

# How Leaders' Intellectual Humility Drives Frugal Innovation: A Moderated Mediation Study of Pharmaceutical SMEs in Pakistan

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## ABSTRACT

**Purpose**—In the face of contemporary challenges, the pursuit of sustainability has become imperative for SMEs of emerging economies. Despite the recent upsurge in attention to leaders' humility, its subdomain, intellectual humility as a leadership psychological trait, has been less explored in sustainability research. Based on Upper Echelon Theory, this study aims to examine how and when leaders' intellectual humility influences the adoption of frugal innovation by examining strategic sustainable orientation as a mediating mechanism and relational embeddedness as a boundary condition in SMEs of the Pharmaceutical industry of Pakistan.

**Study Design/methodology/approach**— This study used a simple random sampling approach for data collection through time lagged design, with a one-month lag between each measurement point (three-time intervals) from 275 managers of SMEs working in the pharmaceutical sector. Moreover, PROCESS-macro by Hayes was used for testing the proposed hypothesis.

**Findings**—Our findings reveal a significant positive impact of leaders' intellectual humility on frugal innovation. In addition, strategic sustainable orientation partially mediates the leader's intellectual humility – frugal innovation relationship. Moreover, relational embeddedness moderates the relationship between leaders' intellectual humility and strategic sustainable orientation, and between leaders' intellectual humility and frugal innovation through strategic sustainable orientation.

**Practical Implications**—This study is novel in introducing intellectual humility as a distinct cognitive leadership trait that shapes strategic sustainable orientation and frugal innovation within the Upper Echelons framework. This study offers context-specific insights from pharmaceutical SMEs in an emerging economy, thereby improving the relevance of humility-based leadership research for resource-constrained settings. Practically, this suggests nurturing intellectual humility in leadership development to foster sustainable outcomes.

**Keywords:** Intellectual Humility (LIH), Strategic sustainable orientation (SSO), Relational embeddedness (RE), Frugal Innovation (FI), Upper Echelon Theory (UET),

**JEL Classification Codes:** M1, M100, M120, M19

## 1 | INTRODUCTION

“If leadership has a secret sauce, it may well be humility”—The Economist (2013, p. 59)

Against the backdrop of Grand societal challenges to protect the people and planet, end poverty and ensure prosperity for all, reflected in UN sustainable development goals (SDG's) (United Nations, 2022), there is pressing need to incorporate sustainability principles into strategies by firms ([Gillani, Kutaula & Budhwar, 2023](#); [Kutaula et al., 2025](#); [Ren et al., 2023](#)). The significance of sustainability has grown globally due to rising concerns about social and economic challenges faced by modern society. In such a situation, leadership plays a crucial role in dealing with current challenges of the contemporary world and guides firms to a more sustainable and responsible future ([Erthal & Wegner, 2025](#)). Leaders need to develop strategies that achieve economic success while also meeting social and environmental obligations ([Tran, 2024](#)).

The persistent environmental issues with growing demands of stakeholders have raised concerns about sustainability and socially responsible behavior in leadership literature ([Arici & Uysal, 2022](#); [Cop, Olorunsola & Alola, 2021](#)). Reflecting on the significance of leadership in tackling societal grand issues, Burns et al. ([2021, p. 131](#)) claimed that “sustainability has become an inextricable aspect of leadership”. Specifically, leaders' humility has now become increasingly important in today's complex, uncertain, and competitive business environments ([Chughtai, Khalid, Guan & Razzaq, 2023](#); [Ou et al., 2014](#); [Owens, Johnson & Mitchell, 2013](#)). It has been recognized as a prerequisite for today's upheavals, crises and opportunities ([Frank, 2023](#)).

Despite “rich philosophical and theoretical roots of humility” ([Ou et al., 2014, p. 4](#)), leaders' humility emerged as a novel approach in leadership development ([Kelemen, Matthews, Matthews & Henry, 2023](#); [Liborius & Kiewitz, 2022](#)). It has been suggested that it is an important component of good leadership ([Newstead, Dawkins, Macklin & Martin, 2021](#)). Humility has its grounds in management and psychology research and is increasingly signifying its strategic relevance ([Nasir, Chinchilla, Chughtai & Khalid, 2024](#); [Petrenko, Aime, Recendes & Chandler, 2019](#)). Particularly, Intellectual humility, as a subdomain of general humility, has a distinctive cognitive core. Humble leadership focuses on ethical and relational concerns, such as accepting mistakes, appreciating contributions of others, and being selfless ([Chan, Hekman & Foo, 2024](#)). In contrast, leadership intellectual humility emphasizes epistemic qualities, specifically recognizing cognitive limitations, open-mindedness, and modifying one's opinion based on new evidence ([Al-Abrow et al., 2023](#)). This distinction highlights the burgeoning significance of leadership intellectual humility as an emerging concept in the field of leadership ([Gao, Niu & Yu, 2025](#)).

Intellectual humility has been defined as “recognizing that a particular personal belief may be fallible, accompanied by an appropriate attentiveness to limitations in the evidentiary basis of that belief and to one's own limitations in obtaining and evaluating relevant information” ([Leary et al., 2017, p. 793](#)). This study follows Leary's ([2017](#)) definition of intellectual humility for leaders' intellectual humility, wherein leaders displaying intellectual humility demonstrate respect and regard for others and are more receptive to others' opinions and suggestions. Traditionally, intellectual humility has been recognized as a moral virtue, now widely acknowledged as a cognitive virtue in contemporary research. In essence, this is a cognitive phenomenon, involving how individuals think about themselves and their social surroundings ([Leary et al.,](#)

2017) and entails deep reflection on one's existing knowledge, recognizing it might be imprecise, imperfect, or out of date (Bowes & Tasimi, 2023). This multidimensional nature of intellectual humility involves metacognitive, emotional, and relational aspects such as inclination to consider contradictory views and respect for others' intellect and opinions (Priest, 2017). The metacognitive attributes such as intellectual humility, perspective-taking, and open-mindedness are viewed as crucial for dealing with complex social problems (Sternberg, 1998; Sternberg, Cianciolo & Antonakis, 2004).

Although research on leaders' intellectual humility is still in its infancy, research findings have demonstrated its relationship to a variety of employee and firm-level outcomes (Porter et al., 2022). Most of the existing research has focused on leaders (general) humility such as positive influence of leader's humility on individual level and team level outcomes (Chandler, Johnson, Jordan & Short, 2023; Kelemen, Matthews, Matthews & Henry, 2023; Naseer et al., 2020; Owens & Hekman, 2016; Owens, Johnson & Mitchell, 2013; Rego et al., 2019) and specifically, on firm level outcomes such as performance and innovation (Petrenko, Aime, Recendes & Chandler, 2019; Tuwey & Ngeno, 2019) with scant research on leaders' intellectual humility. Relatedly, the positive influence of leaders' humility is not confined to only financial performance in the short run but also facilitates the sustainable development of firms in the long run (Ren et al., 2023). Further, it leads firms to implement socially responsible behavior's (Nguyen, Nguyen, Vo & Tuan, 2023) such as green innovation (Cheng et al., 2023). The desire of humble CEOs to achieve something greater than self for the superior benefits and serving collective interests of the firms is what motivates them to learn and grow (Ou et al., 2014).

Given that, sustainability has become a strategic imperative for firms around the globe, where shareholders, employees, and customers are collectively influencing a cultural shift towards more sustainability consciousness (Hengst, Jarzabkowski, Hoegl & Muethel, 2020). In today's rapidly changing global scenario, firms are becoming more conscious about sustainability issues, realizing their responsibility (Hörisch, Freeman & Schaltegger, 2014) and striving to contribute towards the economy, environment, and society for a more sustainable world (Heikkurinen & Bonnedahl, 2013; Khizar, Iqbal, Khalid & Adomako, 2022). This is in line with the declaration made by Weidinger et al. (2014, p. 289) that "without sustainable organizations, there is no sustainable development, thus, no future". Sustainability orientation refers to the degree to which firms incorporate sustainability considerations into their strategic priorities, values, and decision-making processes (Khizar, Iqbal, Khalid & Adomako, 2022). A recent study established that intellectually humble leaders create an environment where openness to diverse perspectives is encouraged, which is necessary for adopting strategic change successfully and enabling firms to adapt in complex and dynamic circumstances effectively (Niu, Willoughby & Zhou, 2021).

Currently, both developed and emerging economies are facing crises, resource scarcity, and stagnant economic growth (Bouncken, Kraus & de Lucas Ancillo, 2022), compelling customers to be highly price sensitive, conscious about protecting the environment, and adopting a frugal way of living (Hossain, 2021). Also, economic downturn and environmental turmoil have greatly influenced the strategy of firms and innovation both in advanced and developing countries (Rossetto & Borini, 2017; Rossetto, Borini, Bernardes & Frankwick, 2017). In such circumstances, SMEs with limited resources and restricted capital are facing difficulties in identifying useful ways for innovation (Lei, Ha & Le, 2020; Yang, Nguyen & Le, 2018).

Concurrently, changing customer behavior toward sustainability highlights the rising need for affordable, eco-friendly solutions ([Sharma, Pandey, Girdharwal & Charon, 2024](#)). Specifically, in the context of SMEs of the Pharmaceutical sector of Pakistan, resources are limited, which restricts heavy R&D investments and increases reliance on affordable creative solutions.

Keeping in view of resource constraints of developing economies, firms are forced to discover novel ways such as sustainable based innovations to strategically enhance their performance ([Dey et al., 2022](#); [Pereira et al., 2022](#)), giving rise to the idea of "frugal innovation," which has captured attention of academics and practitioners ([Dost, Pahi, Magsi & Umrani, 2019](#); [Lei, Gui & Le, 2021](#)). Frugal innovation emerged as a practical approach to enhance performance and achieve a sustainable competitive advantage ([Chughtai, Amin, Khalid & Ahmed, 2023](#)). It is also considered the preferred option for the customers of emerging and developing countries who focus on key features and improved efficiency ([Kroll & Gabriel, 2020](#)). In this regard, Iqbal & Piwowar-Sulej ([2025](#)) have also called for future research on FI and its antecedent factors in the context of SMEs.

Recent research has acknowledged the important role of leadership for driving firms' innovation ([Alblooshi, Shamsuzzaman & Haridy, 2021](#); [Chughtai, Syed, Naseer & Chinchilla, 2024](#)). Specifically, research studies indicate that a firm's FI is primarily influenced by leadership qualities and its intellectual resources, including a strong knowledge base and management expertise, rather than its physical assets, capital, and infrastructure ([Choi, Ha & Choi, 2022](#)). In the context of SMEs of Pakistan's Pharmaceutical sector, the resource-constrained environment demands leaders who can think openly, acknowledge limitations, and integrate social and environmental concerns into firm strategy, making intellectual humility a key driver of sustainability-oriented decisions that ultimately encourage FI.

Based on Upper Echelon Theory (UET) ([Chatterjee & Hambrick, 2007](#); [Hambrick & Mason, 1984](#)), which signifies the key role of top managers in influencing strategic decisions and the overall performance of firms. Among these attributes, personality dispositions, cognitive traits, values, emotions, and other internal attributes are found to influence important strategic outcomes of firms ([Herrmann & Felfe, 2014](#); [Kiss, Cortes & Herrmann, 2022](#)). UET is a keystone in the domain of strategic management and organizational studies, offering insights into how leadership dynamics affect firms' developmental paths. On this basis, Intellectual humility can be conceptualized as leaders' cognitive trait that leads to firms' frugal innovation. The distinctive cognitive mechanisms underlying intellectual humility, particularly epistemic openness, awareness of knowledge limitations, and belief revisability when confronted with new evidence, explain how leaders process information, update strategic judgments, and adapt firm strategies, moving beyond behavioral expressions of humility.

Further, Hambrick and Mason ([1984](#)) built a linear model linking the challenges the firms face and the psychological traits of top managers in their upper echelon with strategic decisions to address these challenges, and the performance of the firm. As they observed, "the heart of the theory is the portrayal of upper echelon characteristics as determinants of strategic choices and, through these choices, of organizational performance" ([Hambrick & Mason, 1984, p. 197](#)). UET also views psychological attributes of executives and top managers as informational filters that influence their responses to external situations ([Hambrick & Mason, 1984](#)),

implying that the relationship between CEO traits and firm performance is indirect. That is, the underlying or mediating mechanism needs to be considered. The core of UET is that the strategy is the main mechanism through which CEOs influence the performance of the firm ([Hambrick & Mason, 1984](#)). UET also elucidates how leaders' attributes translate into motives for taking sustainability initiatives ([Dubey et al., 2019](#)). Therefore, this study suggests strategic sustainable orientation as a mediating variable, which has recently emerged as an important topic of study ([Khizar, Iqbal, Murshed & Ahsan, 2024](#)).

Furthermore, given that innovation emerges because of interactions between internal and external members of firms ([Shalley, Gilson & Blum, 2009](#)). In a situation of strong network ties with external members, this relationship will be more pronounced because such a relationship promotes relational trust among members, which reduces opportunistic behavior, allowing knowledge transmission and facilitating adaptation to external changes ([Cheng, 2020](#)). The social networking position enables a firm to generate benefits, such as access to resources and valuable knowledge, which in turn enhances the firm's strategic direction ([Anwar et al., 2024](#); [Emami, Moradi, Idrus & Almutairi, 2012](#)). Hambrick and Mason (1984) also suggested that personality traits and cognitive frames of leaders shape their perception and understanding of the situation ([Cristofaro, Giardino, Camilli & Hristov, 2024](#)). In line with this, Khizar et al. (2024) made a recent call for further research to examine strategic orientations within their relevant context rather than in isolation. Therefore, this study analyses whether relational embeddedness enhances the impact of LIH on SSO.

### 1.1 | Research Gap and Objectives

Leaders' intellectual humility has recently captured increasing scholarly attention as an influential topic of research in the leadership domain ([Krumrei-Mancuso & Begin, 2022](#)). Despite growing interest in humble leadership, existing research has largely focused on general humility and individual-level outcomes, while the role of leaders' intellectual humility in shaping firm-level innovation remains underexplored, particularly in resource-constrained SME contexts such as Pakistan. Moreover, existing studies on humility and innovation primarily examine direct effects and internal organizational mechanisms, overlooking strategic sustainability orientation as a mediating process and external relational structures as boundary conditions. Accordingly, to fill this gap in the literature, this study aims:

**RQ1:** To examine the effect of leaders' intellectual humility on frugal innovation.

**RQ2:** To investigate the mediating role of strategic sustainable orientation.

**RQ3:** To examine the moderating role of relational embeddedness.

This study makes several theoretical and empirical contributions. First, this study advances research on intellectual humility in the leadership domain by distinguishing it theoretically from general humility ([Davis et al., 2016](#)). Second, by relying on Upper Echelon Theory ([Hambrick & Mason, 1984](#)) as an overarching theoretical framework, this study contributes to the literature of leadership and sustainability by providing novel insights into the key role of intellectual humble leadership in embracing frugal innovation, specifically in developing countries like Pakistan. Third, we contribute to the literature by identifying SSO as a critical explanatory mechanism linking LIH to sustainable outcomes. UET also emphasizes the interplay between leaders' traits and situational factors, allowing us to examine not only the cognitive processes affecting

strategic outcomes but also leaders' relational factors that strengthen these relationships. Fourth, this study identifies the moderating role of RE in the mediating pathway, exhibiting that higher levels of RE also strengthen the indirect effects of leaders' intellectual humility on FI.

## 2 | LITERATURE REVIEW

### 2.1 | Leaders' Intellectual Humility and Frugal Innovation

Intellectual humility is a leadership trait that combines intellectual acuity and humility ([Krumrei-Mancuso & Begin, 2022](#)). Porter et al. ([2022](#)) described this as a metacognitive capability to acknowledge one's limitations of beliefs and knowledge. This is characterized by the ability to detach one's ego from an individual's beliefs, enabling them to refrain from linking their self-concept to the absolute correctness of their beliefs ([Whitcomb, Battaly, Baehr & Howard-Snyder, 2017](#)). This also involves an acknowledgment of others' intellectual contributions, encouraging openness to novel ideas and information ([Hoekstra & Vazire, 2021](#); [Porter & Schumann, 2018](#)). A key feature of intellectual humility is the ability to counter dogmatic thinking and overconfidence in one's beliefs ([Plohl & Musil, 2023](#)). Individuals who exhibit intellectual humility are more inclined to revise their views based on new facts and to critically assess information, therefore reducing the chance of cognitive mistakes ([Gollwitzer, Bao & Oettingen, 2024](#)). Additionally, they are more receptive to information contradicting their convictions, devoting time and attention to examining such contradictory evidence ([Porter & Schumann, 2018](#); [Rodríguez-Sánchez, Montero-Navarro & Gallego-Losada, 2019](#)). This attitude of openness leads to higher cognitive flexibility, a vital component to counter confirmation bias ([Zmigrod, Zmigrod, Rentfrow & Robbins, 2019](#)). This also entails a deep and critical reflection of one's understanding, recognizing that it may be deficient, flawed, or obsolete ([Bowes & Tasimi, 2023](#)). Further, distinctively, humble leaders tend to be self-transcendent and more inclined toward the greater good in comparison to self-focus ([Nielsen, Marrone & Slay, 2010](#); [Snyder & Lopez, 2001](#)). This orientation motivates these individuals to pursue goals beyond self-interests ([House & Aditya, 1997](#)). They are open-minded to innovative ideas and have an orientation to learn and improve continuously ([Morris, Brotheridge & Urbanski, 2005](#); [Tangney, 2002](#)).

Previous research has shown the link between various leadership styles and firm innovation, such as transformational leadership ([Jansen, George, Van den Bosch & Volberda, 2008](#)), charismatic leadership ([Waldman, Ramirez, House & Puranam, 2001](#)), adaptive leadership ([Chughtai, Syed, Naseer & Chinchilla, 2023](#)), transactional leadership ([Waldman, Ramirez, House & Puranam, 2001](#)), servant leadership ([Peterson, Galvin & Lange, 2012](#)), responsible leadership ([Liao, 2022](#)), sustainable leadership ([Iqbal, Piwowar-Sulej & Kallmuenzer, 2025](#)). Specifically, humble leaders are more inclined to promote firm innovativeness because of their qualities of admitting their weaknesses and limitations, openness to seeking suggestions from others, and improving themselves ([Mallén, Domínguez-Escrig, Lapedra & Chiva, 2019](#)). Moreover, they tend to observe the difference between reality and the ideal state, which encourages them to establish sustainability practices ([Carnevale, Huang & Paterson, 2019](#)). As a distinct feature of personality traits, humility focuses on sustainable outcomes and remains receptive to feedback, leading to considerable variation in strategic choice within innovation ([Owens, Johnson & Mitchell, 2013](#)).

Innovation at the grass roots or bottom of the pyramid has become a highly pertinent concern among academics, practitioners, and policy makers ([Agarwal, Grottke, Mishra & Brem, 2016](#); [Agarwal, 2019](#); [Hossain, Simula & Halme, 2016](#)). Frugal innovation is a unique form of innovation in comparison to other types of innovation as it influences triple-bottom-line effects such as social, environmental, and economic ([Iqbal, Piwowar-Sulej & Kallmuenzer, 2025](#)). This is crucial in sustainable development because of its three components, frugal cost, frugal functionality, and frugal ecosystem ([Rossetto, Borini, Bernardes & Frankwick, 2023](#)), which address the social, environmental, and economic bottom lines ([Govindan, 2022](#)). It refers to products and services that use minimal resources, add value through essential features, are more affordable than other market options, and meet the needs of underserved consumers ([Hossain, 2021](#)).

Regarding the theoretical underpinning that explains the relationship of leaders' attributes with firm innovation, many studies focused on the upper echelon's theory ([Iqbal, Ahmad, Li & Li, 2022](#)). Specifically, previous studies have examined personality attributes of leaders such as hubris ([Hayward & Hambrick, 1997](#)), core self-evaluations ([Hiller & Hambrick, 2005](#); [Simsek, Heavey & Veiga, 2010](#)), narcissism ([Chatterjee & Hambrick, 2007](#)) and humility ([Ou et al., 2014](#)) which enriched our understanding of CEO's influence on their firms ([Finkelstein, Cannella, Hambrick & Cannella, 2009](#)). However, despite the importance of humility in the leadership domain, its subdomain of IH impact on frugal innovation remains underexplored. Drawing from UET, which implies that a firm's strategy, structure, and outcomes are reflections of attributes and behaviors of leaders ([Hambrick, 2007](#); [Hambrick & Mason, 1984](#)), the leadership qualities play a vital role in the innovation process of firms ([Cortes & Herrmann, 2021](#)). Therefore, this study argues that intellectual humility as a leader's psychological trait, characterized by openness to feedback, acknowledging one's limitations, revising one's beliefs, and prioritizing collective interests, builds a foundation for sharing novel ideas, which plays a crucial role in adopting frugal innovation. Based on this, we hypothesize that.

**H1.** *Leaders' Intellectual humility positively influences frugal innovation.*

## 2.2 | The Mediating Role of Strategic Sustainable Orientation

Business sustainability has become a key concern due to two primary factors: (a) incorporating sustainability aspects yields long-term advantages for companies ([Calabrese, Costa, Levialdi & Menichini, 2019](#)) and (b) Several stakeholders such as government, customers and employees exert influence on firms to act in a socially and environmentally responsible manner ([Schaltegger, Hörisch & Freeman, 2019](#); [Schmitz, Baum, Huett & Kabst, 2019](#)). In recent years, there has been a rising emphasis on the significance of engaging firms in addressing social and environmental issues to encourage their proactive participation in the social and environmental transformations that society needs ([Khizar, Iqbal, Murshed & Ahsan, 2024](#)). This scenario has led to substantial calls in the literature to understand why some firms have strong strategic commitment to incorporate sustainability than others ([Khizar, Iqbal, Murshed & Ahsan, 2024](#); [Ponte, Viana & Silva, 2023](#)).

Bos-Brouwers ([2010](#)) initially proposed a strategic approach to sustainable orientation, shifting the focus from merely viewing it as a cost or obligation to an opportunity. The strategic stance of firms to incorporate sustainability into their organizational structure is referred to as sustainability orientation (SO). The review on the concept of sustainable orientation shows the variety of approaches but also a consensus regarding its

understanding as a corporate-level strategic orientation ([Khizar, Iqbal, Khalid & Adomako, 2022](#)). Strategic sustainable orientation involves the integration of economic, social, and environmental sustainability aspects into strategic orientations of firms in business and entrepreneurship literature ([DiVito & Bohnsack, 2017](#); [Sung & Park, 2018](#)). This approach reflects a proactive stance of integrating environmental and social objectives with economic outcomes, viewing sustainability as a catalyst for innovation, credibility, and long-term financial returns ([Schaltegger & Burritt, 2018](#)). From this view, the definition put forth by Claudy et al. ([2016](#)) stands out, as it recognizes it as a firm's proactive strategic stance of incorporating environmental and social concerns and interests into its strategic, tactical, and operational processes. Firms with strong sustainable orientation typically predict regulatory changes ([Calabrese, Costa, Levaldi & Menichini, 2019](#)), interact more intensively with their stakeholders ([Freeman, 1984](#); [Martins et al., 2019](#)), and allocate resources towards sustainability-based innovation and governance ([Zahoor & Gerged, 2021](#)). Recently, empirical studies in the manufacturing sector revealed the positive effect of sustainable orientation on green capabilities and environmental performance when combined with supportive internal practices ([Rehman, Bresciani, Ashfaq & Alam, 2022](#)).

The firm-level drivers of SO comprise leadership attitudes and behaviors, top management support and culture, absorptive capacity, and innovation characteristics ([Gallego-Álvarez & Pucheta-Martínez, 2022](#); [Martínez-Ferrero & García-Meca, 2020](#)). Among these factors, leadership plays a vital role in establishing direction and emphasizes formulating sustainability objectives and acquiring the resources necessary for their accomplishment ([Vesal, Siahtiri & O'Cass, 2022](#)). The current evidence revealed the important role of CEOs in affecting firms' strategic decisions ([Gull et al., 2023](#)). Further, leaders provide strategic direction, act as role models, allocate resources, shape the culture of organizations, and enable the adoption of frugal practices ([Chughtai, Amin, Khalid & Ahmed, 2023](#)). Effective leaders play an influential role in shaping strategies that promote sustainable actions, fostering a culture that supports environmental stewardship- the capacity to meet current environmental needs without jeopardizing the future generation's ability to meet their needs ([Haldorai, Kim & Garcia, 2022](#)).

Specifically, humble leaders are inclined to accrue self-knowledge, which inhibits egoism ([Kesebir, 2014](#)) and admit their own limitations ([Landrum, 2011](#)). This allows them to process information more carefully and probably adopt more successful strategy orientations for the performance of firms. In this regard, Collins ([2001](#)) discovered that the ambitions of humble CEOs of high-performing firms centered on the firm's success rather than their own; these CEOs focused on the strategies that were most beneficial for their firms. For instance, top management attributes of charisma and humility help in forming distinctive strategies of their firms ([Ou et al., 2014](#)). Moreover, humility as a leadership quality of showing concern for others and contributing to society should direct firm operations and activities towards identifying, seizing, and exploiting new knowledge that creates value for society, which should boost firm innovation ([Chen, Liu, Zhang & Qian, 2018](#); [Porter & Schumann, 2018](#)). It is regarded as one of the virtues that enables a smooth transition to a more sustainable economic model to address complex environmental and social challenges ([Throop & Mayberry, 2017](#)). Likewise, intellectually humble leaders remain open to novel ideas and feedback, which is critical for

adopting strategic change successfully, enabling firms to adapt in complex and dynamic environments ([Farhikhteh, Kazemi, Shahin & Mohammad Shafiee, 2020](#)).

Upper Echelons theory proposed that the relationship between CEO attributes and firm outcomes is mediated by strategic orientation. Strategy is an important proximal connection to firm success ([Hambrick & Mason, 1984](#)). UET further proposes that a leader's psychological traits serve as the foundation for their cognitive processes and value systems, thereby influencing how they process information, make strategic choices, allocate resources, lead workers, and influence firm performance ([Finkelstein, Cannella, Hambrick & Cannella, 2009](#)). Intellectual humility has been linked to agreeableness and openness traits that foster inclusivity and adaptability ([Davis et al., 2016](#)). Based on this, this study argues that leaders with intellectual humility being open and adaptable to change, are more likely to consider environmental and social issues in strategic planning, which can lead the firm toward sustainable and frugal innovation. Therefore, we hypothesize that,

**H2.** *Strategic sustainable orientation positively mediates the relationship between leaders' intellectual humility and frugal innovation.*

### 2.3 | The Moderating Role of Relational Embeddedness

Relational embeddedness involves high-quality relationships and the exchange of strategic resources between various actors and firms ([Granovetter & Action, 1985](#)). This is shown in the trust and strength of connections among network participants and focuses on the acquisition of a firm's strategic resources through inter-firm relations embedded in networks of social relations ([Kang & Sauk Hau, 2014](#)). Social networks do, in fact, provide firms with access to strategic resources that can improve their competitive edge ([Pallotti & Lomi, 2011](#)) and foster relational norms like commitment and trust ([Granovetter & Action, 1985](#)). Relatedly, social capital of managers represented by external relations both formal and informal facilitates access to diverse information and external resources which strikes new ideas for innovation ([Helfat & Martin, 2015](#); [Martin & Bachrach, 2018](#)) and better enabling sensing and seizing opportunities to support decisions of strategic change ([Helfat & Martin, 2015](#); [Prashantham & Dhanaraj, 2010](#)).

The extensive literature indicates that external social capital can influence a firm's capacity to seize market-driven opportunities, therefore enabling innovation ([Leana & Pil, 2006](#)). In this regard, scholars have emphasized the crucial role of social relations for achieving competitive performance by various firms ([Granovetter & Action, 1985](#); [Pratono, 2018](#)). Even if a firm possesses capability, the complexity of innovation may necessitate resources provided by the company's external social capital, including distinctive capabilities, technical resources, specialized knowledge, and risk sharing ([Albort-Morant, Leal-Millán, Cepeda-Carrion & Henseler, 2018](#)). It has been established that managers' networks and social ties positively influence firm ambidexterity, which enables them to discover and exploit strategic activities ([Cao, Simsek & Zhang, 2010](#)). Managers seeking advice from their social connections reduce their uncertainty about their strategic perspectives and boost confidence by receiving supportive guidance, thereby facilitating strategic transformation ([McDonald & Westphal, 2003](#)). More importantly, developing novel products is often challenging without collaborative work involving multiple companies, as well as other firms and various

societal stakeholders, including citizens, non-profit organizations (NGOs), and government entities ([Jonker & Faber, 2018](#); [Planko & Cramer, 2021](#)). The frequent contacts between network members facilitate the flow of implicit and useful knowledge that leads to developing a business strategy towards sustainability ([Cheng, 2020](#)).

In this regard, several studies have suggested the importance of firms' networking for nurturing sustainability ([Klewitz, 2017](#); [Setya & Djatmika, 2017](#)). The empirical evidence indicates that relational embeddedness of these networks encourages the integration of sustainability practices by enabling the exchange of knowledge and cooperation among stakeholders in the agri-food industry ([López-Arceiz, Santamaría & Del Río, 2020](#); [Zahoor & Gerged, 2021](#)). For instance, Wang and Lv ([2023](#)) study revealed that structural and relational embeddedness in green innovation networks significantly increased corporate environmental responsibility performance through developing green reputation of enterprises in China. Similarly, another recent study showed that developing strong and close ties with partners drives focal firms to develop a sustainable orientation in the hospitality and tourism sector. Further, they suggested that firms should create networks with the members sharing similar values and objectives to adopt a strategic approach to sustainability ([Córcoles Muñoz, Parra Requena, García Villaverde & Ruiz Ortega, 2023](#)).

SMEs often rely on their leaders' networks to gain access to resources and market opportunities effectively ([Liu, Chang & Fang, 2020](#)). Leaders' social capital promotes trust and cooperation, therefore creating a favorable environment for the successful implementation of strategic initiatives ([Reniaty et al., 2025](#)). These relational resources play a vital role in shaping firm strategies and gain competitive advantage. The moderating role of social capital has been examined in a recent study between CEO servant leadership and firm innovation ([Gutiérrez, 2024](#)) and findings of the study revealed that external social capital has significantly contributed to drive firms innovation through their knowledge absorptive capacity, which is in line with the notion that knowledge absorptive capacity leads to increased innovation in collaboration with external parties who offer valuable information and resources ([Rodrigo-Alarcón, García-Villaverde, Ruiz-Ortega & Parra-Requena, 2018](#)) (Rodrigo-Alarcon et al., 2018).

Top managers are perceived to be embedded in various kinds of social networks that provide an abundance of social capital ([Yu, Hou, Qian & Zhang, 2024](#)). These connections can also facilitate the exchange of business practices, structures, and routines, which yield competitive and/or legitimate advantages ([Geletkanycz, Boyd & Finkelstein, 2001](#)) and “impart informational and social influences that have strategy-shaping effects” and influence performance ([Geletkanycz & Hambrick, 1997](#)).

The upper-echelons theory also supports this notion that top managers' beliefs and actions are shaped by their environment ([Hambrick & Mason, 1984](#)). Social capital is a valuable managerial tool that facilitates strategy implementation ([Eisenhardt & Schoonhoven, 1996](#); [Steier & Greenwood, 2000](#)). Understanding the links between leaders' traits and network connections can offer greater insights into how senior managers affect firms' outcomes. In this sense, we argue that intellectual humility as a leadership trait might facilitate stronger ties with external members as it is also linked to prosocial qualities of empathy, gratitude, benevolence, altruism, and universalism ([Krumrei-Mancuso & Newman, 2021](#); [Porter et al., 2022](#)). Therefore, drawing on UET, we assert that the leader's psychological trait of intellectual humility, based on openness,

empathy, and appreciation of others, helps to strengthen network ties by sharing novel ideas and knowledge about sustainability for developing SSO that leads to frugal innovation. More specifically, these arguments advocate a moderated mediating effect of relational embeddedness, which indicates a key boundary condition for achieving the positive indirect effect of a leader's intellectual humility in fostering frugal innovation through strategic sustainable orientation. Accordingly, this study suggests that the conditional indirect effect of LIH on FI through SSO is strong in the context of RE. Therefore, this study provides a more holistic view of the LIH and FI relationship by considering both the mediation effect of SSO and the moderation effects of RE. Therefore, we hypothesize that:

**H3:** *Relational Embeddedness moderates the positive effects of a leader's intellectual humility on SSO, such that the relationship is stronger when relational embeddedness is high and weaker when it is low.*

**H4:** *Relational Embeddedness moderates the positive indirect effects of intellectual humility leadership on Frugal Innovations, such that indirect effects through strategic sustainable orientation are stronger when relational embeddedness is high and weaker when relational embeddedness is low.*

### 3 | METHODOLOGY & DESIGN

#### 3.1 | Participants and Procedures

This study was conducted among SMEs of Pharmaceutical sector of Pakistan. These SMEs contribute 40–60% of the GDP and comprise almost 90% of businesses of both developed and developing economies ([Gherghina, Botezatu, Hosszu & Simionescu, 2020](#)), driving job creation opportunities and economic development ([Aftab, Veneziani, Sarwar & Ishaq, 2022](#)). Specifically, the pharmaceutical industry of Pakistan significantly contributes to the economy at the national and international level ([Ikram, Zhou, Shah & Liu, 2019](#); [Shahzad et al., 2020](#)). The main concern for SMEs of pharmaceutical sector is to attain sustainability in their process and operations ([Milanesi, Runfola & Guercini, 2020](#); [Sheldon, 2017](#)). In this regard, Khizar et al. ([2024](#)) also highlighted that the focus of research studies should be on how developing and emerging economies address the most pressing sustainability issues, given that the existing body of literature has primarily focused on advanced economies that possess a pool of resources and robust mechanisms for investing in sustainability initiatives. The Pharmaceutical sector of Pakistan is facing high regulatory pressure, intensive cost processes, technological issues, restricted finances, inadequate R&D ([Mubarak et al., 2025](#)), and rising demands of customers for value-added and affordable alternatives make this sector suitable for studying sustainability and frugality. In response to this situation, frugal innovation emerged as the best solution to generate high value at low costs to overcome resource constraints of emerging nations such as Pakistan.

This study adopts a positivist, hypothetico-deductive approach using a time-lagged survey design to test causal relationships among variables. Furthermore, we used a simple random sampling technique for data collection, which is considered effective in reducing biases and increasing the generalizability of the data by providing equal chances of selection to participants ([Cohen, Manion & Morrison, 2018](#); [Howitt & Cramer, 2020](#)). This study targeted senior and middle managers of the pharmaceutical sector from major cities of Pakistan (Islamabad, Karachi, and Lahore). The reason for targeting top managers is to improve the integrity

of responses by focusing on those who are engaged in strategic decision-making and initiating and implementing sustainable operations of the firms. First, we identified SMEs of the pharmaceutical industry through the PPMA (Private Pharmaceutical Manufacturers Association). Second, we personally administered questionnaires by contacting their HR department to encourage CEOs, senior managers, and departmental managers to participate in this study. Additionally, the respondents were assured of anonymity and confidentiality of their responses, and informed consent was obtained prior to data collection. A total of 375 surveys were distributed in the first phase, and among those, 335 respondents filled in questionnaires, but finally, 275 usable responses were considered for data analysis after dropping those responses filled incorrectly and containing insufficient information.

### **3.1.1 | Common Method Variance**

To mitigate the risk of common method variance, this study adopted several procedural remedies. Data were collected by using a time-lagged design, as suggested by Podsakoff et al. (2003), to provide a true representation of responses in three-time waves: independent and moderator variables measured at Time 1, the mediator at Time 2, and the dependent variable at Time 3, separated by intervals of four weeks. This temporal separation reduces consistency motives and respondents' ability to infer causal relationships among variables. All the constructs were measured using established multi-item scales from prior studies. Although self-reported measures were necessary given the perceptual nature of the core constructs, these design features provide reasonable confidence that common method bias is unlikely to materially affect the results.

### **3.2 | Measurement Tools**

All respondents were asked to give their opinions using a seven-point Likert scale ranging from strongly disagree-1 to strongly agree-7. All measurement instruments were in English as English is commonly used as a mode of communication in organizations (Naseer, Chughtai & Syed, 2023; Naseer et al., 2016; Naseer et al., 2020).

#### **3.2.1 | Leaders Intellectual Humility**

To gauge leaders' intellectual humility, we employed a 6-item scale developed by Leary (2017). The Cronbach alpha of this scale is 0.95. The sample items are "*I question my own opinions, positions, and viewpoints because they could be wrong*" and "*I reconsider my opinions when presented with new evidence.*"

#### **3.2.2 | Strategic sustainability orientation (SSO)**

To measure SSO, we adopted a 12-item scale developed by Pagell and Wu (2009). This construct comprises 3 dimensions: economic (4 items), environment (4 items), and society (4 items). Previous research suggested including three dimensions and claimed that each captures distinct but related features of strategic orientation, thereby constituting a single construct (Wiklund & Shepherd, 2005). The Cronbach alpha of this scale is 0.94. The sample items are: "*Our company's mission fully considers the importance of financial performance*", "*Our company's mission fully considers the importance of environmental performance*", "*Our company assesses social results of our operational decisions*".

#### **3.2.3 | Frugal Innovation**

For frugal innovation, a nine-item scale developed by Rossetto and Borini (2017) was adopted. The Cronbach alpha of this scale is 0.90. The sample items are "*solutions that offer good and cheap*

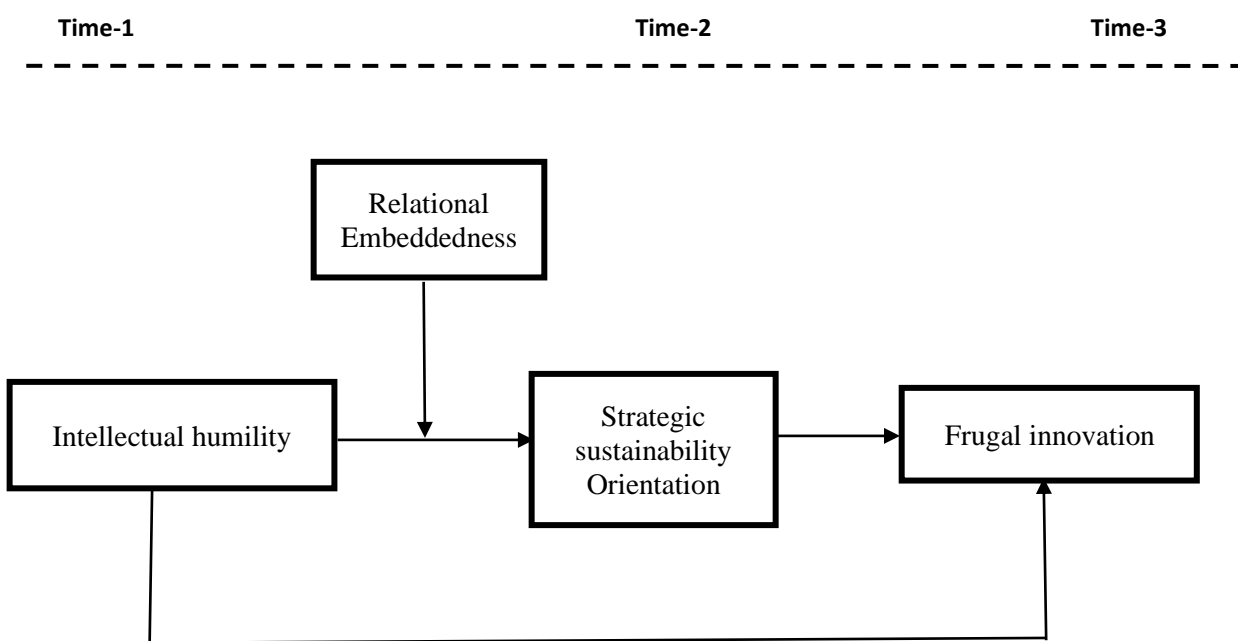
products/services” and “We always search for efficient and effective solutions to customers’ social/ environmental needs”.

### 3.2.4 | Relational Embeddedness

To measure relational embeddedness, we adopted a scale developed by Lin et al. (2009) that classifies network embeddedness into relational, structural, and cognitive forms. We measured relational embeddedness using four items that assess the degree of trust and reciprocity among partners to tap the strength of managers’ ties. The Cronbach alpha of this scale is 0.92.

**Figure 1**

*Proposed Theoretical Framework*



## 4 | RESULTS AND ANALYSIS

### 4.1 | Participants Details

Table 1 presents the demographic characteristics of the participants. The findings indicate that 63% of respondents were male, while 37% were female. Participants’ ages ranged from 25 to 64 years, with the majority (52%) falling between 31 and 40 years old. Most respondents held a master’s degree or higher (53%) and had 6 to 10 years of work experience (50%).

**Table 1***Demographics Characteristics of Participants*

		<b>Frequency</b>	<b>Percent</b>
		(n)	(%)
<b>Gender</b>			
Male		174	63
Female		101	37
<b>Age</b>			
25-30 years		86	31
31-40 years		144	52
41-50 years		37	14
51 and above		8	3
<b>Education</b>			
Undergraduate	4	2	
Bachelors	124	45	
Master's and above	147	53	
<b>Experience</b>			
1-5 Years	38	14	
6-10 Years	137	50	
11-15 Years	55	20	
16-20 Years	32	11	
More than 20 Years	13	5	

**4.2 | Validity**

First, before the main analysis of this study, the researchers tested the validity of all constructs by performing confirmatory factor analysis (CFA) using Fornell-Larker (1981) criterion method and the Heterotrait-Monotrait (HTMT) ratio of correlations, as suggested by scholars. Table 2 presents the validity results for all constructs using both methods.

Discriminant validity is established when the square root of each construct's AVE is higher than its inter-construct correlations (Henseler, Ringle & Sarstedt, 2015). As shown, the bold values along the diagonal represent the square roots of the AVEs, which are higher than their correlations in the same column, and the HTMT values are below the recommended threshold of 0.85 (Henseler, Ringle & Sarstedt, 2015), indicating strong discriminant validity.

**Table 2***Discriminant Validity*

Constructs	HTMT			Fornell-Larker Criteria		
1 LIH	–			<b>.87</b>		
2 SSO	.63	–		.58	<b>.77</b>	
3 FI	.54	.59	–	.42	.55	<b>.71</b>
4 RE	.60	.57	.53	–	.63	.45
			.53			<b>.86</b>

Note: LIH; Leaders Intellectual Humility, SSO; Strategic sustainable orientation, FI; Frugal innovation, RE; Relational embeddedness.

**4.3 | Descriptive Statistics, Reliability, and Correlations**

Table 3 shows the descriptive statistics (mean and standard deviation), reliability statistics (alpha), and correlation values. The Cronbach alpha and the composite reliability of all measures were greater than the cut-off value of .70, which indicates internal consistency reliability (Hair, Risher, Sarstedt & Ringle, 2019). Further, the correlation values among the study variables show that all variables are positively and significantly correlated ( $p < .01^{**}$  and  $p < .05^{*}$ ).

**Table 3***Descriptive Statistics, Reliability, and Correlation*

Construct	Mean	SD	$\alpha$	CR	AVE	1	2	3	4
1 LIH	5.58	1.11	.95	.947	.747				
2 SSO	5.78	.78	.94	.946	.594	.56**			
3 FI	5.52	.63	.90	.900	.501	.39**	.51**		
4 RE	5.75	1.08	.92	.917	.734	.58**	.50**	.40*	

Note: LIH; Leaders Intellectual Humility, SSO; Strategic sustainable orientation, FI; Frugal innovation, RE; Relational embeddedness,  $\alpha$  = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted,  $N = 275$ ,  $*p < .05$ ,  $**p < .01$ .

**4.4 | Model Testing**

First, we conducted a one-way analysis of variance (ANOVA) to determine the effects of demographic variables, such as firm age and firm size, as suggested by previous studies on outcomes. No significant differences in outcomes were found between firms of different ages and sizes. This study follows a regression-based moderated mediation framework, and direct and indirect effects are calculated through the PROCESS-macro using bootstrapping procedures (Hayes, 2018) using SPSS Statistics 21 for statistical analyses. Results about the direct and indirect effects are illustrated in Table 4, where IH positively and significantly influence the FI [ $\beta = .08^{**}$ ,  $p < .01$ , 95% CI [.02, .15], IH also positively and significantly influence the SSO [ $\beta = .39^{**}$ ,  $p < .001$ , 95% CI [.32, .46] and SSO also positively affect FIs [ $\beta = .34^{**}$ ,  $p < .001$ , CI [.24, .44]. These results show positive and significant direct effects of IH and SSO on FI, thus supporting the first hypothesis of this study. Regarding the results of the mediation analysis, which tested the indirect effects of intellectual humility

on frugal innovation via strategic sustainable orientation. The results supported the acceptance of our second hypothesis ( $\beta = .14^{**}$ , CI [0.09, 0.19], showing partial mediation of SSO between IH and FI, as the bootstrap confidence interval included non-zero values between lower- and upper bounds.

**Table 4**

*Direct and Indirect Effects*

<b>Direct Effects</b>	<b><math>\beta</math></b>	<b>SE</b>	<b>t</b>	<b>p-value</b>
LIH $\rightarrow$ FI	.08*	.035	2.55	.011
LIH $\rightarrow$ SSO	.39**	.034	11.16	.000
SSO $\rightarrow$ FI	.34**	.049	6.86	.000
<b>Indirect Effects</b>	<b>Effect</b>	<b>Boot SE</b>	<b>LL 95% CI</b>	<b>UL95% CI</b>
LIH $\rightarrow$ SSO $\rightarrow$ FI	.14**	.025	.09	.19

Note: N= 275, LIH =Leader's Intellectual Humility; SSO = Strategic Sustainable Orientation; RE = Relational Embeddedness. Bootstrapping based on 5,000 samples,  $\beta$  = standardized coefficient, SE = Standard Error, LL = Lower limit, UL= Upper limit, CI= Confidence interval, \* $p < .05$ , \*\* $p < .01$ .

Furthermore, we tested for the moderation hypothesis and the results in Table 5 show that the interaction of IH and RE positively and significantly influences SSO [ $\beta = .04^*$ , SE=.02, t-value=2.14,  $p < .05$ , CI [0.003, 0.08]. Table 5 further shows the results of the conditional indirect effects of RE at three levels (below the mean, at the mean, and above the mean). Particularly, the indirect effect of intellectual humility leadership on FI via strategic sustainable orientation under high relational embeddedness [ $b = .12^{**}$ , SE=.027, LL/UL-CIs=.07/.18] is significantly larger than under low relational embeddedness [ $b = .09^{**}$ , SE=.02, LL/UL-CIs=.08/.13], further the results of the index of moderated mediation analysis showed significant results [Index=0.014, SE=.0063, LL/UL-CIs=.002/.026]; thus, these results also support the H4 of this study.

**Table 5**

*Moderation Analysis*

<b>Moderator: Relational Embeddedness</b>	<b><math>\beta</math></b>	<b>SE</b>	<b>t</b>	
Constant	3.92**			
LIH $\rightarrow$ SSO	.08	.11	0.74	
RE $\rightarrow$ SSO	.01	.09	0.05	
LIH $\times$ RE $\rightarrow$ SSO	.04*	.02	2.14	
$\Delta R^2$ (interaction)	.01*			
<b>Conditional Effects (Simple Slopes)</b>				
<b>Level of RE</b>	<b>Effect</b>	<b>SE</b>	<b>LL 95% CI</b>	<b>UL95% CI</b>
Low (-1 SD)	.27	.042	.19	.35
Medium	.32	.045	.23	.41
High (+1 SD)	.36	.057	.25	.48
<b>Conditional Indirect effects (Slope test)</b>				
	<b>Effect</b>	<b>SE</b>	<b>LL 95% CI</b>	<b>UL95% CI</b>
LIH $\rightarrow$ SSO $\rightarrow$ FI conditional on RE at -1 S.D	.09	.020	.05	.13
	.11	.023	.06	.15

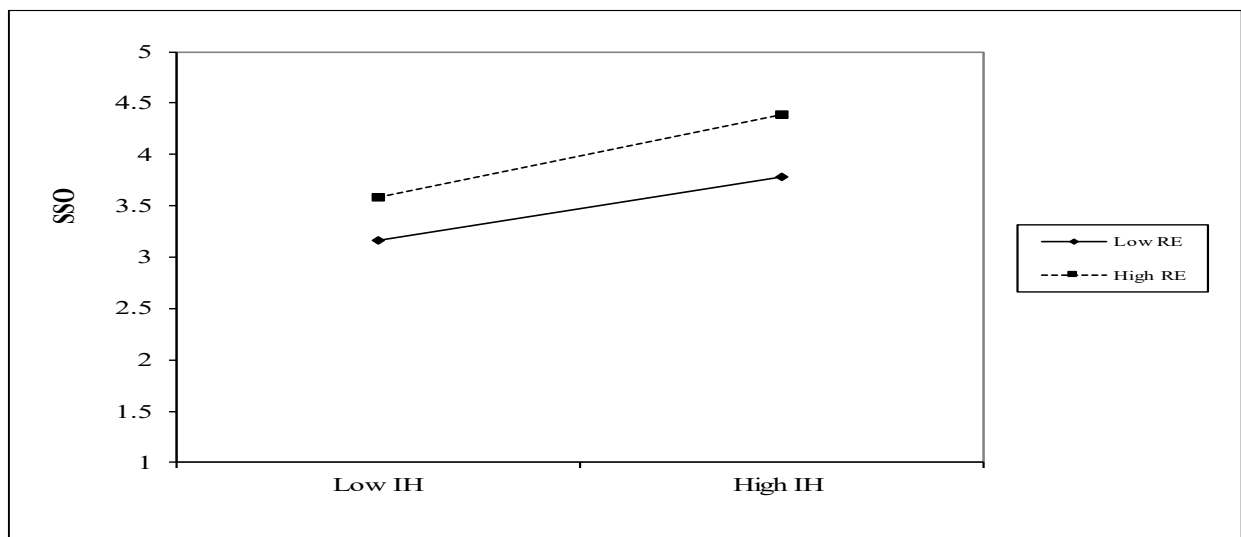
LIH→SSO→FI conditional on RE at median	.12	.027	.07	.18
LIH→SSO→FI conditional on RE at +1 S.D				

Index of Moderated Mediation	Index	Boot SE	Boot LLCI	Boot ULCI
IH × RE → SSO → FI	.014	.006	.002	.026

$N=275$ ; LIH=Leaders intellectual humility; SSO=Strategic sustainable orientation; RE = Relational Embeddedness. Bootstrapping based on 5,000 samples,  $\beta$  = standardized coefficient, SE = Standard Error, LL = Lower limit, UL= Upper limit, CI= Confidence interval, \* $p < .05$ , \*\* $p < .01$ .

**Figure 2**

*Interactive effect of Leaders Intellectual humility and Relational embeddedness on Strategic sustainable orientation*



## 5 | DISCUSSION

Based on UET, this study hypothesized the model to investigate the direct impact of leaders' intellectual humility (LIH) and the indirect impact of strategic sustainable orientation (SSO) on frugal innovations (FI). Furthermore, this study examines the relational embeddedness (RE) as a moderator. For the first hypothesis of the study, the results confirmed that LIH has a positive and significant impact on FI, which is aligned with previous studies that have shown the positive impact of leadership on frugal innovation ([Al Hawamdeh & Al-Edenat, 2025](#); [Chughtai, Amin, Khalid & Ahmed, 2023](#); [Iqbal, Piwovar-Sulej & Kallmuenzer, 2025](#)). The findings of this study highlight the importance of intellectually humble leadership to foster pyramid innovation, i.e., frugal innovation suggesting that such a leadership style of recognizing own limitations and remain receptive to diverse opinions foster a climate of inclusiveness ([Gao, Niu & Yu, 2025](#)) where all are encouraged to share novel solutions to prevailing sustainability issues in resource-constrained environments, thereby, enabling the adoption of FI. For the second hypothesis, our results support partial mediation of strategic sustainable orientation as a critical pathway through which intellectually humble leaders can realize their intellectual virtue for embracing FI and are aligned with previous studies supporting the role of top management in influencing the sustainability orientation of firms ([Emamisaleh & Rahmani, 2017](#); [Khizar,](#)

[Iqbal, Murshed & Ahsan, 2024](#)). These findings indicate that this leadership trait does not produce innovation outcomes on its own. Instead, its influence is realized mainly through strategic decision making. Intellectually humble leaders shape firms' strategic sustainable orientation by recognizing knowledge limits, remaining open to new information, and balancing economic and social priorities, which in turn creates conditions for frugal innovation. This supports leadership and strategy research, arguing that executive traits affect firm outcomes primarily through strategic choices rather than immediate operational actions, and extends Upper Echelons theory by identifying intellectual humility as a cognitive mechanism linking leadership to innovation. Finally, for the third and fourth hypotheses, our findings also support the moderating role of relational embeddedness, which becomes imperative for developing a strategic sustainable orientation and spurring FI. Moreover, empirical findings also support RE-moderated LIH indirect impact on FIs via SSO. We argue that high relational embeddedness influences intellectually humble leaders to develop a sustainable orientation of their firms in such a way that provides access to valuable knowledge and information for adopting FI. Therefore, relational embeddedness constitutes an important boundary condition for when and how intellectually humble leaders can effectively translate their openness and inclusivity for adopting FI by establishing relational embeddedness. Resultantly, the mediating pathway of "LIH—SSO --FI" is significantly amplified, exhibiting a strong moderating effect.

### 5.1 | Theoretical and Practical Implications

This study contributes to the literature in the following ways. First, this study is unique in that it utilizes UET ([Hambrick & Mason, 1984](#)) to examine how and when leaders' IH affect FIs within the context of the pharmaceutical sector. IH is a leadership trait that actively supports open-mindedness and diverse views (Leary et al., 2017). This inclusive approach creates a safe environment where employees feel supported and respected for sharing and experimenting with novel ideas. Second, by finding support for SSO as an underlying mechanism, this study adds knowledge to the UET (Hambrick & Mason, 1984) by explaining the role of strategic decision-making through which leaders influence outcomes. Third, the important contribution of this study lies in its support for the moderating role of RE in IH leadership and SSO. The context of RE further elaborates the lens of UET that leaders with high levels of relational embeddedness, trust, and strength of relationships with network members are more likely to translate their openness and inclusiveness into adopting a sustainable orientation, which leads to fostering FI. Frequent contact among network members fosters the flow of implicit, valuable knowledge that drives business strategy toward sustainability. Therefore, the confirmation of our moderated mediation model extends the recent research that seeks to identify the relational factors that can strengthen or weaken the LIH and sustainable outcomes relationship.

These useful insights are not only confined to refining the theoretical knowledge of leadership effectiveness but also provide useful practical implications for managers and policymakers. The firms should cultivate cognitive openness and diversity in leadership development, rather than focusing merely on ethical behavior. There are numerous methods to foster intellectual humility (IH) that have been identified as effective ([Krumrei-Mancuso et al., 2025](#); [Porter et al., 2022](#)), such as metacognitive interventions ([Meagher, Gunn, Sheff & Van Tongeren, 2019](#); [Porter & Schumann, 2018](#)), which can be incorporated by firms into managers' training. Second, firms need to incorporate a sustainable orientation into their mission, processes, and

operations to contribute to sustainability objectives. Moreover, this study suggests that firms should focus on the interaction between leaders' cognitive traits and inter-firm ties in devising sustainability orientation rather than managing their effects separately. Furthermore, our research provides a roadmap for future studies to further explore how leaders' intellectual humility transforms organizations into sustainable ones. Most of the SMEs in Pakistan are deficient in resources, capital, and R&D capabilities to innovate ([Son, Park, Bae & Ok, 2020](#); [Yan & Ahmad, 2025](#)). Therefore, a large investment in high-tech innovations is not a viable option for improving these firms' innovation capacity. Due to these factors, these firms face challenges in developing economies in identifying inexpensive factors to promote FI ([Dost, Pahi, Magsi & Umrani, 2019](#); [Lei, Gui & Le, 2021](#)). The findings of this study implied that focusing on LIH to develop a sustainable orientation of firms might be an effective strategy for SMEs in developing countries like Pakistan to pursue FI.

### **5.2 | Limitations and Future Research Directions**

This study has some constraints that need to be acknowledged for future research. First, the findings are based on a single industry, i.e., Pharmaceutical SMEs, which may limit the generalizability to other industries or institutional environments. Therefore, future research studies should be expanded to other industries, such as automobiles, to validate our findings. Second, although a time-lagged design was used, we relied on self-reported data, so causal inferences should be interpreted cautiously. Future research should employ longitudinal designs to examine causality among variables for a richer understanding of the present study model. Third, the study focuses on perceptual measures of innovation and sustainability orientation rather than objective indicators, which may not fully capture actual organizational performance. Fourth, researchers are encouraged to replicate this model across other countries and incorporate multi-source, objective data where feasible. Moreover, our study revealed that strategic sustainable orientation is an important underlying mechanism through which IH leadership influences FI, and future researchers can investigate other underlying mechanisms in line with UET (Hambrick & Mason, 1984), for example, cross-functional coordination and knowledge sharing. Future research can also examine other contextual factors, such as inclusive climate and organizational learning culture, to enhance the impact of LIH on sustainable outcomes.

## **6 | CONCLUSION**

This study contributes knowledge to the UET by empirically investigating how and when leaders' intellectual humility fosters frugal innovation. The findings of this study show that LIH exerts a significant positive influence on frugal innovation. Moreover, sustainable orientation serves as a key mediating mechanism, and relational embeddedness as a boundary condition, thereby supporting a moderated mediation model. Theoretically, this study enriches leadership literature by extending UET theory, and practically, it provides useful guidance for cultivating leaders' intellectual humility and adapting firm strategies to achieve sustainable outcomes.

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