Achieving Green Innovation Through CEOs' Green Transformational Leadership and Green Absorptive Capacity: Evidence from the Textile Industry

Burcu Özgül[1]

CEO'ların Yeşil Dönüşümcü Liderliği ve Yeşil Özümseme Kapasitesi Aracılığıyla Yeşil İnovasyona Ulaşmak: Tekstil Sektöründen Kanıtlar	Achieving Green Innovation Through CEOs' Green Transformational Leadership and Green Absorptive Capacity: Evidence from the Textile Industry
Öz	**Abstract**
Mevcut literatür, yeşil özümseme kapasitesinin yeşil dönüşümcü liderlik ile yeşil inovasyon arasındaki ilişkideki aracılık rolünü gözden kaçırmıştır. Bu çalışma, İcra Kurulu Başkanlarının (CEO) yeşil dönüşümcü liderliğinin yeşil özümseme kapasitesi aracılığıyla yeşil inovasyonu nasıl etkilediğini keşfetmeyi amaçlamıştır. Türkiye'de tekstil sektöründe faaliyet gösteren 258 firmadan anket yöntemiyle veri toplanmıştır. Veriler SmartPLS analiz programı aracılığıyla analiz edilmiştir. Sonuçlar, yeşil özümseme kapasitesinin yeşil dönüşümcü liderlik ile yeşil inovasyon arasındaki ilişkide aracı bir role sahip olduğunu açıklığa kavuşturmakta ve kuruluşlarda yeşil inovasyonu teşvik etmenin yeni bir yolunu göstermektedir.	Existing literature has overlooked the mediating role of green absorptive capacity in the correlation between green transformational leadership and green innovation. The present study aimed to explore how Chief Executive Officers' (CEOs) green transformational leadership impacted green innovation through green absorptive capacity. Data were collected from 258 companies in the textile industry in Turkey by survey method. The data were analyzed with the SmartPLS analysis program. The results clarify that green absorptive capacity has a mediating role in the relationship between green transformational leadership and green innovation and indicate a new way to promote green innovation in organizations.
Anahtar Kelimeler: Yeşil Dönüşümcü Liderlik, Yeşil Özümseme Kapasitesi, Yeşil Ürün İnovasyonu, Yeşil Süreç İnovasyonu	**Keywords:** Green Transformational Leadership, Green Absorptive Capacity, Green Product Innovation, Green Process Innovation
JEL Kodları: D29, M19, F64	**JEL Codes:** D29, M19, F64

[1] Dr. Öğr. Üyesi, İstanbul Topkapı Üniversitesi, İktisadi, İdari ve Sosyal Bilimler Fakültesi, Uluslararası Ticaret ve İşletmecilik (Türkçe) Bölümü, burcuozgul@topkapi.edu.tr

1. Introduction

The textile sector represents the second sector with the highest number of negative externalities due to its activities (Martínez-Martínez et al., 2022). Therefore, it faces numerous environmental challenges. Due to the improper disposal of chemicals and toxic metals used in production processes in the textile industry (Zivkovic, Vukadinovic, & Veljkovic, 2018), freshwater resources are polluted, and environmental pollution increases (Periyasamy, Wiener, & Militky 2017). On the other hand, considering the fact that textile products account for 10% of the world's carbon emissions throughout their entire life cycle (Echeverria et al., 2019), it is an important requirement to ensure environmental sustainability in the textile industry (Gbolarumi, Wong, & Olohunde, 2021; Martínez-Martínez et al., 2022). With this awareness, textile companies have started to take into account the impacts of their decisions and management styles on the natural environment and tend to green innovation when taking decisions (Safari et al., 2018; Wang et al., 2020). Green innovation not only allows companies to protect the natural environment but is also regarded as an important way to acquire a competitive advantage (Manrai, 2018; Wang et al., 2020). Therefore, the question of how to enhance green innovation in the textile sector is essential.

Especially recently, researchers have started to examine green innovation separately as green product innovation (GPT) and green process innovation (GPI) instead of addressing it as a general structure (e.g., Xie et al., 2015; Qu et al., 2022; Du & Wang, 2022). Both types of innovation are essential for protecting the natural environment (Du & Wang, 2022). The current study also examines green innovation separately as GPT and GPI. GPT represents developing novel products designed in accordance with environmental standards that protect human health and the natural environment by reducing energy consumption and using raw materials that protect the natural environment (Lin, Tan, & Geng, 2013). GPI involves production processes that use technologies helping to recycle materials, save energy, and reduce adverse impacts on the natural environment (Akhtar et al., 2021). An important question that emerges from the literature is why some enterprises succeed in GPT and GPI while others fail (Du & Wang, 2022). Researchers highlight organizational factors in improving green innovation capability, but few researchers have examined organizational factors (e.g., Jun et al., 2019; Yahya, Jamil, & Farooq, 2021).

It is known that green innovation is technologically complex and costly (Subramanian et al., 2016; Arfi, Hikkerova, & Sahut, 2018) and requires a lot of technical green knowledge (Rakthin, Calantone, & Wang, 2016; Zhang et al., 2020; Özgül & Zehir, 2022). Therefore, for companies to succeed in green innovation, they should be able to acquire, disseminate, and use new green technical knowledge in the external environment (Chen et al., 2015; Du & Wang, 2022). Furthermore, it is also an important requirement for companies to establish mechanisms to internalize new green external knowledge in their processes. Emphasis is placed on green absorptive capacity (GAC), a relatively new concept in the green management literature (Mazon et al., 2022; Al Issa et al., 2022). In the literature, GAC is indicated as an antecedent of GPT and GPI (Ali et al., 2019; Qu et al., 2022; Yahya, Jamil, & Farooq, 2021; Du & Wang, 2022). However, GAC has been studied as an antecedent in developed countries in general (Aboelmaged & Hashem, 2019) but has not been adequately tested empirically in developing countries. Particularly little is known about the orientation of SMEs (small and medium enterprises) in developing countries toward green innovation (Yahya, Jamil, & Farooq, 2021). This issue is important, considering that SMEs cause more damage to the natural environment

and generate more waste than large companies (Johnson, 2017; Mitchell et al., 2020). Moreover, researchers have not considered GAC as a phenomenon that could be essential in enhancing GPT and GPI performance in the textile sector. To fill the mentioned gap in the literature, the current research aims to evaluate the impact of GAC, characterized as a dynamic ability in accordance with the natural resource-based view (NRBV) (Meirun, Makhloufi, & Ghozali Hassan, 2020; Zhou, Govindan, Xie, & Yan, 2021), on GPT and GPI in SMEs in the textile sector. Hence, the present work can make a contribution to the literature and practice by testing this relationship on SMEs in the textile industry that operate in Turkey, which is both in the category of developing countries and among the leading textile exporters (Badi, Muhammad, Abubakar, & Bakir, 2022).

On the other hand, the current literature also lacks an understanding of how to improve a company's GAC (Yahya, Jamil, & Farooq, 2021; Qu et al., 2022). Although the management literature has shown great interest in absorptive capacity, the green management literature has not yet shown this interest (Aboelmaged & Hashem, 2019). With their empirical studies, researchers have indicated green competencies (Qu et al., 2022; Yahya, Jamil, & Farooq, 2021), regulations, eco-friendly product demand, competitive pressure (Mady et al., 2022), green supply chain relationship quality (Lin et al., 2020), green shared vision, green culture (Chen et al., 2020), green human capital, green structural capital (Al Issa et al., 2022), green human resource management practices (Ali et al., 2019) environmental orientation, and managers' green transformational leadership (GTL) (Özgül, 2022) as antecedents of GAC. Furthermore, researchers also call for the antecedents of GAC to be investigated further (Danquah, Ouattara, & Quartey, 2018; Yahya, Jamil, & Farooq, 2021).

The idea that the transformational leadership style supports learning processes has been proven in the leadership literature (Rezaei Zadeh, Hackney, & Zeng, 2022). Therefore, green transformational leaders supporting their subordinates so that they can develop brand-new green ideas and learn new green technologies can support the development of GAC (Özgül, 2022). In the literature, it is known that green transformational leaders develop green organizational learning capabilities (Özgül & Zehir, 2022), green dynamic capabilities (Ahmad et al., 2022), and organizational green learning (Cui, Wang, & Zhou, 2023). Additionally, although Özgül (2022) demonstrated a positive relationship between GTL behavior and GAC, there is inadequate empirical evidence in the said field (Paillé & Halilem, 2019). To fill this gap, the current work suggests that GAC can be improved when CEOs of companies in the textile sector have GTL based on upper echelons theory and aims to contribute to the literature and practice by testing this relationship.

On the other hand, it is known that GTL is among the significant organizational antecedents in promoting GPT and GPI (Begum et al., 2022a; Ahmad et al., 2022). Nevertheless, although the current literature presents pieces of evidence about the positive impacts of GTL directly on GPT and GPI, it is also demonstrated that this relationship is not as simple as discussed in previous research (Ahmad et al., 2022). First, the complexity of the association between GTL and GPT and GPI indicates the presence of some key mechanisms that should be considered when researching this relationship (Singh et al., 2020; Begum et al., 2022a; Ahmad et al., 2022). Second, based on an integrated theoretical account of upper echelons theory and the NRBV, the present study addresses the missing link between GTL and green innovation (GPT and GPI), arguing that green transformational leaders concentrate on improving GAC continuously. The literature has not yet used the mediating role of GAC in the correlation between GTL and green

innovation (GPT and GPI). In Turkey, one of the world's leading textile exporters (Badi et al., 2022), an investigation of the following research questions can make a contribution to the literature and practice:

RQ1. Does CEO' GTL behavior enhance green innovation (GPT and GPI), and GAC?

RQ2. Does GAC mediate the correlation between CEOs' GTL behavior and green innovation (GPT and GPI)?

2. Hypotheses Development

2.1. GTL and GAC

A green transformational leader is a personality who takes environmentally friendly actions and encourages his subordinates to work beyond individual interests, strive for a common green vision, challenge assumptions and address environmental problems in new ways (Chen & Chang, 2013). This personality establishes close relationships with subordinates so that they can improve their green skills (Peng et al., 2020). As is seen, these leaders have the distinctive characteristics necessary to cope with environmental problems and difficulties at various stages of the organizational life cycle (Chen & Chang, 2013). Leaders who exhibit the said leadership style effectively express their green vision and provide the required support for the purpose of achieving corporate environmental goals (Zhou et al., 2018).

Based on upper echelons theory, it can be argued that green transformational leaders concentrate on identifying and developing new green ideas and processes since they take key strategic positions (CEOs), have a pro-environmental orientation, and take decisions to recognize opportunities and achieve organizational effectiveness (Ahmad et al., 2022). GTL behaviors are crucial in renewing the resource base of companies, and these leaders tend toward environmental resources (Lopez-Cabrales, Bornay-Barrachina, & Diaz-Fernandez, 2017). Hence, the pro-environmental orientation of green transformational leaders can guide their actions and decisions to integrate, build, and restructure green skills. As a result, leaders can impact the processes and policies implemented to determine and develop skills through their actions (Ahmad et al., 2022). Therefore, these leaders can support the development of GAC (Chen, Chang, & Lin, 2014a), described as an organizational capability of a company to understand, communicate, combine, describe, and commercialize technological knowledge about the natural environment (Özgül, 2022; Özgül & Zehir, 2022). Scientific discussions also show that green transformational leaders influence their followers' green intrinsic motivations (Li et al., 2020), their pro-environmental behaviors (Graves, Sarkis, & Zhu, 2013; Peng et al., 2020), their commitment to green work (Çop et al., 2020; Huang, Ting, & Li, 2021), green self-efficacy (Zhang, Sun, & Xu, 2020; Jiang et al., 2020), green mindfulness (Chen, Chang, & Lin, 2014b; Zafar et al., 2017), and green creativity (Mittal & Dhar, 2016; Jiang et al., 2020). Additionally, in their studies, scientists have confirmed that GTL behavior improves organizational green learning (Cui, Wang, & Zhou, 2023), green dynamic capabilities (Ahmad *et al.,* 2022), and green organizational learning capability (Özgül & Zehir, 2022). However, researchers have overlooked the relationship between GTL and GAC (Özgül, 2022). From this perspective, the current work argues that GAC will improve when CEOs in the textile sector act in accordance with the GTL style through the lens of upper echelons theory. Considering this, the following hypothesis is proposed in this research:

H1. CEOs' GTL is positively and significantly related to GAC.

2.2. GTL, GPT and GPI

GPT represents a concept related to designing new or improved green products using non-toxic or biodegradable materials (Lin, Tan, & Geng, 2013). GPI refers to using novel clean technologies and end-of-pipe technologies in the production process (Zhang et al., 2020; Xie, Hoang, & Zhu, 2022). For companies to develop innovation, they need to provide direction, attitude, and motivation, have structural resources and capabilities, and encourage groundbreaking thinking in order to use these resources correctly (Zahra & George, 2002; DeCusatis, 2008). Green organizational culture takes an important place in changing attitudes toward the natural environment, assumed to be lacking in companies operating in developing countries (Shariff & Mohd Shariff, 2016; Jun et al., 2019; Shahzad et al., 2020).

Company managers who have taken green management activities as a goal have started to adopt a leadership style that is generally accepted as GTL to overcome the global challenges for the natural environment and find solutions for sustainable development (Çop, Olorunsola, & Alola, 2021). Through the lens of upper echelons theory, such a leader attempts to change attitudes throughout the organization and build a green culture to create and implement environmental sustainability initiatives (Rizvi & Garg, 2021; Özgül, 2022). A personality exhibiting GTL regards technological investments as beneficial to use natural resources efficiently and reduce carbon emissions and takes initiatives to invest in these technologies (Graves, Sarkis, & Zhu, 2013; Li et al., 2020). Accordingly, the current study argues that, in line with upper echelons theory, the GTL of CEOs in the textile industry is an important factor in developing the required capabilities to promote GPT and GPI (Begum et al., 2022a; Ahmad et al., 2022). By taking this into account, the hypotheses below are proposed in the current work:

H2a. CEOs' GTL is positively and significantly related to GPT.

H2b. CEOs' GTL is positively and significantly related to GPI.

2.3. GAC, GPT and GPI

In line with the NRBV (Hart, 1995), companies can acquire a competitive advantage by developing resources and capabilities to protect the natural environment, promote green products and green processes, and support sustainable development (Makhloufi et al., 2022). Being successful in GPT and GPI is attributed to green knowledge technologically (Ziegle & Nogareda, 2009) and the absorptive capacity of this green technological knowledge (Zhang et al., 2020). In other words, to cope with environmental problems, companies need to learn both the technology and market knowledge that protect the environment and the processes that will enable them to absorb green knowledge (Zhang, Meng, & Teng, 2022). Hence, companies are in a position to acquire, assimilate, transform, and exploit both internal and external green technological knowledge to succeed in GPT and GPI (Sanni, 2018; Aboelmaged & Hashem, 2019; Baeshen, Soomro, & Bhutto, 2021). According to the NRBV, GAC can be characterized as an ability that encourages firms to absorb and exploit green knowledge from different stakeholders that exist beyond their borders, including regulatory institutions, customers, competitors, and nonprofits (Schoenherr & Swink, 2012; Shubham, Charan, & Murty, 2018).

As is known, environmental pressures and regulations create opportunities (Paquin, Busch, & Tilleman, 2015). Since companies with high GAC are more vigilant and aware of environmental pressures (Zhang et al., 2020; Mazon et al., 2022), they can overcome these pressures (Pacheco et al., 2018) and turn them into opportunities (Zhang et al., 2020; Mo et al., 2022; Zhang, Meng, & Teng, 2022). When the level of GAC decreases, organizational resistance

to environmental pressures may occur, and a company's legitimacy may be compromised (Zhang et al., 2020; Mo et al., 2022). As a result, standards and legitimacy must first be established to succeed in green innovation. The way to achieve this is having the ability to recognize and search for the new green external knowledge, in other words, to acquire the new green external knowledge. Second, it is necessary to assimilate and transform previous green technological knowledge with novel green technological knowledge. Third, it is to exploit and commercialize green external technological knowledge. Therefore, GAC can provide the three conditions necessary for GPT and GPI and promote developing GPT and GPI (Zhou et al., 2021). The current literature indicates that GAC supports the development of GPT and GPI (Ali et al., 2019; Qu et al., 2022; Yahya, Jamil, & Farooq, 2021; Du & Wang, 2022). Nevertheless, the correlation between GAC and GPT and GPI in the textile sector has not been empirically researched. For this reason, to fill the gap in the existing literature, this study proposes the following hypotheses, assuming that the GAC of SMEs operating in the textile sector will improve their GPT and GPI performance, according to the NRBV:

H3a. GAC is positively and significantly related to GPT.

H3b. GAC is positively and significantly related to GPI.

2.4. The Mediating Role of GAC

From the perspective of upper echelons theory, green transformational leaders, in terms of their qualifications, lead the way through green vision, form teams, and encourage their subordinates to participate in green management activities with the objective of building GPT and GPI activities (Chen & Chang, 2013; Mittal and Dhar, 2016; Ahmad et al., 2022). It has also been empirically supported that green transformational leaders develop green dynamic capabilities and green organizational learning capability by motivating their subordinates to acquire new green knowledge from the markets (Begum et al., 2022a; Ahmad et al., 2022; Özgül & Zehir, 2022).

On the contrary, GAC, described as dynamic capability according to the NRBV, is among the driving forces of green innovation (Aboelmaged & Hashem, 2019; Ali et al., 2019; Qu et al., 2022; Yahya, Jamil, & Farooq, 2021; Du & Wang, 2022). Therefore, the GTL of CEOs can improve the GPT and GPI performance by supporting the development of the company's GAC. In the current literature, there are few studies that focus on the mediating role of organizational factors in explaining the association between GTL and green innovation (GPT and GPI) (Shubham et al., 2018; Majid et al., 2019). The mediating role of green human resource management practices (Singh et al., 2020), creative process engagement (Begum et al., 2022b), and green dynamic capabilities (Ahmad et al., 2022) in the correlation between GTL and green innovation (GPT and GPI) has been investigated. However, researchers have overlooked the mediating role of GAC. To help fill the above-mentioned gap, GAC is suggested as a mediator between GTL and green innovation (GPT and GPI), as one of the contributions of the present study. Based on this, the hypotheses below are proposed.

H4a. GAC significantly mediates the correlation between CEOs' GTL and GPT.

H4b. GAC significantly mediates the correlation between CEOs' GTL and GPI.

Figure 1 presents the research framework.

Figure 1: Research Framework
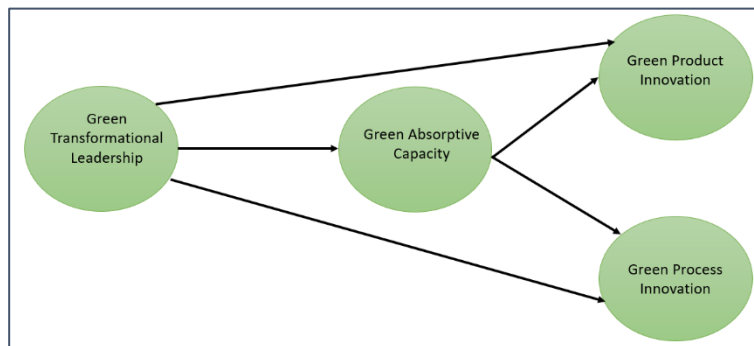
3. Research Methodology

3.1. Sample and Data Sources

The enterprise level is the unit of analysis in the present study. The current research was carried out by collecting data from the managers of the R&D and environment departments of companies operating in the textile industry in Turkey, classified as SMEs with an ISO 14001 certificate, using the survey method. There are 4027 textile companies registered with the Istanbul Chamber of Industry and employing less than two hundred and fifty employees annually. Five hundred textile companies were determined by employing the random sampling selection procedure from among companies with ISO 14001 certificates. Respondents of the study (managers of R&D and environment departments) were informed that they should answer the survey by considering only organizational practices, regardless of their personal feelings, by giving assurance that the present research was conducted with scientific methods and the collected data would be kept confidential. The data collection process was performed between June and September 2022 for the purpose of testing the non-response bias (Dillman, Smyth, & Christian, 2014). Two hundred eighty-four companies participated in this study, 258 of which were usable, representing an effective response rate of 51.6%, which is adequate because of the nature of the survey. Of the textile companies from which data were collected, 31.39% were classified as fabric industry, 20.54% as knitting/weaving industry, 20.15% as apparel sub-industry, 14.72% as yarn industry, and 13.17% as dye/finishing industry, and they employ mostly between 50 and 249 employees.

3.2. Measure of Constructs

In the current study, all constructs, involving GTL, GAC, GPT and GPI, were measured on a scale varying between 1 (strongly disagree) and 7 (strongly agree). The scale items used to measure all constructs are listed in Appendix A. Items were included in the prepared questionnaire with the objective of measuring the GTL behaviors of CEOs. There are items for measuring GAC, second, and GPT and GPI performance, third. Finally, questions were asked to determine the participants' sectors (yarn industry, fabric industry, knitting/weaving industry, dye/finishing industry, and apparel sub-industry) and the numbers of employees in their companies. GTL (six items) was measured by employing the scale adapted from the study by Chen and Chang (2013). GPT (four items) and GPI (four items) were measured by being adapted from the scale developed by Chen, Lai, and Wen (2006). GAC (five items) was measured using the scale adapted from the study by Chen, Chang, and Lin. (2014a).

4. Analysis and Results

4.1.Measurement Model

The hypotheses proposed in the present work were analyzed through SmartPLS 3.0 software, whose analysis logic is based on the Partial Least Square Structural Equation Modeling (PLS-SEM). The main reason for using SmartPLS 3 data analysis program in this work is the possibility of testing the correlations between the variables simultaneously and the absence of the assumption of normality since they are non-parametric (Dijkstra & Henseler, 2015). In SmartPLS software, analyses are performed in two stages, the measurement model and the structural model. Since all variables of the current study are reflective, analyses were performed by following the Consistent PLS Algorithm (PLSc) step. Convergent and discriminant validity were tested in the measurement model. When the item loadings were primarily examined to evaluate convergent validity, since the values of GTL2 and GAC5 items were less than 0.70, these two items were excluded from the analysis, and the analysis was repeated. As seen in Table 1, the loadings of all items are above 0.70. Likewise, Cronbach's alpha, composite reliability, and rho_A values of all constructs are ≥ 0.70. Since the average variance extracted (AVE) value exceeds the critical value of 0.50, as suggested, it can be said that convergent validity is achieved.

Table 1: Reliability and Validity

Constructs	Items	Factor Loadings	P-Values	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Green Transformational Leadership (GTL)	GTL1	0.864	0.000	0.939	0.940	0.954	0.805
	GTL3	0.908	0.000				
	GTL4	0.915	0.000				
	GTL5	0.914	0.000				
	GTL6	0.882	0.000				
Green Absorptive Capacity (GAC)	GAC1	0.902	0.000	0.931	0.932	0.951	0.829
	GAC2	0.910	0.000				
	GAC3	0.913	0.000				
	GAC4	0.917	0.000				
Green Product Innovation (GPT)	GPT1	0.817	0.000	0.864	0.875	0.907	0.709
	GPT 2	0.834	0.000				
	GPT 3	0.875	0.000				
	GPT 4	0.842	0.000				
Green Process Innovation (GPI)	GPI1	0.884	0.000	0.911	0.911	0.937	0.789
	GPI 2	0869	0.000				
	GPI 3	0.902	0.000				
	GPI 4	0.897	0.000				

The Fornell-Larcker criterion was examined first for discriminant validity. The values on the diagonal written in bold in Table 2 are the square root of the AVE value of the relevant variable. These values are higher than the correlation values in the same column and row, as desired.

Table 2: Discriminate Validity

Constructs	1	2	3	4
Green Absorptive Capacity	*0.911*			
Green Process Innovation	0.570	*0.888*		
Green Product Innovation	0.451	0.576	*0.842*	
Green Transformational Leadership	0.528	0.645	0.501	*0.897*

Note: Bold diagonal values represent the square of AVE

Upon examining the cross-loading criterion in Table 3 secondly for discriminant validity, it is seen that each item has the highest factor loading in the variable to which it belongs.

Table 3: Cross-loadings

	GAC	GPI	GPT	GTL
GAC1	**0.902**	0.531	0.405	0.472
GAC2	**0.910**	0.508	0.387	0.485
GAC3	**0.913**	0.545	0.431	0.491
GAC4	**0.917**	0.489	0.419	0.476
GPI1	0.518	**0.884**	0.515	0.591
GPI2	0.531	**0.869**	0.501	0.561
GPI3	0.467	**0.902**	0.475	0.561
GPI4	0.505	**0.897**	0.553	0.578
GPT1	0.366	0.495	**0.817**	0.396
GPT2	0.385	0.472	**0.834**	0.377
GPT3	0.426	0.511	**0.875**	0.512
GPT4	0.332	0.458	**0.842**	0.382
GTL1	0.509	0.604	0.523	**0.864**
GTL3	0.492	0.590	0.404	**0.908**
GTL4	0.448	0.555	0.434	**0.915**
GTL5	0.450	0.592	0.445	**0.914**
GTL6	0.463	0.545	0.430	**0.882**

Finally, the heterotrait-monotrait (HTMT) value was examined for discriminant validity. All results of the HTMT value in Table 4 are ≤ 0.85. Thus, it can be stated that discriminant validity is provided.

Table 4: HTMT

Constructs	1	2	3	4
Green Absorptive Capacity				
Green Process Innovation	**0.617**			
Green Product Innovation	0.499	**0.647**		
Green Transformational Leadership	0.563	0.695	**0.547**	

Note: Bold diagonal values represent the square of AVE

Finally, the statistical significance of the factor loadings was analyzed with the bootstrapping technique (5.000 resamples). T-values in Figure 2 and p-values in Table 1 confirm that all factor loadings are significant.

Figure 2: Evaluation of the Structural Measurement Model
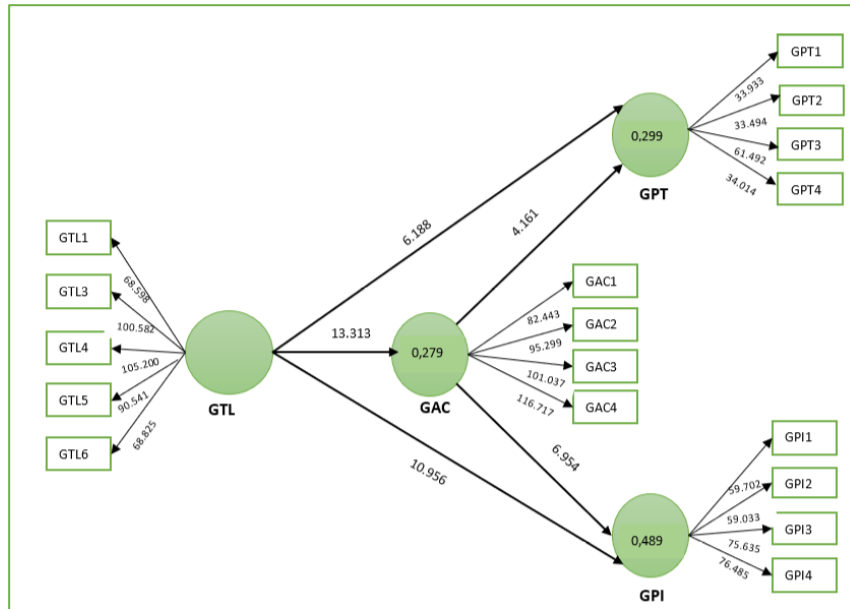
4.2. Structural Model

First, upon examining the variance inflation factor (VIF) to test the linearity (Table 5), it is observed that these values are below the desired threshold value of 3 (Hair et al., 2019). Second, Harman's one-factor test was used with the objective of testing the common method bias (CMB). The total variance rate explained is 36.30% when all variables are gathered under a single factor. These results demonstrate that there is neither a linearity problem nor common method bias among the variables (Harman, 1976). Concerning the variance explained (R^2) values, they were 27.9%, 29.9%, and 48.9% for GAC, GPT, and GPI, respectively. The effect size value (f^2) computed for each predictor variable varies between 0.069 and 0.387. In line with these results, both R^2 and f^2 values can be considered good. The Q^2 predictive relevance value indicates that there are excellent endogenous variables ($Q^2 > 0$). The standardized root mean square (SRMR) equals 0.067 and the normed fix index (NFI) equals 0.865, showing that the model is fit.

A bootstrapping technique (5.000 resamples) was employed to test whether the correlation coefficients were statistically significant. As seen in Figure 2 and Table 5, the path from GTL to GAC is positively significant ($β = 0.528$, t = 13.313, p < 0.001), and hypothesis H1 was supported. Additionally, the paths from GTL to GPT ($β = 0.365$, t = 6.188, p < 0.001) and to GPI ($β = 0.478$, t = 10.959, p < 0.001) are also positively significant, and hypotheses H2a and H2b were supported. Concerning GAC, all of the paths to GPT ($β = 0.258$, t = 4.161, p < 0.001) and GPI ($β = 0.317$, t = 6.954, p < 0.001) were found to be positively significant, and thus, hypotheses H3a and H3b were supported.

Table 5: Hypothesis Testing

Structural path	Coef (β)	S.D.	T-Values	P-Values	Adj. R²	f²	Q²	VIF	Conclusion
GTL→GAC	0.528***	0.040	13.313	0.000	0.279	0.387	0.229	1.000	H1 Supported
GTL→ GPT	0.365***	0.059	6.188	0.000		0.137	0.204	1.387	H2a Supported
GAC→GPT	0.258***	0.062	4.161	0.000	0.299	0.069		1.387	H3a Supported
GTL→ GPI	0.478***	0.044	10.959	0.000	0.489	0.322	0.381	1.387	H2b Supported
GAC→ GPI	0.317***	0.046	6.954	0.000		0.142		1.387	H3b Supported

SRMR= 0.067; NFI= 0.865
Results of the bootstrapping with 5.000 sub-samplings
∗∗∗p <0.001 (two-tailed)

Finally, the current study tested hypotheses H4a and H4b using the mediator analysis procedure suggested by Zhao, Lynch & Chen (2010). The first finding demonstrated that the correlation between GTL → GAC → GPT (β = 0.168, t = 5.898, p < 0.001) was positively significant. Additionally, the correlation between GTL → GAC→ GPI (β = 0.136, t = 3.851, p < 0.001) was also positively significant. In line with the said results, it is possible to indicate the mediating role of GAC. To reveal the type of the said mediation, the direct relationship between both GTL and GPT (β = 0.365, t = 6.188, p < 0.001) and GTL and GPI (β = 0.478, t = 10.959, p < 0.001) was evaluated, and, accordingly, GAC was found to have a complementary partial mediator role (see Table 6). Hence, hypotheses H4a and H4b were supported.

Table 6: Mediation Analysis

Structural path	Coef (β)	S.D.	T-Values	P-Values	Conclusion
GTL → GAC→ GPT	0.168***	0.028	5.898	0.000	H4a Supported Complementary Partial Mediation
GTL →GPT	0.365***	0.059	6.188	0.000	
GTL→ GAC→ GPI	0.136***	0.035	3.851	0.000	H4b Supported Complementary Partial Mediation
GTL →GPI	0.478***	0.044	10.959	0.000	

∗∗∗p <0.001(two-tailed)
Results of the bootstrapping with 5.000 sub-samplings

5. Discussion and Conclusions

Recently, studies on GTL and green innovation (GPT and GPI) have been continuously increasing and making significant advancements in academic circles (Hall, Mairesse, & Mohnen, 2010; Xiang, Stuber, & Meng, 2011). Furthermore, the association between GTL and GAC, which is regarded as an important antecedent in improving green innovation performance, has not attracted attention in the literature. Unlike previous research, the present work addresses the GAC as a mediator variable in the correlation between GTL and green innovation (GPT and GPI), and this study aimed to expand the flow. Based on the upper echelons theory and the NRBV, a

theoretical framework has been developed in this study to interconnect these important concepts. To support the study's hypotheses, empirical evidence was obtained from a survey conducted among companies in the textile industry.

This study's first finding revealed that CEOs' behaviors in line with the GTL style have a significant and positive impact on their GAC. This result is consistent with previous literature (Ahmad et al., 2020), reporting that the green transformational leader engages his subordinates in green thinking to brainstorm and produce green techniques and ideas. Moreover, the above-mentioned result also supports the studies of scientists who advocate the idea that the green transformational leader facilitates green exploratory and exploitative learning (Cui, Wang, & Zhou, 2022) and enhances green organizational learning capability (Özgül & Zehir, 2022) and green dynamic capabilities (Ahmad et al., 2022). Furthermore, the current work makes a contribution to the green management literature by supporting a recent study (Özgül, 2022), which indicates a positive correlation between GTL behavior and GAC.

The second finding of the study clearly demonstrates that GAC is indispensable for promoting GPT and GPI. The said finding is consistent with the results of research in the current literature and improves the literature (Ali et al., 2019; Yahya, Jamil, & Farooq, 2021; Qu, 2022; Du & Wang, 2022). Hence, it can be stated that employees should develop their knowledge, skills and intellectual abilities in order to combat environmental degradation and develop green technologies, services, and production processes that decrease carbon emissions and the inefficient usage of resources (Begum et al., 2022a). The third finding indicates that CEOs' GTL directly impacts GPT and GPI. The said finding of the current research supports previous research (Özgül, 2020; Singh et al., 2020; Begum et al., 2022a; Ahmad et al., 2022). With their GTL, CEOs support and motivate their subordinates to reach the environmental goals of the company through GPT and GPI. In other words, with their unique leadership structure, they inspire and motivate their followers to encourage GPT and GPI by engaging them in green approaches and actions (Chen & Chang, 2013; Ahmad et al., 2022). Especially when the green transformational leader presents a clear vision for greening the enterprise, followers take environmentally friendly actions.

Fourth, the current study presents a new contribution to the green innovation literature by revealing green absorptive capacity as a potential mediator that manages the correlation between GTL and GPT and GPI. The said finding is consistent with the idea that green dynamic capabilities have a mediating role in the influence of GTL style on green innovation (Ahmad et al., 2022). In brief, the probable cause of mediation effects is that the green transformational leader's unique effect on GPT and GPI increases exponentially when subordinates enhance their GAC by introducing green approaches and techniques (Begum et al., 2022a).

In conclusion, the developing role of GTL and the development of GAC will provide benefits to both the company and society when strategically oriented toward GPT and GPI. The above-mentioned empirical findings present several theoretical and practical implications.

5.1. Theoretical Contributions

The present research investigates the association between GTL, GAC, and green innovation (GPT and GPI) and enriches the content related to the NRBV and upper echelons theory. First, the current work expands the research scope of GTL more systematically and comprehensively by showing the correlation between the GAC and GTL of CEOs in the textile industry, based on upper echelons theory. Previous research has successfully stressed the impact of GTL on green innovation, but the effect of GTL on GAC is new (Özgül, 2022). Second, the present research

develops the literature by explaining that GAC improves GPT and GPI through the lens of the NRBV. Third, this work confirms the idea that the GTL of CEOs in the textile industry impacts GPT and GPI. Finally, the present research demonstrates a new way to promote GPT and GPI in organizations by clarifying that GAC has a mediating role in the relationship between GTL and green innovation (GPT and GPI). Studies conducted previously have successfully emphasized the impact of GAC on GPT and GPI performance, but the mediating role of GAC in the correlation between GTL and GPT and GPI performance is novel. Hence, compensating for the deficiencies of the current literature, this study develops upper echelons theory and the NRBV by revealing the mediating role of GAC in the association between GTL of CEOs in the textile industry and green innovation (GPT and GPI).

5.2. Managerial Implications

The present research has specific managerial implications to achieve GPT and GPI. First, by adopting the green transformational leadership style, CEOs should establish green management policies and promote the concept of green corporate culture, thereby creating opportunities for improving GAC. Second, it is essential for top management with decision-making authority to accumulate resources and power on related issues that require financial support in order to improve GAC. Third, companies should form a pleasant atmosphere for learning and cooperation throughout the organization in order to promote and improve the creative abilities of employees for strengthening their awareness and perception of developing green products and green processes. To this end, managers should create a unified belief and determination to develop employees' green innovation awareness and implement green innovation. Thus, green culture must be included in corporate rules and regulations, a green innovation incentive mechanism should be created, and a green innovation reward system should be developed with the objective of guaranteeing the strict implementation of corporate green culture. Fourth, managers should continuously monitor changes in environmental regulations, follow the latest published industrial policies and trends, encourage collaboration and innovation, and strengthen the business knowledge base to further improve green innovation performance. Additionally, companies should communicate and cooperate with customers, suppliers, commercial organizations, universities, and research institutes (Zhang et al., 2020) so that they can have the opportunity to discover and use new green knowledge that covers green technologies. This cooperation can increase the possibility of information flow, resulting in higher GPT and GPI performance.

5.3. Limitations and Future Research

Although the current study contributes theoretically and practically, it is not exempt from several limitations. First, data were collected only from Turkey. For future studies, researchers can try to determine whether the findings are valid for other developing countries or areas with developed institutional environments. Secondly, the present research was performed within the parameters of companies operating in the textile industry. Hence, this research model can be tested and extended in other industries and contexts. Third, dynamic changes in GTL, GAC, and green innovation (GPT and GPI) were not assessed because cross-sectional data were used in this study. Therefore, researchers can investigate long-term dynamics upon long-term data. Finally, future studies may evaluate the mediating role of other organizational factors in the correlation between GTL and green innovation (GPT and GPI) to advance the NRBV and upper echelons theory.

References

Aboelmaged, M., & Hashem, G. (2019), "Absorptive capacity and green innovation adoption in SMEs: The mediating effects of sustainable organisational capabilities", Journal of cleaner production, Vol. 220: 853-863.

Ahmad, B., Shafique, I., Qammar, A., Ercek, M., & Kalyar, M. N. (2022), "Prompting green product and process innovation: Examining the effects of green transformational leadership and dynamic capabilities", Technology Analysis & Strategic Management, 1-13.

Akhtar, S., Martins, J. M., Mata, P. N., Tian, H., Naz, S., Dâmaso, M., & Santos, R. S. (2021), "Assessing the relationship between market orientation and green product innovation: the intervening role of green self-efficacy and moderating role of resource bricolage", Sustainability, Vol. 13, No. 20: 11494.

Al Issa, H. E., Abdullatif, T. N., Ntayi, J., & Abdelsalam, M. K. (2022), "Green intellectual capital for sustainable healthcare: evidence from Iraq", Journal of Intellectual Capital, (ahead-of-print).

Ali, A., Hazoor, M. S., Bari, M., & Mohsin, B. (2019), "Green HRM practices and green innovation: an empirical evidence from pharmaceutical industry in Pakistan", Pacific Business Review International, Vol. 11, No. 6: 61-71.

Arfi, W. B., Hikkerova, L., & Sahut, J. M. (2018), "External knowledge sources, green innovation and performance", Technological Forecasting and Social Change, Vol.129: 210-220.

Badi, I., Muhammad, L. J., Abubakar, M., & Bakır, M. (2022), "Measuring sustainability performance indicators using FUCOM-MARCOS methods", Operational Research in Engineering Sciences: Theory and Applications, Vol. 5, No. 2: 99-116.

Baeshen, Y., Soomro, Y. A., & Bhutto, M. Y. (2021), "Determinants of green innovation to achieve sustainable business performance: Evidence from SMEs", Frontiers in Psychology, 5052.

Begum, S., Xia, E., Ali, F., Awan, U., & Ashfaq, M. (2022a), "Achieving green product and process innovation through green leadership and creative engagement in manufacturing", Journal of Manufacturing Technology Management, Vol.33, No.4: 656-674.

Begum, S., Ashfaq, M., Xia, E., & Awan, U. (2022b), "Does green transformational leadership lead to green innovation? The role of green thinking and creative process engagement", Business Strategy and the Environment, Vol. 31, No.1: 580-597.

Chen, Y. S., Lai, S. B., & Wen, C. T. (2006), "The influence of green innovation performance on corporate advantage in Taiwan", Journal of Business Ethics, Vol. 67: 331-339.

Chen, Y. S., & Chang, C. H. (2013), "The determinants of green product development performance: Green dynamic capabilities, green transformational leadership, and green creativity", Journal of Business Ethics, Vol. 116, No.1: 107-119.

Chen, Y. S., Chang, C. H., & Lin, Y. H. (2014a), "The determinants of green radical and incremental innovation performance: Green shared vision, green absorptive capacity, and green organizational ambidexterity", Sustainability, Vol. 6, No.11: 7787-7806.

Chen, Y. S., Chang, C. H., & Lin, Y. H. (2014b), "Green transformational leadership and green performance: The mediation effects of green mindfulness and green self-efficacy", Sustainability, Vol. 6, No. 10: 6604-6621.

Chen, Y. S., Lin, Y. H., Lin, C. Y., & Chang, C. W. (2015), "Enhancing green absorptive capacity, green dynamic capacities and green service innovation to improve firm performance: An analysis of structural equation modeling (SEM)", Sustainability, Vol. 7, No. 11, 15674-15692.

Chen, Y. S., Lin, S. H., Lin, C. Y., Hung, S. T., Chang, C. W., & Huang, C. W. (2020), "Improving green product development performance from green vision and organizational culture perspectives", Corporate Social Responsibility and Environmental Management, Vol. 27, No. 1, 222-231.

Cui, R., Wang, J., & Zhou, C. (2023), "Exploring the linkages of green transformational leadership, organizational green learning, and radical green innovation", Business Strategy and the Environment, Vol. 32, No. 1: 185-199.

Çop, S., Olorunsola, V. O., & Alola, U. V. (2021), "Achieving environmental sustainability through green transformational leadership policy: Can green team resilience help?", Business Strategy and the Environment, Vol. 30, No. 1: 671–682.

Danquah, M., Ouattara, B., & Quartey, P. (2018), "Technology transfer and national efficiency: Does absorptive capacity matter?", African Development Review, Vol. 30, No.2: 162-174.

DeCusatis, C. (2008), "Creating, growing and sustaining efficient innovation teams", Creativity and Innovation Management, Vol. 17, No. 2, 155–164.

Dijkstra, T. K., & Henseler, J. (2015), "Consistent partial least squares path modeling ", MIS quarterly, Vol. 39, No. 2: 297-316.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014), "Internet, phone, mail, and mixed-mode surveys: The tailored design method". John Wiley & Sons.

Du, Y., & Wang, H. (2022), "Green Innovation Sustainability: How Green Market Orientation and Absorptive Capacity Matter?", Sustainability, Vol. 14, No.13: 8192.

Echeverria, C. A., Handoko, W., Pahlevani, F., & Sahajwalla, V. (2019), "Cascading use of textile waste for the advancement of fibre reinforced composites for building applications", Journal of Cleaner Production, Vol. 208: 1524-1536.

Gbolarumi, F. T., Wong, K. Y., & Olohunde, S. T. (2021), "Sustainability Assessment in The Textile and Apparel Industry: A Review of Recent Studies", IOP Conference Series: Materials Science and Engineering, Vol. 1051, No. 1: 1–16.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019), "When to use and how to report the results of PLS-SEM", European Business Review, Vol. 31, No. 1, 2-24.

Hall, J. K., Daneke, G. A., & Lenox, M. J. (2010), "Sustainable development and entrepreneurship: Past contributions and future directions", Journal of Business Venturing, Vol. 25, No:5, 439–448.

Harman, G. (1976), Practical reasoning. The Review of Metaphysics, Vol. 29, No.3: 431-463.

Hart, O. (1995), "Corporate governance: Some theory and implications", The Economic Journal, Vol. 105, No. 430: 678–689.

Huang, S. Y., Ting, C. W., & Li, M. W. (2021), "The effects of green transformational leadership on adoption of environmentally proactive strategies: The mediating role of green engagement", Sustainability, Vol. 13, No. 6: 3366.

Jiang, H., Wang, K., Lu, Z., Liu, Y., Wang, Y., & Li, G. (2020), "Measuring green creativity for employees in green enterprises: scale development and validation", Sustainability, Vol. 13, No. 1: 275.

Johnson, M. P. (2017), "Knowledge acquisition and development in sustainability-oriented small and medium-sized enterprises: Exploring the practices, capabilities and cooperation", Journal of Cleaner Production, Vol. 142: 3769–3781.

Jun, W., Ali, W., Bhutto, M. Y., Hussain, H., & Khan, N. A. (2019), "Examining the determinants of green innovation adoption in SMEs: A PLS-SEM approach", European Journal of Innovation Management, Vol. 24: 67–87.

Graves, L. M., Sarkis, J., & Zhu, Q. (2013), "How transformational leadership and employee motivation combine to predict employee proenvironmental behaviors in China", Journal of Environmental Psychology, Vol. 35: 81-91.

Li, W., Bhutto, T. A., Xuhui, W., Maitlo, Q., Zafar, A. U., & Bhutto, N. A. (2020), "Unlocking employees' green creativity: The effects of green transformational leadership, green intrinsic, and extrinsic motivation", Journal of Cleaner Production, Vol. 255: 120229.

Lin, R. J., Tan, K. H., & Geng, Y. (2013), "Market demand, green product innovation, and firm performance: evidence from Vietnam motorcycle industry", Journal of Cleaner Production, Vol. 40, 101-107.

Lin, Y. H., Kulangara, N., Foster, K., & Shang, J. (2020), "Improving green market orientation, green supply chain relationship quality, and green absorptive capacity to enhance green competitive advantage in the green supply chain", Sustainability, Vol. 12, No.18: 7251.

Lopez-Cabrales, A., Bornay-Barrachina, M., & Diaz-Fernandez, M. (2017), "Leadership and dynamic capabilities: the role of HR systems", Personnel Review, Vol. 46, No.2, 255-276.

Mady, K., Abdul Halim, M. A. S., Omar, K., Abdelkareem, R. S., & Battour, M. (2022), "Institutional pressure and eco-innovation: The mediating role of green absorptive capacity and strategic environmental orientation among manufacturing SMEs in Egypt", Cogent Business & Management, Vol. 9, No. 1: 2064259.

Majid, A., Yasir, M., Yasir, M., & Javed, A. (2019), "Nexus of institutional pressures, environmentally friendly business strategies, and environmental performance", Corporate Social Responsibility and Environmental Management, July, 1–11.

Makhloufi, L., Laghouag, A. A., Meirun, T., & Belaid, F. (2022). Impact of green entrepreneurship orientation on environmental performance: The natural resource-based view and environmental policy perspective. Business Strategy and the Environment, 31(1), 425-444.

Manrai, A. K. (2018). New research on environmentally responsible consumption behavior and green business strategies. Journal of Global Marketing, 31(4), 229-230.

Martínez-Martínez, A., Cegarra-Navarro, J. G., Garcia-Perez, A., & De Valon, T. (2022). Active listening to customers: eco-innovation through value co-creation in the textile industry. Journal of Knowledge Management, (ahead-of-print).

Mazon, G., Soares, T. C., Birch, R. S., Schneider, J., & Andrade Guerra, J. B. S. O. D. A. (2022), "Green absorptive capacity, green dynamic capabilities and green service innovation: a study in Brazilian universities", International Journal of Sustainability in Higher Education.

Meirun, T., Makhloufi, L., & Ghozali Hassan, M. (2020), "Environmental outcomes of green entrepreneurship harmonization", Sustainability, Vol. 12, No. 24: 10615.

Mitchell, S., O'Dowd, P., & Dimache, A. (2020), "Environmental challenges for European manufacturing SMEs", International Journal of Sustainable Engineering, Vol. 13, No. 3: 159–170.

Mittal, S., & Dhar, R. L. (2016), "Effect of green transformational leadership on green creativity: A study of tourist hotels", Tourism Management, Vol. 57: 118-127.

Mo, X., Boadu, F., Liu, Y., Chen, Z., & Ofori, A. S. (2022), "Corporate Social Responsibility Activities and Green Innovation Performance in Organizations: Do Managerial Environmental Concerns and Green Absorptive Capacity Matter?", Frontiers in Psychology, 13.

Özgül, B. (2022), "Does Green Transformational Leadership Develop Green Absorptive Capacity? The Role of Internal and External Environmental Orientation", Systems, Vol. 10, No. 6: 224.

Özgül, B., & Zehir, C. (2022), "Top management's green transformational leadership and competitive advantage: the mediating role of green organizational learning capability", Journal of Business & Industrial Marketing, (ahead-of-print).

Pacheco, L. M., Alves, M. F. R., & Liboni, L. B. (2018), "Green absorptive capacity: A mediation-moderation model of knowledge for innovation", Business Strategy and the Environment, Vol. 27, No: 8: 1502–1513.

Paillé, P., & Halilem, N. (2019), "Systematic review on environmental innovativeness: A knowledge-based resource view", Journal of Cleaner Production, Vol. 211: 1088-1099.

Paquin, R. L., Busch, T., & Tilleman, S. G. (2015), "Creating economic and environmental value through industrial symbiosis", Long Range Planning, Vol. 48, No. 2: 95–107.

Peng, J., Yin, K., Hou, N., Zou, Y., & Nie, Q. (2020), "How to facilitate employee green behavior: The joint role of green transformational leadership and green human resource management practice", Acta Psychologica Sinica, Vol. 52, No. 9: 1105.

Periyasamy, A., Wiener J., Militky J., (2017), "Life-Cycle Assessment of Denim, In: Sustainability in Denim", Woodhead Publishing, 83-110.

Qu, X., Khan, A., Yahya, S., Zafar, A. U., & Shahzad, M. (2022), "Green core competencies to prompt green absorptive capacity and bolster green innovation: the moderating role of organization's green culture", Journal of Environmental Planning and Management, Vol. 65, No.3: 536-561.

Rakthin, S., Calantone, R. J., & Wang, J. F. (2016), "Managing market intelligence: The comparative role of absorptive capacity and market orientation", Journal of Business Research, Vol. 69, No. 12: 5569-5577.

Rezaei Zadeh, M., Hackney, R., & Zeng, J. (2022), "Augmenting learning processes of absorptive capacity for innovation: Insights for effective leadership within global pharmaceutical companies", European Management Review, Vol. 19, No. 2: 263-284.

Rizvi, Y. S., & Garg, R. (2021). The simultaneous effect of green ability-motivation-opportunity and transformational leadership in environment management: the mediating role of green culture. Benchmarking: An International Journal, 28(3), 830-856.

Safari, A., Salehzadeh, R., Panahi, R., & Abolghasemian, S. (2018), "Multiple pathways linking environmental knowledge and awareness to employees' green behavior", Corporate Governance: The International Journal of Business in Society.

Sanni, M. (2018), "Drivers of eco-innovation in the manufacturing sector of Nigeria", Technological Forecasting and Social Change, Vol. 131 (November 2017): 303–314.

Schoenherr, T., & Swink, M. (2012), "Revisiting the arcs of integration: Cross-validations and extensions", Journal of Operations Management, Vol. 30, No. 1–2: 99–115.

Shahzad, M., Qu, Y., Javed, S. A., Zafar, A. U., & Rehman, S. U. (2020), "Relation of environment sustainability to CSR and green innovation: A case of Pakistani manufacturing industry", Journal of Cleaner Production, Vol. 253: 119938.

Shariff, U. H., & Mohd Shariff, M. N. (2016)," The interplay of innovation, Tqm practices and Smes performance in Pakistan: Moderating effects of knowledge inertia and external", South East Asia Journal of Contemporary Business, Economics and Law, Vol. 9, No.2: 57–62.

Singh, S. K., Del Giudice, M., Chierici, R., & Graziano, D. (2020), "Green innovation and environmental performance: The role of green transformational leadership and green human resource management", Technological Forecasting and Social Change, Vol. 150: 119762.

Shubham, S., Charan, P., & Murty, L. S. (2018), "Institutional pressure and the implementation of corporate environment practices: Examining the mediating role of absorptive capacity" Journal of Knowledge Management, Vol. 22, No. 7: 1591–1613.

Subramanian, N., Abdulrahman, M. D., Wu, L., & Nath, P. (2016), "Green competence framework: evidence from China", The International Journal of Human Resource Management, Vol. 27, No. 2: 151-172.

Wang, J., Xue, Y., Sun, X., & Yang, J. (2020), "Green learning orientation, green knowledge acquisition and ambidextrous green innovation", Journal of Cleaner Production, Vol. 250: 119475.

Xiang, W. N., R. M. B. Stuber, & X. Meng. (2011), "Meeting Critical Challenges and Striving for Urban Sustainability in China", Landscape and Urban Planning, Vol. 100, No. 4, 418–420.

Xie, X., Huo, J., Qi, G., & Zhu, K. X. (2015), "Green process innovation and financial performance in emerging economies: Moderating effects of absorptive capacity and green subsidies", IEEE Transactions on Engineering Management, Vol. 63, No. 1: 101-112.

Xie, X., Hoang, T. T., & Zhu, Q. (2022), "Green process innovation and financial performance: The role of green social capital and customers' tacit green needs", Journal of Innovation & Knowledge, Vol. 7, No.1; 100165.

Yahya, S., Jamil, S., & Farooq, M. (2021), "The impact of green organizational and human resource factors on developing countries' small business firms tendency toward green innovation: A natural resource-based view approach", Creativity and Innovation Management, Vol. 30, No. 4; 726-741.

Zafar, A., Nisar, Q. A., Shoukat, M., & Ikram, M. (2017), "Green transformational leadership and green performance: The mediating role of green mindfulness and green self-efficacy", International Journal of Management Excellence (ISSN: 2292-1648), Vol. 9, No. 2: 1059-1066.

Zahra, S. A., & George, G. (2002), "Absorptive capacity: A review, reconceptualization, and extension", Academy of Management Review, Vol. 27, No. 2: 185–203.

Zivkovic, S., Vukadinovic B., Veljkovic M., (2018), "Cleaner and energy efficient production: a case study", Environmental Engineering and Management Journal, Vol.17: 175-188.

Zhang, J., Liang, G., Feng, T., Yuan, C., & Jiang, W. (2020). Green innovation to respond to environmental regulation: How external knowledge adoption and green absorptive capacity matter? Business Strategy and the Environment, 29(1), 39-53.

Zhang, W., Sun, B., & Xu, F. (2020). Promoting green product development performance via leader green transformationality and employee green self-efficacy: The moderating role of environmental regulation. International Journal of Environmental Research and Public Health, 17(18), 6678.

Zhang, X., Le, Y., Meng, Q., & Teng, X. (2022). Green entrepreneurial orientation and financial performance in Chinese firms: The role of stakeholder engagement and green absorptive capacity. Corporate Social Responsibility and Environmental Management.

Zhao, X., Lynch Jr, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. Journal of Consumer Research, 37(2), 197-206.

Zhou, S., Zhang, D., Lyu, C., & Zhang, H. (2018). Does seeing "mind acts upon mind" affect green psychological climate and green product development performance? The role of matching between green transformational leadership and individual green values. Sustainability, 10(9), 3206.

Zhou, M., Govindan, K., Xie, X., & Yan, L. (2021). How to drive green innovation in China's mining enterprises? Under the perspective of environmental legitimacy and green absorptive capacity. Resources Policy, 72, 102038.

Appendix A.

Green Transformational Leadership

GTL1. Our top management inspires the members of the organization with environmental plans.

GTL2. Our top management provides a clear environmental vision for the members of the organization to follow.

GTl3. Our top management makes the members of the organization work together for the same environmental goals.

GTL4. Our top management encourages the members of the organization to achieve environmental goals.

GTL5. Our top management acts by considering the environmental beliefs of the members of the organization.

GTL6. Our top management stimulates the members of the organization to think about green ideas.

Green Absorptive Capacity

GAC1 The organizational structure of the firm can understand, analyze, and interpret information from external environmental knowledge.

GAC2 The firm can communicate environmental knowledge across its units.

GAC3 The firm can combine existing environmental knowledge with the newly acquired and assimilated environmental knowledge.

GAC4 The firm can recognize, value, and acquire external environmental knowledge that is critical to its operations.

GAC5 The firm can successfully commercialize new external environmental knowledge.

Green Product Innovation

GPT1. Our firm selects the product materials causing the least amount of pollution to conduct a product development or design.

GPT2. Our firm selects the product materials consuming the least amount of energy and resources to conduct product development or design.

GPT3. Our firm uses the lowest amount of materials to comprise the product for product development or design.

GPT4. Our firm would circumspectly deliberate whether the product is easy to recycle, reuse, and decompose for product development or design.

Green Process Innovation

GPI1. The manufacturing process of our firm effectively reduces the emission of hazardous substances or waste.

GPI2. The manufacturing process of our firm recycles waste and emissions, which allows them to be treated and reused.

GPI3. The manufacturing process of our firm reduces the consumption of water, electricity, coal, or oil.

GPI4. The manufacturing process of our firm reduces the use of raw materials.