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## MANAGEMENT | RESEARCH ARTICLE

# Mediating role of green innovation and moderating role of resource acquisition with firm age between green entrepreneurial orientation and performance of entrepreneurial firms

Muzaffar Asad<sup>1\*</sup>, Mazin Aledeinat<sup>2</sup>, Tha'er Majali<sup>3</sup>, Dmaithan Abdelkarim Almajali<sup>3</sup> and Fayiz Dahash Shrafat<sup>4</sup>

**Abstract:** As more stakeholders pay increased attention to environmental concerns, the importance and application of green entrepreneurial orientation and green innovation have increased. Moreover, resource acquisition with firm age also plays a major role in giving confidence to invest in green activities. Therefore, the objective of the study is to identify the mediating role of green innovation and moderating role of resource acquisition with firm age between green entrepreneurial orientation and performance of entrepreneurial firms. The data was collected using simple random sampling. We found stimulating findings on the mediating role of green innovation and the moderating influence of resource acquisition with firm age on the relation between green innovation and performance of entrepreneurial firms based on the analysis of 384 enterprises operating in Karachi and Sialkot cities of Pakistan. More interestingly, our practical research implies that businesses that have been established for a longer time gain more compared to younger enterprises depending on green invention innovation and green utility-model innovation. These findings were a major contribution to the resource-based view and green utility-model. Our study adds to knowledge on both green entrepreneurial orientation and green innovation and guides the future researchers as well as practitioners about policies that they need to follow to gain the best out of green practices. Furthermore, we suggested the government



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Muzaffar Asad is currently working as Assistant Professor at College of Commerce and Business Administration Dhofar University, Oman, as well as Professor of Entrepreneurship, Global Visiting Faculty, at Technology De Monterry, Mexico. Before joining DU he has served as Associate Professor at Foundation University, Capital University of Science and Technology, and University of Central Punjab. He has completed his doctorate from Malaysia in entrepreneurship. He has a vast experience of teaching and training at various universities at national as well as international level. He is the certified trainer of IBA Karachi, Punjab Education Endowment Fund (PEEF), Akhuwat Institute of Social Entrepreneurship and Management (AISEM), and International Islamic University Islamabad (IIUI). He is also the Member of Editorial Board of Chinese Management Review, Sage Open, Journal of Business (European Journal), and Several Journals for Emerald and Springer.

authorities to motivate businesses to invest in green practices and guided the future researchers to identify the same influences of longer period, thereby guiding to go for longitudinal studies over the same model.

**Subjects: Entrepreneurship and Small Business Management; Management of Technology & Innovation**

**Keywords: green entrepreneurial orientation; green entrepreneurship; performance; sustainability; green innovation; entrepreneurial firms**

## 1. Introduction

Entrepreneurial firms especially in the developing countries are under pressure to safeguard the environment by complying with local government rules, stakeholder expectations, and market demands as a result of the increased focus on global environmental protection (Qazi et al., 2020; Sulaiman et al., 2023, 2023). Enterprises must develop their green capabilities to withstand escalating demand from the public and government (Ameer & Khan, 2022; Majali et al., 2022) and to consider the sustainability of the society at large (Kraus et al., 2020; Satar et al., 2023). Entrepreneurs embraced environmental initiatives like developing a firm's green image, reducing impurities, fostering green innovation, and much more (Guo et al., 2020).

Researchers and the public have been paying more and more attention to green entrepreneurial orientation (Domańska et al., 2018; Ramayah et al., 2019). The practice of green entrepreneurial orientation, also called environmental entrepreneurship, eco-business, or sustainable entrepreneurship, involves innovations for environmental protection (Ahmad et al., 2015; Chang, 2011). Green entrepreneurial orientation is the entrepreneurial conduct in an enterprise's green innovation of products, services, and market development to produce profit while considering environmental concerns (Ebrahimi & Mirbargkar, 2017; Ta'amnha et al., 2023). Thus, innovation is key behind achieving superior performance.

Furthermore, it is obvious that the foundation of entrepreneurship is innovation (Chang et al., 2023; Khan et al., 2021), and green innovation is the core of green entrepreneurial orientation (Sulaiman et al., 2023). Using innovation in processes and products, among other things, green innovation is a sustainable focused strategy that aims for the reduction of environmental damage caused by firms' activities (Guo et al., 2020). Hence, it would be right to claim that green innovation being the improvement of a processes or products is leading to the benefits of the environment (Yousaf, 2021).

Green innovation, however, is a contentious green strategy, as a number of scholars contend about green innovation being a costly strategy that can harm performance because it costs a lot to implement (Tariq et al., 2019; Truong & Nagy, 2021). At the same time another group of scholars contend about green innovation being a green strategy able to support long-term growth of entrepreneurial firms because it gives businesses sustainable competitive advantage (Chang, 2011; Fernando et al., 2019). Based on the controversial findings it is mandatory to identify the relationship with the addition of mediating and moderating variable.

The body of knowledge on green entrepreneurial orientation is currently developing but is still there a significant room for further research (Tuan, 2023). The existing research that have looked into how green innovation affects performance have come up with conflicting results regarding the positive, negative, and insignificant impacts (Asadi et al., 2020; Hsu et al., 2021; Lin & Cheah, 2019; Shahzad et al., 2020; Singh et al., 2021). Based on the inconclusive findings of the previous studies, two major research gaps have been identified.

First, many researchers have looked at this relationship using data from the survey without considering the age of the firms (Aboelmaged & Hashem, 2019; Asad et al., 2021). In other words,

it is not recommended to consider the young and mature firms equally, therefore, moderating role of resource acquisition with firm age has been added. Second, existing literature on green practices has prioritized large, well-established businesses while paying little attention to the small enterprises. The same is true for more recently new established businesses (Chen et al., 2016; Lin & Cheah, 2019) and enterprises.

A load of green innovation found in past studies is expected to have a stronger impact on entrepreneurial firms, however, given that their resource bases are comparatively more constrained than those of their large established counterparts (Muangmee et al., 2021). Hence, considering the gaps in the existing body of knowledge, we proposed that resource acquisition with firm age must be considered (Wang, 2019). Secondly, green innovation as a mediator has hardly been analyzed on the entrepreneurial firms operating in the developing countries.

Hence, initially, we investigated that if green entrepreneurial orientation adds to the performance using the theoretical lens of resource-based view and green utility model. Following the prior literature Likert scaled assessment is used to measure green innovation (Majali et al., 2022). Further research is being conducted to determine whether firm age which enhances the resources, risk taking tendency, and experience, which has gone unnoticed in earlier studies, especially for the entrepreneurial firms, substantially moderate the relationship between Green entrepreneurial orientation and performance of entrepreneurial firms, or not.

The current research contributes to several ways to the emerging body of knowledge on green entrepreneurial orientation and performance of entrepreneurial firms (Alvarez-Risco et al., 2021). Initially, this study adds entrepreneurial firms, which have received little attention by the prior researchers, to the body of knowledge on green entrepreneurial orientation. According to Asad et al. (2021), SMEs make up 90% of all businesses in the country and contribute significantly to the invention, technology, and new product innovations (Asif et al., 2021; Sulaiman & Asad, 2023; Ta'amnha et al., 2023). This statistic emphasizes the crucial role that entrepreneurial firms play in developing and emerging economies, putting green concepts into action.

Additionally, by studying the various effects of two different forms of green innovations including product and process innovation on performance of entrepreneurial firms, our research deepens our understanding of how green entrepreneurial orientation affects performance through green innovation and moderated by resource acquisition with firm age, which has hardly been studied for the entrepreneurial firms. Affirmation that green innovation does not hold a guaranteed impact for the businesses, yet it underscores the complexity of green entrepreneurial orientation and its effects on businesses. This study advances the body of knowledge by providing a refined knowledge over the relationship between green entrepreneurial orientation and performance of entrepreneurial firms, through green innovation, influenced by firm age, using the theoretical lens of resource-based view and green utility-model, in the economic settings of Pakistan.

## 2. Literature theory and hypothesis

The concept of green practices is not new (Abbas & Khan, 2023). Throughout the world businesses are moving towards sustainability and green practices (Asad et al., 2023; Pham et al., 2023). However, enterprises in the developing countries are reluctant to follow the same because of the costs associated with the adoption of green practices. The focus of the current research is on the performance of entrepreneurial firms because these firms are more dynamic and are willing to take risky decisions.

Green entrepreneurial orientation acts as a major resource for the businesses. Green entrepreneurial orientation calls for green practices which may develop competitive advantage for the entrepreneurial firms. Likewise, green entrepreneurial orientation is such a resource which can be considered as value and rare among the competitors, moreover, it is innate as well. Thus, the proposition of resource-based view (Wernerfelt, 1984) supports the arguments raised in this

research that green entrepreneurial orientation being a competitive resource can help entrepreneurial firms to gain superior performance. Furthermore, to strengthen the theoretical foundations, the support of green utility-model has been used.

The literature over the relationship between green entrepreneurial orientation and performance of entrepreneurial firms is not conclusive and has certain consistency (Alwakid et al., 2020; Duque-Grisales et al., 2020; Lotfi et al., 2018). Some believe it results in high profitability, while some claimed that it is merely a cost for the small firms. Furthermore, the studies over green entrepreneurial orientation and green innovation have mostly followed the theoretical support of dynamic capabilities (Jiang et al., 2018), while important theoretical foundations of green utility-model have been under researched especially in the context of Pakistani entrepreneurial firms. Thus, in order to fulfill the contextual gap in the settings of Pakistan and theoretical gap in the form of inconsistencies in the available literature, it is better to identify the mediator and moderator which is disturbing this relationship (Baron & Kenny, 1986; Chmura Kraemer et al., 2008).

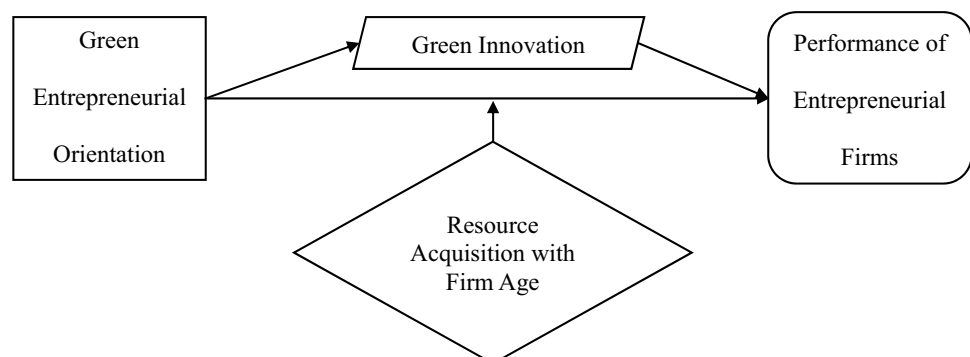
While reviewing the literature, innovation has been analyzed as a mediator by several researchers because innovation requires resources (Chang, 2011; Chen et al., 2016; Ebrahimi & Mirbargkar, 2017; Khan et al., 2021; Majali et al., 2022). However, green innovation is relatively under examined in the context of developing countries. Thus, the current research to enrich the body of entrepreneurial research in the developing countries proposes to identify the mediating role of green innovation between green entrepreneurial orientation and performance of entrepreneurial firms (Melay & Kraus, 2012).

Likewise, with the increasing age of the enterprises, their experience also increases along with their financial strength, and they become capable of making risky investments and absorbing the shocks. Therefore, considering the important role of age in the performance of entrepreneurial firms and following the prior literature over moderating role of resource acquisition with age over different relationships (Abdi et al., 2022; Yin et al., 2022), the current research proposes age to have a moderating role over the relationship between green entrepreneurial orientation and performance of entrepreneurial firms.

Thus, taking the theoretical support of green utility-model and resource-based view the following framework has been developed in figure 1.

The theoretical model developed in this study is based on resource-based view and the supporting theory used in the study is green utility-model. The main contribution of the study is that both the existing theories ignore the importance of age which can act as a major influencer, because with the increasing age the resources of the entrepreneurial firms increase, and they become capable of taking risky decisions for investing in green innovation. Based on the above framework,

**Figure 1. Theoretical Framework.**



in the next section detailed literature review has been conducted to generate discussion over the hypothesis that has been developed based on the framework drawn above.

### **2.1. Green entrepreneurial orientation, green innovation, and performance of entrepreneurial firms**

There have been a variety of expressions implied to define and view green entrepreneurial orientation, including eco-entrepreneurship and sustainable entrepreneurship (Mrkajic et al., 2017; Pratono et al., 2019; Shehzad et al., 2023). The idea behind these phrases is to increase revenues while reducing the harmful effects of business operations on the environment (GallardoVázquez et al., 2023; Rehman et al., 2021; Yousaf, 2021). Green entrepreneurial orientation in this study is defined as organizational innovation of products or processes for financial gain whilst keeping environmental preservation in view (Santini, 2017). Green innovation has been seen as a successful method to save the environment and make money (Lin & Chen, 2018; Wang et al., 2022), because now it is also considered as a good marketing tool to attract customers (He et al., 2023).

Although empirical results are conflicting, green entrepreneurial orientation can cause green innovation which can enable enterprises to achieve the targets in the areas of environmental sustainability and profitability both (Dhrifi et al., 2020). In a former study, the researchers concluded that innovation leads to superior performance (Khan et al., 2021). However, some researchers claimed that green innovation imposing a somewhat adverse impact on financial performance because they view it as a burden for the firms (Alwakid et al., 2020; Lotfi et al., 2018; Xie et al., 2023).

As the core of green entrepreneurial orientation, green innovation frequently requires a high cost of investment, increasing the financial strain on an enterprise (Duque-Grisales et al., 2020). The financial cost and obstacles highlight how challenging green entrepreneurial orientation is for entrepreneurial firms (Zuhaib et al., 2022). It is especially burdening for firms owing to their limited resources and expertise, which might limit how effectively they can implement an environmental plan (Ghazali & Zainurrafiqi, 2023). Despite these obstacles, this study focused on the fact that green innovation often improves performance of entrepreneurial firms.

Green innovation is capable of boosting economic performance of entrepreneurial firms by utilizing both tangible and intangible resources in addition to physical resources and technology (Damer et al., 2021; Fadhel et al., 2022; Huang et al., 2022). One way that green innovation improves the economy is by reducing costs, boosting productivity, or distinguishing products to help them outperform in the market (Ullah et al., 2021, 2021; Zameer et al., 2022; Zhang et al., 2019). Recognizing the physical resources that the enterprises lack and using technology to turn those resources into an advantage will help them perform economically (Suchek et al., 2021).

Enterprises might restructure products or production procedures, for instance, to increase resource regulation and decrease costs (materials, etc.), which will increase profitability (Hu et al., 2022; Lv et al., 2023). Additionally, as recycled resources are less expensive, businesses can increase economic performance by using recyclable materials (Javaid et al., 2022). Thus, implementing green innovation can have a positive influence over the performance of entrepreneurial firms.

Likewise, green innovation can also improve a reputation of the enterprise by influencing how they are perceived as being environmentally friendly (Amaleshwari & Jeevitha, 2023; Khan et al., 2021). According to the concept based on resource, businesses can gain a competitive edge by utilizing both intangible resources and technology in addition to tangible resources (Tu & Wu, 2021). Green image of entrepreneurial firms is shaped by green innovation (Srisathan et al., 2023) which significantly boosts the market repute of the firms.



Consumers, for instance, have a more favorable opinion of firms with green branding (Qalati et al., 2022; Riphah et al., 2022). According to market and commerce specialists, firms' environmental commitment can be a compelling marketing tactic to draw in customers with a strong sense of environmental responsibility (Han, 2021; Li et al., 2020) which can significantly boost profits. Green innovation improves environmental reputation of the firms, which raises consumers' perceptions of its dedication to the environment, increase consumer loyalty, which generates profit (Bilal & Sulaiman, 2021; Sharma et al., 2020; Wang et al., 2020).

Based on this research, green innovation refers to both green utility-model (Yin et al., 2022). Hence, based on the above discussion, there is no harm in arguing that green entrepreneurial orientation leads to green innovation which boosts performance of entrepreneurial firms. Therefore, the following hypothesis has been proposed:

**H<sub>1</sub>:** Green entrepreneurial orientation has a significant impact over performance of entrepreneurial firms.

**H<sub>2</sub>:** Green entrepreneurial orientation has a significant impact over green innovation.

**H<sub>3</sub>:** Green innovation has a significant impact over the performance of entrepreneurial firms.

**H<sub>4</sub>:** Green innovation mediates between green entrepreneurial orientation and performance of entrepreneurial firms.

## **2.2. Green entrepreneurial orientation, resource acquisition with age, and performance of SMEs**

This study argues on the relationship between green entrepreneurial orientation and performance of entrepreneurial firms being significantly affected by the firm's age, because of the inconsistencies found in the literature of green entrepreneurial orientation and performance. Existing research has found that a firm's age has a significant moderating role to change the direction of the relationships (Abdi et al., 2022), as the findings over the relationship between green entrepreneurial orientation and performance are inconsistent. Scholars contend about age of the firm to have a detrimental effect on innovation (Eldridge et al., 2021), whereas some contend that firm age has a favorable effect on innovation (Chatterjee et al., 2021). Researchers have concluded that there is no significant correlation and an inverted U-shaped relationship of firm age with innovation activity (Fan & Wang, 2021; Ramadani et al., 2019). Thus, it also calls to examine the impact of firm over, because it has also certain controversies over its impact on performance.

Former businesses do, in fact, frequently have established external contacts that might provide approach towards assets essential for fostering innovation (Eldridge et al., 2021). A firm's innovation also requires prior relevant experience and expertise (Mokhtarzadeh et al., 2020). To put it another way, cumulative experience, and information from previous trials, including successes and failures, can result in future innovative breakthroughs (Fan & Wang, 2021). Because experience with knowledge is necessary to develop green innovation, older organizations are therefore more likely to have been benefited from green entrepreneurial orientation compared to younger ones (Huang et al., 2022).

Furthermore, older entrepreneurial firms have more established methods for entrepreneurial strategies, which are crucial for facilitating green entrepreneurial activities (Gimenez-Fernandez et al., 2020); in contrast, younger firms frequently lack knowledge of these routines or organizational norms. As a result, we hypothesis that older organizations have resources (such as connections with the outside world and previously accumulated information) that encourage the application of green innovation which consequently improves the performance of entrepreneurial firms. Hence, there is no harm in proposing the moderating role of resource acquisition with firm

age over the relationship between green entrepreneurial orientation and performance of entrepreneurial firms. Thus, the hypothesis is proposed as follows:

**H<sub>5</sub>:** Resource acquisition with Firm age moderates the relationship between green entrepreneurial orientation and performance of entrepreneurial firms.

### 3. Research methodology

The purpose of the study is to identify the mediating role of green innovation and moderating role of resource acquisition with firm age between green entrepreneurial orientation and performance of entrepreneurial firms. Data for this study was gathered from the entrepreneurial firms operating in Sialkot and Karachi cities of Pakistan. These two cities reflect various geographic locations, ecological states, and economic developmental levels. Furthermore, these two cities constitute maximum number of SMEs in the country and have greatest share in the SME contribution in GDP of the country. Entrepreneurial firms were chosen from a diverse variety of industry areas, including, leather, sports goods, surgical instruments, and beauty instruments. Respondents in the sample entrepreneurial firms are Owners and managers. Consent was obtained through emails and phone calls. These respondents received questionnaires. Initially, the perspective respondents list was taken from the Chamber of commerce and industry Sialkot and Chamber of commerce and industry Karachi. Out of that list 1000 respondents were chosen using SPSS random sample selection technique. Then the questionnaires were sent to the respondents and a filter question explaining that is the firm entrepreneurial or not was used to proceed only with entrepreneurial firms. The respondents were asked about the flexibility of their firm in innovation and proactiveness. Those who responded in yes were taken for the final data analysis. The same strategy was adopted by previous researchers (Asad et al., 2023). To help the respondents understand our goals, a description of this survey was included with each questionnaire. Follow-up calls were made two weeks later to remind them, thank them for their involvement, and address any issues they faced while answering the questions. To maintain the anonymity of the survey, respondents forwarded the completed form straight to us, without their identity.

The measuring items were examined by the academic experts in the field of entrepreneurship. Out of 500 distributed questionnaires a total 384 valid questionnaires were returned that were complete and usable. In this study, businesses had an average tenure of 5 years, while there are 30 employees on average at each firm. Each item was evaluated using a seven-point Likert scale, with a range of 1 (strongly disagree) to 7 (strongly agree).

Five items for green entrepreneurial orientation and three items for green innovation measurement were adopted from Majali et al. (2022). Five items for performance of entrepreneurial firms' measurement were adopted from Asif et al. (2021). Furthermore, SMEs demographics especially resource acquisition with age having moderating role is followed from Abdi et al. (2022). The description of items is explained in Table 1.

For the descriptive analysis of variables SPSS 24 has been used. For evaluating the direct mediating and moderating hypotheses SMART PLS 3 has been used (Hair et al., 2013). The method has been used as the same analysis technique has been applied by the prior researchers conducting research in the sector (Hammami et al., 2021; Qalati et al., 2022).

### 4. Analysis and findings

To analyze the hypothesis of the study structural equation modelling has been applied using Smart PLS-3. Even though PLS is a non-parametric test, yet to ensure the generalizability of the findings descriptive and normality of the data was analyzed. In the descriptive mean and standard deviation are calculated only. To confirm normality of the collected data skewness and Kurtosis are calculated. The threshold values for Skewness are less than 3 and for kurtosis less than 8 (Hair et al., 2010).



**Table 1. Description of items**

Performance of entrepreneurial Firms	Income (net profit) of our firm has increased.
	The number of items sold increased.
	Output of our firm has increased.
	Investment of our firm has increased.
	Our firm has bought new machine/equipment.
Green Entrepreneurial Orientation	In general, our firm favors a strong emphasis on green practices, such as R&D, technological leadership, and innovation
	When facing uncertainty, we typically adopt a proactive posture to catch potential green opportunities
	In dealing with competitors, we typically initiate green actions that competitors respond to
	Our firm favors a tendency to be a leader, and always introduce green products, service, or technology first
	In dealing with competitors, we typically adopt a competitive 'undo-the competitors' posture
Green innovation	My company uses materials that produce least pollution.
	My company uses materials that consume less energy and resources.
	My company uses materials that are easy to recycle, reuse, and decompose
Resource acquisition Firm Age	Firm resources increase with the passage of time.
	Experience of our firm increases with the passage of time.
	Risk taking for green initiatives increase with the passage of time.

From the above table the calculated data is normally distributed, and the findings can be generalized as the data is free from any kind of bias. Afterwards, the first step in structural equation modeling is to ensure the reliability and validity which are the two main criteria used in PLS-SEM analysis to evaluate the outer model (Joseph et al., 2013). The first step in evaluation of outer model is evaluating item loadings, followed by Cronbach's alpha, composite reliability, and Average Variance Extracted (AVE). The threshold level for item loading is higher than 0.70 and the same for Cronbach's alpha and composite reliability is 0.7, while the threshold for AVE is greater than 0.5 (Carmines & Zeller, 1979; Claes & Larcker, 1981; Hair et al., 2013). The evaluated values for the abovementioned tests are mentioned in Table 2.

The evaluated values in Table 2 confirm that the items used in the instrument hold sufficient loadings and should be kept in the model. Furthermore, from the calculated values of Cronbach's alpha, composite reliability, and AVE the instrument is reliable and valid. Another measure which is necessary to identify is to confirm that the items used to evaluate one construct are discriminated against from the items used to measure another construct. Therefore, discriminant validity is calculated which shows the capacity of scale to measure the only construct, it is supposed to measure. According to Fornell Larcker Criterion, the square root of AVE of a given construct is larger than its correlation with any other construct (Henseler et al., 2015). The evaluated values for the discriminant validity are mentioned in Table 3.

Table 3 confirmed that the items used to measure one construct are significantly different from the items used to measure the other construct. After ensuring that the outer model is reliable and valid, the inner model has been analyzed. Initially, only independent, mediating, and dependent

**Table 2. Descriptive analysis**

Construct	Mean	Standard Deviation	Skewness	Kurtosis
Resource Acquisition with Age	5.00	3.00	-1.045	-0.282
Performance of Entrepreneurial Firms	5.12	0.667	-1.117	-0.502
Green Entrepreneurial orientation	4.95	0.951	1.249	0.350
Green Innovation	5.38	0.837	-0.569	-1.550

**Table 3. Item loadings reliability and validity**

Variables	Items	Loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Performance of Entrepreneurial Firms	PEF1	0.811	0.939	0.950	0.705
	PEF2	0.900			
	PEF3	0.865			
	PEF4	0.938			
	PEF5	0.825			
Green Entrepreneurial orientation	GEO1	0.932	0.945	0.955	0.775
	GEO2	0.778			
	GEO3	0.915			
	GEO4	0.878			
	GEO5	0.719			
Green Innovation	GI1	0.863	0.859	0.914	0.780
	GI2	0.897			
	GI3	0.889			
Resource acquisition with Age	A1	0.888	0.910	0.943	0.847
	A2	0.982			
	A3	0.951			

variables were introduced in the model and their direct relationships were analyzed. The findings are mentioned in Table 4.

The findings from Table 4 confirmed that green entrepreneurial orientation significantly influences performance of entrepreneurial firms ( $\beta = 0.315$ ,  $t = 2.212$ ,  $p = 0.014$ ). Likewise, green entrepreneurial orientation also significantly influences green innovation ( $\beta = 0.588$ ,  $t = 5.110$ ,  $p = 0.000$ ). Similarly green innovation significantly influences performance of entrepreneurial firms ( $\beta = 0.469$ ,  $t = 3.186$ ,  $p = 0.001$ ). The calculated values confirmed that all the direct relationships are significant. Afterwards the mediating role of green innovation has been analyzed for which the findings are mentioned in Table 5.

Mediating is analyzed using the indirect effects method of PLS-SEM. The findings confirmed that the mediating role of green innovation is significant and positive ( $\beta = 0.240$ ,  $t = 2.307$ ,  $p = 0.011$ ) as shown in table 6. The positive role is analyzed by analyzing the increased value of  $r^2$  after introducing mediator in the model. Afterwards the moderating variable which was resource

**Table 4. Discriminant validity**

Constructs	A	GEO	GI	PEF
Resource acquisition with Age	0.920			
Green Entrepreneurial Orientation	0.556	0.869		
Green Innovation	0.533	0.588	0.883	
Performance of Entrepreneurial Firms	0.541	0.606	0.680	0.840

**Table 5. Direct effects**

Path Coefficients	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
GEO -> PEF	0.315	0.316	0.142	2.212	0.014
GEO -> GI	0.588	0.588	0.115	5.110	0.000
GI -> PEF	0.496	0.484	0.156	3.186	0.001

**Table 6. Mediating Effect**

Path Coefficients	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
GEO -> GI -> PEF	0.240	0.228	0.104	2.307	0.011

acquisition with firm age has been introduced in the model and initially, the direct effect of the age is analyzed. Afterwards, interaction term has been introduced in the model to check the moderating effect of resource acquisition with firm Age between green entrepreneurial orientation and performance of entrepreneurial firms. The findings of the direct effect as well as the moderating effect of resource acquisition with firm age are mentioned in Table 7.

The evaluated value for the direct effect of resource acquisition with firm age is significant which confirms that age of entrepreneurial firms influences the performance of entrepreneurial firms ( $\beta = 0.546$ ,  $t = 4.351$ ,  $p = 0.000$ ). Similarly, when the interaction term was introduced, the moderating effect was also proven to be significant ( $\beta = 0.408$ ,  $t = 2.395$ ,  $p = 0.008$ ). Furthermore, from the abovementioned table the entire model is significant.

To further confirm the findings, effect size has been measured to confirm the importance of intervening variables. Effect size is calculated by evaluating the model with presence and absence of the variable in the model and changes in the  $r^2$  is analyzed (Hair et al., 2010). Using the formula given by Chin et al. (2003) effect size has been evaluated. If the calculated value of the  $f^2$  is 0.02 it shows small effect, however, 0.15 shows a moderate effect, while above 0.35 shows large effect (Chin et al., 2003). The findings for the effects size of mediator and moderator are mentioned in Table 8.

As per the values calculated in the model above, mediator has almost a large effect, but it falls in the range of medium effect. However, moderator is showing large effect as the calculated value is above 0.35. Finally, to check the predictive relevance of the model. Blindfolding technique has

**Table 7. Moderating effect**

Path Coefficients	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
GEO -> GI	0.588	0.588	0.118	4.978	0.000
GEO -> PEF	0.225	0.260	0.112	2.001	0.014
GI -> PEF	0.443	0.425	0.161	2.751	0.003
A -> PEF	0.546	0.543	0.125	4.351	0.000
GEO*RAFA -> PEF	0.408	0.395	0.171	2.395	0.008

**Table 8. Effect Size**

Effects	R <sup>2</sup> included	R <sup>2</sup> excluded	F <sup>2</sup>
Mediator	0.528	0.372	0.331
Moderator	0.544	0.372	0.378

**Table 9. Construct cross Validated Redundancy**

	SSO	SSE	Q <sup>2</sup> (=1-SSE/SSO)
Performance of Entrepreneurial Firms	792.000	495.787	0.374

been applied using construct cross validated redundancy using Stone-Geisser's Q<sup>2</sup> test (Hair et al., 2010). If the calculated value of Q<sup>2</sup> falls below zero, then the model lacks predictive relevance.

The calculated value of Stone-Geisser's Q<sup>2</sup> as mentioned in table 9 confirms that the model holds significant predictive relevance, and it can be used over any similar kind of settings.

### 5. Discussions, implications, limitations, recommendations, and conclusions

Our study uses the data from 384 entrepreneurial firms from leather, sports goods, surgical instruments, and beauty instruments operating in Sialkot and Karachi cities of Pakistan to examine the effect of green entrepreneurial orientation on the performance of entrepreneurial firms and if this link varies because of age of the enterprise. The objective of the study was to identify the mediating role of green innovation and moderating role of resource acquisition with firm age, both the main objectives which were the contribution of the study have been fulfilled.

The findings confirmed the influence of green utility-model to confirm the mediating role of green innovation. We found significant evidence through the collected data that supports the claim that green innovation mediates and enhances performance of entrepreneurial firms. It is due to reduced application requirements, lower costs, a faster application process, and a shorter period of legal protection are characteristics of utility-model innovation (Guo et al., 2020; Zameer et al., 2022; Zhang et al., 2019). In other words, the speedier commercialization of technology, shorter lifecycle of the products which calls for the innovation on continuous bases and the increasing consumer knowledge for the green products calls for green innovation which plays a crucial function. The findings of this research imply towards impact that green utility-model has on performance of entrepreneurial firms which is confirmed for young as well as old enterprises, but the influence is magnified over the old firms, as the moderating role of resource acquisition with firm age is established. This also confirms that with the increase in experience of the entrepreneurs their capability to invest in risky projects mostly gives them advantageous outcomes. This is in line with the prior studies which claim the age holds a significant moderating role

(Abdi et al., 2022; Yin et al., 2022; Ullah et al., 2021). Resource acquisition with firm age as a moderator has shown to have a significant impact because the age of the firm improves experience as well as the financial strength, which helps in taking right decisions and make the firms capable of doing right investments.

### **5.1. Implications of the study**

Numerous theoretical and managerial advancements are made through our research. By distinguishing between several categories of green innovation, this research first adds to the body of knowledge on green entrepreneurial orientation as well as the performance of entrepreneurial firms.

### **5.2. Theoretical implications**

Our research on mediating role of green invention by using the theoretical lens of green utility-model adds to the body of knowledge regarding the relationship between green entrepreneurial orientation and performance of entrepreneurial firms. Performance of entrepreneurial firms is significantly impacted by green innovation in the context of this research. While earlier studies have concentrated on green entrepreneurial orientation, we illustrate why it is crucial for future research to consider the diversity and complications of businesses' green entrepreneurial initiatives.

The empirical results indicate that green entrepreneurial orientation is advantageous for entrepreneurial firms. Younger businesses, however, hardly earn profit from green innovation, yet their future becomes bright because of increasing trends of the consumers towards green activities. We also hypothesized that, given the theoretical justifications for the steady accumulation of resources such as experience, knowledge, and resources, age can also play a significant part for large enterprises. Thus, conformance of the moderating role of resource acquisition with firm age holds another significant theoretical contribution in the RBV which highlight only about the resources, however, in this study, resource acquisition with firm age has been catered as moderator which has proven significant by analysis of collected data.

Finally, we close the study gap found in the existing literature on green entrepreneurial orientation, which prioritizes large firms and mostly ignores small and medium entrepreneurial firms in case it relates to environmental strategy. This study deepens the concept of the relationship between environmentally friendly innovations and the performance of entrepreneurial firms. The results from our study confirm that environmentally friendly innovations encourage businesses to pursue environmentally friendly innovation commonly termed as green innovation.

### **5.3. Managerial implications**

Our research has management implications as well. For instance, businesses are faced with the task of going "green" as the public's awareness of environmental protection grows. Economic growth can be increased through green innovation, which is the core of green entrepreneurial orientation. Businesses may use a variety of creative techniques to combat constraints from the local government and stakeholders (e.g., customers). Policymakers of younger enterprises may be concerned about various sorts of investment in environment-related activities, beyond green technologies, given the general belief that entrepreneurial firms have scarcity of resources. Taking energy-saving equipment, for instance, our research revealed that green ideas might assist entrepreneurial firms. Green technologies are particularly risky because they are accompanied by investment uncertainty, but cost saving and increasing consumer trends towards green and environmentally friendly products can prove beneficial for entrepreneurial firms. To put it another way, green innovations present difficulties only for young firms since they lack the experience and resources needed to create green innovations. Hence, Failures in green R&D experiments could cause significant losses for young entrepreneurial firms.

#### 5.4. Limitations and recommendations

Despite the importance of research theoretically as well as practically, the study has its limitations. First, we restrict our attention to enterprises only in two major cities which are considered as hub of firms in Pakistan, however, a detailed comparison over various cultural settings can further enhance the concept. Regulations pertaining to the environment may vary from area to area. Therefore, additional research in a wider empirical setting is required. Secondly, the study used primary method of data collection based on self-perception of the respondents, even though several measures were taken to avoid any kind of personal biasness of the respondents, however, in any primary study it is impossible to eliminate this issue, hence in future the researchers are guided to conduct qualitative study or to use secondary data to analyze the same model.

Additionally, we measure a firms' green entrepreneurial activities using green innovation. Green innovation can acknowledge an organization's efforts to safeguard the environment. When a firm, however, employs other types of green entrepreneurial tactics, such as maintaining fuel-conserving buildings, utilizing eco-friendly substances, and much more, it might not be a good measurement, but can have momentous impacts over the outcome of the green practices. Future research may consider a green innovation measurement that incorporates a vast range of green innovative activity. Additionally, through the empirical data we found that green invention innovation improves the performance of entrepreneurial firms.

Entrepreneurial firms may also gain from green utility-model innovation along with green invention innovation in various contextual settings. Green utility innovation that has more affordable benefits to the entrepreneurial firms. Therefore, a future study may investigate the implications of green innovation's qualities, and it should be further explored how they affect performance. Future studies may also examine whether entrepreneurial firms and their large, established competitors differ in how much they can gain from green innovation. Large, well-established firms have resource advantages, therefore their preferences for green innovation and how it affects performance may differ from those of entrepreneurial firms.

#### 6. Conclusions

Based on the above discussion, it is obvious that adoption of green entrepreneurial orientation is beneficial for the entrepreneurial firms, as it enhances their performance. Based on the perspective of RBV, this research confirms the positive impact of green entrepreneurial orientation over performance and enrich the theory by identifying the mediating role of green innovation using the theoretical support of green utility model. Furthermore, the confirmation of the moderating role of resource acquisition with firm age is another important finding which highlights the importance of experience and financial strength, which entrepreneurial firms gain with the passage of time.

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#### Supplemental material

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