The Role of Sustainability Practices in Improving Corporate and Sustainability Innovation Performance of the Petroleum Companies of Pakistan

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Abstract

The purpose of this research is to investigate and analyze the vital role of sustainability practices encompassing eco efficiency linked, employee or ethics centered and integrative procedures for enlightening corporate performance and guaranteeing greater sustainable innovation performance. This is achieved by upholding and maintaining EEA trait resilience that comprises engineering, ecological and adaptive facets of resilience. On the basis of tentative assumptions derived through a Triple Bottom Line (3BL) of oil and gas companies, Structural Equation Modeling (SEM) with SMART PLS has been used to perform path analysis for testing these hypotheses. The sample in the envisioned study with cross-sectional study design contains primary or empirical data obtained from the managers of petroleum companies in Lahore, Pakistan. With respect to the current study's context, it can be established that sustainability or socially responsible practices are the ultimate supporting and ancillary beings of petroleum based organizations needed to gratify ecological, engineering and adaptability (EEA) resilience and assist these companies to achieve long term goals pertaining to corporate value, effectiveness and efficacy with augmented heights of sustainable innovation performance. This study features and emphasizes the true

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value of sustainability based on the premise of Institutional Theory and resilience or bounciness of oil and gas companies momentous of Systems Theory based texts. The findings reveal that higher sustainable innovation enactment and enhancement in corporate level performance of these petroleum companies can be sustained and endured in continuity by fetching resilience in adaptiveness, ecosystem protection and engineering processes through installing distinguished ethics, employee and integration centered sustainability and actions in operations.

Keywords: EEA resilience, sustainability, business performance, sustainable innovation based performance

1. Introduction

The significant role of sustainability practices has been highly appreciated in commercial industry operations. The latitude of sustainability in this day and age is hardly confined to the frontiers of economic and financial sustainability for any business or industry (Press & Arnould, 2009). Prominent firms and modern-day industries proactively integrate sustainability reforms and report disclosure of their day to day operations exemplifying crucial aspects of their commercial performance, that is, social, economic and ecological or environmental aspects, to bring forth higher recital innovation and corporate level performance in the longer term. Companies, in the wake of winning competitive rivalry, strive for building sustainability into organizational genetics for enduring and unrelenting resilience and better performance (Dyllick & Muff, 2016). They effectually manage the attainment of sustainability goals with regard to the Triple Bottom Line (3BL) of societal, ecological and financial balance in pursuit of instituting the true essence of sustainability in actual practice (Dyllick & Muff, 2016).

The concept of sustainability has been demarcated earlier using various frames of reference, nevertheless, the basic focus always remains on defending the natural environment (Sheth, Sethia, & Srinivas, 2011). The emergence of the trends of sustainability is dated from 1979, as revealed in the previous studies. This era is defined by the immense global energy crunch and oil crisis that occasioned in several businesses leading them toward transforming their business practices and integrating them with the application of high sustainability procedures, thus, reaping a powerful shift in the tendency and preferences of the consumers for greater efficiency in processes (Lubin & Esty, 2010). This impression funds the evidence that practices of sustainability are vitally indispensable for the petroleum industrial

sector. Additional factors responsible for motivating the industrial sector's all-encompassing petroleum companies to maintain sustainability and social welfare practices have been studied by Press & Arnould (2009). Petroleum industry, therefore, is taking substantial initiatives and serious measures to ensure reduction in environmental hazards and upsurge monetary gains through calculated cost controls (Luchs, Naylor, Irwin, & Raghunathan, 2010). Petroleum industry hence echoes itself as a vital producing, refining and distributing sector industry, contributory to Pakistan's economic growth and vital to the development of the society. Petroleum companies therefore need to appreciate the essentiality of sustainability practices whose employment saves natural ecosystems, stabilizes the economy and safeguards the society against avant-garde gaseous radiations and emissions.

Given the continuing progress in exploration, boring and refinement of deep water oil and gas reserves, pollution with intense hazards in external environment is also increasing exponentially. Doubtless to say, these hazards act as a source of triggering disasters during the unsafe and risky processes of oil and gas extraction and refinement. Such calamities may occur due to manmade and synthetic mistakes, fiascos in managing machine-driven automated equipment and seepage of hydrocarbon, oil and gases, instigating fatal calamities of nature. Thus, the companies that refrain from deploying ethical and enduring practices face obstruction in building adaptive response capabilities and resilience with regard to the robustness of engineering and technical processes and organic safety and lose the ability to proactively retort to dynamic uncertainties. This, as a result, incurs a negative influence on innovation in sustainability enactment as well as company performance in the long run. Consequently, it induces scholars and scientists to comprehend the significance of petroleum manufacturing corporations dealing with oil and gaseous end products and instigates them to argue for the implementation of the practices of sustainability, so as to add and generate an endured value of business against external environmental turbulence by shunning indeterminate tragedies (Castagra.org, 2015).

Pakistan is a land blessed with enormous organic and unprocessed resources and reserves. Energy intake and consumption in Pakistan has been continuously increasing in synchronization with the consistent rise in annual economic growth rate of Pakistan. Oil, gas and hydel energy are prime energy resources and simultaneously the backbone of our economy. The country has observed an 80% increase in oil and gas exploration since 2014. The upstream petroleum companies dealing with the investigation of oil and gas resources have discovered new reserves during the last four years, whereas the

downstream petroleum companies involved in its transmission and distribution network have extracted 32,343 barrels of oil in one day (BOPD) for domestic consumption (Arifeen, 2018). The period comprising the years 2014-2016 proved to be phenomenal for the petroleum sector because oil production reached up to 97,000 BOPD. The inclination toward discovering unexploited hydrocarbons based energy resources of Pakistan is occasioned in a colossal petroleum firms. Oil and gas companies representing the petroleum sector satisfy 20% energy needs at domestic level, however, 80% of the total demand is fulfilled with refined fuel and unfinished oil imports from international crude lubricant market (Express Tribune, 2017). Petroleum sector contributes its huge share in the economic and financial growth of Pakistan. Integrating organic practices of sustainable endurance helps develop resilient and irrepressible capabilities in engineering and technical processes required to generate and contribute value for green initiatives, performance novelty and an inclusive commercial performance.

Nonetheless, there are no research and reporting works that can be found with reference to the application of sustainability practices in different industrial sectors of Pakistan. This research paper seeks motivation from the less or non-representation and negligence of taking into account the studies conducted on Pakistani enterprises with respect to their role in sustainability practices (Mahmood, Kouser, & Iqbal, 2017). According to Faisal (2017), the state and practices regarding sustainability issues, especially in the petroleum sector, are still barely explored within the Pakistani context. Previous studies do reveal the weaknesses of the system of governance in Pakistan that has been a constant source of obstructing the economic and financial development of Pakistan, however, the role of sustainability practices particularly for the sake of climatic protection has not been explained so far (Faisal, 2017).

With the ever increasing trends of globalization, Pakistani companies are also working hard to inculcate the culture of implementing sustainability practices and to integrate all their processes. However, little or no research is found about linking sustainability practices with EEA resilience for petroleum companies (Kiran, Kakakhel, & Shaheen, 2015). The report published by ACCA in 2017 shared its views on "The Evolving Landscape of Pakistan" in terms of sustainability practices. This report concluded that a gradually increasing trend can be found among petroleum companies emphasizing the inculcation of the sustainability factor. These companies include Pak Arab Oil Refinery, Pakistan State Oil, and Pakistan Refinery

Limited. These are the only companies that report their sustainability procedures and practices.

With rapidly increasing consumption and ingestion of oil and fuel based products in Pakistan, the protection of the depleting natural ecosystem and rare resources is becoming essential. Therefore, further studies need to be conducted for motivating these companies to integrate sustainability practices in order to optimize resource resilience. Resultantly, in order to identify sustainability practices and highlight their importance for the company as well as the larger community in the downstream petroleum sector of Pakistan, there is a dire need of creating awareness and execution of social, environmental and economic sustainability practices (Naimi, 2011).

The concept of "resilience" is very much linked to the sustainability of a business (Jansson, 2013). Sustainability is the key foundation of continuing ecological, industrial and adaptive resilience (Jansson & Polasky, 2010; Maltby, Day, & Hall, 2015). Such green initiatives help companies attain robustness and sufficient flexibility to quickly recover from any catastrophes or instabilities (Folke et al., 2002), ensure stability in ecosystems, ecological and natural environment alongside economic stability and growth (Holling, 1996) and battle against peripheral disturbances to adjust accordingly (Walker, Holling, Carpenter, & Kinzig, 2004). Defensible actions embraced by firms help them achieve biological or green adaptation and capitalize upon on engineering structures as well as establish superior adaptive response capabilities in order to consequently rejoin the disorders (Ulanowicz, Goerner, Lietaer, & Gomez, 2009). Organizational bounciness and resilience supported with ecological firmness, engineering adroitness and robust competence entails long term sustained and competitive performance of business. Developing the resilience of a business helps augment enterprise wide performance of the company (Cooper, Liu, & Tarba, 2014). Besides, sustainable modernization or innovation based performance is an evident positive upshot of resilient behavior developed by companies by means of sustainability (Calik & Bardudeen, 2016). O'Brien (2009) in his research paper studied a conceptual framework on ecological resilience and vulnerability in the energy sector. Wan Ahmad, de Brito, and Tavasszy (2016) assessed sustainability practices in oil and gas companies empirically using content analysis. The role of management preparedness in enhancing sustainable strategies for supply chain petroleum industry has been studied using quantitative survey (Ahmad et al., 2016).

This study aims to pursue the starring role or effect of sustainability driven practices espoused by oil and gas companies toward promoting

resilience encompassing engineering, ecological, and adaptive (EEA) aspects. Furthermore, it intends to spot the influence of these resilient competencies on sustainable innovation performance and commercial performance of petroleum companies.

2. Research Question

The current research study is designed to answer of following research question,

Q: What role do petroleum (oil and gas) companies play in improving sustainable innovation performance and corporate performance by means of ecological, engineering, and adaptive (EEA) resilience accompanied by sustainability (green initiative) practices?

3. Research Objectives

While fulfilling the research objectives, a number of means can be considered and appreciated by which the current paper may contribute significantly in the field of sustainability, resilience and performance. Firstly, this paper aims to consolidate these entirely different fields and fabricate a tight connection between sustainability practices and innovation performance in terms of sustainability. Secondly, the resilience of an organization with three important traits including adaptive capacity, ecological friendliness and engineering processes and their role in sustaining long term competitive advantage is the fundamental focus of this study. Thirdly, this study uses a theoretical model developed on the basis of literature supported propositions which have been analyzed empirically to develop a link among the given themes. Fourthly, this study will play a contributory role in symbolizing the utility of the model using Path Analysis based on Structured Equation Modeling (SEM) for statistical model testing. Finally, the paper elucidates its working on the basis of the assumption that having EEA trait resilience established through sustainability practices leads to the enhancement of sustainable innovation performance and overall corporate performance.

4. Theoretical Background and Hypotheses Development

In conformity with the Institutional Theory, it has been expounded that an organization is surrounded by an external field and a controlled environment that forces the organization to execute processes that conform to societal and other legitimate requirements (DiMaggio & Powell, 1983). In response, the organization acclimates and adjusts its structure, processes, policies, and practices in order to synchronize with the external environmental pressures, uncertainties and dynamism. Resultantly, an organization achieves

robustness and resilience (Hsu, Hu, Wei, & Huang, 2014). The prime concern, major influence and pressure put on the organization from external stakeholders such as customers, larger community and government is intended to ensure that their processes and results are green and sustainable (Rentizelas, de Sousa Jabbour, Al Balushi, & Tuni, 2018).

An earlier study conducted by Dubey, Gunasekaran, & Ali (2015) depicts that institutional pressures have forced manufacturing companies to build greener supplier relationships for ensuring sustainability, thus the performance management system of these companies is driven by institutional forces toward adopting sustainability practices (Dubey et al., 2017). 'Regulatory Factor' is one of the institutional forces that significantly drive commercial logistics and supply chain programs as seen in the Malaysian context (Khor, Udin, Ramayah, & Hazen, 2016). Under the backing of institutional theory and logic, another pressure is put through governmental powers that enforces organizations to increase the chances of their success by adopting best sustainability practices (Zhu, 2016). Companies adopting sustainable and green ecological practices are essentially enthused by institutional pressures on them (Seles, de Sousa Jabbour, Jabbour, & Dangelico, 2016).

While institutional pressures influence the oil and gas based organizations to firmly adhere to green and clean environment based sustainability practices and resultantly make them ecologically resilient, they also help them perform better and increase their innovation determined performance (Idemudia, 2014; Shibin et al., 2017). By and large, this study is set to accomplish that Institutional Theory has initiated the debate and has provided the impetus for organizations to adopt sustainability practices due to external institutional pressures posed by the environment. Petroleum companies have taken motivation and influence from institutional compressions and pressures and have drawn their attention toward the notion of sustainability, whose major pillars are ecological protection and green initiatives (Rentizelas et al., 2018). External institutional forces stress on embracing ecological responsibility by petroleum companies, the sustainability practices subsequently followed by these companies nevertheless make them more innovative and best performing in the industry (Hoejmose & Adrien-Kirby, 2012; Rentizelas et al., 2018).

Sustainability through Triple Bottom Line (economy, society and environment) is intent to boost the appeal for business investment. Many companies use "eco-efficiency premium" as an important component integrated into their investment strategies for gaining maximum share value

(Cohen, 2006). This acts as a trigger to prompt the advent of socially responsible investment (Kahn, 2006). It has been found that companies exhibiting high standards of sustainability always outperform their competing firms. This also shows that the investment choices of businesses must be linked with social and ecological ambitions in order to establish higher than usual returns (Margolis & Walsh, 2003). Sustainability practices have a positive influence on organizational performance (Derwall, Guenster, Bauer, & Koedijk, 2005; Dow Jones Sustainability Index, 2005; Kahn, 2006; Cohen, 2006).

The concept of sustainability holds an important relationship with developing resilience for organizations. This is due to the fact that businesses do not operate in silos, rather they exist as interconnected entities. Such 'socio-ecological' relationships and diminishing global boundaries at the same time also create vulnerabilities, thereby causing a dire need for developing important resilience traits, that is, engineering, ecological and adaptive (EEA) (Maltby et al., 2015). Sustainability practices hence act as a tipping point that massively influence business performance in managing these uncertainties and vulnerabilities, thus making organizations resilient in terms of their engineering systems, natural environmental protection and business profitability. Sustainability practices play a fundamental role in developing EEA resilience through the protection of dynamic and complex ecological, social and economic systems (Rockström et al., 2009). The loss of sustainability practices in businesses has been attributed to the loss of resilience of companies (Arrow et al., 2004). Sustainability practices are contributory to the wellness and wellbeing of the organizations by making them more flexible, adaptable and resilient (Millennium Ecosystem Assessment, 2005).

The integration of Systems Theory and Ecology Based Systems helps to better understand EEA trait resilience (Folke et al., 2002). EEA trait resilience comprises three broader areas covering ecological, engineering and adaptive capacity based resilience (Maltby et al., 2015). The concept of ecological resilience deals with the ability of environmental systems to sustain a stable position in terms of their identity, purpose, structure and process (Pedersen et al., 2011). Engineering resilience is the ability of the physical or engineering systems to retain their equilibrium followed by any disturbance in external environment (Folke et al., 2002, Holling, 1996). Systems are said to have robust adaptive capacity if they have the ability to adapt and accommodate any change occurring in the external environment. Systems having a strong adaptive capacity also have greater resilience owing to the

capability of consistently resisting any continuous variations or disturbances by adapting their own processes and functions (Folke et al., 2002).

According to Cartwright and Cooper (2009), having resilient traits is beneficial for the wellbeing of an organization. Exhibiting resilient traits helps to improve corporate performance by helping organizational systems bounce back efficiently and effectively from the setbacks and difficult situations in times of stress (Cooper et al., 2014). Resilient organizations and their individuals demonstrate consistent corporate performance due to their adaptive capacity to efficiently and effectively deal with stressful and tough situations (Avey et al., 2009). Optimistic psychological characteristics exhibited by individuals of an organization are an important facet of EEA trait resilience and remain associated with the positive wellbeing and improved performance of an organization (Higgs & Dulewicz, 2014, Gupta & Singh, 2014). Cooper et al. (2014) have extensively studied the role of resilience in organizational performance implications. Organizations having resilient characteristics are better able to defend themselves against bankruptcy and other business failures and it makes them perform with consistency and maximum effectiveness (Liu & Woywode, 2013). Sustainability practices are conducive to organizational resilience, thereby making them capable of performing better (Harmon, Fairfield, & Behson, 2009).

Sustainable innovation performance can be considered as an important outcome of EEA trait resilience that takes into consideration important aspects of business performance such as financial (economic), environmental (ecological and social) and adaptive capacities (Boons & Lüdeke-Freund, 2013). Organizational performance based on sustainable innovation that capitalizes on EEA trait resilience can be realized through remarkable improvements in technology, services, products and processes. Shuaib et al. (2014) also studied the impact of organizational systems' flexibility and resilience in terms of financial, ecological and adaptive capabilities on sustainable innovation performance of the organization and its consequences for high financial stability, protection of external or natural environment and society at large. Sustainable innovation performance is critically important to an organization's dealing with high ecological and social protection concerns, therefore petroleum companies are required to pursue sustainability practices for developing resilience traits (Calik & Bardudeen, 2016). The adoption of sustainability practices results in sustaining ecological, adaptive and engineering resilience for petroleum companies in a way that they efficiently utilize resources with minimum energy consumption, ensure safety of health, prevent environmental traumas

and retain superior innovation performance (Ketata, Sofka, & Grimpe, 2015). This exhibits that sustainable innovation performance is the key outcome of unveiling three important traits of resilience, that is, engineering, ecology and adaptive capability (Calik & Bardudeen, 2016).

5. Hypotheses

H_1: Sustainability practices followed by petroleum companies encourage them to establish resilient traits in engineering processes, adaptive capacity and ecological safety

H_2: Resilient traits comprising engineering processes, adaptive capacity and ecological safety enhance the corporate performance of petroleum companies

H_3: Resilient traits comprising engineering processes, adaptive capacity and ecological safety prepare petroleum companies for improving their innovation performance with regard to sustainability

H_4: Resilient traits comprising engineering processes, adaptive capacity and ecological safety mediate the outcome of sustainability practices in terms of enhanced corporate performance of petroleum companies

H_5: Resilient traits comprising engineering processes, adaptive capacity and ecological safety mediate the outcome of sustainability practices in terms of boosted sustainability and innovation performance of petroleum companies

6. Research Methodology

6.1 Population, Sampling and Technique for Data Collection

According to the planned sequence of conducting empirical research, primary data collection method has been employed. The sample comprises petroleum companies operating in Pakistan. The downstream petroleum companies in Pakistan are responsible for refining crude oil, as well as processing and purifying it alongside raw natural gas. The companies involved in retail, marketing, selling and distribution of refined petroleum end products in the form of oil and gas are also included in the domain of downstream petroleum subdivision. The companies in Pakistan included in this category and listed on Pakistan Stock Exchange (PSE) comprise Attock Petroleum, Attock Refinery, Byco Petroleum, Burshane, National Refinery, Pakistan Oil Field, Oil and Gas Development, Pak Refinery, Pak Petroleum, Shell and Pakistan State Oil. The petroleum sector of Pakistan accounts for 6% of its contribution toward the economic growth of the country at an annual growth rate of 11-12%. The companies in petroleum industry have been chosen on the basis of important parameters such as being listed in PSE, following Corporate Governance (CG) practices, and regularly reporting/disclosing their financial standing, sustainability and societal practices (Mughal, 2014). These

organizations have laid a sturdy base to secure the longstanding benefits of continuous business survival and sustainability and to raise shareholders' value to the maximum by implanting uppermost safety and wellbeing standards and corporate social responsibility as fundamental components of their operations (OGDCL, Annual Report, 2016).

The population comprises oil and gas based organizations, that is, petroleum companies in Lahore, Pakistan, selected on the basis of specific functional parameters relevant to the purpose of the study. A complete list of 72 petroleum companies regarded as the ultimate population from Lahore, Pakistan was made on the basis of sustainability practices and procedures (Business List Pakistan., oil and gas companies). Primary data was collected using self-administered questionnaires distributed to the 72 companies identified as compliant with the study requirements. The study has a cross-sectional research design and includes self-report based pool of data because respondents themselves read the stated questions (items) in the survey questionnaire and selected a particular response without the interference or guidance of the researcher.

After three visits to each organization and owing to the unavailability of the full list of all employees from all 72 petroleum companies and keeping in view the requirement for choosing a random sample so that the likelihood for the selection of each person could be equal (Trochim, 2006; Penwarden, 2013), 243 usable and valid questionnaires were received with no missing values, constituting a response rate of 64.16%. It was found that mainstream managers at petroleum companies belong to the age group of 31-35 years, having a mean value of 33 years and standard deviation of 27.87. On the other hand, majority of the respondents have a job experience ranging from 10-15 years, having a mean value of 14.01 years and standard deviation of 8.93. A non-response bias was tested in order to analyze the difference between non-respondents and actual respondents. Implementing t tests on the two independent groups, that is, respondents and non-respondents, did not result in any significant differences of age groups and experience or job tenure with $t = .916$, $p < .618$ and $t = .743$, $p < .801$. This proved that there exists no significant difference between respondents and non-respondents in terms of their ages and service tenure for the sampled participants as well as the entire population.

Common Method Variance (CMV) was used to identify systematic error biases in measurement in order to validate the factual relationship among the variables or constructs based on theoretical developments. CMV helped in determining the amount of unauthentic correlation established

between constructs as a result of the self-report survey (Podsakoff & Organ, 1986). CMV was addressed by applying the Harman one-factor test through exploratory factor analysis. Consequently, seven factors were identified (Eigenvalues > 1), representing the highest variance of 33.1% for sustainability practices and cumulative variance of 78.2% (total variance). This shows that variance is not significantly concentrated for one factor, rather it is spread across all factors in a balanced form. It is also interpreted that only a single factor does not solely account for the bulk of the co-variance between the constructs (Podsakoff & Organ, 1986).

6.2 Measuring Instruments

6.2.1 Sustainability Practices

A 15 item scale measuring three key sustainability practices, that is, integrated, eco-efficiency and ethical (employee centered) practices was taken from Harmon et al. (2009). The respondents were asked to designate the level of disagreement or agreement with sustainability practices adopted by their managers across a 5-point Likert Scale with 1 = Strongly Disagree and 5 = Strongly Agree. The value of Cronbach's Alpha Reliability was 0.78.

6.2.2 EEA Trait Resilience

A 12 item scale measuring EEA trait resilience, that is, engineering, ecological and adaptive resilience was adopted from Maltby, Day, and Hall (2015). Respondents were asked to designate the level of disagreement or agreement with the engineering, ecological and adaptive resilience exhibited by their managers across a 5-point Likert Scale with 1 = Strongly Disagree and 5 = Strongly Agree. The value of Cronbach's Alpha Reliability was 0.82.

6.2.3 Sustainability Innovation Performance

A 10 item scale measuring sustainability innovation performance with each of the items measuring economic (innovation expenditure, new sustainable products, material usage), environmental (energy usage, waste emission and pollution, end-of-life management, certification and eco-label), and societal (health and safety, quality and durability, ergonomics) aspects respectively was taken from Calik and Bardudeen (2016). Respondents were asked to designate the level of disagreement or agreement by their managers regarding sustainability innovation performance of their companies across a 5-point Likert Scale with 1 = Strongly Disagree and 5 = Strongly Agree. The value of Cronbach's Alpha Reliability was 0.81.

6.2.4 Corporate Performance

Four item scale measuring corporate performance across four major areas, that is, revenue growth, profitability, market share and customer satisfaction

respectively was taken from Harmon et al. (2009). Respondents were asked to designate the level of performance by their managers regarding performance of their companies on a 5-point Likert Scale with 1 = Much Worse and 5 = Much Better. The value of Cronbach's Alpha Reliability was 0.79.

6.3 Hypothesis Testing Using Statistical Analysis

In order to analyze and test the research model, AMOS 18 software was employed to provide a graphical user interface of Structural Equation Modeling (SEM) using SMART PLS 3. SEM method was completed in two steps. The first step was performing Confirmatory Factor Analysis (CFA) for determining the validity and reliability coefficients of the hypothetical constructs and model measurement estimates. The second step was performing path modeling to determine the structural model estimations in order to test the relationship existing between the variables of the hypothetical research model.

6.3.1 Model Measurement using Confirmatory Factor Analysis (CFA)

As discussed earlier, CFA was performed for assessing the discriminant and convergent validity of the measurement model in this research. The results of discriminant validity reveal that the value of the square root of the Average Variance Extracted (AVE) was greater than the correlations existing among the construct defining latent variables (Fornell & Larcker, 1981), thereby, providing the evidence of discriminant validity and to acknowledge its acceptance. Similarly, the results of assessing the convergent validity of theoretical constructs reveal that the values of all factor loadings (items) in each of the factors were above 0.6. Composite Reliability (CR) coefficients were also falling within the range of 0.79 to 0.91 as shown in the Table 1. Moreover, AVE values were above 0.5 and ranged from 0.72 to 0.88, thereby confirming the convergent validity of the variables (Fornell & Larcker, 1981). The 'Goodness of Fit' index was recorded as 0.938 and it must be equal to or greater than 0.9 (Gaskin, 2013).

6.3.2 Path Analysis using Structural Equation Modeling

6.3.2.1 Cross-Validation Redundancy and Cross-Validation Communality

Realizing the need to evaluate the quality of the structured model based on hypothetically designed constructs, cross-validation redundancy and communality indices were calculated. The value of CV redundancy was assessed to measure the quality of each hypothetical path (structured model)

independently, which showed that for all the endogenous or dependent variables the index of cross-validation redundancy was positive. The measurement of the entire structural model led to the assessment of the CV communality index which was also positive for all the latent variables. These positive indexes for both CV redundancy and CV communality demonstrated the validation of the model fit and its predictive strength (Tenenhaus, 2008) as shown in Table 2.

6.3.3 Correlation Analysis

In order to study the relationship among all the latent variables of the structural model, correlation analysis was conducted as shown in Table 1. All the values were positive leading to the conclusion that there exists a positive relation among all the latent variables in this study.

6.3.4 Path Analysis

Structured Equation Modeling (SEM) was applied for assessing the variation (effects) estimates of the path as shown in Table 3. The result of the first hypothesis (H_1) reveal that sustainability practices incur a positive impact on the EEA trait resilience of petroleum companies. The analysis confirms the presence of a significantly positive relationship of sustainability practices with EEA trait resilience ($\beta = 0.496$, p-value < 0.01). These results positively admit and declare the influential and supporting role of sustainability practices, considering all integrated, efficient and ethical practices for developing effective traits of resilience revolving around engineering robustness, ecological forte and strong adaptability to changes occurring in the external environment. Moreover, in order to assess the impact of EEA trait resilience on performance outcomes of sustainable innovation institutionalized by petroleum companies, path coefficient (β estimate) and significance value of the relationship was analyzed. The results of the statistical analysis validate the existence of a significantly positive relationship of EEA trait resilience (H_2) ($\beta = 0.565$, p-value < 0.01) with sustainable innovation performance in organizations working within the context of oil and gas production, that is, the petroleum sector. It can be interpreted that petroleum companies exhibiting high levels of flexibility and resilient characteristics for engineering systems, natural environment protection and adaptive capability to outperform the anomalies occurring in the external environment can effortlessly accomplish significant goals of sustainable innovation performance that takes into account the areas of economy, environment and society (Triple Bottom Line).

The assessment of the association between EEA trait resilience and corporate performance of petroleum companies accepts the validity of a

significant impact (H_3). The results confirm that EEA trait resilience is a significantly positive predictor of corporate performance of petroleum based organizations having path coefficient (β) of 0.469 and p-value < 0.01. Organizations flourish in their processes, competence and structure by appreciably developing resilient and adaptive capabilities in order to swiftly adjust to the ever changing demands of external environment. Thus they can enhance their revenues, profitability, and market share and customer satisfaction. Furthermore, the results of the analysis also confirm the significance of the last hypothesis (H_4), that is, EEA trait resilience mediates the relationship between sustainability practices and sustainable innovation performance in companies operating in the petroleum sector of Pakistan. The estimates exhibit the significance of the direct relation between sustainability practices and sustainable innovation performance of these organizations through the intervening relationship demonstrated by EEA trait resilience. There exists a direct effect of sustainability practices on sustainable innovation performance through EEA trait resilience with robust strength in the mediation relationship (β = 0.538, p-value < 0.01). It accounts for 53% of the variation examined in sustainable innovation performance and increases the value of sustainability practices by 1%.

Similarly, the results of the analysis also confirm the significance of the last hypothesis (H_5), that is, EEA trait resilience mediates the relationship between sustainability practices and corporate performance in companies operating in the petroleum sector of Pakistan. The estimates exhibit the significance of the direct correlation between sustainability practices and corporate performance of these organizations through the intervening relationship demonstrated by EEA trait resilience. There exists a direct effect of sustainability practices on corporate performance through EEA trait resilience with robust strength in the mediation relationship (β = 0.428, p-value < 0.01). It accounts for 51.3% of the variation examined in corporate performance and increases the value of sustainability practices by 1%.

Table 1
Descriptive Statistics, Discriminant Validity and Convergent Validity

Constructs/ Variables	Mean	S.D.	Series of Loadings	AVE	CR				
						SP	*EEA -RES*	*SIP*	*CP*
Sustainability Practices	4.02	1.06	0.83-0.90	0.77	0.93	0.88			
EEA Trait Resilience	4.34	1.13	0.81-0.89	0.85	0.96	0.34	0.74		
Sustainable Innovation Performance	3.60	1.41	0.70-0.87	0.56	0.89	0.19	0.17	0.81	
Corporate Performance	4.87	1.65	0.81-0.88	0.87	0.96	0.28	0.39	0.43	0.85

Note: All the item loadings have significant p-values < 0.05. The indexes mentioned below the diagonal elements on the right side of the table (column 7-13) exhibit the correlations among the theoretical variables or constructs. The bold highlighted elements in the form of the diagonal represent the average variance explained, that is, square root of variance among the variables.

Table 2
Structured Path Model Analysis (Quality Assessment)

	Cross-Validation Redundancy	Cross-Validation Communality
Sustainability Practices	0.45	0.52
EEA Trait Resilience	0.23	0.48
Sustainable Innovation Performance	0.19	0.29
Corporate Performance	0.33	0.37

7. Conclusion and Discussion

The resolution of this study keeping in view the relevance of the research work is to provide oil and gas manufacturing organizations with a new insight for configuring new and principal ways to apply sustainability practices for improving sustainable innovation performance and overall business performance. This highlights the importance of linking theoretical perspective from research with its practical implementation in petroleum based organizations. The study has emphasized certain key success factors of organizations operating in a dynamic and complex environment, such as Rodger and George (2017) and Casey, Beaini, Pabi, Zammit, and Amarnath (2017) considered environmental adaptability as well as ecological and societal stability as a guide and motivational tool for employees allowing them to execute the strategies of resilience to achieve the long term goals of the organization. With respect to the context of the current study, it can be concluded that sustainability practices are fundamentally supporting entities of petroleum organizations for satisfying the engineering, ecological and adaptability resilience that can help these organizations accomplish goals of long term corporate efficacy and effectiveness, altogether with higher levels of sustainable innovation performance.

Table 3
Path Estimation of the Structured Model (Path Coefficients Collapsed into Total, Direct and Indirect Effects)

Path	**t-values (Standardized β Coefficients)**		
	Total Effect	**Direct Effect**	**Indirect Effect**
Sustainability Practices EEA trait Resilience	0.7(11.73**)	0.50(9.78**)	
EEA Trait Resilience → Sustainable Innovation Performance	0.68(7.21**)	0.57(7.21**)	
EEA Trait Resilience → Corporate Performance	0.45(6.62*)	0.47(7.10*)	
Sustainability Practices → Sustainable Innovation Performance			0.54(6.45*)
Sustainability Practices → Corporate Performance			0.43(9.98**)

*p-value < 0.05
**p-value < 0.01

For an organization whose major concern is to ensure corporate sustainability, it becomes necessary to compete at frontiers of sustained competitive advantage and develop adaptive, ecological and engineering resilience. It must also take necessary initiatives ensuring integrative, eco-efficient and ethical practices of sustainability to proactively improve innovation oriented performance on the fundamental principles of Triple Bottom Line, that is, economical, societal and environmental factors. The results of the study lead to the conclusion that there exists a strong compliance to sustainability practices in petroleum companies making them resilient enough to achieve increased performance goals of organizational growth in terms of high profitability, revenue growth, market share and satisfaction of customers as well as supporting their process and product innovation based performance. This gives a clear motivation that companies are taking serious initiatives in following sustainability procedures up to the international standards of 'Global Reporting Initiative' and have also realized the importance of studying the role of sustainability and its reporting mechanism. Although the movement is fresh in Pakistani context, however, the companies in the petroleum sector are working to enhance their sustainability in order to improve their resilience and performance.

This leads toward the inference that petroleum companies are increasingly inclined toward embracing the execution and reporting of their sustainability and environment related practices due to the serious concerns of consumers about buying biodegradable, green and sustainable products. It can also be deduced that by recognizing the intensifying fuel consumption and rising dire production needs concurrently, Pakistan with a rising population and concurrent consumption needs is resilient enough to bounce back the severe challenges vis-à-vis sustainability by maintaining optimal levels of natural energy reserves. It can be gathered then that following sustainability or green organic practices can evidently assist these companies resourcefully to discover and likewise exploit gasoline resources and decrease wastage of vital resources in future.

Keeping up with the objectives of the current study are the results of the indirect effect of the mediating role of EEA trait resilience in providing a platform for sustainability. It also ensures petroleum companies to maximize both corporate level and ecological, economic and environmental performance, in terms of product and process

innovation, that encourages their employees and invent new ways to perform tasks and innovate for launching new products and services. Executives and managers of petroleum companies can gain maximum input from this research in order to maximize the potential for organizational sustainable innovation and corporate growth based performance by exhibiting highly resilient traits of robust engineering systems, stable societal impact and environmental adaptability to effectively bounce back any likely uncertainties. The implementation of sustainability grounded practices in downstream petroleum companies makes them robust enough to recoil the turbulence and uncertainties in the peripheral environment by mounting absorptive capacity and flexible competencies. Sustainability, together with resilience, is one of the most precarious concerns faced by the petroleum companies who come across various challenges related to the safety of larger communities. Embracing such responsible rehearses assuredly emboldens them to achieve conservation, constructive, industrial and regulating capabilities and qualities of resilience. By their means, it can be learned that petroleum sector can defend its methods and realize sustainability in modernization and innovation besides attaining all-inclusive performance goals at corporate level concerning cost-effectiveness, productivity, market-share, sale revenue progression, and client satisfaction.

Sustainability practices in the intended study have been taken from the perspective of integrated, eco-friendly and virtuous practices that petroleum companies are applying. Future research must consider the key enabling as well as hindering factors that impact the execution of sustainability practices for these companies. Moreover, studying institutional factors that consider external environmental forces pressurizing these firms to adopt sustainability practices while not considering any moderating variable for studying the contingent impact of sustainability practices or resilience on innovation determined performance and corporate performance is the limitation of the current study. Therefore, future researchers can take motivation to consider the impact of following sustainability practices on performance and resilience under environmental dynamism whose presence either boosts or suppresses the eventual impact. Only cross-sectional research design has been considered for the collection of data and that is yet another limitation for a study to be conducted on an industrial sector characterized by rapid advancement and proactive initiative in response

to abrupt environmental demands. Therefore, the results and their practical implication will become more refined if the study is conducted on the basis of longitudinal research design. Moreover, executives and key members of petroleum companies managing corporate governance issues must also be interviewed for an in-depth discourse analysis so as to understand their resilience and adaptability required to effectively sustain long term corporate and innovation oriented performance. Most importantly, small scale, upstream and mainstream petroleum companies need to be taken into account for studying their impact so that the results of downstream, upstream and mainstream companies can be compared using t tests based on independent samples.

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