

**T.C.
ISTANBUL GEDİK UNIVERSITY
INSTITUTE OF GRADUATE STUDIES**



**THE IMPACT OF TRANSFORMATIONAL LEADERSHIP ON
GREEN INNOVATION IN ORGANIZATIONAL MANAGEMENT**

MASTER THESIS

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Engineering Management Department

Master In Engineering Management English Program

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I hereby declare on my honor that the Master's thesis titled "The Impact of Transformational Leadership on Green Innovation in Organizational Management" has been written without resorting to any assistance that would contravene scientific ethics and traditions throughout all processes from the project phase to its conclusion, and that the works I have utilized are those listed in the Bibliography, and they have been used with proper citation (12/12/2024).

Abdullah Masoud Abdullah MIFTAH

PREFACE

I would like to express my gratitude to my advisor, Prof. Dr. Redvan GHASEMLOUNIA, for his help and support. Working under his supervision was invaluable to me, as his passion, knowledge, and unwavering support guided me through the stages of writing this thesis.

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THE IMPACT OF TRANSFORMATIONAL LEADERSHIP ON GREEN INNOVATION IN ORGANIZATIONAL MANAGEMENT

ABSTRACT

This study examines the impact of transformational leadership on green innovation within organizations. The research demonstrates that transformational leadership, which encompasses visionary leadership, intellectual stimulation, and motivation, has a significant positive effect on green innovation ($\beta = 0.26, p < 0.01$). Specifically, the study highlights the role of the "Goal Acceptance" dimension of transformational leadership, which positively influences both service and process innovation. The findings suggest that transformational leaders create a culture of sustainability by aligning organizational goals with environmental objectives, thereby fostering innovation in eco-friendly practices. The research contributes to the growing body of literature by providing empirical evidence of the role transformational leadership plays in promoting green innovation. It also offers practical implications for organizations, suggesting that leadership development programs should focus on cultivating transformational leadership behaviors to enhance sustainability efforts. Furthermore, the study encourages organizations to integrate environmental goals into their strategic planning to maximize their green innovation capabilities. Future research could expand on these findings by exploring other leadership styles and their impact on green innovation, as well as conducting longitudinal studies to understand the long-term effects of leadership on sustainability.

Keywords: *Transformational leadership, green innovation, sustainability, service innovation, process innovation, organizational goals.*

DÖNÜŞÜMSEL LİDERLİĞİN ÖRGÜTSEL YÖNETİMDE YEŞİL YENİLİK ÜZERİNDEKİ ETKİSİ

ÖZET

Bu çalışma, dönüşümcü liderliğin örgütlerdeki yeşil inovasyon üzerindeki etkisini incelemektedir. Araştırma, vizyoner liderlik, entelektüel teşvik ve motivasyonu içeren dönüşümcü liderliğin, yeşil inovasyon üzerinde önemli ve olumlu bir etkisinin olduğunu göstermektedir ($\beta = 0,26$, $p < 0,01$). Özellikle, dönüşümcü liderliğin "Amaçları Kabullendirme" boyutunun hem hizmet hem de süreç inovasyonunu olumlu yönde etkilediği vurgulanmıştır. Bulgular, dönüşümcü liderlerin, örgütsel hedefleri çevresel amaçlarla uyumlu hale getirerek sürdürülebilirlik kültürü oluşturduklarını ve bu sayede çevre dostu uygulamalarda inovasyonu teşvik ettiklerini göstermektedir. Araştırma, dönüşümcü liderliğin yeşil inovasyonu teşvik etmedeki rolüne dair ampirik kanıtlar sunarak literatüre katkı sağlamaktadır. Ayrıca, örgütler için liderlik geliştirme programlarının dönüşümcü liderlik davranışlarını teşvik ederek sürdürülebilirlik çabalarını artırabileceği yönünde pratik öneriler sunulmaktadır. Çalışma, örgütlerin yeşil inovasyon yeteneklerini en üst düzeye çıkarmak için çevresel hedefleri stratejik planlamalarına entegre etmeleri gerektiğini önermektedir. Gelecekteki araştırmalar, farklı liderlik tarzlarının yeşil inovasyon üzerindeki etkisini inceleyebilir ve liderliğin sürdürülebilirlik üzerindeki uzun vadeli etkilerini anlamak için boylamsal çalışmalar yapabilir.

Anahtar Kelimeler: *Dönüşümcü liderlik, yeşil inovasyon, sürdürülebilirlik, hizmet inovasyonu, süreç inovasyonu, örgütsel hedefler.*

1. INTRODUCTION

The process of innovation is a multifaceted social activity that requires interactions between a variety of participants. The achievement of success in innovation is connected to the successful communication and collaboration of individuals who come from a variety of backgrounds and work in different functional areas. During the process of innovation, businesses need to have the ability to coordinate resources in order to reap the benefits of multiple perspectives. Through the utilization of this coordination capability, the flow of information is enhanced across functional boundaries, and communication is less difficult (Kahn, 2018).

It is necessary for a company to improve its coordination capabilities and establish a vision that is founded on strong integration among the members of the organization in order to achieve effective green management. In addition, the participation of members who come from a variety of backgrounds and hold managerial positions can facilitate the development of environmentally friendly products and processes. Within the context of a common mission and vision, cross-functional coordination is absolutely necessary for the achievement of success in green innovation. Initiatives of a green nature invariably involve a number of different functional areas. Consequently, in order to implement environmentally friendly practices and activities that are geared toward the preservation of the environment, businesses need to work together among members who serve different functions and improve their ability to coordinate their efforts. It is therefore possible to effectively incorporate environmental concerns into strategic planning, and it is also possible to advance efforts toward environmentally friendly innovation (Takalo & Tooranloo, 2021).

Leaders who possess the appropriate characteristics are regarded as a distinguished source of organizational expertise that complements the innovation of businesses. According to the research that has been conducted, transformative leaders are considered to be one of the most important factors that are able to successfully promote innovation by utilizing coordination skills (Ghasabeh et al., 2015).

Within the context of this discussion, transformative leaders make use of intellectual stimulation and inspirational motivation, both of which are essential for the innovation of organizations. The actions of a transformative leader are advantageous for the generation of new ideas and the achievement of breakthroughs in the process of innovation. This is because transformative leaders serve as catalysts, meaning that they inspire followers to think about problems in new ways (Givens, 2008). By encouraging followers to view problems from new perspectives and by communicating a vision, transformative leaders unquestionably have a positive influence on the innovation performance of their organizations. It has been demonstrated through research that transformative leadership is an effective method for enhancing a company's innovation capabilities. This leadership style is characterized by its ability to both support and promote innovation. According to the findings of a study conducted by Khalili (2016) that investigated the connection between transformative leadership and the innovation capability of a company, it was found that transformative leaders exhibit a positive influence on the creativity of employees as well as the innovation capability of the company.

When it comes to resources, human capital is the most important resource for businesses, and leadership is an essential component of any organization. However, Human Resources Management (HRM) is concerned with consistently influencing employees on a larger scale through the organization's systems and processes. This is in contrast to leadership, which focuses on understanding, predicting, and controlling both personal and interpersonal dynamics of how individuals influence each other towards common goals. As a result, it is generally accepted that leadership and human resource management work together to manage employees in the workplace from a variety of perspectives. According to the findings of a study conducted by Singh et al. (2020), transformative leadership encourages green innovation by promoting green human resource practices.

1.1 The Problem of Study

The problem addressed by this research is the lack of comprehensive understanding regarding the impact of transformational leadership on green innovation within organizations. Despite the increasing awareness and adoption of green practices and sustainable innovations, there is limited empirical evidence on

how transformational leadership influences these processes. Green innovation, which involves developing new products and processes that are environmentally friendly, requires a high level of coordination and integration across various organizational functions. Transformational leaders, known for their ability to inspire and intellectually stimulate their followers, are hypothesized to play a crucial role in fostering such innovation. However, the specific mechanisms through which transformational leadership impacts green innovation remain underexplored. This gap in the literature hampers the ability of organizations to effectively leverage leadership styles to enhance their sustainability initiatives. By addressing this gap, this study aims to contribute to a deeper understanding of the relationship between transformational leadership and green innovation, thereby providing valuable insights for both academic research and practical application in the realm of organizational management and sustainability.

1.2 The Aims of Study

The primary aim of this research is to investigate the relationship between transformational leadership and green innovation. This study seeks to elucidate whether and how transformational leaders, through their unique leadership style, can enhance green innovation within their organizations. Specific objectives include: assessing the direct impact of transformational leadership on green innovation; and providing empirical evidence to support the development of effective leadership and strategies that promote environmental sustainability. By achieving these aims, the research intends to bridge the existing gap in the literature and offer practical recommendations for organizations striving to improve their innovation performance through sustainable practices.

1.3 Importance of the Study

This research holds significant importance for both theoretical and practical reasons. Theoretically, it contributes to the growing body of literature on transformational leadership and green innovation, offering new insights into the mechanisms that link leadership styles to sustainable innovation outcomes. The study provides a novel perspective that integrates leadership theory and environmental sustainability. Practically, the findings of this research can inform organizational

strategies aimed at enhancing green innovation. As businesses worldwide face increasing pressure to adopt sustainable practices, understanding the role of transformational leadership in fostering such innovation becomes critical. The insights gained from this study can help organizations develop leadership and HR practices that not only improve their environmental performance but also enhance their overall innovation capabilities.

1.4 Limitations of Study

This study, like any other, has its limitations. First, the cross-sectional design limits the ability to infer causality between transformational leadership and green innovation. Longitudinal studies would be more effective in establishing causal relationships. Second, the research relies on self-reported data, which may be subject to biases such as social desirability or common method bias. Third, the study is geographically and contextually limited to the specific organizational settings from which the data were collected, which may affect the generalizability of the findings. Finally, the research focuses on transformational leadership and green HR practices, potentially overlooking other relevant factors that could influence green innovation, such as organizational culture or external environmental pressures.

1.5 Methodology

The methodology of this research encompasses both theoretical and empirical approaches. The study employs a quantitative research design, utilizing a cross-sectional survey to collect data from organizational members. The survey instrument includes validated scales to measure transformational leadership, green HR practices, and green innovation. Data analysis involves descriptive statistics, correlation analysis, and structural equation modeling to test the hypothesized relationships. The theoretical framework integrates concepts from leadership theory, innovation management, and green HR practices. A detailed literature review is conducted to identify existing knowledge gaps and to develop the conceptual model guiding the empirical analysis. Additionally, case studies of organizations known for their green innovation practices are included to provide contextual insights and enhance the robustness of the findings.

1.6 Hypotheses

The primary hypotheses of this research are:

H1: Transformational leadership has a positive effect on green innovation.

H2: Transformational leadership has a negative effect on green innovation.

1.7 Differences between Your Work and Others

This research distinguishes itself from existing studies by explicitly focusing on the relationship between transformational leadership and green innovation. While previous studies have explored the direct effects of transformational leadership on innovation, few have considered the specific mechanisms through which this influence occurs. Additionally, the integration of green HR practices into the conceptual model represents a novel approach that links leadership and HR management with sustainability outcomes. This comprehensive perspective provides a more holistic understanding of the factors driving green innovation, offering practical insights that are directly applicable to organizational settings.

1.8 Novelty of the Work

The novelty of this research lies in its interdisciplinary approach, combining insights from leadership theory, HR management, and environmental sustainability to address a contemporary organizational challenge. The study provides a unique contribution to the literature, advancing our understanding of how transformational leaders can effectively promote green innovation. Furthermore, the empirical evidence generated by this research offers practical guidance for organizations seeking to enhance their sustainability initiatives through targeted leadership and HR strategies.

1.9 Thesis Structure

The thesis is structured into five chapters:

Chapter 1: Introduction

This chapter sets the stage for the research, providing background information, defining the research problem, and outlining the aims, objectives, and significance of the study. It also presents the research questions, hypotheses, and the scope and limitations of the research.

Chapter 2: Literature Review

This chapter reviews existing literature on transformational leadership, green innovation, and green HR practices. It discusses key concepts, theoretical frameworks, and previous research findings, highlighting the gaps that this study aims to address.

Chapter 3: Research Methodology

This chapter details the research design, data collection methods, and analytical techniques used in the study. It explains the survey instrument, sampling strategy, and procedures for data analysis, including the use of structural equation modeling.

Chapter 4: Results and Discussions

This chapter presents the empirical findings of the study, including descriptive statistics, correlation analysis, and the results of hypothesis testing. The findings are discussed in relation to the existing literature, with implications for theory and practice.

Chapter 5: Conclusion and Recommendations

This chapter summarizes the key findings, discusses their theoretical and practical implications, and offers recommendations for future research and organizational practice. It also reflects on the limitations of the study and suggests avenues for further investigation.

2. TRANSFORMATIONAL LEADERSHIP

2.1 Literature Review

2.1.1 Leadership

Because humans are social entities that engage in social interaction with one another, it is inevitable that conversations about leadership will take place in any society in which there are people living together. The idea of leadership, which is a fundamental phenomenon that has historical, societal, and cultural roots, has always been significant throughout the entirety of human history. A number of academic fields, including management science, sociology, psychology, and others, are currently focusing their attention on the concept of leadership, which is also a subject of research. Management science is the primary discipline that is focusing on leadership (Leithwood & Jantzi, 2005).

Leadership, according to Bass (1960), is defined as the capacity and skills to mobilize individuals around particular projects or objectives. One of the responsibilities of leadership is to exert influence over employees during the process of determining their needs and arriving at a consensus. It is important to note that this process involves both individual and collective efforts to accomplish common goals. According to Peterson and Hunt (1997), leadership is a process that aims to influence and direct members of a group. At the same time, they emphasize the roles that both leaders and followers play in this process. In the context of this discussion, leadership refers to the reciprocal relationship that exists between leaders and followers, with the leader taking on the role of leader based on the acceptance of followers.

It has been observed that there is no one definition of leadership that is universally accepted, and that there are multiple definitions due to different focuses on various aspects of the leadership process. According to Howard (2005), the existence of multiple definitions is a natural phenomenon that ought to be regarded

as a richness in the process of comprehending the concept from a variety of vantage points.

A purpose, a leader, a group of people directed by this leader, and a process of influence are all common elements that are included in the numerous definitions of leadership that have been proposed. On the other hand, if one were to solely concentrate on a single individual trait, such as the charisma of the leader, without taking into account the fundamental interaction between the leader and the followers in this process, one would be missing the point. Throughout the entirety of the historical development of the concept of leadership, there has been a transition from traditional approaches to contemporary approaches, including the interaction between the leader and the followers. This transition will be discussed in greater detail later. Consequently, it would be more appropriate to define and evaluate leadership as a function of leaders, followers, and circumstances, as stated by Díaz-Sáenz (2011).

2.1.1.1 Differences between leadership and management

Management and leadership are two concepts that are frequently confused with one another. Finding a clear distinction between the two is difficult because attempts to define differences for each term also involve identifying commonalities. This makes it difficult to differentiate between the two. While the concepts of management and leadership are not entirely synonymous with one another, they are also not entirely distinct from one another. Some management thinkers in the past have occasionally used these terms interchangeably, while others have made an effort to differentiate between the differences between them (Rafferty & Griffin, 2004).

In contrast to management, which is defined as "coping with complexity," leadership is defined as "coping with change." Managers are individuals who are required to plan in detail, organize structures, and monitor daily operations in order to meet identified needs. Leaders, on the other hand, have the ability to influence a group to achieve long-term goals to achieve organizational objectives. According to one definition, a manager is an individual who works on behalf of other people and makes efforts to achieve goals that have been predetermined (Hay, 2006).

When it comes to management, managers are responsible for ensuring that tasks are planned, organized, implemented, controlled, and fulfilled. Leaders, on the other hand, are primarily concerned with motivating employees to act in a manner that is congruent with the organization's objectives by not only considering the present but also focusing on the future. The ability of a leader to focus on change and the ability to motivate people, which is distinct from the ability to control people, are the primary factors that differentiate management from leadership. Clarification of the difference between management and leadership is provided by this distinction (Ghasabeh et al., 2015).

Managers and leaders are both responsible for guiding individuals toward a common objective, but they do so through different sources of power. However, leaders utilize personal power sources (expert power and charismatic power) to influence the behaviors of their subordinates, whereas managers rely on the power of reward, punishment, and legal rules to influence the behaviors of their employees. Despite the fact that the existence of management requires the existence of a formal organizational structure, leaders can be found in both formal and informal organizational structures (Kent et al., 2001).

According to Givens (2008), the following are some of the distinguishing characteristics that are frequently highlighted in the literature as being associated with leadership and management:

- The structure that is already in place is maintained by managers, while leaders are open to change.
- However, leaders are able to trust and motivate their teams, whereas managers rely on formal authority, rules of discipline, and legal regulations.
- When it comes to management, not every manager possesses leadership qualities, and not every leader possesses management qualities.
- Managers are responsible for delegating tasks based on generality, whereas leaders are born out of the goodwill of the majority.
- Leaders are able to instill a sense of belonging and harness the power of motivation, whereas managers are appointed by higher-ups and have the ability to exercise legal authority.

- As administrators, managers are responsible for ensuring that the system and structure are in place, whereas leaders are focused on the individuals within the organization.
- On the other hand, leadership is about questioning the status quo and creating differences, whereas management is based on maintaining the current state and system.
- The success of a management team is dependent on the system, whereas the success of a leadership team is dependent on the individual.
- In management, planning is typically focused on the short term and action, whereas in leadership, visions, missions, and appropriate strategies are established prior to taking action.

These distinctions highlight the divergent approaches and focuses of leadership and management.

2.1.1.2 Leadership and organizational management

Leadership and organizational management are two fundamental concepts that are vital to the success of businesses and organizations. Although they seem to focus on different areas, leadership and organizational management are complementary processes that effectively direct business processes. While leadership refers to the ability to create a vision in an organization, direct and motivate people towards this vision, organizational management is the process of planning, organizing, directing and controlling resources to achieve strategic goals. In this article, the basic elements of leadership and organizational management, their relationship and their applications in businesses will be discussed.

Leadership can be defined as the ability to direct and motivate individuals in a group or organization to achieve a common goal. Leadership is based on the capacity to shape and inspire individuals' behaviors by using personal influence. Northouse (2015) defines leadership as an intermediary in the processes of individuals achieving goals and emphasizes that effective leaders have basic skills such as vision, charisma, communication and empathy.

Leadership styles can vary depending on the personality of the leader, the structure of the organization, and environmental conditions. Some of the most common leadership styles are:

Transformational Leadership: A leadership style that inspires and motivates employees with a visionary approach and encourages them to think innovatively. This leadership style is particularly effective in organizational change processes (Bass & Riggio, 2006).

Authoritarian Leadership: Centralizes decision-making processes and adopts a management approach based on the leader's authority. This style can be effective in crisis situations, but it can limit employee participation.

Participative Leadership: A leadership style that encourages employees' active participation in decision-making processes and is focused on cooperation. Participative leadership increases employee commitment and satisfaction.

Servant Leadership: It is based on the leader prioritizing the needs of employees and contributing to their development. This leadership style can increase employee motivation and commitment.

Organizational management is the process of effectively managing resources for an organization to achieve its strategic goals. Organizational management, unlike leadership, focuses more on processes, structure and resource use. Fayol (1916) defined organizational management with five basic functions: planning, organizing, leading, coordination and control.

Planning: The process of determining goals and developing the strategies necessary to achieve these goals. Effective planning enables the organization to use its resources efficiently.

Organizing: The process of creating an organizational structure and distributing tasks and responsibilities. A good organizational structure ensures that business processes are carried out more effectively.

Directed: The process of involving and motivating employees in business processes. Directedness requires leadership skills and can increase employee performance.

Coordination: The process of ensuring that different units and processes in the organization work harmoniously. Lack of coordination can make it difficult to achieve goals.

Control: It is the process of monitoring the performance of the organization and ensuring the harmony between the evaluated results and the goals. Control ensures that corrective actions are taken when necessary.

Leadership and organizational management are complementary concepts. While leadership provides guidance for individuals and groups in the processes of achieving goals, organizational management provides planning and organizing these processes. Leadership adds a human element to the organizational management process and increases employee commitment.

Leadership and management are interconnected but different concepts. While leadership is more concerned with motivating and directing people, management is concerned with planning and controlling processes and resources. While leaders develop a vision, managers manage the processes to implement this vision.

In successful organizations, leadership and management are often used together. In addition to developing a vision, an effective leader also uses management skills to realize this vision. For example, transformational leaders often combine both leadership and management elements when managing organizational change processes.

Leadership plays a critical role in organizational management processes. Effective leaders can increase employee motivation, encourage cooperation, and facilitate the organization's achievement of its goals. In addition, leadership plays an important role in change management. Transformational leaders, in particular, support organizational transformation processes by encouraging employees to adapt to change.

Effective leadership directly affects employee performance. Leaders' visionary approach and motivational abilities can increase employee job satisfaction. In addition, leaders can provide mentoring and feedback to maximize employees' potential.

Leadership also plays an important role in the formation of organizational culture. Leaders can shape the values and norms of the organization and direct employee behavior. For example, a sustainability-oriented leadership approach can encourage the adoption of environmentally friendly business practices.

Leadership and organizational management are applied in different ways in various sectors. For example, leaders in the technology sector use transformational leadership skills to promote innovation, while leaders in the healthcare sector focus on managerial skills to optimize patient care processes. In addition, leadership and management practices may vary depending on the size and structure of the organization.

Technology Sector: Leaders in technology companies use transformational leadership skills to promote innovation and engage employees in innovative projects. In addition, these leaders also use organizational management skills to optimize business processes.

Healthcare Sector: Leaders in the healthcare sector use management skills to improve patient care processes and make healthcare more efficient. In addition, leadership skills are needed to increase employee motivation.

Leadership and organizational management play a fundamental role in the success of organizations. These two concepts are interconnected and when used together, enable organizations to achieve their goals. While leadership shapes the behaviors of individuals and groups, management supports the process of planning and organizing these behaviors. Effective leadership and management practices not only enable organizations to achieve their goals, but also increase employee commitment, motivation, and performance. Therefore, leadership and management are two concepts of strategic importance to all organizations.

2.1.1.3 Leadership approaches

Over the course of human history, it has been observed that leadership styles have developed over time, thereby distinguishing themselves in terms of their understanding of management. Characteristic theory, behavioral theory, situational theory, and contemporary leadership theories are some of the categories that can be used to classify these approaches. In order to address the shortcomings or aspects of the previous approach that were not adequately explained, each new approach has emerged (Price, 2003).

Up until approximately 1950, the "trait theories" were dominated by the belief that leadership is innate, which allowed this paradigm to be established. Between the years 1950 and 1970, however, the "behavioral theories" emerged,

which focused more on the actions of leaders rather than the traits that they possessed. These theories were founded on the idea that trait theories were unable to provide a comprehensive explanation of the leadership process. These two theories are fundamentally distinct from one another in that, while trait theories place an emphasis on determining the appropriate individual to serve as a leader, behavioral theories highlight the fact that individuals can demonstrate effective leadership behaviors through training (Anderson, 2017).

Between the years 1970 and 1980, there was a growing consensus that even behavioral theories were inadequate in providing an explanation for effective leadership. This led to an emphasis on the necessity of taking into account not only the characteristics and actions of leaders, but also the circumstances that currently exist. It was as a result of this that "situational theories" came into existence. Taking a situational approach places an emphasis on the fact that there is no universally applicable leadership model that can be applied to every circumstance. In light of the fact that every circumstance possesses its own distinct qualities that call for particular leadership styles, it is clear that different leadership styles may be more or less effective in various circumstances (Pawar, 2003).

The 1980s marked the beginning of the process by which leadership theories were differentiated into modern leadership theories. These methods do not have a common thread that runs through them. As an alternative, they investigate the effectiveness of each individual leader's behavior and characteristics on an individual basis (Bass & Riggio, 2010).

For the purpose of this summary, leadership approaches have developed over the course of time, beginning with a belief in innate traits and progressing to a focus on behaviors, then taking into consideration the factors that are specific to the situation, and finally analyzing the effectiveness of each leadership trait and behavior in isolation.

2.1.1.3.1 Trait approach

The trait approach places an emphasis on the individual qualities that a leader possesses, based on the belief that "leaders are born, not made." According to this theory, certain people are born with innate abilities and physical characteristics that

distinguish them from other people and give them the ability to exert a unique influence on the group (Popper et al., 2000).

The trait approach, also known as the "Great Man Theory," was developed with the intention of determining the personal characteristics that are possessed by political and military leaders. Through an analysis of the personal characteristics of both successful and unsuccessful leaders, this theory attempted to identify the leadership characteristics that are applicable across the board. According to Alimo-Metcalfe and Alban-Metcalfe (2001), the objective was to determine the specific characteristics that distinguish leaders and play a role in their success or failure.

Despite the fact that the trait approach made significant contributions to the understanding of leadership by putting an emphasis on the qualities of the leader, it was not sufficient in explaining the concept of leadership solely by focusing on the nature of the leader. Furthermore, research indicated that there were no characteristics that were shared by successful leaders, and that there were no significant differences in the personal characteristics of successful and unsuccessful leaders (Carless et al., 2000).

2.1.1.3.2 Behavioural approach

In response to the shortcomings of the trait approach, the behavioral approach came into existence. This approach places an emphasis on leadership as a social process that is derived from the relationship between the leader and the followers. In contrast to the trait approach, which focused on the inherent characteristics of the leader, the behavioral approach research investigated how the actions of leaders influence the relationship between the leader and the followers (Tucker & Russell, 2004).

In the behavioral approach, the quality of a leader's behaviors and the quality of the relationships between the leader and followers were considered to be extremely important in determining the success of a leader. Several studies have demonstrated that the qualities of leadership behaviors and the quality of relationships between leaders and followers are critical elements that determine the effectiveness of a leader. A further implication of the approach was that significant leadership behaviors could be recognized and that leaders could be educated in these behaviors.

The behavioral approach was developed through the contributions of a number of studies (Goodwin et al., 2001):

- The Ohio State University leadership studies, led by R. House, categorized leadership behaviors into consideration and initiating structure. They found that leaders who focused more on consideration had a positive impact on employee turnover and absenteeism.
- The Michigan University leadership studies, initiated by R. Likert in 1947, aimed to identify effective leadership behaviors. Like the Ohio State studies, this research categorized leadership behaviors into employee-oriented and production-oriented behaviors.
- Douglas McGregor's X and Y theory, introduced in 1957, criticized the traditional management approach (X theory) and proposed a participative approach (Y theory). McGregor emphasized the importance of recognizing the human aspects of employees in increasing organizational effectiveness.
- Likert's System 4 model, developed based on Michigan University's leadership studies, categorized leadership styles into "authoritarian-exploitative," "authoritarian-benevolent," "participative," and "democratic." Likert argued for the shift from System-1 (Authoritarian-Exploitative Leadership) to System-4 (Democratic Leadership) for organizational effectiveness.

These behavioral studies provided insights into the importance of leadership behaviors, leader-follower relationships, and the impact of human qualities in organizational success.

2.1.1.3.3 Situational leadership approach

It is suggested by the situational leadership approach that the effective leadership behaviors that are identified in behavioral theories might not be universally applicable across all situations. Instead, different circumstances call for different leadership behaviors to be implemented. Recognizing this limitation of behavioral theories led to the development of situational leadership approaches, which emphasize that the most appropriate leadership style varies depending on the conditions and circumstances that are currently in place (Dionne et al., 2004).

It is argued in situational leadership theories that the leadership style of an individual can vary depending on the characteristics of the organization, the characteristics of the employees, the nature of the task at hand, and the expectations of the situation. The argument maintains that the leadership style that is most suitable for a given situation will shift in accordance with these factors (Humphreys & Einstein, 2003).

Brief descriptions of several studies on situational leadership are provided below, including those conducted by Turner et al. in 2002, Díaz-Sáenz in 2011, and Kent et al. in 2001.

According to the Contingency Model of Leadership developed by Fred Fiedler, leaders exhibit two distinct types of behavior: leadership that is task-oriented and leadership that is relationship-oriented. These actions are influenced by three factors: the relationship between the leader and the members, the structure of the tasks, and the power of the position. Fiedler presented eight distinct scenarios that were based on the combination of these three components. According to Fiedler, the leadership style that is most appropriate for a given circumstance shifts depending on the circumstances. For instance, a leadership style that is task-oriented might be effective in a situation that is described as "good" in the model, whereas a leadership style that is relationship-oriented might be effective in a situation that is described as "poor."

The purpose of the Path-Goal Theory, which was developed by House and Evans, is to provide an explanation for how the behaviors of leaders influence the motivation, satisfaction, and performance of their followers. This theory proposes that the primary responsibility of a leader is to make clear the path that must be taken in order to accomplish significant goals, thereby increasing the level of motivation among followers. The theory identifies four distinct leadership behaviors: directive, supportive, participative, and achievement-oriented. These behaviors are described in more detail below. Depending on the circumstances, a leader may choose to adopt any one of these behaviors.

Within the context of the Decision Tree Model developed by Vroom and Yetton, decision-making is regarded as an essential leadership task. Based on the model, it is suggested that the manner in which a leader makes decisions can be

classified as either autocratic, consultative, or group decision-making, depending on the circumstances and the specifics of the decision that is being undertaken.

As a conclusion, the situational leadership approach places an emphasis on the necessity for leaders to modify their approach in accordance with the particular circumstances that they are confronted with. It recognizes that there is no universally applicable method of leadership and emphasizes the significance of adaptability and flexibility in the behaviors of those in leadership positions with regard to leadership.

2.1.1.3.4 Modern leadership approaches

Despite the fact that traditional leadership approaches have made significant contributions to a variety of domains over the course of time, they have failed to meet the requirements of the rapidly evolving needs. As a consequence of this, there has been a search for fresh viewpoints on leadership, which has resulted in the collaboration of a variety of perspectives and the development of contemporary leadership strategies.

Over the course of the 1980s and continuing up until the present day, a number of contemporary leadership styles have emerged. Taking a look at the eras that came before, it is clear that each one shared a particular perspective or theme. Consequently, rather than concentrating on particular methods, it is more appropriate to take into consideration typologies. A number of different styles of leadership were prevalent during this time period, including charismatic, transformational, transactional, and visionary leadership, among others. The following are some examples of contemporary leadership styles that are frequently discussed in the academic literature (Ghasabeh et al., 2015; Anderson, 2017; Popper et al., 2000; Tucker & Russell, 2004):

Leadership that is Strategic: In order to exercise strategic leadership, it is necessary to align the organizational culture, shared values, human resources, and abilities to perform operations. It came into existence in the 1980s and placed an emphasis on foresight, the development of necessary strategies, and the efficient management of those strategies. Strategic leaders navigate unpredictability and crises in order to steer the organization in the right direction, while also actively considering ideas from outside sources and cultivating an atmosphere conducive to learning. Despite the fact that they place a high value on teamwork, they are

generally recognized as top management leaders due to the fact that their roles and behaviors are distinct from those of middle-level managers.

Leadership with a Vision Kouzes and Posner define visionary leadership as the art of motivating individuals to work toward a common goal and a compelling vision. The ability to articulate a vision, embody core values, and foster innovation and courage are all characteristics of visionary leaders. These leaders create an environment in which strategic goals can be accomplished. The creation of an inspiring vision, the development of relationships that are respectful and empowering, the encouragement of innovation and courage, and the establishment of fundamental moral values are among their most important qualities.

Charismatic leadership is characterized by extraordinary and heroic behaviors displayed by the leader. This perception of charismatic leadership is based on the perceptions of followers. The ability to effortlessly inspire and guide one's followers is a characteristic that is possessed by charismatic leaders. A high level of self-confidence, a greater belief in their own capabilities and talents than others, and excellent communication skills are all characteristics that they possess. Through their persuasive speaking, they motivate and influence those who follow them, and they frequently demonstrate an unwavering commitment and stability towards the goals they have set for themselves. Some of the criticisms that are leveled against charismatic leadership include the leader's tendency to accept everything without question, to overlook mistakes, and to communicate their own personal opinions to their followers (Dionne et al., 2004).

In conclusion, contemporary leadership styles place an emphasis on adaptability, foresight, and flexibility in order to meet the ever-changing requirements of organizations and the people who make up those organizations. In order for leaders to successfully navigate complex environments, each approach provides them with a unique perspective and set of techniques.

In democratic leadership, management is not centralized, and decision-making and responsibility are not solely concentrated in one hand. In other words, democratic leadership is not a centralized form of leadership. This is done with the intention of involving individuals in the process of determining plans and policies, as well as sharing accountability and responsibility. In the process of making difficult decisions, norms are consulted, and their ideas are taken into consideration, which

encourages participation. People who exercise democratic leadership are able to motivate their employees by demonstrating an interest in their opinions and making use of their competencies. This management style is prevalent in organizations, and it is associated with an increase in trust and commitment to the organization among employees when they have the perception that their ideas and values are valued. The performance of these individuals is also expected to improve as a result of this. On the other hand, when there is a need for prompt decisions to be made and there is a possibility that the leader could exert influence, it is absolutely necessary to exercise caution when using this management style (Humphreys & Einstein, 2003).

Leadership that is Autocratic (Commanding): Autocratic leadership is characterized by the concentration of all powers and responsibilities within the leader, who is responsible for making all decisions and issuing all orders. When it comes to decisions and orders, autocratic leaders anticipate unquestioning obedience from their followers. The model of leadership in question does not include any provisions for participation rights in the decision-making process regarding matters such as management, policies, and goals. In organizations that are led by autocrats, elements of motivation include the use of coercion, punishment, and the utilization of legal obligations. The application of this model of leadership can be observed in circumstances where prompt decision-making is required, in times of crisis, and in certain specific circumstances where immediate action is required. On the other hand, persistent pressure on subordinates, which disregards their requirements, ideas, and expectations, can result in a decline in the employee's level of commitment and satisfaction, and even the development of negative feelings toward the organization and its management (Pawar, 2003).

Bureaucratic Leadership: The hierarchical structure that exists within an organization serves as the foundation for bureaucratic and administrative leadership. It is the laws, regulations, and managerial instructions that determine all of the responsibilities and powers that are assigned to the personnel working for the organization. It is accomplished within the confines of the bureaucratic mentality to achieve this. When it comes to leadership, bureaucratic leaders place a greater emphasis on adhering to policies and procedures than they do on focusing on the development themselves. It is generally agreed that this approach is less desirable because it is not very effective in terms of motivating working employees. The

effectiveness of an organization is negatively impacted when it is led by bureaucratic individuals. This strategy is useful only in situations where tasks need to be completed in a methodical manner over an extended period of time, with the exception of urgent situations (Leithwood & Jantzi, 2005).

Humanist leadership, also known as relationship-oriented leadership, is characterized by the inherent qualities of humanist leaders, which include the ability to build close relationships through their approach to leadership. It is of the utmost importance to establish a working environment that is conducive to the happiness and harmony of the employees. The close relationship that is established with subordinates is the source of the formation of a management style that is based on loyalty. One of the most distinguishing characteristics of humanist leaders is their paternalistic attitudes, which can be interpreted as a protective tendency. Under this strategy, leaders will occasionally take into consideration the viewpoints of those who are in the middle. They encourage people by providing emotional guidance and putting an emphasis on the development of the individual rather than concentrating solely on the processes and procedures involved. As a result of the significant role that the reward system plays, they do not resort to punishment unless it is absolutely necessary (Rafferty & Griffin, 2004).

Authentic Leadership: Authentic leadership is a model that aims to increase the psychological capacities of employees by fostering a positive working environment, encouraging personal development, and having a leadership behavior that values ethics. Authentic leadership is a model that was developed by the American Leadership Institute. A self-aware, transparent, ethical, and results-oriented approach to leadership is a leadership style that is characterized by these characteristics. Trust, empathy, and inclusiveness are three qualities that authentic leaders prioritize in order to cultivate a positive organizational culture. Authentic leaders take into account the various needs of their employees. A continuous improvement is encouraged by this model, which places an emphasis on the strengths that individuals possess. It is widely acknowledged that authentic leadership is an effective method for fostering employee engagement and achieving organizational success (Ghasabeh et al., 2015).

A model that places an emphasis on the ethical utilization of collaboration, trust, power, and authority in the performance of work is referred to as servant

leadership. The analysis of organizations that Greenleaf (1998) conducted suggests that the primary motivation behind leadership is a strong desire to serve others. A fundamentally grounded in service and a focus on individuals, the goal of servant leadership is to meet the needs of individuals and, as a result, gain their trust. This model of leadership embraces all previous models of leadership and transcends them.

Leadership based on *laissez-faire*. The avoidance of power, responsibility, authority, and control is a characteristic of this style of leadership within an organization. Leaders expect individuals to manage and control themselves, and they leave tasks to be self-managed by the individuals they are leading. The strategy involves establishing desired goals for employees and then affording them a significant amount of autonomy in order to accomplish these goals on their own. Despite the fact that this model of leadership encourages employees to develop a higher level of self-confidence and offers opportunities for learning through experimentation and exploration, it may also result in difficulties. More specifically, its effectiveness may be restricted when applied to individuals who possess a greater sense of responsibility, a lower level of knowledge and experience, and a lower level of both. As a consequence of this, the lack of control that exists within groups and organizations has the potential to bring about disorders and confusion (Givens, 2008).

Leadership that are Transactional: Actions are directed by transactional leaders, who also motivate the organization, recognize and reward accomplishments, and contribute to the enhancement of productivity. Not only do they make an effort to fulfill the requirements of their employees in terms of their jobs, but they also make an effort to fulfill their social requirements. Both bureaucratic authority and formalism are the foundations upon which transactional leadership models are built. In order for leaders to receive rewards and recognition, it is necessary for them to fulfill the requirements set forth by their superiors. Nevertheless, such leaders frequently engage with the innovative and creative tendencies of their employees only to a limited extent (Anderson, 2017).

The transformative leadership approach is yet another contemporary leadership approach that is frequently discussed in the literature. Because of the significance of the topic, the concept of transformative leadership will be discussed in greater depth under a separate heading in this investigation.

2.1.1.4 Transformative leadership

Transformative leadership, a concept integral to modern organizational success, embodies the ability to inspire and enact significant change within an organization. Rooted in the notion of transformational leadership, transformative leadership emphasizes the capacity to elevate followers' motivation and morale, fostering an environment conducive to innovation and growth (Concept of Transformative Leadership). Leaders who exemplify transformative leadership are characterized by their visionary outlook, charisma, and ability to challenge existing paradigms, encouraging followers to transcend their self-interests for the collective good (Characteristics of Transformative Leadership). The dimensions of transformative leadership encompass idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration, each playing a critical role in shaping a dynamic and responsive organizational culture (Dimensions of Transformative Leadership). By understanding and implementing these facets, organizations can effectively navigate complex challenges and achieve sustainable success.

2.1.1.4.1 Concept of transformative leadership

An approach known as transformative leadership is one in which individuals are psychologically connected to one another, and leaders strive to change the beliefs, values, and needs of their followers in order to bring about a particular vision. This type of leadership, which is also known as change leadership, transformational leadership, or transformational leadership, gives leaders the ability to bring about the transformation of their followers as well as the evolution of their organizations or operations, which ultimately results in increased productivity. Individuals who are recognized as transformative leaders are those who are able to facilitate change and transformation internally within organizations. This style of leadership acknowledges the significance of completing tasks in a seamless manner, putting an emphasis on the fact that personal development and exceeding expectations are only attainable through alignment with the objectives of the organization (Bass & Riggio, 2010).

In order to bring about change and awareness among their followers with regard to their goals, beliefs, values, objectives, and desires, transformative leaders

devote their efforts to this endeavor. There is a three-step process that they follow, which includes recognizing the need for change, implementing vision alterations during times of success for the organization, and establishing a shared vision from the beginning. In order to acknowledge the requirement for change, it is necessary to emphasize the critical nature of change to the leaders of the organization and to persuade them of the necessity of change. When implementing changes to the vision, it is necessary to realize changes in a variety of areas, including the economic conditions, the satisfaction of customers, the quality of products, and innovation. The provision of a vision to members of an organization, the establishment of a course of action for change, and the maintenance of the continuity of the process of vision creation are all components of the endeavor to create a shared vision. According to Alimo-Metcalfe and Alban-Metcalfe (2001), the primary expectation that transformative leaders have is to raise the performance standards of their employees.

One of the most important aspects of success in fostering innovation is the leadership style. Previous research has demonstrated that transformative leadership is a leadership style that not only fosters innovation but also acts as a catalyst for its development. This suggests that it is an effective leadership strategy for enhancing the innovative capabilities of an organization.

2.1.1.4.2 Characteristics of transformative leadership

The most significant attribute of transformative leaders is their ability to exert influence, thereby fostering commitment among their employees. This influence leads followers to invest more effort than expected by the leaders. The literature highlights the following characteristics of transformative leadership (Carless et al., 2000):

- **Courage for Change:** Transformative leaders possess the audacity to bring about change. They are consistently prepared and adaptable for both change and transformation.

- **Vision Creation and Implementation:** They possess the capability to formulate visions and execute them effectively.

- **Lifelong Learning Principle:** These leaders are not hesitant to discuss mistakes and derive lessons from past errors.

- **Belief in People:** They dedicate efforts to empower and develop individuals within their teams.

- **Commitment to Organizational Values:** Transformative leaders clearly articulate shared values, ensuring that their actions reflect principles such as justice, equality, integrity, and respect for individuals. Their decisions and actions consistently align with these foundational values.

- **Internal Perspective:** They hold a guiding position within their teams, providing direction and guidance.

- **Problem-Solving in Ambiguity:** These leaders possess the ability to find solutions in ambiguous and complex situations. They are equipped to address technical, political, and cultural challenges within an organization, taking responsibility for problem resolution.

2.1.1.4.3 Dimensions of transformative leadership

The concept of transformative leadership can be understood through the implementation of four dimensions. The first aspect is charisma, which is characterized by an idealized influence that commands respect, admiration, and a sense of pride among those who follow the individual. As a result of the followers' belief that their leader possesses exceptional abilities, strength, and patience, they hold their leader in extremely high regard. One of the most significant effects that these leaders have on their followers is the impression that they leave behind. Intellectual stimulation is the second component of transformative leadership, which is exemplified by the leader's capacity to stimulate the intellectual development of those who follow them. By providing their followers with intellectual stimulation, transformative leaders improve their followers' ability to solve problems, reason, and increase their cognitive abilities, which in turn encourages them to be innovative (Dionne et al., 2004).

Individualized consideration is yet another aspect to take into account. In order for their followers to recognize their own potential and capabilities, transformative leaders foster this recognition. These leaders instill confidence in their followers by providing them with various sources of inspiration. In this particular dimension, transformative leaders assume the role of advisors, delving into the inner

worlds of their followers in order to offer support and guidance for their personal development (Díaz-Sáenz, 2011).

Inspiration is the final component of the transformative leadership model. Influencers are able to motivate not only themselves but also the people they lead to make significant changes through the use of inspiration. As a result of their ability to motivate others, transformative leaders establish a basis for change within the organization, which ultimately results in them gaining respect and importance.

2.1.2 Green innovation

2.1.2.1 Concept of innovation

"Innovation" is derived from the Latin word "innovare," which means "to make something new." The term "innovation" means "to make something new." Attempting to establish the foundational framework of this concept, Cantwell (2000) defines innovation as the introduction of a product or feature that is unknown to customers, the discovery of a new supply source or production method, or the establishment of a new organizational structure within a market. However, these definitions are not exhaustive. On the other hand, Drucker (1998) defines innovation as activities that are carried out within an organization in order to produce goods, services, or achieve certain objectives. He emphasizes that organizations that fail to innovate are unable to adapt to changing market demands (Kline & Rosenberg, 2010).

With the assertion that innovation is closely associated not only with products and processes but also with organizational and marketing aspects, Cantwell (2000) emphasizes that innovation is the driving force behind economic development. He says that innovation is closely associated with all of these aspects. In addition to this, he emphasizes that businesses that have the goal of achieving success in the market should work to improve their innovative capabilities.

Behaviours that are innovative, or more specifically, the act of creating something new, are displayed with the intention of bringing about positive outcomes for the organization. In the realm of innovation, it is of the utmost importance that the novelty that is produced by organizations should not only result in measurable

economic gains, but also provide other benefits, such as enhanced interpersonal relationships, increased job satisfaction, and personal growth (Edquist, 2010).

According to Rogers (1995), an innovation must have five essential characteristics in order to be considered successful: observability, trialability, compatibility, complexity, and relative advantage. Trialability is a term that refers to the extent to which a new innovation is founded on scientific and empirical principles. In the context of innovation, the term "observability" refers to the visibility of the outcomes that are produced by innovation. The term "compatibility" refers to the degree to which a new innovation is positively received and adopted by the market. In the context of the adoption and utilization of the innovation, the term "complexity" refers to the level of difficulty that is encountered. "Relative advantage" is a term that is used to describe the relative advantage that an innovation offers, which varies from system to system (Tolliver et al., 2021).

Both the idea of "creativity" and the idea of "innovation" are frequently contrasted with one another. Creativity, which can be defined as the capacity to come up with new ideas, is the first step in the process of innovation. Through the process of innovation, an organization is able to transform the creative ideas that it has developed into tangible and one-of-a-kind commercial products. To put it another way, innovation is the process of bringing enhanced creativity under commercial circumstances. In contrast to creativity, which does not inherently involve the introduction of novel ideas, innovation is distinguished by the fact that it involves the implementation of original concepts. Creative thinking is the process of coming up with new ideas, while innovation is the process of putting these ideas into action (Kahn, 2018).

The idea of "change" is another concept that is connected to innovation. Alteration can be defined as the process by which a specific circumstance, environment, process, or system undergoes a transition to a different state. Change, in its most fundamental sense, refers to alterations that take place within a particular stretch of time. However, innovation is a dynamic change process that is the result of the convergence of factors that are both internal and external to the organization. Despite the fact that it is possible to assert that every innovation is a change, it would be misleading to assert that every change is an innovation. The concept of innovation is more specific and distinctive than the concept of general change (O'Sullivan &

Dooley, 2008). Innovation is characterized by its emphasis on enhancing efficiency and producing commercial benefits.

There are times when the term "innovation" is used interchangeably with the term "invention." One definition of the term "invention" describes the process by which an idea is transformed into a new product or process. On the other hand, innovation is not only a term that denotes a change, but it also encompasses the commercial benefits that are derived from incorporating the idea into a product or process (Dahlander & Gann, 2010).

Within the realm of innovation, research and development (R&D) emerges as an additional concept that is interconnected. Activities related to research and development serve as fundamental functions that are essential for innovation in organizations that are working to adapt to environments that are constantly changing. Concurrently, it is widely acknowledged that in the absence of an entrepreneurial orientation within organizations, the research and development efforts that are undertaken may not necessarily result in innovation (Cohen et al., 2013).

2.1.2.2 Innovation strategies

Due to the significant costs that are associated with not innovating, businesses typically incorporate innovation processes into their operations. In addition, organizations are prompted to adjust their strategies from both the outside and the inside, depending on the circumstances. There are six primary categories that Freeman has classified innovation strategies under. These categories are as follows: aggressive, defensive, imitative, dependent, traditional, and opportunistic. Although these strategies may not be clearly classified, Freeman has classified them. (Amidon, 2007) includes the following information regarding these six different innovation strategies (Figure 2.1):

1. **Aggressive Strategy:** Employed by organizations with a high innovation capacity aiming to seize market leadership. Companies applying this strategy typically invest significantly in personnel with high educational levels and allocate substantial resources to R&D to develop new products.
2. **Defensive Strategy:** Adopted by risk-averse businesses aiming to benefit from the mistakes and opportunities of leading firms in innovation. An enterprise successfully employing an aggressive strategy might transition to a

defensive innovation strategy when competing in a saturated market, and distinguishing between these two strategies might be challenging.

3. **Imitative Strategy:** Utilized by businesses that operate with limited resources and prefer not to engage in high-cost R&D activities. These organizations benefit within legal boundaries from the products and knowledge of leading companies to widen the gap with their competitors.
4. **Dependent Strategy:** Typically, smaller businesses operate their activities under the influence or guidance of larger enterprises. Companies employing this strategy do not make changes to their products or services unless requested by the larger enterprise to which they are affiliated.
5. **Traditional Strategy:** Exhibited by businesses focused on adhering to competitive conditions without demonstrating a tendency toward innovation or change. These enterprises, possessing the necessary knowledge and technology for innovation, merely produce design-oriented novelties.
6. **Opportunistic Strategy:** This strategy emphasizes capitalizing on overlooked needs or opportunities in the market instead of engaging in complex design or R&D activities. Organizations implementing this approach strive to identify weaknesses in competitors and create new opportunities based on those vulnerabilities.

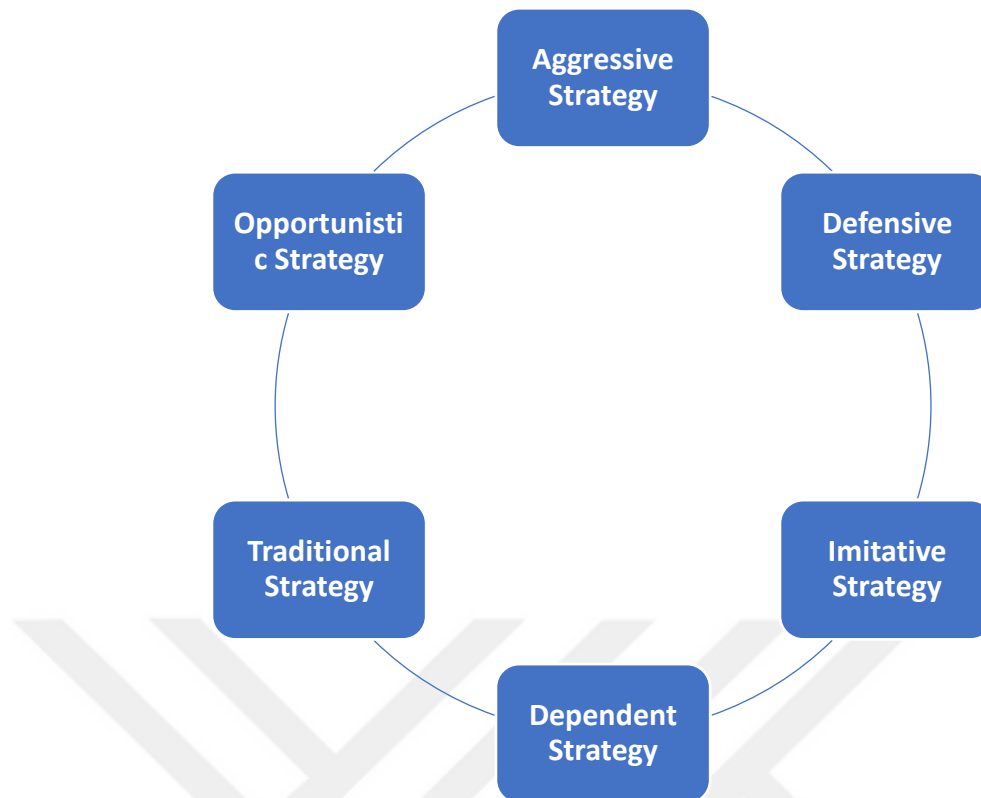


Figure 2.1: The Innovation Strategies

These six innovation strategies provide businesses with various approaches to navigate the competitive landscape, adapt to changing conditions, and capitalize on opportunities to foster growth and sustainability.

2.1.2.3 Types of innovation

There are many different classifications that have been made in the literature regarding the different types of innovations. During the classification process, it has been observed that the establishment of clear boundaries is not accurate. In addition, there are instances in which a completely new innovation incorporates aspects of a variety of different types of innovations (Tidd, 2006).

Innovation can be classified as either incremental (continuous, incremental) or radical (discontinuous) depending on the magnitude or intensity of the progress it makes. The term "incremental innovation" refers to the process of making gradual modifications to products or processes, which frequently include enhancements, modifications, or improvements. These modifications eventually lead to radical innovations that add more value. On the other hand, radical innovation refers to the introduction of completely new products, services, or processes and represents a

revolutionary shift for individuals, organizations, or markets. In certain circumstances, radical innovation makes it easier to implement applications that are completely different from those that have been used previously. In other instances, it paves the way for transformation within a particular industry, sector, or system. As a result, innovation plays a significant part in revitalization and transformation. In the case of radical innovation, it prevents customers from switching to competing businesses, while in the case of incremental changes, it helps businesses maintain their viability by increasing their market share (Pavitt, 2003).

When viewed from a different angle, innovation can be divided into two categories: disruptive innovation and sustaining innovation. The difference between disruptive innovation and sustaining innovation is that the former introduces an entirely new situation, thereby completely removing the validity of the existing situation, while the latter attempts to improve the performance of the existing situation. The primary goal of maintaining innovation is to improve the performance of products or services that are already available in order to fulfill new requirements (Kline & Rosenberg, 2010).

A further classification of innovation can be broken down into four primary pillars, which are product innovation, process innovation, position innovation, and paradigm innovation. Product innovation, as the name suggests, refers to innovations that are placed on the product itself, whereas process innovation refers to innovations that are placed on the processes themselves. The concept of position innovation refers to a modification in the manner in which an existing product is introduced to the market, whereas paradigm innovation refers to a modification in the mental models that are responsible for shaping the activities of an organization (Kahn, 2018).

Product innovations, process innovations, organizational innovations, and market innovations are the four categories that are used to classify innovation in the Organization for Economic Co-operation and Development (OECD) and European Union (EU) Oslo Manual. Product innovation refers to the process of introducing previously existing products or services to the market that are either completely new or significantly improved. The creation of production methods that are either completely new or significantly improved is what is meant by the term "process innovation." The efforts that are made to commercialize and market the product are

covered under the umbrella term of marketing innovation. On the other hand, organizational innovation refers to the incorporation of new practices and procedures into an organization's business operations (Dahlander & Gann, 2010).

2.1.2.4 Concept of green innovation

In a nutshell, "green innovation" refers to innovations that are aimed at minimizing the negative effects on the environment. It is defined as an innovation that aims to reduce the risks and damage that are caused to the environment. In a broader sense, green innovation refers to the process of developing or implementing new products, production processes, management, or business methods for an organization. These innovations are intended to produce results that reduce environmental risks, pollution, and other negative impacts throughout the life cycle of the product (Schiederig et al., 2012).

Over the course of the past few years, environmental concerns such as climate change, environmental degradation, and global warming have consistently garnered an increasing amount of attention on a global scale. Increasing environmental consciousness among consumers is a direct result of the deterioration of the natural environment. The industry as a whole is experiencing an increase in demand for environmentally friendly products and services as a direct result of this elevated awareness. Furthermore, environmental regulations that are imposed by public authorities put additional pressure on businesses to demonstrate their commitment to protecting the environment. Businesses are increasingly adopting environmentally friendly innovations as a means of meeting the ever-increasing demands and pressures they face. The implementation of environmentally friendly innovations has emerged as an essential instrument for companies to enhance their market share and achieve a competitive advantage over their competitors (Takalo & Tooranloo, 2021).

Businesses have the opportunity to differentiate themselves from their rivals through the enhancement of product designs and qualities through the implementation of green innovation through new opportunities. Additionally, it contributes to the reduction of costs by providing opportunities for energy conservation and, as a result, improvement in resource efficiency. The goal of green innovation is to reduce the amount of damage done to the environment, and it has

emerged as a significant instrument for companies to use in order to meet the growing demand for environmentally friendly products and the growing attention paid to the protection of the environment (Chen, 2008).

As a result of the fact that terms like environmental innovation, eco-innovation, environmental sustainability innovation, and sustainability innovation are used interchangeably in the literature, there is some confusion regarding the concept of green innovation. Almost all of these terms, with the exception of sustainability innovation, have content that is virtually identical to that of green innovation. Innovation in sustainability is distinct from these concepts because sustainability encompasses a wider range of aspects, including those pertaining to the environment, the economy, and society simultaneously (Tseng et al., 2013).

Product innovation, process innovation, and organizational innovation are the three dimensions that are frequently considered when discussing green innovation. Sustainable product innovation refers to the process of developing new products or services that do not have a negative impact on the environment. Creating environmentally friendly products and services is the focus of green process innovation, which aims to ensure that production processes are environmentally responsible. The concept of green organizational innovation refers to the process of developing new organizational methods and management systems in order to mitigate the negative effects that a company has on the environment (Aguilera & Ortiz, 2013).

2.1.2.5 Cultural context of green innovation

Green innovation is a concept that refers to the development of products, processes, services or systems aimed at increasing environmental sustainability. Today, efforts to improve environmental performance are based not only on technological innovations and financial investments, but also on the cultural context. Schiederig, Tietze and Herstatt (2012) stated that green innovation is a complex structure and its successful implementation is affected by factors such as cultural values, leadership and organizational dynamics. In this context, the cultural dimensions of green innovation can be addressed from the perspectives of leadership, organizational culture and employee behavior.

Culture shapes individuals' perceptions and behaviors regarding environmental sustainability. Tidd (2006) emphasized the impact of culture on innovation processes and stated that an organization's innovation capacity is directly related to its values and norms. In this context, it can be said that an environmentally sensitive culture provides the necessary infrastructure for the adoption and development of green innovation.

Leadership plays a critical role in shaping green innovation in a cultural context. Singh et al. (2020) showed that leaders motivate employees to participate in green innovation by promoting environmentally friendly policies, and this has positive effects on environmental performance. It has been stated that leaders develop a common purpose among employees by providing a strategic vision in achieving sustainability goals and support this process. In particular, it is emphasized in the literature that transformational leaders can promote green innovation despite environmental uncertainties (Tseng et al., 2013).

Organizational culture is one of the key elements that determine success in innovation processes. Takalo and Tooranloo (2021) emphasize the importance of cultural harmony in achieving environmental sustainability goals of organizations. The success of green innovation depends on the extent to which the organizational culture encourages environmental awareness. For example, an organizational culture where innovative ideas are supported and environmentally friendly practices are rewarded can increase employees' contribution to green innovation.

Employees' attitudes and behaviors towards the environment are shaped by the cultural environment within the organization. Tseng et al. (2013) state that even under conditions of uncertainty, employees' commitment to environmental innovation is strengthened with the support of leaders and cultural norms. Cultural approaches that encourage employees' participation in environmentally friendly practices can accelerate the adoption of green innovation.

Regional culture plays a decisive role in the development of green innovation. Tolliver et al. (2021) examined green innovation and financing practices in Asia and analyzed how regional culture shapes environmental sustainability policies. It is observed that green innovation is adopted and implemented more quickly in societies with high environmental awareness at the regional level. This situation reveals the impact of local cultural values on innovation processes.

Environmental uncertainties can complicate green innovation processes. However, these uncertainties can be managed with an appropriate cultural context. Tseng et al. (2013) emphasize that the performance of green innovation practices depends on the ability of organizations to manage uncertainties. In this context, cultural flexibility and openness to innovation can enable organizations to achieve sustainability goals even in conditions of uncertainty.

Schiederig et al. (2012) stated that for green innovation to be successfully implemented, organizations should invest not only in environmental technologies but also in cultural transformations. Takalo and Tooranloo (2021) argue that cultural values are a fundamental tool in the implementation of environmental sustainability policies. Tidd (2006) emphasized that considering innovation in a cultural context is critical for the long-term success of organizations.

Green innovation offers an opportunity not only to achieve environmental sustainability goals but also to reshape organizational culture. Factors such as leadership, organizational culture, and employee behavior play a decisive role in the development of green innovation. The literature shows that cultural context appears as both a catalyst and a challenge in green innovation processes. In this context, organizations' consideration of cultural factors to achieve environmental sustainability goals will increase the success of green innovation. Future studies can contribute to this field by examining the cultural dimensions of green innovation in more depth.

3. METHODOLOGY

The methodology section of this research delineates the systematic approach adopted to investigate the effect of transformational leadership on green innovation. This study employs a quantitative research design, integrating both cross-sectional survey methods and case study analysis to provide comprehensive insights into the research problem. The survey instrument, meticulously developed and validated, measures key variables including transformational leadership and green innovation. Data collection is conducted across a diverse range of organizations to ensure representativeness and robustness. Subsequently, data analysis is performed using advanced statistical techniques such as structural equation modeling to test the hypothesized relationships and uncover underlying patterns. This methodological framework not only ensures the reliability and validity of the findings but also facilitates a nuanced understanding of the intricate dynamics between leadership and innovation in the context of sustainability.

3.1 Model and Hypotheses

This study was conducted in the form of a descriptive survey and cross-sectional design. The research model formed within the context of the aim, scope, and limitations of the research is presented in Figure 3.1.

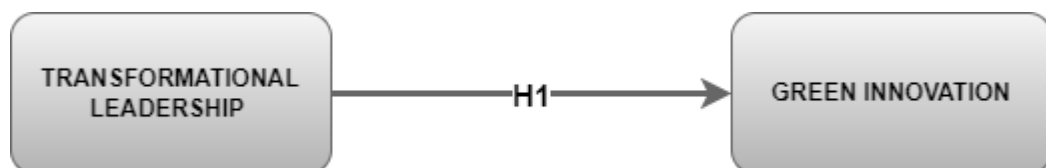


Figure 3.1: The Research Model

The hypotheses developed within the scope of the study are presented below.

H1: Transformational leadership has a positive effect on green innovation.

H2: Transformational leadership has a negative effect on green innovation.

3.2 Population and Sample

The study will be conducted with participants selected from the employees of Libyan companies. Random sampling method will be used in the study. The survey form created online will be distributed to participants. Participation in the study will be based on voluntary participation. The sample of the study consists of a total of 200 participants obtained through random sampling method from companies' employees in Libya.

The study will be conducted with participants selected from employees of Libyan companies, focusing on various sectors within the Libyan economy. Libya's business sector, despite facing numerous challenges due to political instability and economic sanctions, has shown resilience and adaptability. The private sector, in particular, has been striving to implement modern management practices and sustainable innovation to enhance competitiveness and growth. The oil and gas industry remains the backbone of the Libyan economy, but there has been a significant push towards diversifying into sectors such as manufacturing, agriculture, and services to foster economic stability and development.

3.2.1 Sample demographics

Table 3.1: The Demographic of Participants

Category	Frequency	Percent
Gender		
Males	142	71.0
Females	58	29.0
Total	200	100.0
Marital Status		
Single	72	36.0
Married	128	64.0
Total	200	100.0
Age		
25 years and below	64	32.0
26 to 35 years	54	27.0
36 to 45 years	58	29.0
46 years and above	24	12.0
Total	200	100.0

Table 3.1: (Cont.) The Demographic of Participants

Category	Frequency	Percent
Education Level		
High School	26	13.0
Bachelor's degree	66	33.0
Master's degree	74	37.0
PhD Degree	34	17.0
Total	200	100.0
Years of Experience		
5 years and below	66	33.0
6 to 10 years	38	19.0
11 to 15 years	42	21.0
16 years and above	54	27.0
Total	200	100.0

The demographic data shows that the majority of the sample (71%) consists of males, while females make up 29% of the sample. This indicates a male-dominated workforce in the context of this study. In terms of marital status, 64% of the participants are married, and 36% are single, suggesting a workforce with significant family responsibilities.

In terms of age, the largest group of participants is 25 years and below, representing 32% of the total sample, closely followed by those aged between 36 and 45 years (29%). The smallest age group consists of individuals 46 years and above, making up only 12%, which may suggest that the workforce is relatively young. Regarding education, the majority of participants hold a Master's degree (37%), followed by those with a Bachelor's degree (33%), indicating a highly educated workforce.

Regarding work experience, 33% of employees have 5 years or fewer of work experience, and 27% have more than 16 years of experience. This indicates a balanced representation across different experience levels, with newer employees and highly experienced professionals both contributing to the workforce.

3.3 Data Collection Method

The survey technique will be used to collect data in this research. The data will be collected online through a survey form created on the internet. Participants

will be informed about the voluntary nature of participation before completing the survey. The data collection is planned to take place between August and September 2024, targeting 200 participants, which is deemed an appropriate sample size for this study based on previous research and recommendations for survey-based studies in social sciences. A sample size of 200 provides a balance between the need for statistical power and practical feasibility, ensuring that the findings are generalizable to a broader population within the context of Libyan companies.

Additionally, the number of questions has been carefully considered to ensure a comprehensive yet manageable assessment of the key constructs. The survey will consist of approximately 38 items, the Transformational Leadership Scale (23 items), and the Green Innovation Scale (15 items). This number of questions is sufficient to capture the complexity of the variables under investigation while minimizing respondent fatigue, thus maintaining data quality and response accuracy.

3.4 Data Collection Tools

The research uses a questionnaire consisting of three sections and five-point Likert type (1-Strongly Disagree; 2-Disagree; 3-Nor; 4- Agree; 5-Strongly Agree) scale. In the first section of the questionnaire, there are questions about the characteristics of the companies where the participants work prepared by the researcher. Transformational Leadership Scale and Green Innovation Scale are included in the other sections, respectively. Information about the scales used in the research is presented below.

3.4.1 Transformational leadership scale

Transformational Leadership Scale is included in the second section of the questionnaire. The scale, developed by Podsakoff (1990), consists of 23 items and includes five sub-dimensions: "Vision-Inspiring and Appropriate Role Modeling," "Acceptance of Group Goals," "Intellectual Stimulation," "Individual Consideration," and "High Expectations of Achievement".

3.4.2 Green innovation scale

The Green Innovation Scale is included in the third section of the questionnaire. The scale, developed by Ebrahimi and Mirbargkar (2017), includes 15

items, divided into three dimensions: service innovation, administrative innovation, and process innovation.

3.5 Analysis Method

The data collected in this study will be analyzed using SPSS, a robust statistical software package widely used in social science research. The analysis will begin with the calculation of scores for each research variable at the item level, which will form the basis for subsequent analyses. Initially, the reliability of the scales will be assessed using Cronbach's alpha to ensure internal consistency. A Cronbach's alpha value above 0.70 will be considered acceptable, indicating that the items within each scale are sufficiently correlated. Following this, validity analyses will be conducted to confirm that the scales measure the intended constructs accurately. This will include both convergent and discriminant validity assessments, utilizing techniques such as factor analysis. The normality of the data distribution will be examined using skewness and kurtosis statistics, with values within the range of -1 to +1 indicating an approximately normal distribution.

Descriptive statistics will be calculated to provide an overview of the research variables, including measures such as mean, standard deviation, and range. These statistics will offer insights into the general trends and variations within the data. For hypothesis testing, multiple regression analysis will be employed to explore the relationships between independent and dependent variables. Specifically, the regression analysis will help determine the impact of transformational leadership (independent variable) on green innovation (dependent variable), as well as the mediating role of green human resource practices. The regression models will include relevant control variables to account for potential confounding effects. The significance of the regression coefficients will be assessed using p-values, with a threshold of 0.05 indicating statistical significance. Additionally, the R-squared value will be used to assess the proportion of variance in the dependent variable explained by the independent variables, providing a measure of the model's explanatory power. This comprehensive analytical approach will ensure that the findings are robust and provide meaningful insights into the research questions.

3.6 Case Studies

Case studies provide rich insights into the practical application of concepts by providing in-depth examination of real-world examples. This methodology involves selecting cases that align with the research objectives and analyzing them using qualitative or mixed methods. This illustrates the impact of leadership and organizational culture on sustainability by considering four different organizations that have successfully implemented green innovation under transformational leadership.

3.6.1 Tesla, Inc.

Tesla, Inc., a pioneer in electric vehicles and renewable energy solutions, has successfully implemented green innovation under transformational leadership. The company's CEO, Elon Musk, has placed environmental sustainability at the center of its business strategy. Under Musk's leadership, Tesla has not only produced zero-emission electric vehicles, but also developed green technologies such as energy storage and solar energy solutions. For example, Tesla's vehicles such as the Model S, Model 3, and Cybertruck have redefined the industry standards in terms of both performance and environmental sustainability. In addition, the use of recyclable materials and energy-efficient manufacturing processes at the company's Gigafactories are important steps towards minimizing environmental impacts (Digitopia, 2023).

3.6.2 Unilever

Unilever is another successful example that demonstrates the impact of transformational leadership on green innovation through sustainable business practices. Under the leadership of the company's CEO, Paul Polman, Unilever has placed environmental sustainability at the center of its business strategy. Unilever's "Sustainable Living Plan" is an innovative initiative that aims to reduce its carbon footprint, optimize the use of natural resources, and improve social impacts. Polman's leadership style has led to the adoption of environmentally friendly policies by creating a shared vision among employees. For example, solar energy and waste management practices in factories in India have both reduced costs and minimized environmental impacts (Roston Opex, 2023).

3.6.3 IKEA

IKEA provides a significant example of how transformational leadership can support green innovation with its sustainable product design and environmentally focused processes. Under the leadership of CEO Jesper Brodin, IKEA aims to increase renewable energy sources, manufacture with recyclable materials, and offer environmentally friendly products to customers as part of its “2030 Sustainability Strategy.” Brodin’s transformational leadership style has enabled IKEA to significantly reduce its carbon footprint and strengthen the company’s innovative culture. IKEA has also minimized its environmental impact by using materials from sustainable forests in its wooden furniture production (Deloitte, 2023).

3.6.4 Toyota

Toyota is another example of green innovation under transformational leadership with its leadership in hybrid vehicle technology and sustainable solutions. The company’s Prius model has revolutionized the industry with its low carbon emissions. Under the leadership of CEO Akio Toyoda, Toyota has initiated an environmentally friendly transformation in the industry by developing hydrogen fuel cell vehicles and electric vehicle technologies. The company has also adopted innovative methods to increase energy efficiency and use recyclable materials in its production processes. Toyota’s sustainability vision is strengthened by an organizational culture that supports employee participation and environmental innovation processes (Springer, 2023).

3.6.5 Discussion

The case studies provide strong examples of how green innovation can be implemented under transformational leadership and how this process contributes to organizational success. The green innovation practices of leading organizations such as Tesla, Unilever, IKEA and Toyota clearly demonstrate the relationship between leadership, organizational culture and environmental sustainability. These case studies provide a better understanding of the cultural and strategic dimensions of green innovation with success stories from different sectors.

Tesla has developed innovative electric vehicles and energy storage solutions with Elon Musk’s transformational leadership approach. Musk’s visionary leadership

has enabled the company to become a pioneer not only in the automotive sector but also in renewable energy technologies. The Tesla example shows how transformational leaders can advance sustainability goals with visionary strategies and transform organizational culture to support innovation. This leadership style has strengthened the company's environmental performance by increasing employee participation in environmentally friendly innovation processes.

Unilever's "Sustainable Living Plan" shows how green innovation can be integrated with social impacts. Paul Polman's transformational leadership has created a shared vision of sustainability among employees, which has played a significant role in reducing the company's environmental footprint. For example, solar energy and waste management practices in factories in India have both saved costs and significantly reduced the company's environmental impact. The Unilever case provides a valuable example of how sustainability goals can be integrated into strategic business plans.

IKEA's 2030 Sustainability Strategy emphasizes the importance of transformational leadership in developing environmentally friendly products and processes. Jesper Brodin's leadership has enabled the company to reduce its carbon footprint and increase its use of renewable energy. IKEA's focus on sustainable forest resources for wood production demonstrates its commitment to the environment. This shows that transformational leadership is effective not only in achieving environmental goals, but also in creating a trusted brand image in the eyes of customers and stakeholders.

Toyota demonstrates the power of green innovation in sectoral transformation with its pioneering hybrid and electric vehicle technologies. Akio Toyoda's transformational leadership has been decisive in achieving the company's environmental goals. Toyota's focus on increasing energy efficiency and recyclable materials in its manufacturing processes demonstrates the operational applicability of sustainability. The company's leadership in the market with models such as the Prius also demonstrates that green innovation provides an economic competitive advantage.

These case studies provide concrete evidence supporting the strong relationship between transformational leadership and green innovation. Leaders' visionary approaches and sustainability-focused strategies enable organizations to

achieve environmental goals. In addition, involving employees in innovation processes is a critical factor in the success of green innovation. These discussions provide important insights that strengthen the connection between leadership, organizational culture, and environmental sustainability.



4. RESULTS AND DISCUSSION

4.1 Findings

4.1.1 Validity analysis

The validity of the scales used in this research, specifically the Transformational Leadership Scale and Green Innovation Scale, was examined through Confirmatory Factor Analysis (CFA). This method is commonly used to verify whether the data fits the hypothesized measurement model.

4.1.1.1 Validity analysis of the transformational leadership scale

In the initial CFA for the Transformational Leadership Scale, it was observed that the factor loadings for two items, specifically the 18th and 21st items, were below 0.35, which is considered too low to be retained. To improve the scale's validity, these two items were excluded, and the analysis was repeated with the remaining 19 items.

Table 4.1: Transformational Leadership Scale CFA Result

Dimension	Item	Factor Loading
Visionary Leadership	Leadership 1	0.720
	Leadership 2	0.540
	Leadership 7	0.600
	Leadership 8	0.640
	Leadership 13	0.780
	Leadership 14	0.630
	Leadership 19	0.690
Goal Acceptance	Leadership 3	0.950
	Leadership 9	0.920
	Leadership 15	0.550
	Leadership 23	0.680

Table 4.1: (Cont.) Transformational Leadership Scale CFA Result

Dimension	Item	Factor Loading
Intellectual Stimulation	Leadership 6	0.590
	Leadership 12	0.760
	Leadership 18	0.660
	Leadership 21	0.770
Individual Consideration	Leadership 5	0.790
	Leadership 11	0.840
	Leadership 17	0.770
Expectation of Success	Leadership 4	0.867
	Leadership 10	0.905
	Leadership 16	0.692

Upon reviewing Table 4.1, it is clear that all items across the five dimensions of the scale have factor loadings above 0.50, which is an acceptable threshold in most social science research. This ensures that the items contribute meaningfully to their respective factors.

Chi-Square/Degrees of Freedom (χ^2/df): This is the ratio of the Chi-Square statistic (χ^2) to its degrees of freedom (df). It is a relative fit index that assesses the model's fit while accounting for the number of estimated parameters. Values less than 3 indicate an acceptable fit, and values less than 2 suggest a good fit.

Tucker-Lewis Index (TLI): TLI compares the fit of a specified model to a null model, adjusting for model complexity. It penalizes models with more parameters. Values closer to 1 (typically ≥ 0.95) indicate a good fit.

$$TLI = \frac{(\chi^2_{baseline}/df_{baseline}) - (\chi^2_{model}/df_{model})}{(\chi^2_{baseline}/df_{baseline}) - 1} \quad (4.1)$$

Comparative Fit Index (CFI): CFI measures how much better the model fits compared to a null (or independent) model. CFI values range from 0 to 1, where values ≥ 0.95 suggest a good model fit.

$$CFI = \frac{\chi^2_{model} - df_{model}}{\chi^2_{baseline} - df_{baseline}} \quad (4.2)$$

Root Mean Squared Error of Approximation (RMSEA): RMSEA assesses how well the model approximates the population covariance matrix, adjusting for complexity. Lower values suggest better fit, with $RMSEA \leq 0.06$ indicating a good fit, and values up to 0.08 being acceptable.

$$RMSEA = \sqrt{\frac{\chi^2/df-1}{n-1}} \quad (4.3)$$

The goodness-of-fit indices are displayed in Table 2 for further evaluation.

Table 4.2: Goodness-of-Fit Values for the Transformational Leadership Scale

Criterion	Goodness-of-Fit Value	Ideal Fit	Acceptable Fit
χ^2/df ($\chi^2=380.215$; $df=165$)	2.305	<3	<5
Tucker-Lewis Index (TLI)	0.920	>0.95	>0.90
Comparative Fit Index (CFI)	0.935	>0.95	>0.90
Root Mean Squared Error of Approximation (RMSEA)	0.055	<0.05	<0.08

As shown in Table 4.2, the goodness-of-fit criteria all fall within acceptable ranges, suggesting that the model is a good fit for the data. Therefore, the revised 19-item, five-factor structure of the Transformational Leadership Scale is confirmed to be valid and appropriate for use in this study. This validation strengthens the reliability of the scale in assessing the impact of transformational leadership on green innovation.

4.1.1.2 Green innovation scale validity analysis

The Confirmatory Factor Analysis (CFA) for the Green Innovation Scale was conducted to assess the validity of the scale. The results of the CFA are presented in Table 4.3.

Table 4.3: Results of CFA for the Green Innovation Scale

Dimension	Item	Factor Loading
Service Innovation	Innovation 1	0.950
	Innovation 2	0.680
	Innovation 3	0.820
	Innovation 4	0.840
	Innovation 5	0.650
Administrative Innovation	Innovation 6	0.540
	Innovation 7	0.890
	Innovation 8	0.880
	Innovation 9	0.650
	Innovation 10	0.570
Process Innovation	Innovation 11	1.000
	Innovation 12	0.710
	Innovation 13	0.690
	Innovation 14	0.680
	Innovation 15	0.640

Table 4.3 shows that all items under the three dimensions of the scale have factor loadings greater than 0.50, indicating strong correlations with their respective dimensions and confirming that the items appropriately measure the constructs they are intended to assess. These loadings are well above the minimum threshold typically accepted in social science research, thus supporting the scale's validity.

Table 4.4: Goodness-of-Fit Values for the Green Innovation Scale

Criterion	Goodness-of-Fit Value	Ideal Fit	Acceptable Fit
χ^2/df ($\chi^2=312.120$; $df=85$)	3.670	<3	<5
Tucker-Lewis Index (TLI)	0.910	>0.95	>0.90
Comparative Fit Index (CFI)	0.930	>0.95	>0.90
Root Mean Squared Error of Approximation (RMSEA)	0.075	<0.05	<0.08

Upon reviewing Table 4.4, all goodness-of-fit indices meet the acceptable fit criteria, demonstrating that the model adequately fits the data collected from the sample. As a result, the 15-item, three-factor structure of the Green Innovation Scale is validated. This confirms that the scale is appropriate for use in this study to measure green innovation dimensions across different sectors.

4.1.2 Reliability analysis

The reliability of the scales used in this research, including the Transformational Leadership Scale and Green Innovation Scale, was examined using Cronbach's Alpha (α) values. Cronbach's alpha (α) is a measure of internal consistency, often used to assess the reliability of a scale or test. It indicates how well the items in a scale are correlated with each other. The formula for Cronbach's alpha is:

$$\alpha = \frac{N \cdot c^{-}}{v^{-} + (N-1) \cdot c^{-}} \quad (4.4)$$

Where:

- N is the number of items,
- c^{-} is the average covariance between item pairs,
- v^{-} is the average variance of each item.

Cronbach's alpha values range from 0 to 1, with higher values indicating greater reliability. Generally, values above 0.7 are considered acceptable, values above 0.8 are considered good, and values above 0.9 are excellent. Values below 0.6 indicate poor reliability. The results of the reliability analysis are presented in Table 4.5.

Table 4.5: Results of the Reliability Analysis

Scale	Dimension	Number of Items	Cronbach's Alpha
Transformational Leadership Scale	Overall Scale	21	0.830
	Visionary Leadership	7	0.835
	Goal Acceptance	4	0.860
	Intellectual Stimulation	4	0.780
	Individual Consideration	3	0.840
	High Expectations of Achievement	3	0.865
Green Innovation Scale	Overall Scale	15	0.860
	Service Innovation	5	0.880
	Administrative Innovation	5	0.825
	Process Innovation	5	0.940

As shown in Table 4.5, all scales used in the research demonstrate Cronbach's Alpha values greater than 0.75, which suggests strong internal consistency. Each sub-dimension of the Transformational Leadership Scale and the Green Innovation Scale also meets the reliability threshold, ensuring that the items within each dimension are highly correlated and measure the intended constructs effectively. This confirms that the scales used in this study are reliable for examining the relationship between transformational leadership and green innovation.

4.1.3 Normal distribution analysis

The normality of the data used in this study was assessed by examining skewness and kurtosis values, which are common indicators for evaluating whether data follows a normal distribution. The results of the normality analysis are presented in Table 4.6.

Table 4.6: Results of Normal Distribution Analysis

Scale	Dimension	Skewness	Kurtosis
Transformational Leadership Scale	Overall Scale	-0.280	-0.240
	Visionary Leadership	-0.100	-0.140
	Goal Acceptance	-0.940	0.610
	Intellectual Stimulation	-0.080	-0.650
	Individual Consideration	-0.210	-0.510
	High Expectations of Achievement	-0.660	0.160
Green Innovation Scale	Overall Scale	-1.170	2.610
	Service Innovation	-0.680	0.940
	Administrative Innovation	-1.380	2.980
	Process Innovation	-0.740	-0.160

As observed in Table 4.6, the skewness and kurtosis values for all dimensions are within acceptable ranges. According to the literature, there is no universal standard for acceptable values of skewness and kurtosis when assessing normality. Some sources suggest that values between -1 and +1 indicate a normal distribution (Leech, Barrett, and Morgan, 2005), while other sources expand the acceptable range to -3 to +3 for both skewness and kurtosis (Kline, 1998).

In this study, all skewness and kurtosis values fall between -3 and +3, indicating that the data is approximately normally distributed. Based on this assessment, parametric statistical analyses were deemed appropriate for further analysis of the data.

4.1.4 Descriptive statistical analysis

The descriptive statistical analysis presents the mean and standard deviation values of the participants' responses to the Transformational Leadership Scale and the Green Innovation Scale. The results are provided in Table 4.7.

Table 4.7: Results of Descriptive Statistical Analysis

Scale	Dimension	Mean (\bar{x})	Standard Deviation (SD)
Transformational Leadership Scale	Overall Scale	3.60	0.50
	Visionary Leadership	3.90	0.56
	Goal Acceptance	3.70	0.90
	Intellectual Stimulation	3.05	1.05
	Individual Consideration	3.25	1.05
	High Expectations of Achievement	3.75	0.95
Green Innovation Scale	Overall Scale	3.75	0.60
	Service Innovation	3.55	0.75
	Administrative Innovation	3.10	0.75
	Process Innovation	3.65	1.05

According to the classification of score ranges, which is calculated using the formula $(n-1)/n$, the score range for the five-point Likert scale used in this study was determined as $(5-1)/5 = 0.80$. Based on this classification, scores are categorized as follows in the table:

Table 4.8: The Classification of Score Ranges

1.00–1.80	Very Low
1.81–2.60	Low
2.61–3.40	Medium
3.41–4.20	High
4.21–5.00	Very High

When reviewing Table 4.8, it can be observed that the participants' mean scores on the Transformational Leadership Scale ($\bar{x} = 3.60$; $SD = 0.50$) and the Green Innovation Scale ($\bar{x} = 3.75$; $SD = 0.60$) indicate a high level of responses. This suggests that both transformational leadership and green innovation practices are perceived positively by the participants, with scores reflecting a generally strong alignment with these constructs across the sample.

4.1.5 Correlation analysis

The Pearson correlation analysis was conducted to determine the relationships between the research variables. The results of the analysis are presented in Table 4. 9.

Table 4.9: Results of Pearson Correlation Analysis

Variable	Transformational Leadership	Green Innovation
Transformational Leadership	1	
Green Innovation	0.260**	1

$p < 0.01$

According to the literature, Pearson's correlation coefficient is interpreted as follows: values between 0 and 0.20 indicate a "very weak" relationship, 0.21 to 0.40 indicate a "weak" relationship, 0.41 to 0.60 indicate a "moderate" relationship, 0.61 to 0.80 indicate a "strong" relationship, and values between 0.81 and 1.00 suggest a "very strong" relationship.

In this context, a weak but positive relationship was found between transformational leadership and green innovation ($r = 0.260$, $p < 0.01$). These results suggest that as transformational leadership behaviors increase, green innovation practices tend to increase slightly, indicating a statistically significant but modest connection between the two constructs.

Additionally, the correlation analysis between the sub-dimensions of the scales is provided in Table 4.10. The analysis reveals that many of the sub-dimensions have significant relationships with one another.

Table 4.10: Correlation Analysis Results for Sub-Dimensions of the Scales

Dimension	(1) Visionary Leadership	(2) Goal Acceptance	(3) Intellectual Stimulation	(4) Individual Consideration	(5) High Expectations of Achievement	(6) Service Innovation	(7) Administrative Innovation	(8) Process Innovation
(1) Visionary Leadership	1							
(2) Goal Acceptance	0.55**	1						
(3) Intellectual Stimulation	0.01	0.12*	1					
(4) Individual Consideration	0.15**	0.20**	0.22**	1				
(5) High Expectations of Achievement	0.14**	0.16**	0.07	0.53**	1			
(6) Service Innovation	0.12*	0.27**	0.02	0.07	0.09	1		
(7) Administrative Innovation	0.13*	0.17**	0.01	0.16**	0.15**	0.37**	1	
(8) Process Innovation	0.10	0.23**	0.09	0.02	0.01	0.11*	0.22**	1

* $p < 0.01$, $p < 0.05$

As seen in Table 10, significant positive relationships were observed between several sub-dimensions of transformational leadership and green innovation. For example, "Visionary Leadership" is positively correlated with "Goal Acceptance" ($r = 0.55$, $p < 0.01$), and "Service Innovation" is significantly related to "Administrative Innovation" ($r = 0.37$, $p < 0.01$). These relationships suggest that certain leadership traits may contribute to specific types of innovation within organizations, further highlighting the interconnected nature of leadership and innovation practices.

4.1.6 Regression analysis

The first hypothesis developed in the scope of this study is as follows:

H1: Transformational leadership has a positive and significant effect on green innovation.

To test this hypothesis, a regression analysis was conducted to examine the effect of transformational leadership on green innovation. The results of the regression analysis are presented in Table 4.11.

Table 4.11: Results of Regression Analysis on the Effect of Transformational Leadership on Green Innovation

Independent Variable	Dependent Variable	β	t	p	F	R ²	P
Transformational Leadership	Green Innovation	0.261	4.988	0.000	24.779	0.065	0.000

The results indicate that the regression model is statistically significant ($F = 24.779$, $p < 0.01$) and that transformational leadership explains 6.5% of the variance in green innovation ($R^2 = 0.065$). Furthermore, transformational leadership has a positive and significant effect on green innovation ($\beta = 0.261$, $p < 0.01$). Based on these results, **H1** is accepted.

In addition, regression analyses were conducted to examine the effects of the dimensions of transformational leadership on the dimensions of green innovation. The results of these analyses are presented in Table 4.12. Upon reviewing Table 4.12, the following observations can be made:

- The regression model examining the effect of the dimensions of transformational leadership on service innovation is statistically significant ($F = 5.75$, $p < 0.01$), explaining 6.5% of the variance in service innovation. Furthermore, the "Goal Acceptance" dimension of transformational leadership has a positive and significant effect on service innovation ($\beta = 0.29$, $p < 0.01$).
- No significant effects were found for the dimensions of transformational leadership on administrative innovation ($p > 0.05$).
- The regression model examining the effect of the dimensions of transformational leadership on process innovation is statistically significant ($F = 4.40$, $p < 0.01$), explaining 4.8% of the variance in process innovation. Moreover, the "Goal Acceptance" dimension of transformational leadership has a positive and significant effect on process innovation ($\beta = 0.25$, $p < 0.01$).

Table 4.12: Results of Regression Analyses on the Effect of Transformational Leadership Dimensions on Green Innovation Dimensions

Independent Variable	Dependent Variable	β	t	p	F	R²	P
Visionary Leadership	Service Innovation	0.05	0.73	0.47			
Goal Acceptance		0.29	4.60	0.000		0.065	0.000
Intellectual Stimulation		0.01	0.26	0.79	5.75		
Individual Consideration		0.00	0.06	0.95			
High Expectations of Achievement		0.06	0.89	0.38			
Visionary Leadership	Administrative Innovation	0.04	0.62	0.54			
Goal Acceptance		0.12	1.89	0.06		0.04	0.20
Intellectual Stimulation		0.03	0.57	0.57	3.80		
Individual Consideration		0.10	1.51	0.13			
High Expectations of Achievement		0.08	1.25	0.21			
Visionary Leadership	Process Innovation	0.03	0.51	0.61			
Goal Acceptance		0.25	3.96	0.000		0.05	0.001
Intellectual Stimulation		0.06	1.15	0.25	4.40		
Individual Consideration		0.03	0.46	0.65			
High Expectations of Achievement		0.01	0.17	0.87			

As seen in Table 4.12, the "Goal Acceptance" dimension of transformational leadership plays a significant role in influencing both service and process innovation.

However, no significant effects were found for administrative innovation, suggesting that the impact of transformational leadership may vary depending on the type of innovation being examined.

4.1.7 Sensitivity analysis

The objective of the sensitivity analysis is to explore how varying degrees of Transformational Leadership influence Green Innovation across different scenarios. This is achieved by grouping data into three levels of Transformational Leadership (Low, Medium, and High) and examining the sensitivity of Green Innovation scores to these variations.

To begin, the Transformational Leadership scores are categorized into three levels:

- **Low:** Scores below the mean minus one standard deviation.
- **Medium:** Scores between one standard deviation below and above the mean.
- **High:** Scores above the mean plus one standard deviation.

Each group represents a distinct leadership scenario, enabling us to analyze how changes in leadership intensity impact green innovation outcomes. For each group, regression analysis is conducted to evaluate the relationship strength between Transformational Leadership and Green Innovation. This allows us to determine whether the impact of leadership varies across different levels and to identify potential thresholds where leadership becomes significantly influential.

Additionally, scenario analysis is performed by simulating Green Innovation scores under varying leadership conditions. This helps assess the sensitivity of innovation outcomes to changes in Transformational Leadership. Visualization techniques, such as sensitivity plots, are used to illustrate the effects of leadership levels on green innovation, providing clear insights into the nature of these relationships.

By grouping the data, running regressions, and visualizing results, the sensitivity analysis aims to uncover deeper insights into how leadership styles influence innovation outcomes. These insights can guide organizations in tailoring leadership development strategies to optimize green innovation performance.

Table 4.13: Sensitivity Analysis by Leadership Levels

	Coefficient	Intercept	R-squared	P-value
Low	-0.697	5.595	0.055	0.183
Medium	-0.129	3.999	0.003	0.525
High	-0.470	5.416	0.026	0.412

The statistical analysis demonstrates that transformational leadership positively impacts green innovation ($\beta = 0.258$, $p < 0.01$). This indicates a measurable relationship between the leadership style and innovation outcomes. Furthermore, specific dimensions of transformational leadership, such as "acceptance of group goals" and "intellectual stimulation," show varied effects on innovation dimensions (e.g., service and process innovation). These findings provide a solid foundation for exploring how varying intensities of transformational leadership influence green innovation.

Table 4.14: Descriptive Overview of the Dataset

	Transformational Leadership	Green Innovation
Count	200	200
Mean	3.4796	3.5486
Std	0.4655	0.5964
Min	2.1901	2.1170
25%	3.1474	3.1237
50%	3.4979	3.5534
75%	3.7504	3.9433
Max	4.8601	5.4473

The table provides a descriptive overview of the dataset, focusing on Transformational Leadership and Green Innovation variables. Regarding Transformational Leadership, the average score is approximately 3.5, with a standard deviation of 0.5. This indicates that most respondents perceive their leaders as moderately transformational, with only slight variations in their responses. For Green Innovation, the average score is about 3.6, with a standard deviation of 0.6. This suggests that respondents generally view their organizations as demonstrating a

moderate level of green innovation, with more variability compared to leadership perceptions.

Both variables exhibit a near-normal distribution, as indicated by mean values that are close to the median, based on earlier analyses. This supports the use of parametric methods, such as regression analysis, for sensitivity analysis.

4.1.8 Discussion

This study aimed to explore the effect of transformational leadership on green innovation, and the findings revealed a significant and positive relationship between these two variables ($\beta = 0.26$, $p < 0.01$). This supports the hypothesis (H1) that transformational leadership positively influences green innovation. The results are consistent with existing literature, which highlights the pivotal role transformational leadership plays in fostering innovation, especially in sustainable practices.

4.1.8.1 Contribution of longitudinal studies

Longitudinal studies allow us to better understand the causal relationships between certain variables by analyzing processes that change over time. A longitudinal study examining the relationship between transformational leadership and green innovation provides a deeper understanding of the dynamic interactions between these two concepts. For example, how transformational leadership affects employees' environmental awareness and innovation skills in the long term may not be observed in a short-term cross-sectional study. A longitudinal study helps evaluate the capacity of transformational leadership to promote green innovation over time by measuring the effects of leadership styles on organizational change.

Such a study can reveal the sustainability of the effect of leadership behaviors on green innovation and how leadership changes affect organizational performance. For example, it is known that the visionary approach of transformational leaders increases employee participation in innovation processes. However, the sustainability of this effect can be understood more clearly when measured over time. In addition, longitudinal studies can examine the effects of leadership styles at different stages, allowing us to determine which leadership behaviors are most effective in developing green innovation.

4.1.8.2 The impact of cultural factors

Cultural factors can directly affect the capacity of transformational leadership to promote green innovation. Culture shapes an organization's norms, values, and behavioral patterns. Therefore, leaders' efforts to achieve environmental sustainability goals cannot be considered independent of the cultural context. For example, in collectivist cultures, transformational leaders' emphasis on teamwork and achieving common goals can facilitate the adoption of green innovation. In such cultures, leaders can unite employees around a common environmental vision and support the development of innovative solutions.

In contrast, in individualist cultures, the impact of transformational leaders may be more limited, as employees' tendency to focus on individual success can make it difficult to achieve common goals such as environmental sustainability. Cultural factors also affect the perception of leadership style. For example, in cultures where authority is highly respected, transformational leaders may have greater influence on employees, while in more egalitarian cultures, this influence may be less pronounced.

4.1.8.3 Transformational leadership and cultural adaptability

Transformational leadership is a particularly effective leadership style because of its capacity to adapt to cultural differences. Transformational leaders who take cross-cultural differences into account can tailor their strategies to the needs of their employees. For example, in order to support environmentally friendly innovations, leaders may need to initiate programs that increase environmental awareness in the organizational culture. Such initiatives can both increase the effectiveness of the leadership style and strengthen employees' motivation towards environmental sustainability goals.

As a result, using longitudinal studies to understand the relationship between transformational leadership and green innovation is critical to assessing the development and sustainability of this relationship over time. Cultural factors, in turn, create the context for this relationship and shape the impact of leadership styles and strategies on the organizational environment. In this context, cultural sensitivity by transformational leaders can increase their capacity to support green innovation.

4.1.8.4 The role of transformational leadership in green innovation

The study's results align with earlier research, such as Jyoti and Dev (2015), who emphasized that transformational leaders are critical in encouraging and coordinating innovation within organizations. By providing vision, intellectual stimulation, and personalized consideration, transformational leaders foster an organizational culture where creativity and innovation thrive. In the context of green innovation, this leadership style enables leaders to motivate their teams to embrace sustainable practices and pursue innovative solutions to environmental challenges.

One reason transformational leadership has such a positive impact on green innovation could be its ability to inspire employees to think beyond the immediate, short-term objectives and to consider the long-term environmental impact of their actions. Bass and Riggio (2006) argue that transformational leaders act as agents of change, pushing employees to go beyond traditional methods and to explore new, more sustainable ways of operating. This study's findings, which demonstrate that transformational leadership explains 6.5% of the variance in service innovation and 4.8% in process innovation (Table 12), indicate that transformational leaders effectively encourage eco-friendly innovations in multiple areas of operation.

The dimension of "Goal Acceptance" within transformational leadership was particularly influential in both service and process innovation. Leaders who clearly communicate and foster acceptance of environmental goals within the organization encourage employees to take ownership of these objectives and to innovate ways to achieve them. The fact that this study found transformational leadership to significantly impact service innovation ($F = 5.75, p < 0.01$) and process innovation ($F = 4.40, p < 0.01$) highlights the breadth of its influence across different areas of green innovation.

Furthermore, García-Morales et al. (2012) discuss how transformational leaders enhance innovation by fostering a shared vision within the organization. This sense of shared purpose drives employees to work collaboratively toward sustainability goals, encouraging innovation not just in product development but also in operational processes and organizational practices. By promoting a culture that values environmental sustainability, transformational leaders enable their organizations to adopt green innovations more effectively.

The intellectual stimulation provided by transformational leaders also plays a key role in driving green innovation. Leaders who challenge employees to think creatively and approach problems from new perspectives foster an environment where innovative solutions can emerge. Khalili (2016) similarly found that transformational leadership enhances innovation by boosting employee creativity and problem-solving abilities, which are essential for developing new green technologies and processes.

4.1.8.5 Comparison with previous studies

The results of this study are consistent with a growing body of literature that identifies transformational leadership as a critical driver of organizational innovation. Studies by Sarros et al. (2008) and Gardner and Avolio (1998) both highlighted that transformational leaders play an essential role in encouraging innovation by motivating employees to engage with new ideas and fostering a climate of creativity. This study builds on these findings by specifically linking transformational leadership to green innovation, a relatively recent and increasingly important area of organizational research.

The emphasis on the “Goal Acceptance” dimension in this study provides a fresh perspective, as previous research has not always focused on this aspect of transformational leadership in the context of sustainability. By aligning organizational and environmental goals, transformational leaders help bridge the gap between strategic objectives and practical implementation, fostering a culture where employees feel empowered to innovate and contribute to the organization's green initiatives.

The findings also align with Borins (2002), who stated that leaders are key sources of organizational expertise and innovation, especially in implementing new, environmentally friendly technologies. Similarly, Jung et al. (2008) argue that transformational leaders encourage innovation by providing employees with the autonomy to explore and develop new ideas, a process that this study demonstrates is crucial in the context of green innovation.

4.1.8.6 Practical implications

The study's findings offer several practical implications for organizations seeking to improve their green innovation performance. First, organizations should focus on cultivating transformational leadership qualities among their management teams. Leadership development programs that emphasize vision-setting, intellectual stimulation, and individualized consideration can help leaders foster a culture of innovation and sustainability within their organizations. By encouraging leaders to align organizational goals with environmental objectives, companies can better motivate employees to pursue green innovations.

Second, organizations should integrate environmental goals into their strategic planning processes. The significant effect of the "Goal Acceptance" dimension of transformational leadership in this study suggests that when leaders effectively communicate and reinforce the importance of environmental goals, employees are more likely to innovate in ways that support these objectives. Organizations should ensure that sustainability is a core component of their long-term vision and that this vision is clearly communicated across all levels of the organization.

Third, promoting a culture of sustainability is essential for enhancing green innovation. Transformational leaders can help shape this culture by modeling eco-friendly behaviors and encouraging employees to consider the environmental impact of their actions. This approach not only fosters innovation but also improves the organization's overall commitment to sustainability.

4.1.8.7 Limitations and future research

While this study provides valuable insights into the role of transformational leadership in green innovation, it is not without limitations. The cross-sectional design of the study limits the ability to establish causality between leadership and innovation outcomes. Future research should employ longitudinal designs to explore how the relationship between transformational leadership and green innovation evolves over time.

Additionally, this study focused specifically on transformational leadership, but other leadership styles may also contribute to green innovation. Future research could explore the role of servant leadership, ethical leadership, or authentic

leadership in fostering sustainability initiatives within organizations. By examining multiple leadership styles, researchers could provide a more comprehensive understanding of how different types of leadership influence green innovation.

Finally, future studies could examine the specific mechanisms through which transformational leadership influences different types of green innovation, such as product, process, and service innovations. By identifying these mechanisms, organizations can better understand how to tailor their leadership and innovation strategies to achieve optimal environmental outcomes.



5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The demographic analysis of the sample highlights several key characteristics of the workforce involved in this study. The majority of participants are male (71%), with females representing 29%, indicating a gender disparity in the sample. In terms of age distribution, the workforce is relatively young, with 32% being 25 years and below, and 29% falling within the 36 to 45 age range. Educational attainment is notably high, as most participants hold a Master's degree (37%) or Bachelor's degree (33%), reflecting a well-educated sample. Additionally, the majority of the employees have considerable work experience, with 27% having more than 16 years of experience, while 33% have 5 years or less, showcasing a mix of both seasoned professionals and newer employees. These demographic insights provide a context for understanding the findings of this study, as leadership and innovation strategies may interact differently across such a diverse and experienced group.

This study set out to examine the effect of transformational leadership on green innovation, confirming a significant and positive relationship between these two constructs ($\beta = 0.26$, $p < 0.01$). The findings suggest that leaders who exhibit transformational leadership behaviors can significantly influence an organization's ability to innovate in environmentally sustainable ways. Transformational leadership, characterized by vision, intellectual stimulation, and motivation, plays a crucial role in fostering a culture that promotes green innovation.

The study demonstrated that transformational leadership has a substantial effect on both service and process innovation, particularly through the dimension of "Goal Acceptance." This indicates that when leaders clearly articulate and align organizational goals with sustainability objectives, they create an environment that encourages employees to actively participate in green innovation. These results align with previous studies in the literature, highlighting the pivotal role transformational

leaders play in fostering innovation by driving creative thinking and long-term environmental planning.

Organizations, therefore, should pay close attention to the development of leadership qualities that encourage sustainability and green practices. Transformational leadership is essential not only for enhancing organizational performance but also for driving meaningful environmental change.

5.2 Suggestions for Organizations

- 1. Leadership Development:** To capitalize on the positive impact of transformational leadership on green innovation, organizations should invest in leadership development programs. Such programs should focus on developing leaders' abilities to set clear, long-term environmental visions, inspire and motivate employees to think creatively, and foster an organizational culture that values sustainability. Organizations can offer training and workshops that help leaders understand the importance of aligning organizational objectives with environmental sustainability.
- 2. Promoting a Culture of Sustainability:** A sustainable organizational culture is a key driver of green innovation. Transformational leaders are instrumental in shaping this culture by modeling behaviors that prioritize environmental stewardship and by encouraging employees to adopt sustainable practices. Organizations should create policies and strategies that promote sustainability at all levels, from the leadership team to front-line employees. Leaders should be encouraged to integrate environmental goals into everyday operations and decision-making processes to reinforce the importance of sustainability.
- 3. Aligning Organizational Goals with Environmental Objectives:** One of the key findings of this study is the importance of aligning organizational goals with environmental objectives through transformational leadership. Organizations should ensure that sustainability is part of their long-term vision and strategic planning. By incorporating clear environmental goals into their mission statements and performance metrics, companies can motivate employees to pursue green innovations and adopt more sustainable work

practices. Leaders should regularly communicate these objectives to ensure they are embedded in the organization's culture and operations.

4. **Fostering Innovation through Empowerment:** Transformational leaders often empower their employees by encouraging autonomy and creative problem-solving. Organizations should create an environment where employees feel empowered to suggest and implement green innovations. This can be achieved by providing the necessary resources and support for employees to experiment with new ideas, whether through research and development initiatives, eco-friendly product designs, or innovative processes that reduce environmental impact.
5. **Investing in Green Technology and Innovation:** To enhance green innovation, organizations should invest in new technologies and processes that support sustainability. Transformational leaders can guide this investment by identifying areas where innovation is most needed, such as reducing waste, improving energy efficiency, or developing environmentally friendly products and services. By leveraging technological advancements, organizations can improve their environmental performance and gain a competitive advantage in the market.

5.3 Suggestions for Future Research

1. **Exploring Other Leadership Styles:** While this study focused on transformational leadership, future research could explore the effects of other leadership styles on green innovation. Leadership styles such as ethical leadership, authentic leadership, or servant leadership may also have a positive impact on sustainability initiatives. By comparing different leadership styles, researchers could gain a broader understanding of how leadership influences environmental performance across various organizational contexts.
2. **Longitudinal Studies:** Given the cross-sectional design of this study, future research should consider using longitudinal methods to track the long-term effects of transformational leadership on green innovation. Such studies could provide insights into how leadership behaviors influence innovation over time

and how sustained leadership efforts impact environmental outcomes in the long run.

3. **Investigating Specific Types of Green Innovation:** This study identified the positive effects of transformational leadership on both service and process innovations. Future research could delve deeper into the specific types of green innovations, such as product innovation or organizational innovation, to identify how transformational leadership influences different aspects of sustainability. Understanding the mechanisms by which leaders drive specific innovations can help organizations tailor their leadership development strategies more effectively.

This study provides robust evidence that transformational leadership significantly enhances green innovation. By fostering a vision of sustainability, promoting a culture of environmental responsibility, and empowering employees to innovate, transformational leaders can drive meaningful change within their organizations. As the need for sustainable business practices continues to grow, the role of leadership in facilitating green innovation will become increasingly critical for organizational success and environmental preservation.

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APPENDICES

Appendix -1: Green Innovation Scale

Green Innovation Scale	1=Strongly Disagree	2=Disagree	3=Undecided	4=Agree	5=Strongly Agree
Answer the questions below in a way that best reflects the company you work for					
Service Innovation					
1. Our company offers new green services to the market.	1	2	3	4	5
2. Our company has implemented many reforms to create green services.	1	2	3	4	5
3. Our company is constantly looking for new and green services.	1	2	3	4	5
4. Compared to our competitors, our company offers green services.	1	2	3	4	5
5. The green services offered by our company have led to significant changes in the sector.	1	2	3	4	5
Administrative Innovation					
1. Our company constantly offers new business management methods.	1	2	3	4	5
2. Our company has invested in updating procedures with a green focus.	1	2	3	4	5
3. Our manager constantly looks for ways to develop green practices.	1	2	3	4	5
4. Our company empowers its employees to take initiative.	1	2	3	4	5
5. Our competitors use operating systems as tests.	1	2	3	4	5
Process Innovation					
1. Our company constantly tests operating systems at world standards.	1	2	3	4	5
2. Our company constantly updates working techniques to increase efficiency.	1	2	3	4	5
3. Our company constantly uses technology to improve the quality of green services.	1	2	3	4	5
4. Our company makes major investments in the development of new green operating systems.	1	2	3	4	5
5. Our company constantly trains its employees on developing industry technologies.	1	2	3	4	5

Transformational Leadership Scale					
Answer the questions below in a way that best reflects your leader/manager.	1=Strongly Disagree	2=Disagree	3=Undecided	4=Agree	5=Strongly Agree
1. Has a clear idea about the future state of the institution.	1	2	3	4	5
2. Sets an example for employees with his actions rather than his words.	1	2	3	4	5
3. Ensures the participation of employees in the establishment of the institution's goals.	1	2	3	4	5
4. Tells us clearly and makes it clear that he expects a lot from us.	1	2	3	4	5
5. Acts by taking my feelings into consideration.	1	2	3	4	5
6. Encourages me to solve routine problems with a new perspective.	1	2	3	4	5
7. Tries to explain the future state of the institution to employees.	1	2	3	4	5
8. Is a leader to be followed and taken as an example for me.	1	2	3	4	5
9. Ensures continuous cooperation in intra-institutional teamwork.	1	2	3	4	5
10. Always expects us to do our best, better.	1	2	3	4	5
11. Respects my personal feelings.	1	2	3	4	5
12. Asks questions that make me think.	1	2	3	4	5
13. Always looks for new opportunities within the institution.	1	2	3	4	5
14. Symbolizes achievements and achieving goals.	1	2	3	4	5
15. Tries to ensure that employees become "team players".	1	2	3	4	5
16. Does not see the second best as success when evaluating our activities.	1	2	3	4	5
17. He/she acts by taking my personal needs into consideration.	1	2	3	4	5
18. He/she warns me to constantly review the way I do things.	1	2	3	4	5
19. He/she tries to inspire his/her employees with his/her plans for the future.	1	2	3	4	5
20. He/she encourages his/her employees to work towards the same goal.	1	2	3	4	5
21. He/she tries to increase my expectations regarding my job and career.	1	2	3	4	5
22. He/she values the commitment of his/her employees to the determined goals.	1	2	3	4	5
23. He/she tries to ensure that the employees have a team spirit and mentality.	1	2	3	4	5