

The Effect of Green Innovation on Corporate Sustainability in the Seed and Pesticide Multinational Companies Working in Pakistan

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Abstract

Environmental awareness among corporate stakeholders has made green innovation voice of the day. Lot of research has been conducted on green innovation. But still there exists a controversy for its effect on corporate sustainability. This study is focused to address the gap, to investigate studying the relationship between green innovation and corporate sustainability. The hypothesized relationship, represented in the conceptual framework was empirically tested, after a cross sectional survey was conducted among multinational pesticide companies working in Pakistan. Data were collected through self-administered questionnaire from 267 employees. The data was analysed through SEM-PLS. The findings showed that green innovation demonstrated a highly significant positive effect on corporate sustainability. Thus, green innovation enables organization to achieve long term financial, social and environmental success of the organizations.

Keywords: *green innovation, corporate sustainability, green products, environmental sustainability*

Introduction

Organizations do not exist to carry out merely the economic objectives. Economic performance of the organizations serves only the needs of the direct shareholders. Companies are supposed to look after the welfare of other stakeholders as well i.e. employees, community and society. That strategic focus enables the organizations to achieve long-term success and sustainability. The corporate sustainability is the business strategy that is holistically focused on the integration of the economic, ethical, cultural and environmental priorities in an organization. They are there to serve better the needs of all the stakeholders i.e. shareholders, employee, customers and society as well (Liu & Yan, 2018). In the commercial sectors, although organizations are primarily focused on the financial performance but there should be a good balance between financial, social and environmental goals. Corporate sustainability portrays a balance between organizational economic, environmental and social goals that ultimately leads to achieve social, environmental and economic performance of the organizations (Lampikoski, 2015).

Corporate sustainability is the indispensable ability of the organizations in the modern corporate world to achieve competitive advantage. It is preferred by the corporate leadership to adopt it as a

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business approach to guide the decision-making process (Rashid & Aslam, 2019). Sustainability is frequently thought as a long-term goal or vision (Ghardallou, 2022). Research survey shows that 93% CEOs worldwide see corporate sustainability as an important attribute for the organization's long term success, while only 38% CEOs are of the view that the outcome of the sustainability measures could accurately be quantified (Maas et al., 2016).

Industrialization and rapidly expanding corporate operations are amongst the major causes of environmental degradation that is negatively affecting the earth's ecosystem (Long et al., 2017). Consumers and society are well aware of the detrimental effects of the corporate operations. Legislating and regulatory bodies are now playing a very active role in regulating the manufacturing and service organizations to protect the environment and interests of the society (Sohaib & Ali, 2019). Working for sustainability is not merely a philanthropic approach being focused on the current. It is a highly strategic move towards business that ensures to serve the needs of the current and future stakeholders as well. It is not compromising the needs of the future. It facilitates the organizations short-term competitive advantage. In the long-term it protects, maintains and enhance natural for the long term (Artiach et al., 2010; Joshi & Li, 2016)

Corporate sustainability is achieved through the implementation of green innovation (Xie et al., 2019). Sustainability doesn't come itself. Organizations need to have a lot of capabilities and resources to achieve this long-term success. Existing research work have addressed numerous resources and capabilities that are helpful for corporate sustainability but green innovation was found to be addressed it in a holistic way (Yongan Zhang et al., 2019). Green innovation is carried out by the companies to ensure their economic, social and institutional performance. These three outcomes are among different dimensions of the corporate sustainability. There is another dimension of corporate sustainability as well i.e., environmental aspect but companies' value and go for green innovation investing in it, considering economic, social and institutional performance. Only environmental dimension of the corporate sustainability does not motivate companies to invest in and exploit the green innovation although green innovation helps achieve economic objectives as well. The investment decision of the companies in green innovation is dependent upon the weightage being given to economic, institutional, and social sustainability. The more a company is stable institutionally and economically, the more it would be attracted to invest in green innovation. Just giving value to environmental sustainability does not motivate the companies for green innovation (Saunila et al., 2018).

The process of manufacturing is all about product, process and management. So green innovation is holistically carried out through

green product, green process and green management innovation (Xie et al., 2019). Green product innovation focuses on improving product design, whereas green process innovation focuses on improving manufacturing processes to reduce energy waste, pollution, and the organization's negative impact on the environment (Tang et al., 2018). Apart from these two types of green innovation, another major field of green innovation is green management innovation. All these three components of green innovation are highly linked. They must be evaluated together in order to present a comprehensive and holistic view of green innovation (Xie et al., 2019).

This pesticides' application is inevitable for crop protection. It has almost doubled the production of crop during nineteenth century. The urge to enhance the yield to meet the food requirement of the growing population is still pressurizing on the intensive usage of pesticides. However, the surveys carried out across the globe on application of pesticides have shown the detrimental effects in soils, aquatic ecosystems, and on all type of organisms as well. That is why chemicals characterized by their long-lasting effects have been trimmed from the product portfolio. New product lines have been added characterized by their biodegradability. Such less toxic products should be included to the product line for better yield and environmental safety (Carvalho, 2017). Large multinational pesticide companies i.e. Bayer, Syngenta, Monsanto etc. working in Pakistan, have started investments in relatively safe products which is contributing towards the environmental sustainability (Ferrell et al., 2018; Marrone, 2014). These companies are already working in the genetically modified objects (GMOs), including both seeds and herbicides, which have lesser pressure on environment, not damaging the non-targeted organism and environment, with high yield returns (Tollens et al., 2004).

Green product innovation, which is concerned with product design innovation, and green process innovation, which is concerned with bringing changes and improvements to manufacturing processes in order to save energy, reduce pollution, minimize waste, and reduce a firm's negative impact on the environment, have both been extensively researched (Tang et al., 2018). e.g. (Díaz-García et al., 2015; El-Kassar & Singh, 2019; D. Li et al., 2018; P. Li et al., 2019; Ma et al., 2017; Rezende et al., 2019; Tang et al., 2018; Tariyan, 2016; Xie et al., 2019; J. A. Zhang & Walton, 2017). Besides these two popular dimensions of green innovation there is another type of green innovation that is green management innovation. It has rarely been touched in the past researches. All these three dimensions holistically make the green innovation. They are dependent upon each other. The interdependence among all three dimensions of green innovation is yet to be clearly investigated (Xie et al., 2019). This gap is the focus of this study. Current studies conducted on green innovation are related

to green industries. Very few studies on green innovation have been carried out, on non-green industries e.g. (Calza et al., 2017; Kushwaha & Sharma, 2016; Lin et al., 2014). Therefore, numerous non-green industries should be focused (Calza et al., 2017). The pesticide industry which is typical non-green industry is the focus of this study. Green innovation and its dimensions as drivers of corporate sustainability have been studied (Lozano, 2015; Tariyan, 2016), however, the study conducted by Lozano is qualitative while the other study by Tariyan is limited mainly to financial and some non-financial performance metrics, rather than environmental and social performance. Also, these researches have addressed all three major types of green innovation but have not clearly touched the triple bottom line of corporate sustainability i.e. an organization's environmental, social, and financial performance, with a focus on green process innovation, green product innovation, and green management innovation. There exists a clear scope to investigate all these dimensions of green innovation with reference to social, economic and environmental dimension of corporate sustainability. To fill this gap, the current research is carried out using quantitative method. The organizational performance, is encompassing financial, social and environmental factors. Green management innovation doesn't affect the performance of the organization but it affects green product innovation that is why it needs to be investigated with green product and green process innovation (Motors & Europe, 2016).

Research Objective

Referring to extant research quoted in the preceding pages, following objective has been developed.

- To analyze green innovation's effect on corporate sustainability.

Research Question

Based on the objective mentioned above, the following research question has been formulated.

- Does green innovation affect corporate sustainability?

Review of Literature

Importance of Green Innovation for the Corporate Sustainability

Importance of environmental protection is recognized by consumers, regulatory bodies and the general public as well. Depletion of natural resources and environmental damages are sources of concern for them. Green innovation in the manufacturing process is recognized as a remedy to protect the environment and preserve the resources. To adopt green innovation is really a great challenge for organizations across the globe. The perceived value of green innovation is motivating them to enhance their green potential and follow green innovation protocols (Asadi et al., 2020a). Research

conducted on green innovation and its effect on corporate sustainability reported that it may enhance environmental performance at the rate of 55% while the economic performance of the organization, at the rate of 50%. They also came to the conclusion that green innovation had a significant and positive impact on the organization's environmental performance (Asadi et al., 2020b). The impact of green product and process innovation on an organization's environmental performance was investigated. Green production innovation had a direct positive substantial influence on environmental performance, but no significant effect on organizational performance or competitive advantage had been identified. There was no evidence of direct relationship between green process innovation and competitive advantage. Green process innovation, on the other hand, was found to have a high and positive impact on both organizational and environmental performance. (El-Kassar & Singh, 2019). Green process innovation positively affected corporate sustainability (Kuzma et al., 2020).

Green Innovation and Corporate Sustainability

Green process innovation had a major positive impact on the organization's environmental and social performance, as well as its long-term business sustainability. However, it was discovered that green product innovation had no substantial impact on environmental, social, or economic performance. (Singh et al., 2020). Green product innovation was discovered to be a mediator between green process innovation and financial performance. Green process innovation facilitates the adoption of green product innovation (Xie et al., 2019). In all three areas of corporate sustainability, green innovation was crucial in boosting the organization's economic, environmental, and social performance (Roscoe et al., 2016).

Without taking managerial concern into account, both of these dimensions of green innovation had a significant positive effect on organisational performance. Whereas when managerial concern was taken into account, green process innovation had a stronger positive impact on organisational performance. Green product innovation demonstrated no significant effect on organisational performance (Tang et al., 2018). Green innovation had a favourable and significant impact on both a company's environmental performance and competitive advantage. Although the environmental performance effect was larger than the competitive advantage effect (Asadi et al., 2020b). A highly significant positive association between green innovation and corporate sustainability was observed (Gupta & Gupta, 2020).

Green product and green process innovation affect environmental performance positively, provided the quality of green initiatives are guaranteed. Green innovation encourages companies to

enhance their environmental performance. Green product and process innovation boosts a company's financial and social performance while lowering environmental hazards. Waste reduction and cost cutting are two aspects of the company's social performance (Singh et al., 2020). Green innovation's dimensions for example, green product innovation, green process innovation, and green management innovation have all been found to improve organisational performance. Apart from green product, green process, and green management innovation, green marketing innovation had the strongest direct, positive, and greatest impact on organisational performance, whereas the other aspects had the weakest. The outcome reflects the importance of all sorts of green innovation, but they can only be effective if they can provide a competitive edge to the enterprises who use them (Tariyan, 2016).

Green product and process innovations may have a greater impact on a company's corporate competitive advantages than competitors that do not invest in or apply them. Many benefits are gained when manufacturing firms practice green innovation, including reduced hazardous waste emissions, efficient use of energy and resources, smart material selection, creating very little pollution or consuming the least amount of energy or resources, as well as product development for ease of recycling, reprocessing, and decomposition. These operations assist both the company and the environment (Wahid & Lee, 2011). Through green corporate identity and environmental organizational legitimacy, green innovation strategy has a positive impact on green innovation. It also earns green organizational identity, which helps firms achieve green innovation performance by portraying them as genuine entities (Soewarno et al., 2019). Green product innovation can help companies meet environmental sustainability criteria, and developing green products can help them extend their current market and meet customer expectations, which can lead to long-term competitive benefits (Song et al., 2020). Corporate sustainability lessens the risk of environmental degradation, caused by the business operations and also eliminate its negative effect on the society as well. It also helps organizations to survive in the diverse environmental, social and economic contexts. It creates positive effects on environment and society that is the bottom line for the sustainable entrepreneurship (Freudenreich & Schaltegger, 2017).

When the impact of green innovation and its two components, green product innovation and green process innovation, on a company's economic performance was investigated, it was determined that they improved the company's image as well as its long-term profitability. The appearance of the firm mirrored its role as a mediator. However, no statistically significant relationship could be shown between green process innovation and short-term profit (Ma et al., 2017). Green product innovation mediated the association between green process innovation and financial performance, according to the

findings of the study. Green process innovation also aided green product innovation by generating revenue, while green product innovation produced revenue through green process innovation. As a result, all components of green innovation must be supported to ensure that a significant advantage is demonstrated through both green process and green product innovation. Furthermore, the study discovered that the company image moderated the association between green product innovation and financial performance of the organization. Although the unawareness on the part of the customers was found a big challenge that need to be looked into. The findings also showed that better green image of the organization could affect positively the purchase decision and enhanced the market demand for the green products. So invested made by organization to improve the firm image would increase the revenue from the green product innovation (Xie et al., 2019).

Green management innovation was the primary source of green product innovation, rather than an afterthought. The effect of green management innovation on radical green product innovation was more significantly mediated by regulatory bodies as formal institutions than the effect of incremental green product innovation. whereas the effect of green management on incremental product innovation was more substantially mediated by social legitimacy as an informal institutional advantage than its influence on radical product innovation (Moters & Europe, 2016). Green technology innovation (green product innovation and green process innovation) and green management innovation, according to research findings, can greatly lower an organization's budgetary restrictions. This study also discovered that the connection between corporate environmental disclosure and green innovation might improve an organization's financial performance and, as a result, improve its financing conditions (Yuming Zhang et al., 2020). According to the findings of a study on environmental management, both green product innovation and green process innovation have a positive relationship with corporate competitive advantage (Calza et al., 2017). Green process innovation influenced green product innovation positively, as both green process and green product innovation improved corporate financial performance (Xie et al., 2019).

Improvements in corporate sustainability are more likely as a result of a positive relationship between the organization's environmental and economic performance (Wagner, 2005) but the relationship does not depict exactly the concept of corporate sustainability because, by definition ,it needs not to be limited to economic and environmental corporate performance only, it is a triple bottom initiative encompassing corporate environmental ,economic and social performance bringing about environmental ,economic and social benefits for the practicing companies (Liu & Yan,

2018). Although numerous studies have been undertaken on various types of green innovation and their impact on company financial performance, the holistic notion of corporate sustainability and its relationship with green innovation has received little attention (Chang, 2016; El-Kassar & Singh, 2019; Ma et al., 2018; Tariyan, 2016). Although there rarely exists some research work on the relationship between green innovation (it's all three types) and corporate sustainability. These findings and numerous others like this, are the major source of attraction for the academia, research and corporate professionals to study this rarely enquired relationship, determined to enhance the competitiveness and sustainability (Lin et al., 2014).

Research Gap

By researching the relationship between green innovation and business sustainability, the current research study will address a research gap. There are few relevant researches works in this area, and most of the relevant research works are limited to some types of green innovation. However, because these types of green innovation are interdependent, the organization could reap better and more positive results if all three major types of green innovation are used (Tariyan, 2016). This research is going to investigate the effect of green innovation on the corporate sustainability.

Sustainability necessitates a strategic balance between the organization's social, economic, and environmental goals while pursuing the main business agenda. When economic, social, and environmental sustainability are all attained, then sustainability can be achieved (Asadi et al., 2020b). Without these essential operational aspects, firms cannot create substantial, long-lasting innovations or could influence the customers. All three attributes were assessed in the current study in the selected firms combined. The economic aspect of industrial sustainability is frequently given precedence over the other two dimensions. The balance has essentially been achieved. (Kuzma et al., 2020). Organizations frequently place a greater emphasis on the economic factors than on the other aspects (Neri et al., 2018). This is relevant only for a shorter period (Lozano, 2015). Following economic goals, however, isn't enough to assure sustained viability (Neri et al., 2018). It will be crucial to develop standards that can improve both social and environmental aspects of performance in order to achieve the accompanying economic gains (Henri & Journeault, 2009).

Even while all three of the aforementioned elements have an effect on a company's success, various businesses may prioritise them in different ways when implementing green innovation strategies (Fernando et al., 2019a). Furthermore, it is a proven fact that organizations with high retention, happier employees, improved communication and enhanced brand acceptability would benefit provided the issues related to environment are resolved (Mousa &

Othman, 2020). Having satisfied customers and employees could only pay when the companies are portraying social accountability that ultimately demonstrate the social performance of the company (Wagner, 2013). Companies that are capable enough to reduce process emissions, minimize wastes and hazardous substances are said to be performing with reference to the environment (Zhu et al., 2008). Many businesses across a wide range of industries are attempting to plan and execute various performance metrics that contribute to environment for the competitive advantage (Rodríguez-Antón et al., 2012). Green innovation, environmental performance and business strategies are the weapon to gain competitive advantage (Dangelico & Pujari, 2010). Organizations which follow these trends will definitely be having a competitive edge (Yang et al., 2011). Many businesses will be able to minimise greenhouse gas emissions as well as other hazardous and solid waste by implementing the required actions (Daily et al., 2012). According to a previous study, improvements in manufacturing function with increased productivity will improve environmental performance (Montabon et al., 2007).

Economic performance is actually the ultimate increase in the financial and marketing strengths of a company that is only could positively be achieved through green innovation (Green & Inman, 2005). This component pertains to how businesses influence their internal and external financial health. It is reflected in the company's financial performance and also in the strong relationship of the company with its direct and indirect stakeholders. According to certain studies, it is linked to company's proactiveness for better efficiency in its routine business operations (Carroll & Shabana, 2010). Green innovation, as a primary engine, has the potential to drive economic growth. Some companies are starting to build the next generation of clean technologies to aid in their long-term financial success. Various companies e.g. BP and Shell are now very proactively involved in resourcing renewable energy sources such as solar, wind, and other types of energy (Hart et al., 2003). It's worth emphasising that green innovation techniques can have a positive impact on organisational costs. Costs of energy consumption, as well as the processing and disposal of waste, will be lowered, and penalties will be avoided if any environmental accidents occur (Zhu & Sarkis, 2004). Green innovation builds competitive advantages and organizational performance as well (Sezen & Çankaya, 2013). By lowering waste and expenses, green innovation reduces negative environmental effects while simultaneously improving a company's economic and social performance. As a result, increasing economic growth has been linked to green innovation. (Chang, 2011). When economic, social, and environmental sustainability are all attained, then sustainability can be achieved (Asadi et al., 2020b). Based on the prior literature, the

following hypothesis is presented for the three pillars of corporate sustainability:

Hypothesis 1: *Green innovation has positive effect on corporate sustainability.*

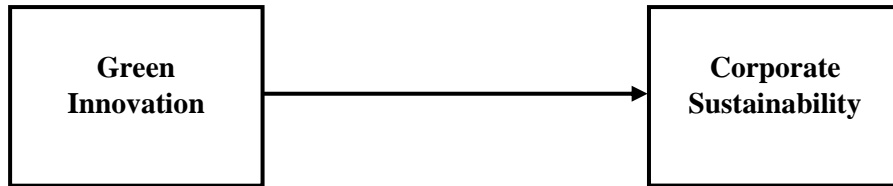


Figure 1: Conceptual Framework

Research Methodology

The present research study was carried out to analyse green innovation and its effect on the corporate sustainability. The analysis was conducted through a quantitative research method. The research was executed within seed pesticide multinational companies working in Pakistan. The relationship between the study variables was conceptualized through a theoretical framework in the light of the extant literature. The framework of the study has clearly defined the hypothesis. The hypothesized relationship among variables is based on resource-based view theory that depicts the study variables' association. The proposed hypothesis is described as they could be measured while operationalizing the relationship among variables. The study describes and examines two constructs (green innovation and corporate sustainability), therefore, the research design for the study is descriptive as the main characteristic of this type of research is to answer questions relating to what, when, why, where and how. The survey strategy was utilized to answer the research questions and achieve the study's objectives. In business and management research, the survey method is particularly popular. The deductive research approach is associated with the survey research strategy (Saunders et al., 2009). and provides an easier, quicker, less expensive and more accurate way to collect data and information (Luz Yolanda Toro Suarez, 2015). The survey research strategy is mostly used in descriptive as well as correlational studies (Saunders et al., 2009). All things considered, quantitative research is the most appropriate method for conducting this study because the characteristics of the research type mentioned above are aligned with the study's purpose, type of data, philosophy, research approach, and nature of the procedure to be used for the study.

Population of the Study

The current study's research was addressed through a survey conducted using a research questionnaire, that was filled out by a sample of the target population. Employees of multinational pesticide and seed corporations working in Pakistan make up the study's population. There are total six multinational pesticide and seed companies working in Pakistan; As a result, the study's population represents the total number of employees employed by all six international pesticide and seed businesses operating in the country. The list of the companies has been received from the Crop Life Pakistan, a recognized international association of multinational pesticide and seed companies working across the globe. Current list of pesticide and seed multinational companies working in Pakistan includes, Corteva, Bayer Crop Science, Syngenta, Arysta, FMC and ICI. There are total 2282 employees in these companies.

Krejci and Morgan and Cohen Statistical Power are two approaches used by researchers to select sample size (Penyelidikan, 2006). According to Krejci and Morgan (1970) method, 248 will be a representative sample for a population up to 685. The target respondents of this study are the executives of the companies. The number of the executives in these companies is 685. The population of the current study was consisted of 685 executives in sales, marketing, supply chain, human resource and purchase department. On the basis of Krejci and Morgan, the researcher chose 267 respondents as the sample size for this study. As the overall sample consists of 267 executives in various department in all six multinational pesticide and seed companies working in Pakistan, therefore, to give a fair and accurate representation to each and every executive and to select the individual respondent for this study, the researcher has used a two steps sampling procedure. In step one the research has used simple random sampling to give proportionate representation to all members and to each selected company, while in second step the researcher has used systematic random sampling with replacement mechanism to select individuals for the study. In the proceeding sections the researcher has explained both steps in detail. In order to give representation to employees in all functions i.e., sales, marketing, supply chain, human resource and purchase department and also to each selected company, the researcher has used proportionate stratified sample. A total of 267 employees are selected on the basis of their proportion in the target population. Similarly, 60 employees from Bayer Crop Sciences Pakistan, 73 employees from Syngenta Pakistan, 30 from Corteva Pakistan, 74 from FMC Pakistan ,18 from Arysta Pakistan and 12 from ICI Pakistan, have been selected on the basis of their proportion in the target population.

Table 1
Total Population

Company	Employees		
	Executives	Staff	Total
Bayer Crop Sciences Pakistan	148	552	700
Syngenta Pakistan	184	316	500
Corteva Pakistan	82	211	293
FMC Pakistan	187	321	508
Arysta Pakistan	51	118	169
ICI	33	79	112
Total	685	1597	2282

Table 2
Proportionate Stratified Sampling based on Functions and Company

S #	Company	Total Population						Sample(n)					
		Sales	Marketing	Supply Chain	Human Resource	Procurement	Total	Sales	Marketing	Supply Chain	Human Resource	Procurement	Total
1	Arysta Life Science Pakistan Pvt. Ltd	29	4	6	9	4	52	10	1	2	3	2	18
2	Bayer Crop Science Pakistan (Pvt.) Ltd	56	30	25	23	21	155	21	12	9	9	9	60
3	Corteva Agri Science Pakistan (Pvt) Ltd	46	8	11	9	8	82	17	3	4	3	3	30
4	FMC Pakistan (Pvt) Ltd	89	25	42	19	16	191	33	9	16	8	8	74
5	ICI Pakistan Ltd. (Agrochemicals Division)	14	5	4	5	5	33	5	2	1	2	2	12
6	Syngenta Pakistan Limited	74	28	33	31	24	190	28	11	13	12	9	73
	Total	308	100	121	96	78	703	114	38	45	37	33	267

Table 3
Demographic Characteristics of the Respondents

Demographic Variables	Category	Frequency	Percentage
Company	Arysta Life Science Pakistan Pvt. Ltd	18	6.7
	Bayer Crop Science Pakistan (Pvt.) Ltd	60	22.5
	Corteva Agri Science Pakistan (Pvt) Ltd	30	11.2
	FMC Pakistan (Pvt) Ltd	74	27.7
	ICI Pakistan Ltd. (Agrochemicals Division)	12	4.5
	Syngenta Pakistan Limited	73	27.3
Function	Sales	114	42.7
	Marketing	38	14.2
	Supply Chain	45	16.9
	Human Resource	37	13.9
	Procurement	33	12.4
Management Level	Top Management	9	3.4
	Middle Management	162	60.7
	Lower Management	96	36.0
Gender	Male	258	96.6
	Female	9	3.4
Education	Graduation	10	3.7
	Post-Graduation	256	95.9
	Doctorate	1	.4
Age	21 to 30 Years	5	1.9
	31 to 40 Years	13	4.9
	41 to 50 Years	217	81.3
	> 50 Years	32	12.0
Experience	01 to 10 Years	10	3.7
	11 to 21 Years	6	2.2
	22 to 32 Years	234	87.6
	> 32 Years	17	6.4

Measurement of Study Variables

Research conducted on green innovation and its effect on corporate sustainability reported that it may enhance environmental performance at the rate of 55% while the economic performance of the organization, at the rate of 50. It was also concluded that green innovation had a significant and positive impact on the organization's environmental performance (Asadi et al., 2020b). Green innovation had a positive and significant influence on both a company's environmental performance and competitive advantage, however the magnitude of the effect on environmental performance was greater than competitive advantage (Asadi et al., 2020b). Green innovation decreases negative environmental effects while also increasing a company's economic and social performance by reducing waste and expenses. As a result, green innovation has been linked to increased economic growth (Chang, 2011). When economic, social, and environmental sustainability are all attained, then sustainability can be achieved (Asadi et al., 2020b).

This study has built and used a valid and reliable self-administered questionnaire with five-point Likert scale for data collection purpose. For this purpose, the researcher has adopted, scales from relevant studies, which fully reflect all the dimensions of each variable of the current study. There are two main parts of the self-administered questionnaire. The first section of the questionnaire contains demographic information about the respondents. This information is related to name of the company, employees' function, management level, gender, educational qualification, age and experience of the employees. The second part is related to questions about green innovation. At the start of the questionnaire, background of the study and its objectives have been given. Along with the questionnaire, a brief covering letter was attached. The letter explained the objectives of the research with an additional assurance of confidentiality for the respondents. Besides, with an explicitly explained concepts to give a clear idea of the concepts and to restrict the respondents input is based on concept of operationalization, brief explanations have also been provided where required. The detail of each research instrument is provided as per the following sections. In order to measure green innovation, the researcher has adapted questionnaire from (Ma et al., 2017). The study identified 14 items that comprise green innovation ,including current and reviewed rules and procedures followed by the organization , reviewed tasks and functions of the organizations employees ,reviewed management systems, changed employees compensation policy , restructuring of the current communication systems, organizational hierarchy ,the efficiency of the manufacturing with decreased emissions ,re-usage of wastes ,enhanced energy usage ,raw material usage ,minimal usage of raw material etc. To measure the variable “ corporate sustainability “ five items were selected .The items being included in the questionnaire were taken from the scales used of (Saunila et al., 2018). Items included were comprised of products and services of the company, products environmental friendliness and company responsiveness towards the consumers' demands.

Data Collection

The survey was used to collect data for this investigation. There are many survey methods to collect data, including questionnaires, interviews, and observations (Uma Sekaran, 2014). As previously stated, the nature of this study is descriptive and correlational, hence data was collected from a sample of 267 executive level individuals working in six multinational pesticide and seed companies in Pakistan via a self-administered questionnaire.

Self-administered questionnaires through online submission is generally cheaper and within short span of time it could be executed. It is inexpensive and less time consuming than personally

administered-questionnaire but according to (Uma Sekaran, 2014) due to non-response rate and non-response, the researcher personally distributed the questionnaires among the respondents.

After two weeks a second visit was arranged to collect the questionnaires and also to remind the respondents to respond to the questionnaire. Similarly, multiple visits were conducted to collect the questionnaires. After many efforts, 267 out of 300 filled questionnaires were returned.

Data Analysis and Results

Data was properly screened and prepared for final analysis. The statistical package for the social sciences (SPSS) version 25 was used to screen and prepare the data. Prior to calculating scores for green innovation (GI) and corporate sustainability, the data was screened and prepared. Smart PLS 3.0 was used to evaluate the hypothesized relationship between variables using structural equation modelling (SEM).

Table 4
Descriptive Statistics and Correlation

Variables	Min.	Max.	Mean	SD	Skewness	Kurtosis	Correlation
Green Innovation	2.07	4.93	3.89	0.67	-0.68	-0.18	
Corporate Sustainability	1.80	5.00	3.58	0.72	-0.14	-0.32	0.856*

* $p < 0.01$

The mean value for green innovation was found equal to 3.8954. The minimum was 4.93 and the maximum was 5.00. The mean value of corporate sustainability was 3.587. The minimum was 1.8 and the maximum was 5. It is comparable to the mean scores reported by previous studies. The mean value (3.3182) of corporate sustainability, was reported by (Yongan Zhang et al., 2019). They discovered this while researching the impact of management and technology innovation on organizational success and sustainability plays a mediating role. Similarly mean value on linear scale (3.74) of corporate sustainability was reported (Fazal et al., 2017). While working on They discovered the mean value in "Host-Country Characteristics, Corporate Sustainability, and the Mediating Effect of Improved Knowledge: A Study among Foreign MNCs in Malaysia."

The table 4 shows that there is a positive correlation between green innovation and corporate sustainability ($r=0.856^*$, $p= 0.000$)

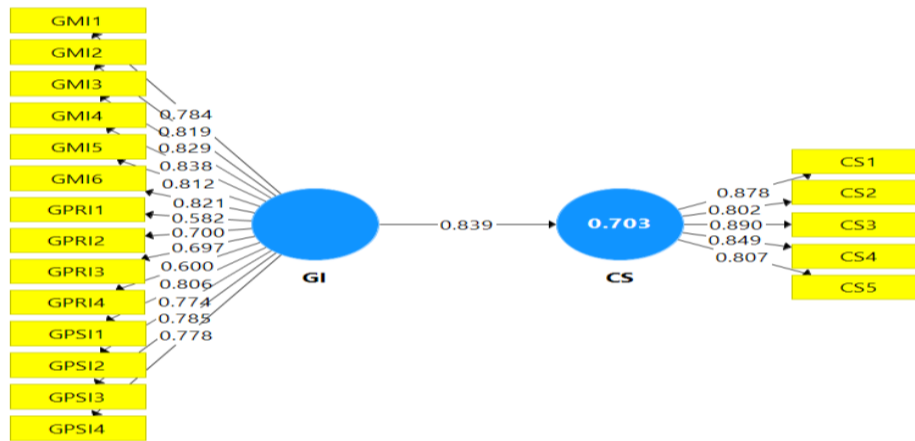


Figure 3: Measurement Model (PLS Algorithm)

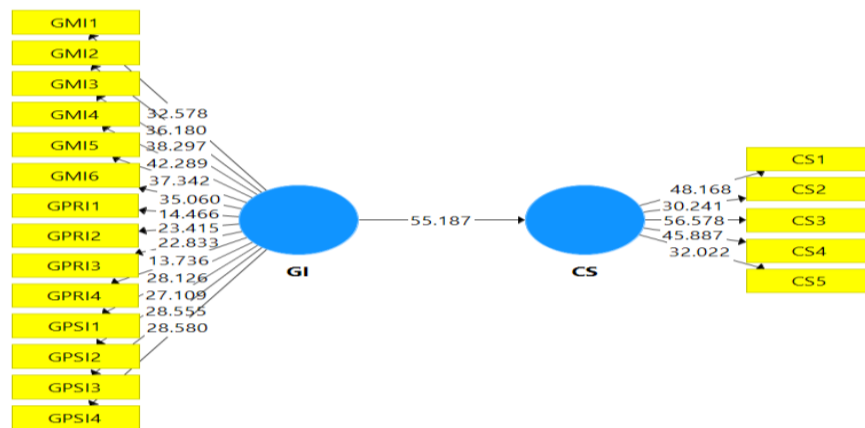


Figure 4: Measurement Model (Bootstrap)

Table 5
Items Loading and Reliability

Construct	Indicator	Outer Loadings			Reliability Statistics		
		Outer Loading	t Statistic	P Values	CA	CR	AVE
Corporate Sustainability	CS1	0.878	48.168	0.000	0.900	0.926	0.716
	CS2	0.802	30.241	0.000			
	CS3	0.890	56.578	0.000			
	CS4	0.849	45.887	0.000			
	CS5	0.807	32.022	0.000			
Green Innovation	GI1	0.784	32.578	0.000	0.944	0.951	0.582
	GI2	0.819	36.180	0.000			
	GI3	0.829	38.297	0.000			
	GI4	0.838	42.289	0.000			

GI5	0.812	37.342	0.000
GI6	0.821	35.060	0.000
GI7	0.582	14.466	0.000
GI8	0.700	23.415	0.000
GI9	0.697	22.833	0.000
GI10	0.600	13.736	0.000
GI11	0.806	28.126	0.000
GI12	0.774	27.109	0.000
GI13	0.785	28.555	0.000
GI14	0.778	28.580	0.000

Measurement Model

Individual item dependability was established using the indicators' loadings on their respective constructs (calculated using the PLS Algorithm), the t-statistic value, and significance (found using bootstrap procedures with 5000 samples, no sign change). As a general guideline, the latent idea should account for at least 50% of the variance in each indicator (i.e., exceeding 0.70) (Ringle et al., 2020). However, according to (John Hulland, 2012), A threshold of 0.5 or higher is reasonable when (1) equivalent additional signals for the latent construct exist and (2) the environment in which the standard instrument is used differs from the one in which it was designed. Furthermore, (3) in PLS-SEM, a low-loading indicator that does not load higher on any other component is likely to improve the model's predictive power.

Three items with loadings of less than 0.7 but greater than 0.5 were preserved, based on Hulland's (1999) recommendation of keeping items with loadings of up to 0.5 in case of contextual changes in scale usage and the items being additive to the model's predictive power Hair et al., (2017) also stated that removing items with a loading of less than 0.7 should only be considered if the construct's content validity is not jeopardised.

All of the constructs' CA and CR values are listed in Table 5. Internal consistency reliability was demonstrated by CR values ranging from 0.900 to 0.944. (Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, 2017). The majority of the constructs' Cronbach's Alpha scores were also found to be within acceptable boundaries. Given that Cronbach's alpha is a more conservative measure of internal consistency reliability than composite reliability, and that genuine internal consistency reliability values often fall somewhere between composite and Cronbach's alpha (Hair et al., 2010), all of the LOCs were found to be internally consistent and reliable.

Structural Model

According to the path coefficient computed using the bootstrapping approach, green innovation has a significant positive effect on business sustainability (=0.839, t=55.187, p=0.000) (5,000

subsamples, one-tailed). As a result, the relationship between green innovation and corporate sustainability may be established.

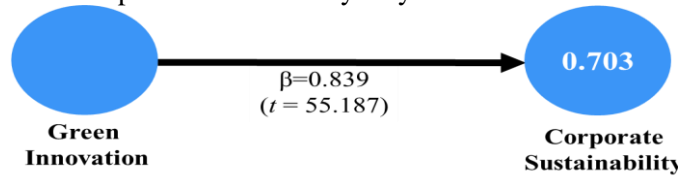


Figure 2: Structural Model

Table 6
Hypothesis testing (structural model)

Path	Path Coeff.	t stat.	CI		F ²	R ²	Q ²
			LL	UL			
GI → CS	0.839*	55.187	0.802	0.864	2.372*	0.703*	0.470

* $p < 0.01$

Table 6 shows that green innovation has a substantial positive effect on corporate sustainability ($=2.372$, $t=8.23$, $p=0.000$) as determined by the path coefficient derived using the bootstrapping approach (5,000 subsamples, one-tailed). As a result, the positive relationship between green innovation and corporate sustainability may be confirmed. According to the results for f^2 effect size reported in Table 7 green innovation has a considerable effect on business sustainability ($f^2=2.372$). The structural model's Q2 value of larger than 0 (Table 9) revealed the model's predictive relevance for the endogenous constructs, namely corporate sustainability (0.470)

Discussion

The structural model was evaluated for the hypothesized relationship between the variables of the study. To gauge the impact of green innovation on the corporate sustainability, total effects from the structural model was assessed, also the coefficient of determination (R^2), effect size (f^2), path coefficient, bias-corrected Confidence Interval (CI) and Stone-Geisser's predictive relevance (Q^2) was estimated. The findings of the study showed that green innovation had a very significant positive substantial role in the enhancement of corporate sustainability, and that green innovation performance enhancement was a strong predictor of the enhancement of corporate sustainability in the multinational pesticide and seed companies. These conclusions are in conformance with study conducted by (Saunila et al., 2018) who investigated the relationship of green innovation with corporate sustainability. Furthermore, it was explained that green innovation had a similar effect on all three dimensions of corporate

sustainability i.e. economic sustainability, social sustainability and institutional sustainability.

The findings of the study with respect to green innovation and corporate sustainability are also similar as reported by (Rehman et al., 2021) who described active involvement of organization in green innovation is likely to achieve a robust corporate sustainability especially the environmental dimension of the corporate sustainability. Similarly the findings of this study are also positively matched with findings shared by (Zailani et al., 2015) about the research work conducted on Malaysian automotive companies which concluded that green innovation significantly affects all the three dimensions of corporate sustainability i.e. environmental, economic, and social sustainability.

Moreover research findings shared by (Kuzma et al., 2020) also indicated that green innovation positively impacts corporate sustainability. Similarly, research findings reported by (Dai & Xue, 2022) showed that green innovation could have a greater impact on firm value in enterprises at the stages of growth and decline rather than those at the mature stage. Research conducted by (Asadi et al., 2020a) in the Malaysian hotel industry also showed that green innovation is positively associated with all three dimensions of corporate sustainability i.e. economic, social and environmental performance of the organization. The results presented by (Fernando et al., 2019b) are also same as this study concluded. Green innovation was described as having three dimensions: green product innovation, green process innovation, and green management innovation, according to them. There were three components to corporate sustainability: financial performance, environmental performance, and social performance. It also demonstrates that green innovation had a substantial impact on the energy-intensive corporate sustainability.

Limitations and Future Research Directions

The findings are limited in generalizability due to the study's cross-sectional methodology and self-reported survey. Longitudinal research will be required in the future. The study included a sample of global pesticide and seed companies operating in Pakistan, but excluded local and national pesticide firms. However, because the contribution of national and local enterprises to the entire plant protection industry is critical and widely recognised. The national and local seed and pesticide businesses should be considered in future investigations. This country is aware of the issues it has in terms of the environment, and it is pursuing a number of green programmes to ensure long-term success. It may not, however, be indicative of other

countries with differing rules, organisational structures, or economic issues.

Implications and Conclusions

The findings of this study help multinational companies to better understand the Pakistani organizational demand regarding the corporate sustainability. It suggests that the mere financial performance of the organization does not make it sustainable, it must perform well both socially and environmentally. That three-fold performance of the organization could be achieved through the green innovation. The study also motivates the national and local seed pesticide companies to invest in green innovation for corporate sustainability. The study also implies that companies must adopt environmental management programs continuously reviewing and modifying rules and regulations, restructuring the systems and improving resource utilization in all the business operations. This research found that green innovation techniques have an impact on both environmental and corporate performance. So, it concludes that green innovation should be viewed as a proactive strategy for corporate sustainability. The study was based on self-report from lower, middle and top management of the companies. The findings showed that every level of management holistically knew the importance of green innovation for the corporate sustainability. So, the leadership need to proactively further the agenda of green innovation within all the functions and systems of the company recognizing it from every employee within the organization.

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