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Examining Effect of Green Knowledge Acquisition, Green Transformational Leadership, and CSR on Sustainable Green Practices: Mediating Effect of Green Innovation.

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ABSTRACT

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Green sustainable practices can play a key role in gaining competitive advantage in the present complex marketplace. It is important to identify factors that can improve the sustainable green practices of organizations. Therefore, this research aims to examine the effects of CSR, green transformational leadership, and green knowledge acquisition on sustainable green practices through green innovation. Present study utilizes quantitative research approach to examine effect different factors on sustainable green practices. Data was gathered using simple random sampling from the employees working in organizations across the USA. PLS approach was used to confirm the validity of the model, specifically Smart PLS was employed for analysis. Results revealed that green innovation is one of the important antecedent of sustainable green practices. Results also underscore that green knowledge acquisition, transformational leadership, and CSR Plays key role to enhance green innovation. Also, statistics confirmed the mediation of green innovation. The originality of the research lies in providing empirical evidence from United States on the relations among green transformational leadership, CSR, and green knowledge acquisition on sustainable green practices by using green innovation as a mediator within a single framework.

INTRODUCTION

Organizations are facing numerous challenges, including environmental issues and the depletion of natural resources. Therefore, sustainable green practices are considered essential for ensuring long-term societal well-being and environmental protection. Sustainable green practices refer to responsible activities and behaviors aimed at promoting ecological balance, minimizing waste, conserving resources, and reducing pollution. Organizations are increasingly adopting these practices to address growing concerns related to climate change, environmental degradation, and unsustainable consumption patterns (Sharma, 2026).

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From a societal perspective, sustainable green practices ensures responsible use of environmental resources for future generations, preserving natural ecosystems, and improving public health. The adoption of sustainable green practices encourages communities and individuals to engage in environmentally conscious behaviors, including sustainable consumption, recycling, and energy conservation (Chaves-Castro et al., 2025). Additionally, these practices support economic stability by promoting efficient resource allocation and reducing environmental costs. Organizations and communities that actively promote sustainable green practices experience stronger environmental awareness among citizens, an improved quality of life, and a cleaner environment (Omer et al., 2025).

Green knowledge acquisition is critical for employees and society due to growing environmental and sustainability challenges (Baquero, 2025; Kaba et al., 2025). Green knowledge acquisition helps employees understand practices related to environmental protection, eco-friendly workplace behaviors, and resource utilization. Employees with strong green knowledge acquisition are capable of supporting organizational initiatives related to sustainability, conserving energy, and reducing waste (Barba-Aragón & Jiménez-Jiménez, 2024). These employees also contribute to environmentally conscious decision-making. Regular green knowledge acquisition improves employees' ability to enhance organizational performance on a long-term basis.

Green knowledge acquisition also promotes awareness among the general public regarding sustainable living practices, climate change, and environmental protection. It encourages communities and individuals to adopt environmentally friendly behaviors and consumption patterns that support ecological balance and social welfare (Boutaleb & Toukabri, 2026). Moreover, green knowledge acquisition contributes to the development of a sustainable society by improving citizens' knowledge so they can contribute to promoting sustainable development and addressing environmental issues. Therefore, effective green knowledge acquisition is vital for building environmentally responsible societies and workplaces (Khan et al., 2024).

Over the last few decades, green transformational leadership has emerged as an important managerial approach that encourages environmentally responsible behavior among employees and promotes environmental sustainability (Younis & Hussain, 2023). Organizational leaders who practice green transformational leadership inspire other employees by communicating a motivating and clear environmental vision so they can participate in sustainable workplace practices. By providing supportive leadership behaviors, environmental awareness, and ethical guidance, green transformational leadership encourages employees to become committed to organizational sustainability goals and adopt innovative green practices (Zehra et al., 2026).

Green transformational leadership also plays a highly significant role in shaping organizational culture that values sustainable development and environmental responsibility (Katou & Gianni, 2026). Such leadership enhances employee engagement and motivation to strengthen organizational reputation in society. Additionally, organizations led by environmentally responsible leaders contribute toward sustainable economic growth, resource conservation, and ecological protection. Thus, green transformational leadership is an important factor in creating environmentally conscious organizations (Alkandi, 2025).

Studies have mentioned that corporate social responsibility has gained importance for organizations, as they are expected to contribute toward environmental sustainability (Ajibike et al., 2023). Organizations that adopt corporate social responsibility initiatives focus on the well-being of society, communities, and employees along with economic performance. By adopting responsible business practices, corporate social responsibility helps organizations enhance long-term organizational sustainability, strengthen stakeholder trust, and build a positive organizational image (Gurler, 2026).

Additionally, corporate social responsibility creates an ethical and supportive work environment for employees that improves organizational commitment, motivation, and employee satisfaction

(Banerjee, 2025). Employees also feel engaged and proud when they work for organizations that are socially responsible and actively contribute toward community development and environmental protection (Bernardino, 2021). Furthermore, corporate social responsibility also supports social welfare by encouraging sustainable development initiatives, promoting ethical practices, and addressing environmental concerns. Therefore, corporate social responsibility is important for creating a balance between social and environmental responsibilities and organizational objectives (Ashurov et al., 2024).

In the present environmentally sensitive and competitive business environment, green innovation is important for firms that are looking for sustainable growth. Green innovation shows the development of products, and processes that improves organizational efficiency and minimize environmental impact (Mamun, 2026). Additionally, organizations respond effectively to the expectations of stakeholders that focuses on green innovation (Javed et al., 2026). For employees, green innovation encourages the adoption of sustainable work practices, problem-solving, and creativity that improve environmental performance within the organization (Gallardo-Vázquez & Sanchez-Hernandez, 2014). Employees contribute to operational efficiency that are engaged in green innovation (Mamun, 2026). Moreover, green innovation also promotes environmental protection, sustainable consumption, and cleaner production methods that contribute toward ecological balance and healthier communities. Overall, firms investing in green innovation achieve sustainable competencies while supporting social development and environmental goals (Ran & Qijia, 2025). The study aims to investigate the impact of green knowledge acquisition, corporate social responsibility (CSR), and green transformational leadership on green innovation and sustainable green practices among organizations working in USA. Present study selected United States as the context of research because business environment of US is known for awareness of employees regarding green innovation, adoption of environmental business practices by the organizations, and expectations of stakeholders regarding environmental sustainability. Additionally, Organizations based in US operates in highly competitive and innovative driven market where all stakeholders give priority to environmental responsibility.

LITERATURE REVIEW

Green Innovation (GI) and Sustainable Green practices (SGP)

Studies has referred green practices as a number of different initiatives intended to encourage and create trade that outcomes in creating business innovation and meeting human needs in sustainable manner (Sarmad et al., 2024). Terms green practices and going green are interlinked. In other words, different organizations look for and gather information that can lead to environmentally conscious and earth friendly practices and choices, that has potential to secure the resources of planet and sustain resources for its people in future (Chivandi et al., 2023). Organizations implement different green practices with purpose to minimize impact of their business operations on the environment (Umar et al., 2022). These actions by organizations can be grouped into different categories on the basis of their scope of application, including communication, education, and waste management, transport and facilities management, water consumption and energy, and wild life and natural resources (Chaves-Castro et al., 2025).

Studies has referred GI as product that minimize the risks and impact to the environment, prevent waste generation when they are disposed, and utilization of fewer resources (Wang & Liu, 2022). In other words, green product innovation is not only important for the protection of environment, but it is also important for more significant environmental benefits as compared to conventional products. Few studies have also defined GI as Innovation in software or hardware that is linked to green processes or products, including technologies that are involved in corporate environmental management, green product design, waste recycling, pollution prevention, and energy efficiency (Lin et al., 2024).

Green technology innovation is vital for operation practices and green production. Furthermore, GI can play important role to improve competitiveness of organization by altering environmental

performance (Wang, 2022). GI recently covers all state-of-the-art solutions that minimizes negative effect to the environment and promote green practices. It also helps in conservation of natural resources and provide support in maintaining ecological balance (Kouser et al., 2025).

The main advantage of technological innovation has its influence on adoption of innovation. Green adoption practices simplifies relationship between green practices and technological innovation (Alraja et al., 2022). Thus, GI has significant effect on SGP by enabling processes and technologies that minimize environmental harm such as waste reduction, energy efficiency, and lower pollution. It serves as important approach that improves organizational competitiveness and performance while improving ecological responsibility. The research by Beatson et al. (2020) mentioned that GI has positive effect on SGP.

H1: GI has positive influence on sustainable green practices.

Green Knowledge Acquisition (GKA) and Green Innovation (GI)

The research of Chen et al. (2014) defined GKA as process to acquire knowledge regarding environmental protection. The assimilation and acquisition of green knowledge will help manufacturing firms to enhance facilitation of the environmental resources. Green knowledge also helps manufacturing firms to develop resources that are important for the protection of environment (Borah et al., 2023).

This concept involves concrete efforts of organization to systemize, extract, and procure knowledge regarding preservation of environment. Organizations mostly gain knowledge from different external and internal resources, that are linked to their interests. The knowledge gained can be shared with stakeholders of the organization and can be retained so it can be used in future. Studies also mentioned that organizations that mostly employee, create and acquire knowledge for the betterment of organization (Pham et al., 2026). Thus, organizations mostly focus on development of mechanism that is required to organize knowledge so it can be used for future use (Idrees et al., 2023).

The main focus of a number of studies is to look for factors that are important to acquire green knowledge (Al-Faouri, 2023). Organizations gain green knowledge and become equipped to develop innovative processes, services and products to minimize the environmental harm. It also help the organizations to respond effectively to consumer demands and environmental challenges for sustainable products, proving organizations a competitive advantage (Borah et al., 2023). GKA play an important role to enhance GI by providing required insights and information that is required for sustainable development. Organizations that invest actively in acquisition of green knowledge are likely to achieve innovative outcomes to benefit long term business success and environmental protection. Khan et al. (2024) discussed the importance of GKA and revealed that GKA has positive significant effect on GI.

H2: Green knowledge acquisition has positive significant effect on Green Innovation.

Green transformational leadership (GTL) and Green Innovation

Transformational leaders play important role to promote personal growth of all of their followers by addressing developmental aspirations and concerns. These leaders motivate and inspire individuals to look for a creative solution of any problem as a mean to create change (Sobaih et al., 2022). Green transformational leaders achieve organizational goals by inspiring their followers (Chen et al., 2025). They also play vital role to develop environmental friendly habits among employees to provide them a strategic direction and clear vision (Janjua et al., 2024). Leaders also encourage the development of culture that helps in GI by providing a number of different means such as rewards, promotions, skill development, and training. Green transformational leaders also set certain performance criteria so that each employee can contribute actively to the green transformation (Rizal et al., 2024).

The main point emphasize that it is important to understand the way environmental principles shape the organizational staff, operations, strategies, and culture. Green transformational leaders intellectually engage, innovate, and motivate their employees to achieve environmental goals. These leaders make environmental sustainability a main goal of organizational ethics using influence, charm, and vision (Amjad et al., 2025). Green transformation leaders have dramatic effect on the internationalization of environmental values and development of strategies at all levels of organization (Sanusi et al., 2023).

Several studies supported the relationship between GTLand GI. Such leaders realize the characteristics, dynamic capabilities, and responsibilities of their employees. They also understand the external and internal motivational forces that may impact the positive outcome of the employees. When organizational leadership communicates clear vision for the sustainability of environment through green transformational leaders, the vision is operationalize by fostering green culture in organization (Le & Gia, 2025). Green transformational leaders foster an innovative culture that enhances environment friendly culture within organization (Younis & Hussain, 2023). When sustainability is emphasized by green transformational leaders, employees receive and expect rewards for environmentally friendly behavior. The empirical study conducted by Alkandi (2025) highlighted that GTLis one of key antecedent of GI.

H3: Green transformational leadership has positive significant effect on Green Innovation.

CSR and GI

Studies discussed corporate social responsibility as voluntary exercise of the organization to incorporate economic, social and environmental concern into activities of business, therefore strengthening the affiliation with stakeholders of organization (Marco-Lajara et al., 2022). The main focus of this concept is on different factors that can contribute to address the environmental, social, and economic impact surrounding the organization (Mo et al., 2022). As a whole, CSR shows the behavior of organization in society, and its influence on the social admissibility and enterprise reputation that in-turn improves innovation performance. The CSR practices of organization are reactive and proactive actions with purpose to gain competitive advantage (Tran et al., 2025).

Scholars treat activities of CSR as important driver to enhance organizational innovation. Therefore, most of the organizations adopt activities of CSR as a path of regular innovation to develop novel prospects of markets to prosper and emerge (Mbanyele et al., 2022). Activities of CSR also support organizations to gain groundbreaking consequences that can be viewed in a well-organized eco-friendly management, pollution deterrence, and application of energy (Hao & He, 2022). In terms of relationship between activities of CSR and innovation, past studies showed inconsistent results showing correlation between different activities of CSR and innovation. Organizations that actively focus on environmental CSR activities and show responsible management of resources are able to control pollution, waste management and sustainable production processes. As a result, organization is able to develop new environmental friendly operational methods, services, and products (Gurler, 2026).

CSR enhances reputation of organization among stakeholders, investors, and customers. Therefore, businesses are motivated to innovate and their market competitiveness is increased (Shahzad et al., 2020). Through different environmental commitments, organizations mostly allocate organizational resources towards R&D for sustainable packaging, renewable energy solutions, and cleaner technologies that directly promotes GI. CSR encourages organizations to comply with environmental regulations and find out demands of future sustainability, minimizing risks while developing long term business opportunities. The study of Mo et al. (2022) revealed that CSR activities have positive significant link with GI.

H4: CSR has positive effect on green innovation.

Mediating Role of Green Innovation

Scholars have recognized CSR as key strategic factor of environmental sustainability within the organization. scholars also suggested that organization that are engaged in different activities of CSR are likely to adopt eco-friendly production systems, resource efficient operations, and environmental responsible policies. Whereas scholars also argued that CSR is not enough alone for the implementation of SGP unless organization transform their environmental and social commitment into innovative practices (Yumei et al., 2022). Therefore, GI has a very important role as mediator. GI is referred as development of managerial practices, processes, and friendly products that minimizes environmental harm while improving efficiency of organization (Kraus et al., 2020). past empirical studies showed that CSR focused organizations often invest more on environmental process innovation, sustainable product design, and green technologies. As a result, these innovations enhance SGP by sustainable utilization of resources, pollution control and waste reduction. This, GI plays the role of bridge by which initiatives of CSR that are later translated into long term SGP. The research by Juo and Wang (2022) also revealed mediating role of GI in their study. So, this study assumes that

H5: Green Innovation mediates between CSR and sustainable green Practices.

Studies have considered GKA as basic capability of organization that enable organizations to implement, adopt, and understand environmentally friendly strategies. GKA involves obtaining knowledge related to environment from different external stakeholders, and internal experiences, technological developments, research institutions, and market trends. Studies also indicated that organizations that possess strong green knowledge have more capability to respond effectively to different challenges of environment and identify sustainable opportunities. It is vital to understand that acquired knowledge may not lead to SGP directly (Malik et al., 2023). Therefore, GI plays an important role as mediator. With the help of GI, organizations are able to convert knowledge of environment into sustainable operation systems, energy efficient technologies, cleaner production technologies, eco-friendly products (Khan et al., 2024). Scholars also highlighted that organizations having higher level of GKA show stronger capability to innovate that later have impact on sustainable initiatives. In other words, GI provide path to connect GKA and SGP. In past, Zameer et al. (2022) also demonstrated mediating role of GI in their study. So,

H6: Green innovation mediates between green knowledge acquisition and sustainable green practices.

GTL is discussed as vital approach of leadership that encourages organizations and employers to give priority to sustainable oriented goals and environmental responsibilities. Leaders having orientation of green transformational style, often inspire their followers through motivation regarding environmental conscious behavior, intellectual stimulation, and environmental vision. A supportive environment is created by such leaders where employees are given opportunity to develop environmentally sustainable solutions and think creatively (Nureen et al., 2023). Despite this linkage, the direct association between GTL and SGP is not possible in absence of innovative initiatives. GI provides linkage at the operational level that translates vision of leadership into environmental outcomes. Organisations that get guidance from transformational leaders often introduce different new green technologies, implement sustainable product improvements, and redesign eco-friendly processes (Begum et al., 2022). Organizational capability enhances as result of such innovation that helps organizations to adopt environmental responsible operations. Thus, GI plays the intervening role between GTL and SGP as discussed by Sobaih et al. (2022).

H7: Green innovation act as mediator between and sustainable green practices.

On the basis of above discussion, figure 1 is developed illustrating research framework showing antecedents of sustainable green practices.

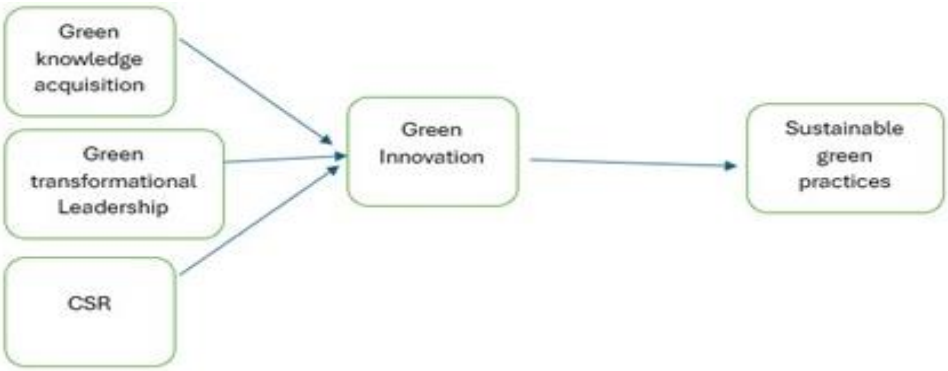


Figure 1: Framework

METHODOLOGY

Current literature review has shown that there exists a significant association of GKA, GTL and CSR on GI and then on SGP. Therefore, the response for present study was taken from employees of different companies based in USA. The research methodology that has been adopted for this research is cross-sectional in design and quantitative in nature. The measurement scales developed in Likert scale for SGP was adapted from Kouser et al. (2025), measurement scale of CSR was adapted from Gallardo-Vázquez and Sanchez-Hernandez (2014), scale of GTL was adapted from Sobaih et al. (2022), items of GI was taken from Sarmad et al. (2024), and measurement items of GKA was adapted from Sahoo et al. (2023). Simple random sampling was used to distribute questionnaire among 300 students, having response rate of 63%. SEM approach was used for analysis by using Smart PLS 4 along with SPSS (Ramayah et al., 2018).

RESULTS

There are five constructs involved in the proposed framework of the study. Three constructs are independent variables, whereas one is mediator and one is dependent variable. Analysis started with SPSS for evaluation of demographics of the respondents. As per the results, 91.21% of respondents were male, and remaining respondents were female. In terms of age, 27.21% participants had the age of more than 18 and less than 30 years, 40.68% had the age more than 31 and less than 45 years, and remaining respondents had the age more than 45 years. In terms of marital status, 61.28% respondents were married, and remaining were either not married or divorced.

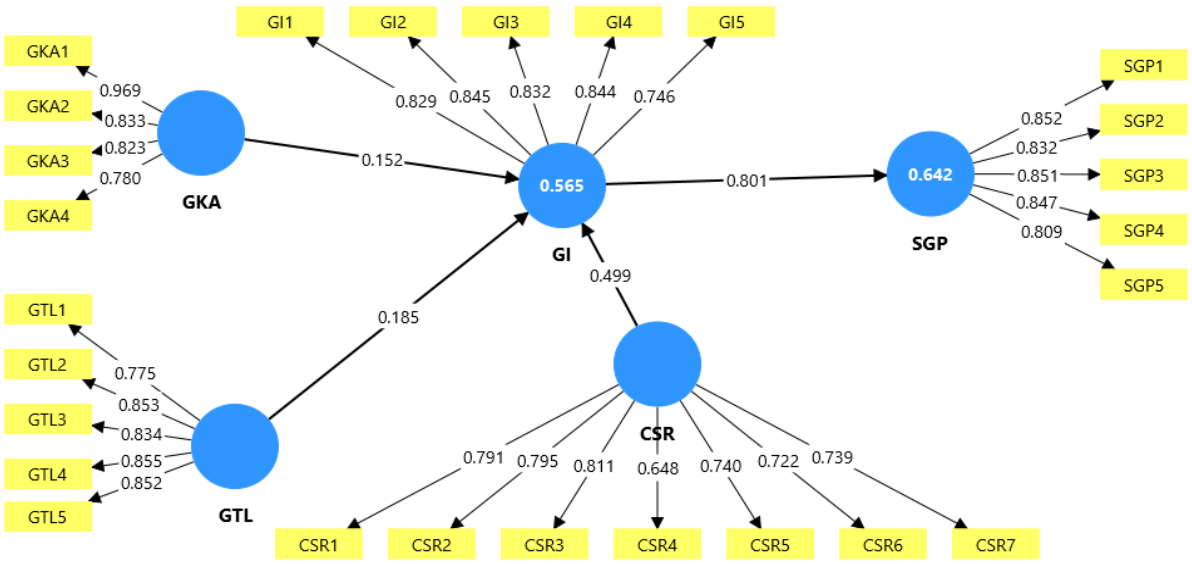


Figure 2: Outer model

After evaluation of demographics from SPSS, at next stage Smart PLS was used for further analysis. Beginning from measurement model analysis, validity and reliability were examined through AVE and composite reliability. Assessment of convergent validity involves examination of AVE, composite reliability (CR) and factor loading. Literature recommends the value of factor loading to be more than 0.50 (Hair et al., 2014) and the same for AVE to be more than 0.50. Table 1 and figure 2 shows the factor loading is higher than 0.50, meeting the required criteria.

Table 1: Loading

	CSR	GI	GKA	GTL	SGP
CSR1	0.791				
CSR2	0.795				
CSR3	0.811				
CSR4	0.648				
CSR5	0.740				
CSR6	0.722				
CSR7	0.739				
GI1		0.829			
GI2		0.845			
GI3		0.832			
GI4		0.844			
GI5		0.746			
GKA1			0.969		
GKA2			0.833		
GKA3			0.823		
GKA4			0.780		
GTL1				0.775	
GTL2				0.853	
GTL3				0.834	
GTL4				0.855	
GTL5				0.852	
SGP1					0.852
SGP2					0.832
SGP3					0.851
SGP4					0.847
SGP5					0.809

Further, CR and AVE were examined for the assessment of convergent validity. Table 2 shows that all values of CR are higher than 0.70. Moreover, AVE figure is also higher than 0.50 (Henseler et al., 2015), meeting the required criteria for further assessment of measurement model analysis.

Table 2: CR and AVE

	CR	AVE
CSR	0.900	0.564
GI	0.911	0.673
GKA	0.915	0.730
GTL	0.920	0.696
SGP	0.922	0.703

Discriminant validity test was conducted to check the variance among the variable of the study. This test is important to show that there is difference among the variables that are involved in study. For this purpose, two approaches were used namely Fornell and Larker approach, and HTMT approach. Table 3 shows that all values at the diagonal are higher than remaining values meeting

requirements of Fornell and Larker approach.

Table 3: Fornell and Larker approach

	CSR	GI	GKA	GTL	SGP
CSR	**0.751**				
GI	0.725	**0.820**			
GKA	0.604	0.561	**0.854**		
GTL	0.730	0.638	0.584	**0.835**	
SGP	0.780	0.801	0.670	0.723	**0.838**

In terms of HTMT approach, Henseler et al. (2015) mentioned that all values of the matrix must be less than 0.90. Table 4 shows that HTMT values are less than 0.90, meeting the required criteria. Thus, discriminant validity is confirmed using HTMT and Fornell and Larker approach.

Table 4: HTMT criteria

	CSR	GI	GKA	GTL	SGP
CSR					
GI	0.826				
GKA	0.694	0.634			
GTL	0.826	0.714	0.661		
SGP	0.883	0.898	0.758	0.809	

Additionally, R square value was assessed at the end of measurement model for the examination of impact of independent variables on the outcome variables. Figure 2 and Table 5 shows that GI is affected 56.5% and SGP is affected 64.2% by the proposed exogenous variables.

Table 5: R square

	R-square
GI	0.565
SGP	0.642

The estimates regarding the relationships that were hypothesised between exogenous constructs and latent constructs at the stage of structural model. The relationship strength is shown through the significance and magnitude of the estimates. Path coefficients that are closed to +1 show positive strong relationship, whereas value that is closed to -1 show strong negative relationship. Whereas significance is determined through P and t values. Table 6 shows findings of study.

Table 6: Results

	B	SD	T	P values
CSR -> GI	0.499	0.068	7.307	0.000
GI -> SGP	0.801	0.021	38.084	0.000
GKA -> GI	0.152	0.056	2.722	0.003
GTL -> GI	0.185	0.066	2.778	0.003
CSR -> GI -> SGP	0.400	0.057	7.040	0.000
GKA -> GI -> SGP	0.122	0.044	2.741	0.003
GTL -> GI -> SGP	0.148	0.054	2.732	0.003

Statistical results given in Table 6 show that CSR has positive effect on GI with t= 7.307, β= 0.499; GI has significant positive association with SGP having t=38.084, β=0.801; GKA has positive impact on GI with t=2.722, β=0.152; and GTL have positive significant effect on GI with β=0.185, t=2.778. In terms of mediating results, GI mediates the relationship between CSR and SGP, t=7.040; GI mediates between GKA and SGP, t=2.741; and GI mediated between GTL and SGP, t=2.732. Thus, all proposed hypotheses are supported.

DISCUSSION

SEM approach as Smart PLS as tool was used to get the results of the study. Findings revealed that green innovation has positive significant effect on sustainable green practices. This finding shows that U.S. based organizations that adopt green innovation are likely to implement sustainable green practices at the managerial and operational levels, particularly in response to increasing environmental regulations, stakeholder expectations, and the growing emphasis on environmental initiatives in the United States. The findings also suggest that employees working in different organizations in the USA that help in the promotion of green activities are likely to support and be engaged in green practices in their daily operations and activities. U.S.-based employees are encouraged through green innovation to adopt environmentally responsible behaviours, participate in eco-friendly operational processes, and improve resource utilization over time. Employees working at U.S based organizations mostly perceive those different kinds of green initiatives, including waste reduction systems, green product development, and environmentally sustainable technologies, provide strength to sustainable green practices within the organization while they are operating in the U.S. Furthermore, green innovation develops awareness among U.S.-based employees about environmental sustainability. Additionally, it also motivates U.S based employees to contribute toward the environmental sustainability goals of the organization. The findings also indicate that U.S. based employees play a key role in the implementation of sustainable green practices successfully when organizations provide supportive environmental policies and innovative green solutions. These results are aligned with past studies that emphasized that green innovation play key roles to enhance sustainable green practices (Beatson et al., 2020).

Results also demonstrate that green knowledge acquisition has positive significant influence on green innovation as discussed in past by Khan et al. (2024). These findings highlight the vitality of green knowledge acquisition to enhance the ability of U.S.-based organizations to develop sustainable business practices and innovative environmental solutions. Green knowledge acquisition helps U.S. based employees to obtain important information that is linked to eco-friendly operational strategies, sustainable production methods, green technologies, and environmental management. Through effective green knowledge acquisition, U.S based organizations gain the ability to identify challenges related to the environment and generate green ideas in order to handle these challenges. The present study further shows that green knowledge acquisition provides strength to employee creativity that encourages green innovation within services, products, and processes. U.S. based employees who participate in the acquisition of green knowledge are likely to contribute to sustainable organizational improvements and innovative environmental initiatives. Additionally, green knowledge acquisition provides support to learning on a continuous basis and also provides support to the integration of innovative activities into environmental knowledge.

Results highlights that green transformational leadership is vital to enhance green innovation. In past, Alkandi (2025) also demonstrated same findings in their study. In other words, green transformational leadership plays a very important role in promoting green innovation within U.S. based organizations. One of the possible reasons for this result is that transformational leaders mostly encourage U.S.based employees to challenge conventional working methods and think creatively, which supports the development of innovative ideas and environmentally friendly practices which are consistent with the innovation-oriented organizational culture commonly observed among U.S. firms. U.S. based transformational leaders mostly inspire employees through continuous motivation, intellectual stimulation, and an environmental vision towards sustainability objectives. Such practices of transformational leadership develop a supportive environment where U.S. based employees are encouraged to think about green solutions in order to avoid failures. Furthermore, transformational leadership provides strength to the environmental commitment of employees and enhances their willingness to take part in activities that are based on innovation and contribute to sustainable results.

Green transformational leadership enhances collective problem solving, knowledge sharing, and collaboration, which are important for green innovation. Additionally, green transformational leadership inspires responses to environmental challenges and promotes organizational adaptability, which enables organizations to adopt innovative green products, processes, and technologies in sustainability oriented and competitive markets.

Results also revealed that CSR activities of US based organization have positive significant effect on green innovation (Mo et al., 2022). The relationship between CSR and green innovation can be explained by using environmental factor of CSR, that encourages organizations operating in US to focus on environmentally friendly operational practices and sustainable values. US based organizations that are actively engaged in activities of environmental CSR and similar other initiatives often focuses on responsible resource usage, pollution control, energy efficiency, and waste reduction, creating a very strong base for innovative green practices. Organizations are pushed to explore sustainable businesses processes, eco-friendly products, and new technologies because of environmental commitments with purpose to improve environmental performance. Furthermore, CSR also increase pressure on organization to meet the expectations of stakeholders regarding environmental responsibility and sustainability. As a result, US based organizations are willing to spend more on R&D for environment friendly solutions. CSR also shapes attitude of employees by strengthening employee awareness regarding sustainability and environmental protection goals, that later support innovative behavior. Thus, focus of different CSR activities is to focus on continuous green innovation within US firms.

The mediating role of green innovation was also supported in this study. Results indicated that green innovation mediates the path of green transformational leadership and sustainable green practices. These findings also suggest that green innovation play the role of key mechanism by which green transformational leadership enhance sustainable green practices. The relationship mentioned in result shows that leaders having transformational leadership qualities encourage their employees to generate ideas that are environmentally innovative, improve green operational processes, and adopt eco-friendly technologies. Organization operating in USA can easily develop innovation-oriented culture with the help of green transformational leadership that provide support to creativity. Subsequently, these innovative activities strengthen sustainable green practices at all functions of the organization. Moreover, transformational leadership enhance environmental commitment and motivates the employees as well that further facilitates in green innovation.

Study also supports the mediating effect of green innovation between CSR and sustainable green practices. In the United States, organizations that emphasize on the CSR initiatives are likely to focus on resource efficient technologies, environmentally safe products, and cleaner production methods to fulfil the responsibilities of sustainability. These innovations based on environment help the organizations in the United States to translate their environmental commitments into long term sustainable practices and green actions. Moreover, environmental CSR also encourages organizations within United states to improve ecological performance, pollution reduction, energy conservation, and waste management. Resultantly, green innovation is considered as vital process by which initiatives of environmental CSR can effectively be converted into green practices.

Statistical results also showed that green innovation mediates the relationship between green knowledge acquisition and sustainable green practices. These results implies that within US business environment, green knowledge acquisition provides sustainable related insights, technical expertise, and important environmental information is provided to the organization that provide support to different green solutions. In context of US, organizations having strong capabilities of green knowledge acquisition are likely to adopt sustainable practices, develop eco-friendly processes, and identify environmentally friendly methods. Whereas the impact of green knowledge acquisition can be more effective if they are transformed into activities of green activities. Organizations in United States, are able to improve their sustainable performance through green innovation. So, green knowledge

acquisition plays the role of important foundation that improves green innovation and ultimately leads to sustainable green practices (Sobaih et al., 2022). Overall, these results show that organizational environment of US, characterized through increased environmental expectations, advanced technological capabilities, and strong stakeholder awareness, provides conditions to organizations that are favorable so they can translate CSR initiatives, transformational leadership, and green knowledge into sustainable green practices.

LIMITATIONS AS FUTURE DIRECTIONS

Some of the limitations of the study are highlighted in this section along with future recommendations. Firstly, this model identifies the antecedents of sustainable green practices. The performance is one of the important indicators that must be assessed in term of green initiatives. Therefore, future studies should look for the factors that can improve green performance of the organization. Further, study focused on the factors like green knowledge acquisition and green transformational leadership as two of the antecedents of green innovation. It is proposed to examine the role of supply chain in improvement of green innovation. Additionally, this study is conducted in context of US that may limit generalizability of the results to other cultural settings. It is proposed to conduct similar study in countries based in Asia.

Also, the study focuses on the environmental dimension of CSR as exogenous variable. It is recommended that future studies should focus on consolidated CSR activities including all other dimensions. Additionally, the R square value of the study is 56.5% and 64.2% for mediator and DV respectively. It shows that future studies should focus on identification of other variables that can improve R square values as well. It is also proposed to explore moderating effect of employee satisfaction.

THEORETICAL AND MANAGERIAL IMPLICATIONS

In terms of theoretical implications, this study extends the U.S. sustainability management literature by integrating green knowledge acquisition, CSR, green transformational leadership, green innovation and sustainable green practices into a single framework within the context of organizations operating in the United States. Research enhances the understanding of green innovation as mediator between sustainable green practices and its antecedents in the US business environment. Study also broadens the application of knowledge-based perspectives and transformational leadership in environmental management research by providing empirical evidence from the United States, thereby enriching the generalizability of sustainability theories across developed economies.

In terms of managerial implications, results suggests that that managers of U.S. organizations should invest in green knowledge acquisition, CSR initiatives, and encourage transformational leadership behavior to improve innovative capacity. Managers should also align sustainability initiatives with evolving stakeholder expectations, regulatory requirements, and market demands in the United States while promoting environmentally friendly solutions to enhance sustainable green practices.

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