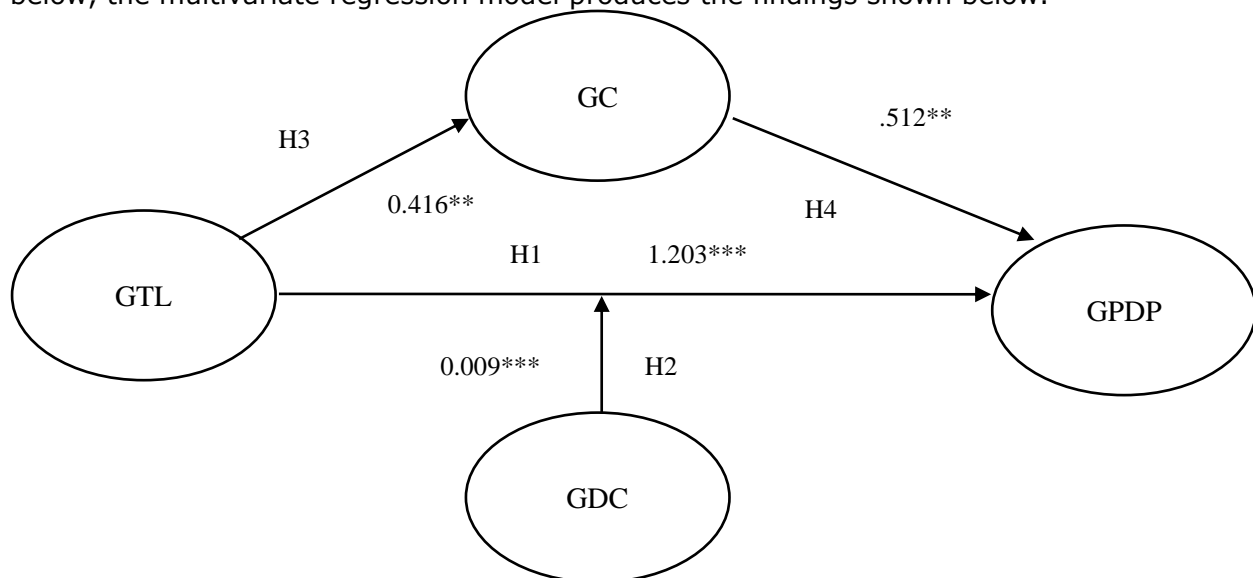

Figure 1: Multivariate Regression Model Output
Source: Author's Fieldwork, 2022

4. Discussion

In this section, the empirical results are discussed in the light of extant literature. Given the results of the study, it is observed that the full four-factor model for the study depicts an acceptable fit as depicted by the various fit measures mentioned earlier. The constructs in our study also display good discriminant validity, as shown by their favourable Average Variance Extracted scores, and strong construct validity and their Discriminant Validity scores. Furthermore, high Cronbach's alpha values were reached for each construct. These results suggest that all four constructs are sufficiently trustworthy, identifiable from one another, and internally consistent to be used in this investigation.

Our study's main objective is to assess how GTL affects the effectiveness of GPD. This objective was met by running the multivariate regression model. The empirical results demonstrated that there is a positive effect of GTL on GPD Performance. In other words, there exists a direct relationship between GTL and GPD Performance. Ghanaian SMEs' manufacturing industry product development leaders who engage in transformational leadership are more likely to improve their GPD Performance. This means that Ghanaian manufacturing industry leaders should motivate, inspire and encourage their project members to develop green products that attain environmental goals that are beyond current anticipations from stakeholders concerned about environmental wellbeing. According to Zhang, Xu, and Wang (2020), transformational leaders are characterized by their desire and attempt to push and empower employees to attain super-standard environmental goals. Similar to the current study, Chen and Chang (2013) realized that GTL positively impacted GPD Performance among Taiwanese electronics manufacturers.

The second goal of the study is to assess how GDC impact the relationship between GTL and GPD Performance. We accomplished this goal by using a multivariate regression model. The empirical results show that GDC has a positive moderating effect on the link between GTL and GPD Performance. In other words, GDC boosted GTL 's effects on the effectiveness of GPD. When SMEs in Ghana's manufacturing sector believe their products will give them a dynamic competitive advantage within their industry, they are more likely to design superior products that adhere to environmental protection regulations.

The third objective of the study is to assess the impact of GTL on GPD Performance through GC. The empirical results revealed that there exists a complementary (partial) mediation of GC on the relationship between GTL and GPD Performance, according to Hair Jr et al. (2017). This result demonstrated that manufacturing industry leaders of SMEs in Ghana who pursue transformational leadership in developing environmentally sustainable products need to institute a dynamic working atmosphere where creativity and ingenuity are appreciated and rewarded. Zhang, Sun, et al. (2020) agree that creativity in a transformational leadership setting improves the performance of companies in developing green products.

5.   Conclusions

The findings of the study indicated that there is a direct connection between GTL and the performance of GPD. Thus, product development leaders in Ghanaian SME industries that participate in transformational leadership have a greater chance of improving their GPD performance. Also, manufacturing industry leaders of SMEs in Ghana who actively adopt transformational leadership in the development of environmentally sustainable products must institute a dynamic working environment where creativity and innovation are valued and rewarded. The research also indicated that the use of GC within the context of transformational leadership enhances the quality of environmentally friendly products which the manufacturing industry generates. This implies that leaders in Ghanaian businesses should motivate, inspire, and urge their employees to produce environmentally friendly goods that achieve environmental goals that go above the present expectations of stakeholders concerned about the health of the environment. The research also reveals that transformational leaders are characterized by their desire and endeavour to push and empower staff to accomplish super-standard environmental goals. This is one of the characteristics that distinguishes transformational leaders from other types of leaders. In the same spirit, this research found that GDC boosted the influence that Green Transformational Leadership had on the performance of GPD. Product development leaders of SMEs in the Ghanaian manufacturing industry are more likely to develop better products in terms of adherence to environmental protection standards when they believe the products offer them dynamic competitive advantages within their industry. This is because SMEs in Ghana are more likely to be environmentally conscious than larger companies. The current study adopts an innovative strategy by introducing a conceptual framework that takes into account the mediating role of GC and the moderating effect of green dynamic capability in the relationship between GTL and GPD performance. This study stands out for being innovative in how it included these elements and how they interacted with the idea of sustainable practices.

5.1.   Recommendations

In this section, some recommendations are passed based on the conclusions of the study. First, future research may focus on testing the conceptual framework developed in another industry besides the manufacturing industry in Ghana. For instance, future studies may focus on service industries which emit greenhouse gases during their service delivery. Such studies are relevant because extant literature and the current study focus wholly on product-based companies. However, service companies also contribute to environmental pollution and should be investigated for their GPD processes and performance.

Next, future studies may also consider investigating GTL, GDC, GC and GPD performance using longitudinal data. The longitudinal data would help researchers explore the differences in these constructs in the different stages. Given the dearth of studies

employing longitudinal data, the recommended studies will provide a unique perspective on the issues relating to GPD.

In addition, the study recommends that Ghanaian SMEs in the manufacturing industry should deliberately cultivate a working environment conducive to eliciting creativity from employees. When employees are allowed to exhibit their creativity in product development, they may significantly contribute to developing better green products. In turn, employee creativity should be induced by Ghanaian SME manufacturing industry leaders adopting a transformational leadership style.

The study also recommends that Ghanaian SME manufacturing industry leaders consider GTL as a key dynamic capability that can improve their chances of developing better green products. These firms must deliberately develop leadership training programmes to nurture and develop transformational leadership virtues among their leaders.

The final recommendation of this study is that the Association of Ghana Industries (AGI) and Environmental Protection Agency (EPA) should develop and enforce policies, and monitor and evaluate the product development procedures and outputs of SME manufacturing companies in Ghana.

Authors Contribution
Jerry Owusu Banahene: Conceptualized the research framework and hypothesis development.
Divina Dzifa Classpeters: Contributed to the literature review, provided insights into green transformational leadership, and assisted in the formulation of research objectives.
Oscar Agyemang Opoku: Provided expertise in green dynamic capabilities and green product development performance.

Conflict of Interests/Disclosures
The authors declared no potential conflicts of interest w.r.t the research, authorship and/or publication of this article.

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