

# THE IMPACT OF GREEN TECH INNOVATION ON FINANCIAL PERFORMANCE OF PAKISTANI FIRMS (CASE OF KMI-30)

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#### Abstract

The point of this study was to look into how new green technologies affect the bottom lines of Pakistan's KMI-30 companies. The study's main goal is to find out whether green technology innovations have a good or negative effect on firms' revenue and profits, that is, whether they make firms more or less money. The study uses data from the Karachi Market Index-30 of Pakistan, which is listed on the Pakistan Stock Exchange. The regression method shows that the company's huge investments in green processes and products caused costs to rise. For that matter, investing in green products and methods might help keep the environment clean and also make money for the business in the long run.

**Keywords:** Green Technology, Green Product, Green Process, Green Image, Financial Performance

### **INTRODUCTION**

Businesses are constantly looking for new green technologies because people are becoming more worried about the environment (Ullah et al., 2024). To the contrary, it is very important that manufacturing companies protect the environment, especially those that work in industries that pollute a lot. Companies should think about more than just the environmental benefits of changing how they do things. They should also think about what their customers want and their corporate social responsibility (Manzoor et al., 2023, 2024).

Many developed countries have put in place codes of behavior, laws, and rules to stop these kinds of things from happening (Alhadid & Abu-Rumman, 2014). Businesses have always paid attention to new green technologies because people are becoming more worried about the state of the earth. Innovations in green technology are expected to have two effects: they will help the environment and bring the economy up to date with new technology ((Ullah et al., 2024).

Green process innovation and green product innovation are the two main types of green technology innovation (Amores Salvadó, 2012). Different kinds of new green technologies have been looked at and their effects looked at. It was found that green process innovation and green product innovation are both good signs of that success (Cheng et al., 2014).



## **1.1. Research Problem**

This study looks at the role of green product innovation as well as the role of green innovation and green process in changing these effects. It adds to what we already know about how green technologies can help businesses make more money. Next, we use content analysis to look at how well green process and product innovation is going at the level of the business. To fill in the above research gap and help us learn more about how new green technologies can help businesses make more money, this study wants to present a broad theoretical framework that examines the various elements that impact the connection between new green technologies and better business finances. This makes our results more specific and useful. Finally, we talk about what it means for businesses and governments that use green technology innovation and how to make it more profitable to do so. This can help policymakers make better tools to support green innovation practices.

#### **1.2. Research Questions**

- a. Does Green Tech Innovation impact financial performance?
- b. Does Green Product Innovation impact financial performance?
- c. Does Green Process Innovation impact financial performance?
- d. Does Green Image impact financial performance?

## **1.3. Research Objectives**

- a. To investigate the impact of Green Tech Innovation on financial performance.
- b. To investigate the impact of Green Product Innovation on financial performance.
- c. To investigate the impact of Green Process Innovation on financial performance.
- d. To investigate the impact of Green Image on financial performance.

#### LITERATURE REVIEW

#### 2.1. Green Technology Innovation

Due to the growing concern that people have regarding the state of the environment, the business sector has been paying consistent attention to the development of environmentally friendly technologies (Ullah et al., 2024)). According to Alhadid & Abu-Rumman, (2014), Green Technology Innovation can be define as the use of new hardware and software to make green goods or processes. This can be done by saving energy, preventing pollution, recycling waste, making green product designs, and managing a company's environmental impact (Y.-S. Chen et al., 2006). It is possible for green technology innovation are looked at in this study. There are two types of green innovation: green process innovation and green product. To make new goods or ways of doing things, businesses need to be motivated and able to think of new tools and products (Chen & Huang, 2009).

### **2.1.1. Green Product Innovation**

Coming up with new green products is a process that has many steps. There are three main types of environmental concerns: waste, energy use, and pollution. These were picked because they have the most impact on the environment at different stages of a product's life: when it is made, when it is used, and when it is thrown away (Manzoor et al., 2023). Three key parts make up the green product innovation measurement. All three have to do with making new products. To begin, the business needs to pick products that are the least harmful to the environment. Second, the business has to make goods with the fewest number of materials possible. Third, the business needs to think carefully about how easy it is to recover, reuse, and break down the product (Ullah et al., 2024).



## 2.1.2. Green Process Innovation

Green Process Innovation is when new ideas are used to change how things are made and handled in ways that are better for the environment or don't hurt it at all (Alhadid & Abu-Rumman, 2014). The point of green process innovation is to either make things with less energy or use waste in a useful way (Xie et al., 2019). According to Utterback & Abernathy, (1975), To measure green process innovation, there are three parts. First, the process of making something basically stops the release of dangerous materials or waste. Second, it makes less water, energy, coal, and oil use. Third, it makes less use of raw materials. Green process innovation has been shown to help businesses stay competitive and last for a long time (Chen et al., 2006; Ullah et al., 2024; Sezen & Cankaya, 2013).

#### 2.1.3. Green Image

Its most important partners should have a good impression of the company. This is called its core image (Amores Salvadó, 2012). There is something called a "corporate green image" that shows how partners see how green or environmentally friendly a company is. A company that works to improve its "green" image not only stays out of environmental protests and possible legal trouble, but also meets higher customer standards for how eco-friendly and long-lasting it is. The "green image" of a business is thought to have a lot to do with how happy its customers are. Businesses that work to improve their green image get better green images (Chen, 2010). Being green can also help companies have a better reputation with the public, which can lead to more sales and higher stock prices (Zhu & Sarkis, 2006). There has been a lot of pressure on businesses all over the world to become "greener" because people are becoming more aware of the environment (Zhu & Sarkis, 2006).

#### **2.2. Financial Performance**

Green management can make it easier to save money and make more money in the long run by getting rid of pollution and reusing waste materials (Alhadid & Abu-Rumman, 2014). There are three ways to make more money: get better access to certain markets, make your product stand out, and sell technology that stops pollution (Ambec & Lanoie, 2008). Taking into account how well the business did at improving its people capital. Financial performance measures include things like how much of sales come from new products, how much money is made, how much is spent on capital, and how much is made back on assets. (ROA). Income per share (EPS), return on investment (ROI), and net income after taxes are some other ways to figure it out (Amalia Yunia Rahmawati, 2020). Market-based or accounting-based metrics can be used to evaluate success in CG's empirical research. While Lo (2003) uses return on equity (ROE) to gauge operational success, (Klein, 1998) uses return on assets (ROA) to gauge operational performance. The operational performance measures ROE and ROA are defined by (Brown & Caylor, 2004, 2005) as the return on investment and assets, respectively. The income produced by a company's physical assets should be examined in the return on assets (ROA) report when assessing its operating performance (Manzoor et al., 2023).

#### 2.3. Hypotheses

H1: There is significant impact of Green technology innovation on financial performance.

H2: There is significant impact of green product innovation on financial performance.

H3: There is significant impact of green process innovation on financial performance.

H4: There is significant impact of green image on financial performance.



## **2.4.** Conceptual Framework



Fig 1: Conceptual Framework

#### **RESEARCH METHODOLOGY** 3.1. Research Design

This is where the research design comes in. It tells us how we will answer the research questions and organize the facts in a way that makes sense within the research framework. This book tells you everything you need to know about study, from the main ideas behind it to the different parts of it. The order of this research is the same as the famous onion model of research (Saunders et al., 2009). Research design is like building (Srivastava & Rego, 2011), usually used to help researchers get the best answers possible to their questions (De Vaus, 2001). It gives scholars a "framework of study" to help them gather and look at solid data (Bryman & Cramer, 2002, 2012). It's also important that the research design fits with the research goal. Using this method, scientists can get "a numerical or quantitative account of trends or views of a population by studying a group of that population" (Creswell & Creswell, 2017).

## **3.2. Deductive Method**

A proposed deductive research framework will be shown in this study. The theory is always an important part of the research; in order to come up with and test a new hypothesis, the research uses existing theories. The current study uses a method called "deduction." To use this method, you have to find evidence to support your hypotheses and then test them. This method tests ideas and theories that most people agree on in order to look into a certain object or event. Because of this, if this event is real after being studied and if the important ideas are real (Bryman & Cramer, 2002, 2012).



## 3.3. Quantitative Research

The third part of Saunders' research onion gives ideas for how to collect data and look at it statistically. When starting to build a research project, it's important to choose the right research method. Once a research design has been made, it is time to choose whether to use a quantitative, qualitative, or hybrid approach to data collection. When it comes to data, numbers are the most reliable. When people fill out questionnaires for a study, the answers are written down as numbers so that the study can do statistical analysis. What the research is about and how it was designed also affect how the data is gathered. A list of the KMI-30 index listed on the Pakistan Stock Exchange (PSX) could be gotten for this study. The first two layers help us pick a method. Positivist philosophy uses numbers, logic, and surveys and questionnaires to collect information, run statistical tests, and look into how variables are related (Christensen et al., 2011). The "positivist" philosophy serves as the foundation for this study, which employs the "quantitative" approach to investigate relationships through the use of the deductive methodology.

## 3.4. Data Collection

The process of conducting any kind of research begins with the gathering and examination of pertinent data, which is an essential step in the process. According to Bryman and Cramer (2002, 2012). The kind of data that is necessary for the research that is currently being carried out is contingent on the study that is being carried out. The phrase "primary data" refers to information that has not been used in a study in the past but is currently being gathered for the very first time for the purpose of conducting research. This information is being gathered for the very first time.

### **3.5.** Population and Sampling

As of 2020, there were 531 public companies listed on the Pakistan Stock Exchange (PSX). These companies came from all kinds of industries, from service businesses to manufacturing ones. The KMI-30 Index from the PSX would be my main focus and area of interest. This will be done as part of the research project. The sample size was made up of the top 30 different companies of the KMI-30 index from different sectors like textile, chemical, cements and automobile sectors in Pakistan that are traded on the stock market. Once the study's size is known, it will use convenience sampling to get the data it needs from a secondary source, like a company's annual report. The study talks about the time period from 2018 to 2022 when the data were collected.

#### 4.1. Regression Equation

The data from the Random-effects GLS regression can be used to make the regression equation for this study. The regression equation shows how the independent factors ( $Proc_1$ ,  $Prod_1$ ,  $Prod_2$ , and  $Gi_1$ ) are related to the dependent variable (ROA). From the results, we got the following regression equation:

Here is the regression equation formatted for easy copying and pasting:

 $ROA = 8.236802 + 5.411661 \cdot proc_1 + 5.838955 \cdot prod_1 - 8.547333 \cdot prod_2$ 

Where:

ROA: is the Return on Assets.

Proc<sub>1</sub>: represents green process innovation.

Prod<sub>1</sub>: represents green product innovation (type 1).

Prod<sub>2</sub>: represents green product innovation (type 2).

Gi1: represents green image.



The values for  $Proc_1$ , 5.838955 for  $Prod_2$ , -8.547333 for  $Prod_2$ , and -4.199713 for Gi<sub>1</sub> was found in the regression output, and they are used in this equation. The constant term is 8.236802. This equation shows how the variables are related to each other on a quantitative level. It shows how different aspects of green technology innovation affect financial success.

## 4.2. Regression Results

The Random-effects GLS regression analysis looked at how new green technologies affect the Return on Assets (ROA) success of a business. The results are shown in this chapter. The separate things that were looked at were green process innovation, green brand, and green product innovation. The study tries to figure out how these environmentally friendly new ideas will affect the business's bottom line. In the sections that follow, we'll talk about the data in more detail and show how each variable affected ROA and how important it was statistically.

Roa	Coef.	Std. Err	Z	<b>P&gt;</b>  z	[95%	Interval]
					coef.	
Proc <sub>1</sub>	5.411661	2.012375	2.69	0.007	1.467477	9.355844
Prod <sub>1</sub>	5.838955	2.827133	2.07	0.039	.2978759	11.38003
Prod <sub>2</sub>	-8.547333	2.867159	-2.98	0.003	- 14.16686	-2.92780
Giı	-4.199713	2.068178	-2.03	0.042	- 8.253267	146159
cons	8.236802	1.694116	4.86	0.000	4.916395	11.55721
sigma_u		0				
sigma_e		11.011896				
rho		<b>0</b> (fraction of variance due to u i)				

#### 4.2.1. Random-Effects GLS Regression Tests

 Table 1: Random-Effects GLS Regression Tests

 4.3. Regression Analysis Results

<b>4.5.</b> Regression Analysis Results				
Random-effects GLS regression	Number of obs. $=$ 150			
Group variable: proc_1	Number of groups $=$ 2			
R-sq: within $= 0.1424$	Obs. per group: $\min = 25$			
between $= 1.0000$	avg = 75.0			
overall = 0.1425	max = 125			
	Wald $chi2(4) = 24.09$			
	Prob > chi2 = 0.0001			
corr. $(u_i, X) = 0$ (assumed)				

## 5.1. Discussion

New green technologies and how well businesses do financially are not as easy as the study's research suggests. Adding eco-friendly ideas to business plans is hard because this link is very subtle. It is very important to run your business in an eco-friendly way, and the fact that green process innovation can help your business make more money makes it even more clear. This study proves that it is possible to make more money and that it pays off to use eco-friendly methods to make things run more smoothly (Ma et al., 2021; Qing, Chun, Dagestani, et al., 2022; Qing, Chun, Ock, et al., 2022) by giving complex views on how different aspects of green innovation have different effects. Instead, try making a picture that



is more complex. Not many new green products have been shown to make businesses more successful. Other kinds of improvements might have different results, and some might even make things worse. This change shows that how important it is to think carefully about the details and results of various green product breakthroughs. Also, it makes it more likely that specific plans are needed to lessen any bad effects and boost the good effects of making green products on business success.

The strong link between financial success and green image also shows how important stakeholders' opinions and a company's reputation are in determining market outcomes. Businesses that want to stand out in a busy market may find that having a strong "green" image, which means being committed to sustainability and environmental responsibility, is very helpful. A bad green image, on the other hand, could really hurt a company's bottom line, especially in fields where environmental problems are very important. These new ideas add to what's already been written about green innovation by helping us understand how different parts of sustainability efforts have different effects. More ideas about sustainability are added by this study, which looks at how new green technologies affect businesses' bottom lines (Kong et al., 2016). It also has useful effects for companies that want to switch to more environmentally friendly ways of doing business.

#### 5.2. Conclusion

In conclusion, strategic investments in green process innovation have been shown to positively impact financial performance for firms. However, careful evaluation of the financial implications of different types of green product innovation is essential. Furthermore, effective management of corporate green image and reputation is crucial for long-term financial success. These key takeaways highlight the importance of integrating sustainability considerations into corporate strategies to enhance overall financial performance.

### **5.3. Direction for Future Research**

More research could be done in a few key areas to learn more about the link between developing green technologies and how well a company does financially. Locomotive studies, which look at changes and trends over time, would show how this link changes over time. Looking into organizational factors like leadership styles and organizational culture might help us understand how internal processes affect the results of green innovations on the bottom line. Studies that focus on a certain industry would give more detailed information about how new green technologies affect different areas. Comparing companies that have used green innovations to companies that haven't could help us figure out how well they work. Additionally, qualitative research methods could be used along with quantitative analyses to provide deeper understanding of the reasons for and difficulties of adopting green innovations. These areas of study would help us get a fuller picture of how new green technologies affect how well businesses do financially.

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