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Bridging the Gap: A Comparative Study of Internal Stakeholder Engagement Strategies in the Process Industry for Green Innovation Implementation

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Author:
Anastasia Pritsa

Chair & First Supervisor:
Dr. W.W. (Wijnand) Veeneman
Second Supervisor:
Dr. N. (Nikos) Pachos-Fokialis

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Executive Summary

This thesis investigates the intricate relationship between internal stakeholder engagement, green innovation implementation, and project success within the process industry. Drawing from a mixed-methods approach, the study combines theoretical insights from extensive literature with survey data collected from participants in the NAP Network. The research addresses challenges encountered during green innovation initiatives and identifies strategies to engage internal stakeholders effectively, ultimately boosting project success.

To comprehensively achieve the research goals, a mixed-methods approach was adopted. The study began with a thorough literature review, establishing variables, conceptualizing relationships, and forming a theoretical framework. This groundwork informed the development of a questionnaire capturing insights, strategies, and challenges related to internal stakeholder engagement, process industry type, green innovation implementation, and project success.

The survey process upheld ethical standards, ensuring participant consent and anonymity. The questionnaire reached NAP-affiliated participants, a significant process industry network. This method facilitated the collection of data on stakeholder engagement strategies, encountered challenges, and diverse viewpoints on green innovation.

Findings provide valuable insights into the complex dynamics linking internal stakeholder engagement, green innovation implementation, and project success in the process industry. Despite the sample size limitation (N=24), collected data offers perspectives that illuminate challenges faced and strategies employed.

The research identifies shared and individual challenges faced by various process industry sectors during green innovation initiatives. Common hurdles encompass resistance to change, lack of top management support, and competing priorities. Interestingly, industry-specific challenges did not significantly hinder green innovation implementation, possibly due to participants' expertise and confidence. These challenges emphasize the pivotal role of effective internal stakeholder engagement in surmounting obstacles and driving successful green innovation.

Respondents' insights reveal various strategies to engage internal stakeholders in green innovation projects. Workshops and collaborative sessions stand out as highly effective approaches, fostering creativity, cross-functional collaboration, and shared responsibility. This underscores the significance of interactive methods in overcoming challenges and promoting successful implementation. However, the strategies used for engaging internal stakeholders do not necessarily guarantee project success.

Furthermore, findings highlight how internal stakeholders' perspectives and concerns positively influence green innovation practices and project success. Participants' views on green innovation vary, with some seeing it as a response to environmental demands, while others perceive it as a way to gain a competitive edge and enhance brand reputation. Successful green innovation practices also contribute to project success in the process industry. These perspectives underscore the diverse motivations driving green innovation implementation.

Acknowledging limitations stemming from extensive literature, potential researcher bias, and a relatively small sample, the study suggests avenues for future research. Recommendations encompass replicating the study with a larger sample, exploring

specific industry sectors, and examining the financial implications of green innovation implementation.

In conclusion, this study blends theoretical insights with survey data to offer a comprehensive understanding of the intricate relationship between internal stakeholder engagement, green innovation implementation, and project success in the process industry. The research underscores the critical role of effective stakeholder engagement strategies in overcoming challenges and propelling sustainable innovation initiatives. Despite limitations, these insights hold potential for practical applications and serve as a basis for further research in the field of green innovation and sustainability.

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List of Abbreviations

PS Project Success. 16, 23, 33, 35–42, 48, 65–67

PW Internal Stakeholders' Perspectives & Worries. 16, 22, 33–42, 46, 47, 65, 66

SW Shift Work. 24, 39, 45

1 Introduction

Climate change has become an urgent global issue, necessitating a collective effort to mitigate its impacts and transition towards a sustainable future. Reaching net-zero greenhouse gas emissions is essential to halting the harmful impacts of climate change, and it has become increasingly popular among governments, businesses, and individuals (EU Council, 2023). Companies are turning more and more of their attention to green innovation in response to this call to action in order to lessen their environmental impact, advance sustainable lifestyles, and aid in the transition of the world to a low-carbon economy. This paradigm shift towards environmentally friendly innovation emphasizes the urgency of addressing climate change and the crucial role that corporations play in promoting this transition (Lin & Chen, 2017).

In today's continuously shifting business environment, innovation is a critical driver of development and competitiveness for organizations in the process industry (Collins Dictionary, 2023a) in order to handle sustainability issues, differentiate themselves from the competition, improve operational efficiency, respond to market changes (Bergfors & Larsson, 2009), and attract and retain top talent (Alves, Dieguez, & Conciecao, 2019). Simultaneously, numerous companies that actively develop and take part in sustainability networks and groups have sprung up during the past few years. These programs seek to promote communication, knowledge exchange, and group learning among many stakeholders. By working together, these companies want to obtain insightful information, share best practices, and successfully traverse the road of innovation toward a sustainable future (*NAP Process Industry Network*, 2023). Yet, the successful implementation of a new innovation often demands extensive knowledge and additional resources, as well as the active participation and support of numerous stakeholders within the organization.

To ensure the successful implementation of green innovation initiatives, it is crucial to explore the distinctive characteristics of the two primary types of process industries: Batch and continuous operations (Malhotra, 2005). In response to economic viability and increasing government pressure for necessary environmental changes, Batch process industries often contemplate transitioning to continuous processes. This not only presents challenges in terms of operational changes but also poses considerations regarding the integration of innovative practices (Costandy, Edgar, & Baldea, 2019).

Understanding the specific requirements and challenges associated with each industry type is essential for incorporating internal stakeholders effectively. Furthermore, it is important to shed light on how the implementation of green innovation strategies differs between Batch and continuous process industries (Benavides, Salazar, & Diwekar, 2013). The focus should be on how these changes are communicated to stakeholders, the methods of stakeholder engagement employed, and the critical variables that stakeholders consider during the implementation of green innovation initiatives (Widén, Olander, & Atkin, 2014).

In this study, we will investigate how addressing these aspects can enable organizations to ensure a comprehensive approach that fosters stakeholder support and endorsement, thereby facilitating the successful completion of green innovation projects.

1.1 Problem Statement

In recent decades, many industries have undertaken significant efforts to transition from Batch operations to continuous processes. This transition holds substantial potential and offers numerous advantages, including enhanced automation, simplified scale-up, and increased throughput (Costandy et al., 2019). However, despite the promising benefits of shifting from Batch to continuous processes, the implementation of innovation emerges as a critical challenge. Even for businesses that exhibit reluctance towards transitioning from Batch to continuous operations, the implementation of innovative practices remains indispensable. Organizations must embrace and effectively incorporate innovative techniques to sustain competitiveness and respond to evolving market demands, irrespective of the specific operational changes involved (Lin & Chen, 2017).

Within the process industry, the problem of "Project Failure" holds significant importance as a pervasive issue encountered across various projects. The reasons behind project failure can be attributed to a multitude of factors. One significant factor that contributes to project failure is unsuccessful internal stakeholder engagement (Sutterfield, Friday-Stroud, & Shivers-Blackwell, 2006). When stakeholders are not engaged effectively, it can result in poor communication, unclear objectives, and conflicting priorities (Freeman, 1984). This can cause delays, cost overruns, and ultimately project failure . Therefore, it is essential for companies to recognize the importance of stakeholder engagement and implement appropriate tactics to address the issue. By understanding the project's business needs and engaging stakeholders effectively, companies can mitigate the risks associated with project failure and ensure project success (Sutterfield et al., 2006).

The problem of inadequate internal stakeholder engagement is particularly critical in the process industry due to the nature of its operations. Process industry organizations operate in complex and often hazardous environments, where innovation projects can have a significant impact on worker safety, the environment, and the company's financial performance (Malhotra, 2005). Successful innovation projects in the process industry require not only the involvement of technical experts but also the active participation of stakeholders (Widén et al., 2014) such as operational personnel, maintenance staff, and project management teams. These stakeholders have critical knowledge and expertise that is essential for successful innovation implementation, and their active participation is crucial for ensuring that the project is completed safely, efficiently, and within the allotted time-frame (Hamel, 2006). Without adequate stakeholder engagement, project teams may encounter unexpected challenges, delays, and increased costs, ultimately leading to project failure (Bourne & Walker, 2004). Therefore, addressing the problem of inadequate stakeholder engagement is critical for the process industry's long-term success and sustainability (Bourne & Walker, 2004).

Innovation is crucial to the growth and competitiveness of process industry organizations, but successfully implementing innovations frequently necessitates the active engagement and help of several internal stakeholders (Widén et al., 2014). Despite this, there is a lack of understanding of the strategies used by process industry businesses to involve internal stakeholders in the implementation of novel technologies, as well as how these strategies differ between different types of processes (DataMyte, 2022). Additionally, the critical elements that stakeholders consider while adjusting to these advances are uncertain, particularly in the age of green innovation(Weng, Chen, & Chen, 2015).

1.2 Significance and Relevance to MOT Program

The significance of this study lies in one and only one question. Why do projects fail? The cause is frequently at the first obstacle rather than the last one: stakeholder engagement. Projects fail all the time, despite how important they are to our everyday personal and professional life. When researching the trends and success rates of technical projects, non-scientific sources, such as the Standish Group statistics, statements like “70% of companies report having at least one failed project in the last year” and "Most Common Causes of Project Failure: Poor communication – 30% " were found.

Projects largely fail for non-technical reasons, according to Hayden (2004), including problems with negotiation, teamwork, and communication. Stakeholder management has been emphasized by authors Bourne and Walker as a crucial project success aspect. The authors have highlighted the importance of stakeholder management as a key project critical success factor. Especially they stated that: "Without attention to the needs and expectations of a diverse range of project stakeholders, a project will probably not be regarded as successful even if the project manager was able to deliver it within the original (or agreed) time, budget and scope" (Bourne & Walker, 2004, p 227).

The existing literature primarily addresses the process industry as a whole, without delving into the distinctions between Batch and continuous processes. The main goal is to develop a set of guidelines or best practices for managing stakeholder involvement and participation throughout the innovation implementation process, once the crucial variables have been identified. These variables may include the degree of cooperation and communication between stakeholders, the accessibility of resources and assistance, safety limitations, employee engagement and training, and corporate culture. The investigation will also look into specific methods for incorporating internal stakeholders, such as operational staff, maintenance personnel, business owners, and project management teams, in the implementation of innovation. (Bowen et al., 2017).

Numerous sources emphasize the importance of green innovation in the process sector while highlighting the crucial role that employees played as primary drivers of this revolutionary development as shown in Figure 1. Any process industry business looking to introduce new technologies and encourage green innovation would benefit from incorporating the findings of this study that ensure the successful integration of green innovation.

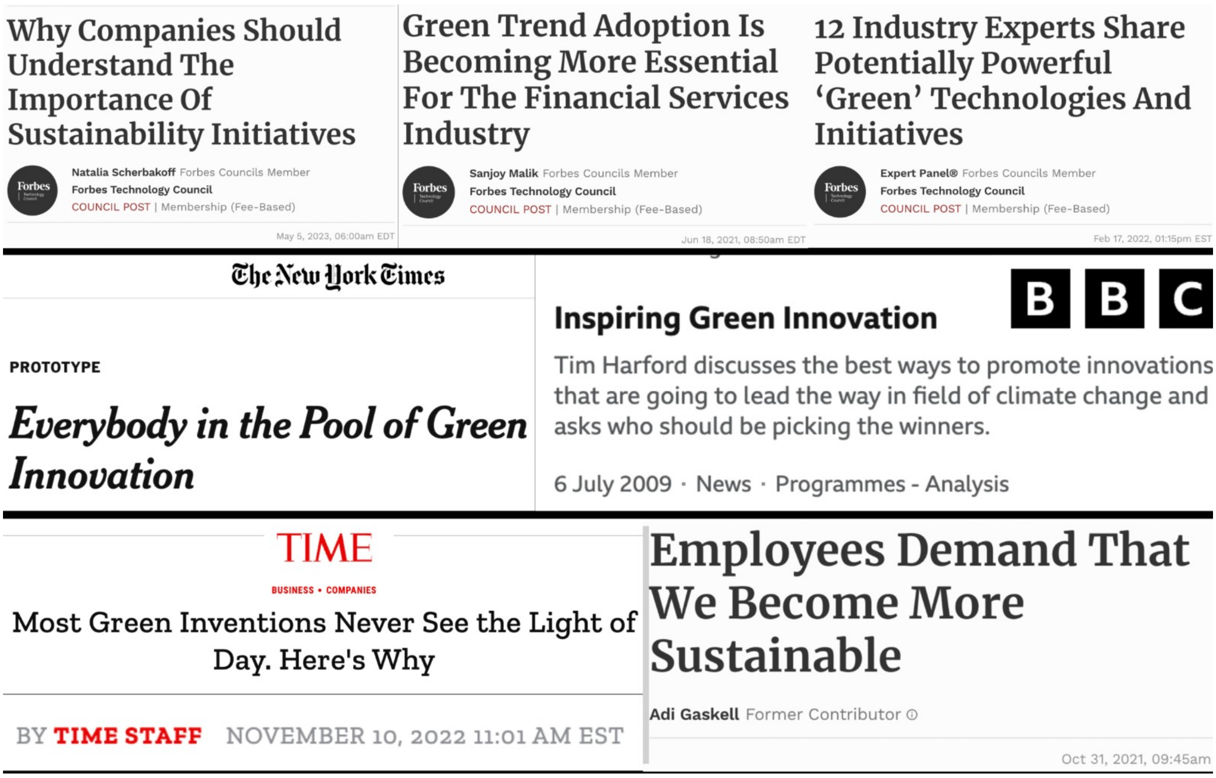

Figure 1: News outlets

The Master of Technology (MOT) degree prepares students to find, assess, and apply technologies that have a positive influence on society. The program teaches students analytical and managerial abilities that will enable them to drive social and economic value from technology. The creation of internal stakeholder engagement techniques in the process industry sector during the implementation of innovation is the focus of this thesis research. This study tackles an important issue in the field of MOT by analyzing the effectiveness of these tactics in promoting stakeholder participation.

The knowledge and abilities learned in various MOT courses will be extremely useful in this research. Courses in stakeholder management and decision-making, for example, will be critical in examining strategies and identifying the relevant actors involved in stakeholder engagement. Furthermore, the approaches learned in Inter- and Intra-organizational Decision-making for deconstructing decision processes in complex problems will be used to structure the analysis and identify the players and organizations involved in internal stakeholder engagement initiatives. Additionally, the Leadership and Technology Management course is extremely important to the research because it emphasizes the importance of leadership and management in businesses. It emphasizes the importance of workers to an organization's performance and the function of leadership in putting management policies and procedures into practice. Finally, the research process can be effectively guided by taking the Research Methods course. For properly analyzing the application of green innovation, this course offers insights on data gathering, analysis, and interpretation.

This research project coincides with the MOT program's orientation and provides an opportunity to apply information and skills obtained in MOT courses to a practical situation.

2 Research design

2.1 Research Objective

The **objective** of this study is to identify the challenges faced by the process industry, particularly continuous and batch processes, in effectively engaging internal stakeholders. The study aims to address their concerns and apprehensions in order to ensure the implementation of green innovation initiatives. By understanding and addressing these challenges, the study aims to provide insights and recommendations that can assist organizations in successfully implementing green innovation practices and ensuring project success.

2.2 Research Questions

This thesis comprises a set of clear research questions. The main research question is focused on identifying the strategies that can be employed to foster stakeholder engagement. In order to delve deeper into this topic, the main question is further broken down into four sub-questions. The first sub-question investigates the comparative challenges faced by Batch and Continuous process industries in implementing green innovation. The second sub-question examines the critical factors influencing internal stakeholder engagement in green innovation implementation, and how these factors differ between Batch and Continuous process industries. The third sub-question explores the most effective strategies utilized by process industry businesses to involve internal stakeholders, and the variations in these strategies between Batch and Continuous process industries. Sub-question number four investigates the standards or requirements which assess the success of the implementation of green innovation practices.

Main Question

How can different types of process industries effectively engage with their internal stakeholders to ensure the successful implementation of green innovation?

Sub-question 1

1- *What are the challenges specific to both Batch process industries and continuous process industries in implementing green innovation practices?*

Sub-question 2

2- *What are the concerns and perspectives of internal stakeholders regarding green innovation practices in the process industry, specifically in Batch and continuous processes?*

Sub-question 3

3- *What are the key strategies used by process industry businesses to engage internal stakeholders in green innovation practices?*

Sub-question 4

4- *What is the impact of the implementation of green innovation practices on project success?*

3 Literature review

3.1 The process industry

The process industry includes a wide range of industries that produce and transform raw materials and chemicals into final goods. The following are some of the primary categories of process industries:

- Exploration, extraction, refining, and distribution of oil and gas products are all part of the oil and gas sector.
- Chemical Industry: This industry manufactures chemicals such as fertilizers, polymers, and industrial gases, among other things.
- Pharmaceutical industry: This industry is involved in the research, development, and manufacturing of pharmaceuticals and therapies.
- Food and Beverage Industry: The manufacturing of food and beverages, including processing, packaging, and distribution, is included in this industry.
- Paper and Pulp Industry: This industry manufactures paper, cardboard, and other pulp-based goods.
- Textile Industry: This industry manufactures textiles such as garments, carpets, and household products.
- Mining industry: This industry extracts and processes minerals and metals such as coal, gold, and iron.
- Water Treatment Industry: The purification and distribution of drinking water, industrial use, and waste disposal are all part of this business.
- Renewable Energy Industry: The generation of energy from renewable sources such as wind, solar, and hydropower is included in this business.

Ultimately, the process sector is crucial to satisfying modern society's expectations, producing the key products and resources that power our everyday lives (*Process Industries | AFRY*, 2023).

Dennis and Meredith (2000) conducted an extensive analysis of past research on general process industry characteristics and concluded that seven main types of process industries: (1) process job shop, (2) fast batch, (3) custom blending, (4) stock hybrid, (5) custom hybrid, (6) multistage continuous, and (7) rigid continuous . All industries that produce and transform raw materials and chemicals into final goods fall under these categories, which can be broadly categorized into two types based on the ability to stop the process and the production rate (*Process Industries | AFRY*, 2023). For the purpose of this research, we will focus only on Batch and continuous process industries in order to narrow down the scope.

3.1.1 Batch process industry

In a Batch process, a fixed quantity of raw materials is fed into the production line and processed as a single unit or Batch. The process is then stopped and the output is removed before the next Batch is started, as presented in Figure 2. Batch processes are typically used for smaller production runs or products that require customization (Benavides et al., 2013).

Among the literature the advantages that are noted among the researchers are many. According to Hock, Siang, and Wah (2021), Benavides et al. (2013) and Malhotra (2005) the Batch procedure has various advantages:

- Greater quality control: Because all components are combined at once, it is simple to guarantee that they are correctly integrated and that the finished product fulfils all quality requirements (Malhotra, 2005).
- Greater flexibility: Because it is simpler to adjust the recipe or procedure mid-batch, batch processing is more versatile than continuous processing. This might be useful if the product has to be changed for quality or safety concerns (Benavides et al., 2013).
- Improved traceability: Batch processing allows items to be traced back to their original batch, which can be helpful for quality control or recall (Hock et al., 2021).
- Reduced capital investment: Since batch processing employs simpler equipment, it requires less capital investment than continuous processing. This might be a huge benefit for small enterprises or startups with limited resources (Benavides et al., 2013).
- Reduced risk of contamination: When all of the components are combined at once, there is less likelihood of contamination during the process (Malhotra, 2005).

Employing a batch procedure has several advantages. It does, however, provide certain difficulties. In accordance with Hock et al. (2021) more storage space is required for batch processing since the materials must be blended together in batches and then kept until they are needed. Additionally, batch processing takes longer than continuous processing because each batch must be mixed, processed, and then stored before the next batch can be processed (Malhotra, 2005). Lastly, this manufacturing process has increased waste and production costs (Benavides et al., 2013). Errors in batch processing can result in increased waste and production expenses since the entire batch may need to be discarded if quality requirements are not met (Hock et al., 2021).

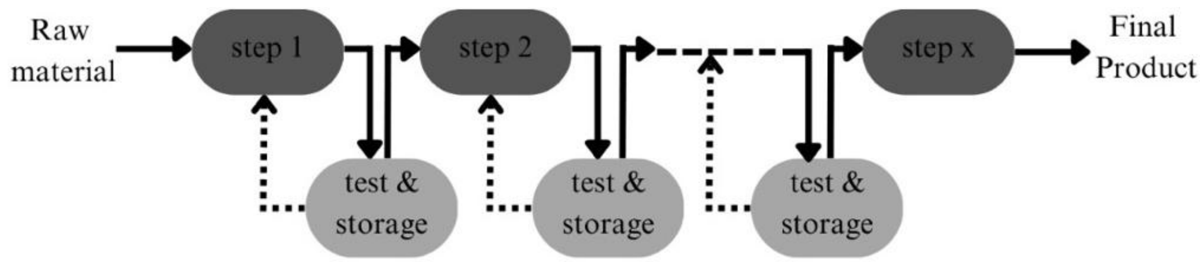

Figure 2: Batch Manufacturing (Hock et al., 2021)

3.1.2 Continuous process industry

In a continuous process, the raw materials are continuously fed into the production line and the output is also continuously produced, without interruption, as depicted in Figure 3. The process runs 24/7 and requires constant monitoring to ensure consistent output quality. Examples of continuous processes include petroleum refining, chemical manufacturing, and paper manufacturing (Benavides et al., 2013).

Exactly like batch processing, continuous processing offers some advantages as well according to Hock et al. (2021), Benavides et al. (2013) and Malhotra (2005), including:

- Increased efficiency: The components are constantly going through the system with rare shutdown/down-times (Benavides et al., 2013).
- Less labor-intensive: It takes fewer workers to run, continuous processing and often is fully automated (Hock et al., 2021).
- Improved safety and hygiene: The components are less prone to become contaminated(Malhotra, 2005).
- Lower storage space: The product is generated and packed in a continuous stream (Hock et al., 2021).
- Shorter processing as well as holding time: This leads in a fresher output since the product has less time to decay(Benavides et al., 2013).
- Continuous processing may create a bigger volume of product in a shorter amount of time due to its increased efficiency(Hock et al., 2021).

Although this type of manufacturing process has advantages, it also has disadvantages. Since continuous processing employs more complicated and expensive equipment, it demands a higher capital investment than batch processing and at the same time, continuous processing might be more difficult to set up than batch processing since the equipment is more complicated (Benavides et al., 2013). Moreover, it is more difficult to adjust the process mid-stream reducing the flexibility, continuous processing is less versatile than batch processing (Malhotra, 2005). Additionally, production starting and shutdowns are riskier because of the complexity of continuous processes and in case of contamination, there is a high potential for the total product to be affected (Hock et al., 2021).

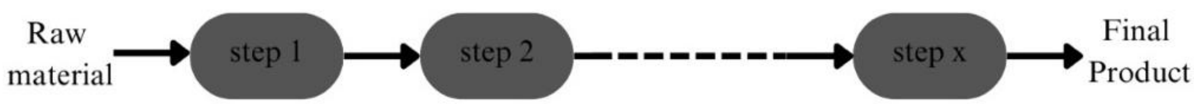

Figure 3: Continuous Manufacturing (Hock et al., 2021)

3.2 Green Innovation

The term "green innovation" (GI) referred to a form of the invention with the primary purpose of reducing or eliminating environmental harm based on the research by Franceschini, Faria, and Jurowetzki (2016). Green innovation, according to Jayaraman, is an umbrella concept for technologies for waste recycling, green product design, energy conservation, and pollution avoidance. These functions can be integrated into a facility's upgrade process within process industries, providing an environmentally responsible approach to production (Jayaraman, Jayashree, & Dorasamy, 2023). According to Knegtering and Pasman (2009) organisations have the flexibility to choose between hardware, software, or a combination of both when updating their facilities with innovative solutions. Simultaneously, they can pursue green innovation by focusing on either green products or green processes, contributing to a more sustainable and environmentally conscious approach to business operations (Albort-Morant, Leal-Millán, & Cepeda-Carrión, 2016).

Legal regulations are the primary external driver of green innovation in businesses enhancing green innovation adaption and subsequent green innovation implementation (Aboelmaged & Hashem, 2019). Specifically, the European Green Deal, published by the Commission on December 11, 2019, aims to make Europe the first climate-neutral continent by 2050. The Net-Zero objectives that firms are aiming for, as well as the stringent time frame that must be followed, drive batch as well as continuous process industries to explore, develop, and implement green innovations, sometimes successfully, sometimes not (Zhang, Sun, Yang, & Wang, 2020).

3.2.1 Green Innovation implementation in Batch and Continues process industry

In accordance with Aboelmaged and Hashem (2019), the ease with which innovations may be implemented in a manufacturing process is determined by various organizational factors, technology advantages, company resources, and outside influences. Moreover, factors influencing the establishment of green innovation are also the personnel and the firm management (Trotha, Azarmipour, & Epple, 2018). An equally important factor and frequently overlooked is the employees' perception regarding the innovation implementation climate of the company (Singh, Akbani, & Dhir, 2020). George and Shoemaker (2002) argue that corporate technological innovation risks encompass seven factors: R&D risk, production risk, financial risk, market risk, policy risk, cultural risk, and management risk. The scope of this research will primarily concentrate on only two significant aspects: production risk and management risk. These factors effectively capture the disparities between batch and continuous production processes, as well as the level of employee engagement fostered by management.

Investigating the literature about the green innovation implementation in the Batch and Continues process it is clear that the benefits and risks of each process are some internal drivers that govern the rate at which green innovation may be implemented in the functions of the processes (Sun, Wu, & Yin, 2020). As mentioned earlier Batch operations are more adaptable than Continuous processes because they allow for fluctuations in raw materials, production conditions, and output quality without affecting the entire manufacturing line (Hock et al., 2021).The level of automation and equipment of the industry also serves as a pivotal production factor that shapes the implementation of innovation (Bergfors & Larsson, 2009). Lastly, regarding both industries, Singh et al. (2020) suggests that businesses that encourage innovation and engage in research are more likely to implement new technologies and processes, whereas companies that take a conservative stance may be less likely to implement extension green innovations.

3.3 Stakeholders Identification

The classical interpretation of the term stakeholder is stated in Edward Freeman's book, Strategic Management: A Stakeholder Approach (1984), where the book defines a stakeholder as "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Freeman, 1984, p 46). According to Freeman, a basic, conventional list of stakeholders includes five major and five subsidiary stakeholders. Primary stakeholders include employees, suppliers, financiers, communities, and customers, while secondary stakeholders include competitors, government, media, special interest organizations, and consumer advocate groups (MacDonald, 2009). Based upon the concepts first articulated by Freeman, and then embraced and expanded on by Cleland and Ireland (2022), this research tries to extend its attention to internal stakeholders, with a particular emphasis on those linked with the process industry .

3.3.1 Internal Stakeholder Engagement in process industry

Based on Hamel (2006) internal stakeholders are those who are directly involved in or affected by management innovation. Although Freeman (1984) and Fassin (2009) include customers and suppliers as the internal stakeholder, this research will exclude them to prevent discrepancies in the applicability to businesses. In an industry and consequently, the process industry, any personnel inside the facility who will be affected or anticipate they will be affected by the activities are considered stakeholders (Freeman, 1984). The emphasis will be on operational workers, maintenance employees, business owners, and the project management team because they are on the front lines of engagement when a new innovation is adopted.

"Stakeholder engagement" is a method used by businesses to achieve what stakeholders agree on toward specific results (Manetti, 2011, p 112). According to Cappelli and Neumark (2001), employee involvement is the central notion in nearly all research investigating high-performance work systems and organizational success. Employees are divided into three broad groups according to how they view their workplaces being engaged, not engaged or disengaged (Chandani, Mehta, Mall, & Khokhar, 2016).

By researching the literature on employee involvement rather than the general stakeholders, it was noted that employee engagement is implemented by four interconnected variables: empowerment, training, contingent remuneration, and communication as described by Marin-Garcia and Bonavia (2015). Sutterfield et al. (2006) argues that internal stakeholder engagement is a crucial aspect of the process industry, and effective engagement can lead to improved performance, enhanced reputation, and long-term sustainability .

3.3.2 Internal Stakeholders Perspectives on Green Innovation

Implementation of innovation is a complex process involving multiple stakeholders, each with its own set of interests and considerations (Jayaraman et al., 2023). Numerous studies have consistently demonstrated that employees' perspectives on green innovation significantly influence their respective organizations (Weng et al., 2015), (Jayaraman et al., 2023), and (Zhang et al., 2020). Consequently, it becomes crucial for managers to acknowledge the importance of involving employees in environmental management as an integral part of strategic organizational planning. Weng et al. (2015) suggested that by encouraging employee participation in green initiatives, businesses can drive future performance and effectively address environmental concerns.

Furthermore, employees who display a higher level of environmental commitment are more likely to actively engage in resolving the organization's environmental challenges and embrace opportunities for acquiring new skills (Jayaraman et al., 2023). The possible gains from the green innovation are evaluated by the personnel and these advantages include greater professional standing, pride in making a difference in the environment, greater professional standing (Weng et al., 2015), or potential competitive advantages for the company (Sun et al., 2020). Personal preferences of employees influenced by their age, experience, and expertise also have an impact on the process of implementing change initiatives (Weng et al., 2015).

However, the implementation of green innovations poses certain challenges, such as increased workloads and potential dissatisfaction among employees when introducing new activities or practices necessary for the successful adoption of green initiatives (Karimi Takalo, Sayyadi Tooranloo, & Shahabaldini parizi, 2021). Based on the study by Zhang et al. (2020), employees are reluctant to the changes unless they share a pro-environment attitude since green innovation requires time and effort. The impact of green innovation on their job functions and whether it might result in job loss or reorganization is a common worry among employees (Jayaraman et al., 2023).

When comparing the industries of batch and continuous manufacturing, it is evident that employees in continuous process projects, particularly those involved in shift work, place significant importance on having predictable schedules that allow them to effectively manage their personal obligations (Dhande & Sharma, 2011). Consequently, the introduction of a novel green innovation has the potential to disrupt their established routines (Jayaraman et al., 2023) and introduce uncertainty regarding their shift patterns (Dhande & Sharma, 2011). In addition, employees concerns including possible disruptions to the uninterrupted production flow when implementing innovations, including green innovation. This is due to the fact that the incorporation of any innovations, and to an extent green innovation, often necessitates process shutdowns or modifications that can potentially impact production efficiency and output. However, it should be noted that there are instances where production can be carried out without the need for a complete halt, enabling the implementation of some green innovations (Fore & Mbohwa, 2015).

In contrast, employees engaged in batch processes, characterized by production occurring in discrete batches or cycles, don't have these worries about shifts but are concerned about the impact of the new green innovation on the overall flow of production (Puigjaner & Espuña, 1998).

In the process industry, whether engaged in Batch or continuous manufacturing projects when implementing a green innovation safety is the most common denominator that all groups prioritize, as it is essential for the well-being of all involved (Fauzi Rahman Jayaraman, Shariff, & Zaini, 2020). Risk reduction is another critical issue that internal stakeholders emphasize to ensure the success and long-term viability of innovation implementation (Knegtering & Pasman, 2009).

3.3.3 Strategies for Effective Internal Stakeholder Engagement in Green Innovation

Businesses adopt stakeholder engagement practices based on a set of guidelines that are universally applicable across various process industries (MacDonald, 2009). Particularly when concentrating on internal stakeholder engagement, and more especially employee engagement, businesses have a multitude of tools and tactics at their disposal to successfully involve their staff members in their processes (Osborne & Hammoud, 2017).

There are several common methods used to involve employees in decision-making processes, these methods first include sharing information through emails or other communication channels. The initial step involves project or organizational management in providing fundamental information regarding upcoming activities, such as the implementation of green innovation. Although this form of communication may be considered generic and impersonal, it still plays a crucial role in acquainting employees with the forthcoming changes (Men, 2014). Managers should also prioritize enhancing two-way communication channels, creating an environment where employees feel comfortable expressing their thoughts and concerns (Kompaso & Sridevi, 2010).

The second phase entails holding team meetings (Osborne & Hammoud, 2017), which can differ based on the size of the team or the specific areas of responsibility for each project. These meetings may have varying team compositions (Freeman, 1984). This strategy provides a more interactive and interpersonal way to conduct information sharing, providing insightful observations into the genuine reactions of employees. Based on the study by Men (2014) employees can express their concerns, participate in conversations, and even offer alternative suggestions or solutions during these meetings. In this collaborative setting, the management should ensure that it empowers the team members and holds them accountable for actively contributing to and taking responsibility for the decision-making process (Kompaso & Sridevi, 2010).

Following the aforementioned steps, the next phase involves educating internal stakeholders in practical skills to boost their confidence and facilitate the safe implementation of necessary changes(MacDonald, 2009). This often entails conducting training (Kompaso & Sridevi, 2010) and workshops (Manetti, 2011) where employees can gain firsthand experience and insight into what to expect. According to Kompaso and Sridevi (2010) employees are more prepared to handle upcoming scenarios thanks to opportunities for hands-on learning, which also increases their sense of expertise and preparedness.

It is crucial for management to set up feedback loops as we move forward with the green innovation implementation process to ensure that internal stakeholders remain engaged (Men, 2014). Surveys and other research techniques are frequently used to gather data and create precise, action-oriented plans (Kompaso & Sridevi, 2010). It's essential to assess and evaluate the strategies' efficacy to guarantee a successful implementation. In accordance with the study by Osborne and Hammoud (2017) this assessment explains any ambiguous areas and assists in determining the necessity for any necessary improvements.

Finally, by adopting a rewards system, management may effectively boost and maintain employee engagement (Osborne & Hammoud, 2017). Employee motivation and engagement can be raised by acknowledging and rewarding them for their contributions and efforts during the green innovation implementation process. These rewards may take many different forms, including cash incentives, bonuses, recognition initiatives, or chances for professional progress (Kompaso & Sridevi, 2010). Employees are more likely to remain interested, devoted, and driven to actively participate in the implementation process when their efforts are valued and acknowledged (Osborne & Hammoud, 2017). Additionally, this encouraging reinforcement can help the firm develop a culture of innovation and constant growth (MacDonald, 2009).

3.3.4 Involving Internal Stakeholders in Green Innovation

Following the examination of the viewpoints expressed by internal stakeholders and the methods employed to engage with them in relation to green innovation, it is essential to investigate the underlying significance of involving them in the decision-making processes pertaining to the implementation of green innovation. Internal stakeholder involvement in green innovation decision-making can boost commitment to and ownership of sustainable efforts (Song, Yu, & Xu, 2021). Participatory decision-making, according to Wiradirja et al. (2020), enables employees to offer insightful comments, speak up for the environment and provide solutions for sustainability issues. The sense of empowerment, engagement, and responsibility that is fostered by this involvement increases employees' motivation to support sustainable practices (Song et al., 2021).

According to Fazal-e-Hasan et al. (2023) involving internal stakeholders, such as employees, in green innovation efforts help them align their understanding of sustainability goals with the organization's objectives. Involving internal stakeholders also promotes a shared vision, corporate learning, and a sustainability-oriented culture (Morgan & Zeffane, 2003). In addition to the benefits mentioned, the author suggests that this involvement also increases employees' hope and satisfaction. Moreover, it reduces the turnover rate, leading workers to perceive their potential success in green innovation activities as a vital factor in their personal growth and the progress of the organisation (Fazal-e-Hasan et al., 2023).

Meanwhile, resistance to change, lack of awareness, and communication barriers pose challenges in the involvement mechanisms (Wiradirja et al., 2020). As analysed in Section 3.3.3 organizations must provide a supportive environment, provide training, explain benefits, and value employee input in order to overcome these difficulties. Simultaneously, investing in building trust in management through two-way communication channels can yield the desired outcomes (Morgan & Zeffane, 2003).

3.4 Green Innovation implementation and Project Success

The word "Success" has a vast variety of meanings and different stakeholders have different perspectives on the term. Success is therefore difficult to quantify or estimate and what can seem to be a failure in one project could be a success factor in another, as indicated by Shokri-Ghasabeh and Kavousi-Chabok (2009). Numerous studies have emphasized the significance of selecting suitable criteria so that "project success" can be accurately quantified (Müller & Turner, 2007), (Tseng, Wang, Chiu, Geng, & Lin, 2013), (Shokri-Ghasabeh & Kavousi-Chabok, 2009) and (COLLINS & BACCARINI, 2004).

According to Shokri-Ghasabeh and Kavousi-Chabok (2009) it is crucial to distinguish between the two evaluation components, more specifically, success factors make it easier to attain success while success criteria are used to judge accomplishment. In order to address the research objective, this section will concentrate on identifying the factors and criteria that contribute to success in the context of green innovation, with a specific focus on their connection to internal stakeholders, particularly employees.

Achieving a competitive advantage is a key component in attaining project success, while project success, in turn, reinforces the competitive advantage (Albort-Morant et al., 2016). As suggested by Tseng et al. (2013) integrating green practices within a firm strengthens its competitive advantage and environmental performance. Therefore, green innovation is a crucial intangible asset that transcends industry boundaries and contributes to process industry future performance (Ben Arfi, Hikkerova, & Sahut, 2018).

Project success depends on tracking, analyzing, and improving the development and effectiveness of green innovation projects as suggested by Ben Arfi et al. (2018). Shokri-Ghasabeh and Kavousi-Chabok (2009) research showed that projects with monitoring and evaluation procedures performed by the management were better able to spot potential problems and modify plans of action. Additionally, the extent to which top management provides support directly affects the growth and success of any project (Shokri-Ghasabeh & Kavousi-Chabok, 2009).

"Innovations need to overcome the hurdles of affordability, adaptability, scalability, replicability and sustainability" (Orvill, 2019, p 68), expanding this concept to green innovation, it becomes crucial for green practices to be replicable and scalable, necessitating the development of standardized frameworks that enable broader implementation across industries. Employing a preapplied framework can enhance the chances of project success (Shokri-Ghasabeh & Kavousi-Chabok, 2009).

Evidence suggests that projects that prioritize and achieve their objectives for green innovation are more likely to be successful even in uncertain circumstances. The process with clearly defined green innovation targets, according to a study by Tseng et al. (2013), are more likely to effectively address environmental challenges and respond swiftly in tackling these issues. Consequently, their proactive approach towards long-term sustainable practices yields successful outcomes in terms of environmental impact mitigation and overall performance improvement (Tseng et al., 2013).

In the context of green innovation, the literature offers a variety of viewpoints on the significance of stakeholder participation as an element in project success. While some studies emphasize the critical role of successfully involving stakeholders (Albort-Morant et al., 2016), others seem to be unsure of its significance (Shokri-Ghasabeh & Kavousi-Chabok, 2009). The study Ben Arfi et al. (2018)

emphasizes the critical need of incorporating a variety of internal stakeholders, specifically employees in decision-making about green innovation utilizing open communication promote a sense of ownership and commitment, which improves implementation results. Additionally, the study specifically addresses that when outside experts are present, employees feel frightened and embarrassed. The success of green innovation processes is constrained by this work environment, which has a detrimental impact on the standard of information exchange (Ben Arfi et al., 2018).

However, further research is needed to fully understand the extent of stakeholder engagement's impact on project success in the context of green innovation indicating the presence of a gap in the existing literature

4 Theoretical framework

4.1 Green Innovation implementation model

Following the directions given by Sekaran and Bougie a theoretical framework and model were constructed to direct the study process based on the thorough literature review carried out. In order to implement green innovation in the process industry under the distinction of Batch and Continuous process industries, the theoretical framework builds on previously developed ideas, concepts, and practical data. This framework provides a basis for comprehending the essential elements, difficulties, and approaches related to internal stakeholder involvement in green innovation initiatives. Different hypotheses were formed from this theoretical framework and will be put to the test in order to respond to the research questions.

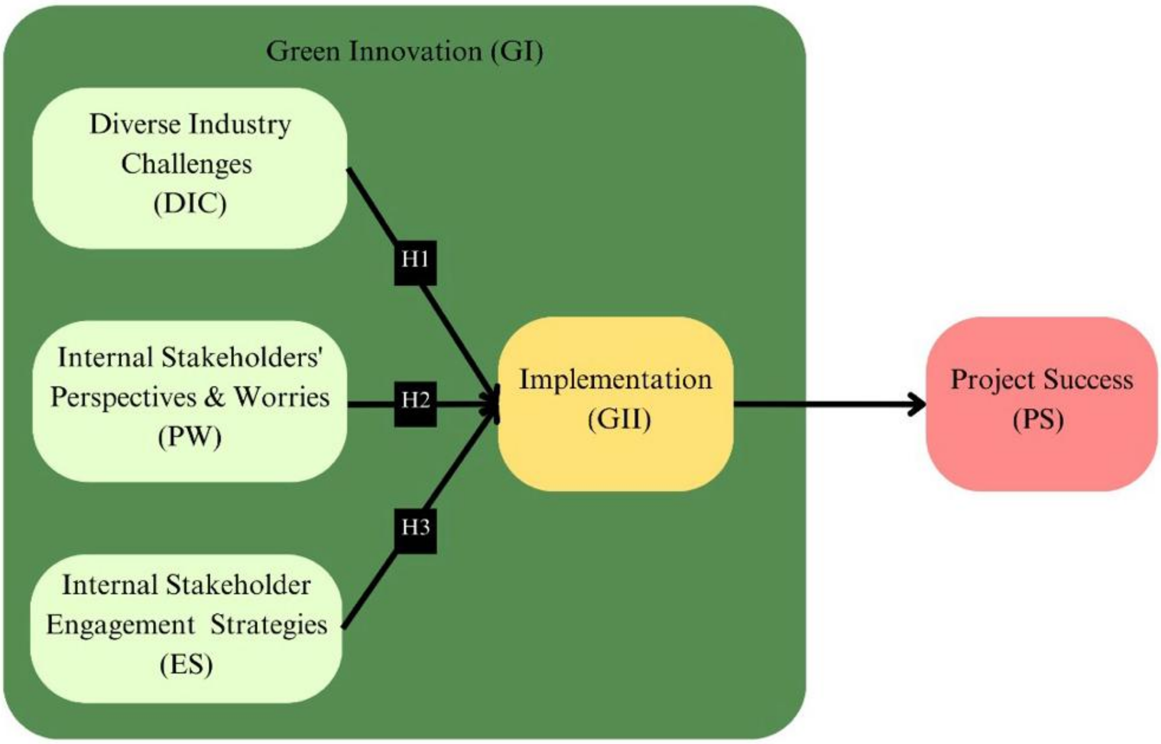

Figure 4: Theoretical framework - Green innovation implementation model

The research framework displays five crucial factors that will direct the investigation in Figure 3. The ideas being studied are covered by these variables. The study explores the four primary variables within the context of Green Innovation (GI), which functions not as a variable itself but as an encompassing environment and contextual backdrop for the research. The variables include the following three independent variables: "Diverse Industry Challenges (DIC)", "Internal Stakeholders' Perspectives & Worries (PW)", and "Engagement Strategies (ES)". These independent variables might have either a positive or negative impact on the variables that come after them. "Implementation (GII)" serves as a mediating variable by standing between the three independent variables and the dependent variable that follows. It acts as an intermediate step in the causal chain. "Project Success (PS)" serves as the study's dependent variable and as the desired outcome of the research. The linkages and possible effects between the independent variables, the mediating variable, and the dependent variable are examined and researched while keeping in mind this conceptual framework. The existing literature presents contradictory information regarding the positive and negative effects of the independent variables in question. As a result, the interpretation and determination of the nature of these impacts will depend on the researcher's perspective regarding the formulation of the hypothesis.

4.2 Hypothesis Development

A distinct name will be used to identify each hypothesis: H1 for Hypothesis 1, H2 for Hypothesis 2, and H3 for Hypothesis 3. The use of hypothesis statements (H1, H2, and H3) offers an organized and methodical approach to the research process, it is vital to mention. All of the hypotheses reflect a particular research claim or prediction that will be examined in light of the application of green innovation. Each independent variable is connected to the dependent variable through a mediator, forming a sequence of paths that demonstrate the flow of influence. It starts with the independent variable, passes through the mediator, and ultimately impacts the dependent variable. The hypotheses recognize the intermediary process connecting the variables by taking into account the mediator in the analysis, which also aids in understanding the underlying mechanisms and any causal relationships involved (Sekaran & Bougie, 2016).

Based on the comprehensive literature review, the following hypotheses have been formulated:

Hypothesis 1 (H1): *The presence of diverse industry challenges in the process industry negatively influences the implementation of green innovation and, as a result, project success.*

This hypothesis raises the possibility that the categories of process sectors may differ in how easily green innovation can be implemented. As mentioned in the Section 3.2.1 batch operations allow for variations in inputs, working conditions, and output quality without affecting the entire production line, they are more adaptable than continuous processes (Sun et al., 2020). Despite the positive correlation between green innovation practices and project success in the process industry (Ben Arfi et al., 2018), the presence of industry challenges negatively impacts the successful implementation of green innovations that was thoroughly examined in the Section 3.4.

Hypothesis 2 (H2): *The presence of perspectives and concerns of internal stakeholders in the process industry positively influences the implementation of green innovation and, as a result, project success.*

According to this hypothesis, internal stakeholders' concerns and priorities procedures have an impact on the extent to which green innovation practices are implemented in the process industry. Analized before in Section 3.3.2, their perspectives can influence the implementation to various degrees, either positively (Weng et al., 2015) or negatively (Zhang et al., 2020).In simpler terms, the acceptance and eventually the successful integration of green innovation rely on how internal stakeholders, particularly experts/employees, consider and assess factors such as the environment and sustainability (Jayaraman et al., 2023) in relation to their workload and work routines

(Dhande & Sharma, 2011). Additionally, this hypothesis emphasizes how crucial it is to take into account internal stakeholders' opinions and comments when deciding how to successfully embrace and carry out green innovation efforts. The management engagement of the company has a big impact on how successful projects be and how well green practices are implemented (Ben Arfi et al., 2018) according to the analysis in Section 3.4.

Hypothesis 3 (H3): *The presence of strategies employed to engage internal stakeholders positively influences the implementation of green innovation and, as a result, project success.*

This Hypothesis implies that utilizing appropriate strategies, such as emails(Men, 2014), training (Kompaso & Sridevi, 2010), or workshops (Manetti, 2011), to engage internal stakeholders positively correlates with achieving project success (Cappelli & Neumark, 2001) and effectively addressing the implementation of green innovations. The various types of involvement and the related duties assumed by management are thoroughly analyzed in Section 3.3.2 of the literature study. Considering the significant influence of the organization's communication setting on project success and the implementation of green practices (Ben Arfi et al., 2018), as highlighted in Section 3.4 it becomes imperative to investigate this hypothesis.

5 Methodology

5.1 Research Design

Consulting the book of Sekaran and Bougie (2016) "Research Methods of Business: A Skill Building Approach ", in order to pinpoint the key variables that have an impact on green innovation implementation, and internal stakeholder involvement in green innovation implementation in the process industry, a literature research and verification approach will be employed to address the topics. A thorough literature review of prior studies on the topic was conducted as the first stage.

Useful academic databases including Web of Science, Scopus, and Google Scholar were used to conduct the literature review. The papers, studies, and reports with the greatest emphasis on the challenges faced by the industry when implementing green innovation, on factors of impact and strategies on internal stakeholder engagement in innovation implementation in the process industry will be the focus of the literature review. The major elements of those topics were been well understood as a result of this review.

To supplement the literature review, snowballing was used to find additional relevant studies that were missed in the literature review as the second stage. Snowballing is a technique that involves following the references cited in the literature to identify extra applicable research. This technique helps to ensure that no important studies are missed. By employing this technique, all sub-questions will be thoroughly investigated, contributing to a comprehensive analysis of the research topic.

The research materials used in this study underwent a thorough quality assessment. Although the objective was to focus on recently published studies with a minimum of 20 citations, due to the highly specific and niche nature of the study area, it became exceedingly difficult to find such extensively cited sources. As a result, a compromise was made, and older or less-cited studies were incorporated. However, despite this compromise, all the selected papers underwent a thorough evaluation for relevance, methodology, author credibility, and the soundness of their conclusions.

Following an extensive literature review and employing a snowballing methodology, this research study collected primary data through the administration of a questionnaire/survey as the third stage. This Data Collection instrument was designed to gather information related to the engagement of internal stakeholders in the implementation of green innovation within Batch and Continuous process industries. The data collected were utilized to verify the findings obtained from the literature review and to perform a quantitative analysis.

The study used the theoretical framework previously depicted in Figure 4 to guide the formulation of questionnaire questions for the quantitative analysis and then the statistical analysis. This framework drew upon existing literature and theories related to green innovation, internal stakeholder engagement, and process industries. The research questions could be successfully addressed thanks to the hypotheses generated by this framework, which also served as a guide for the data-gathering procedure (Sekaran & Bougie, 2016).

5.2 Sampling

The primary focus of this research was to examine the successful implementation of green innovation within the process industry. It also attempted to investigate the methods used to involve internal stakeholders and ensure the implementation's success. The unit of analysis for this study was individuals, and extensive research was conducted on their traits, actions, and views. The findings of this study were based on information gathered at the individual level.

The population of this study consists of internal stakeholders specifically the employees and experts working in the Batch or Continuous process industries. People from diverse departments, such as project management, operations, maintenance, safety and other relevant jobs, are focus groups that will be included. When it comes to organizational changes, these workers are on the front lines, and they play a crucial part in assisting their companies in implementing green innovation ideas into practice. The research study aimed to include participants from a variety of businesses operating in the Batch and Continuous process industries to obtain a representative sample. To ensure a sufficient representation of the target population, the sample size was determined using appropriate sampling techniques.

5.3 Selection Criteria

Employees from different projects and different businesses in the process industry are selected for this research. As mentioned, the network participating in the research is named NAP, or the Process Industry Network, and is a platform for the Dutch process sector. According to their website, NAP is more than just a branch organization; it operates as a knowledge network organization with the main goal of improving the country's process industry's organization, vitality, and sustainability. The member businesses in NAP have a shared dedication to sustainability and environmentally friendly innovations. They are committed to creating both private and public policies that support these ideals. These business participants often engage in large-scale operations and uphold clear values and a solid corporate culture, which direct their choices and overall business strategy (*BUSINESS PARTICIPANTS - NAP*, 2023).

5.4 Data Collection Procedures

The data collection procedures for this research study involved the distribution of a questionnaire to potential participants within the NAP network. Leveraging this network allowed the research study to access a pool of potential participants with relevant knowledge and experience in the field of green innovation implementation in the process industry.

The questionnaire was carefully designed to gather important information about the implementation of green innovation in the process industry. The questions were thoughtfully crafted to encourage detailed and insightful responses from participants in a respectful and professional manner.

To ensure ethical considerations and informed consent, in the opening statement of the survey the participants were approached with a clear explanation of the research study's purpose and the voluntary nature of their participation. The questionnaire included a consent statement at the beginning, and participants were required to indicate their consent before proceeding with the survey. This ensured that participants were aware of the study's objectives and willingly provided their responses.

During the data collection process, specific protocols and guidelines were followed to maintain the integrity and quality of the data as specified by the Human Research Ethics Committee (HREC) of TU Delft. The study followed the mandatory HREC screening service for research involving data from Human Research Subjects. It obtained the corresponding approved application which is included in the Appendix A.3, demonstrating adherence to the ethical standards and regulations established by the HREC.

The survey was administered during the summer of 2023. The location of data collection was primarily focused on the Netherlands due to the research study's context and the presence of the NAP network. The duration of data collection spanned two weeks to allow participants sufficient time to complete the survey while ensuring a reasonable time frame for data gathering. The survey was conducted exclusively in the English language to ensure consistency and facilitate broader participation from respondents.

Initially, the survey was sent to the NAP director, who then forwarded it to five key experts within the NAP council for further distribution. Subsequently, the survey was disseminated to an undisclosed number of participants within the NAP network with an approximate count of around 40. Consequently, only the complete received replies could be considered, while the precise count of individuals who had access to the survey remained unknown. After sending out the survey, two follow-up emails were sent to participants. The first follow-up email was sent seven days after the initial distribution, followed by a second email sent ten days later the initial distribution. These reminders were intended to prompt participants who may have missed or forgotten to complete the survey. The purpose was to increase the response rate and gather comprehensive data for analysis, while also respecting participants' time.

Unfortunately, due to various constraints, only 24 responses were received, resulting in a sample size of 24 out of 40 and a response rate of 60%. It is worth noting that the survey was submitted 33 times in total, 3 of the received responses were incomplete, and 6 submissions were left empty, indicating that some participants may have been using the survey as a testing ground. With the conceptual model incorporating three predictors crucial for exploring relationships, this smaller sample size is a consideration. While the sample size isn't ideal, it comes close to the recommended "10-to-1 rule" for regression analysis with three predictors (Shtatland, Kleinman, & Cain, 2005). It's important to acknowledge that this smaller sample size may have implications for the generalizability of the findings to the entire population of NAP network participants.

However, despite this limitation, the collected data still provides valuable insights that can be explored in a descriptive manner. The analysis of the data will be undertaken with utmost seriousness and will be executed in accordance with scientific standards, ensuring its integrity and respect. The necessity for thoroughness and accuracy will be recognized and upheld throughout the process.

It is essential to recognize the preliminary nature of the findings and consider them as indicative rather than definitive.

6 Measurement

The research utilised the survey/questionnaire method for data gathering and hypothesis testing. The measurement scales utilized in the questionnaire were derived from existing literature and subsequently modified to suit the specific context of the research study. Relevant scales from various studies were identified and carefully chosen based on their applicability to the research variables. To ensure their suitability, these scales were then adjusted, resulting in the development of self-developed scales.

Both closed and open-ended questions are employed to capture the participants' personal opinions, experiences, and viewpoints. The closed-ended questions provide a structured approach to measure participants' agreement or disagreement with specific statements, while the open-ended questions allow for more in-depth and nuanced responses. The survey employs a six-point Likert-type scale to assess the variables, with respondents indicating their level of agreement on a scale ranging from 1 (strongly disagree) to 5 (strongly agree) and the option "Don't Know". This scientific research involves recording and analyzing variables using different levels of measurement. This is particularly relevant in collecting demographic data and Likert scale questions, where all four levels of measurement (Nominal, Ordinal, Interval, and Ratio) are utilized (Sekaran & Bougie, 2016). It is important to note that the open-ended questions included in the survey are not intended for evaluation in the final findings. Rather, they serve the purpose of providing a better understanding of the participants' job description and gathering specific examples of green innovation that were on their minds while responding to the survey.

The Appendix A.2 of this study contains all 50 survey questions including the demographic questions that were utilized to gather the study's data. The demographic characteristics of participants were measured with 6 questions. The selected demographic questions were chosen to align with the research objectives and ensure their relevance to the study. These standard demographic items aim to gather pertinent information about the participants such as their process industry employer, years of working experience, domain of activity and more.

6.1 Independent Variables

Diverse Industry Challenges (DIC) in the context of Green Innovation (GI): The relationship between green innovation and the specific processes employed in batch and continuous industries is addressed with 10 items. The terms "Batch" and "Continues" are not used in the formulation of the items. The demographic component of the survey asks participants to indicate the process industry they are now employed in. Some examples of the items used in the questionnaire are "Implementing green innovation in our production process is challenging.", and "The time required to implement green innovation in our processes is generally low." the rest are included in the Appendix A.2. These items were drawn and adjusted from the literature and the studies referenced include Hock et al. (2021), Benavides et al. (2013) , Malhotra (2005), Aboelmaged and Hashem (2019),Trotha et al.(2018),George and Shoemaker (2002), and Bergfors and Larsson (2009).

Internal Stakeholders' Perspectives & Worries (PW) in the context of Green Innovation (GI): 10 items were used for measuring each person's worries and perspectives in relation to their views on green innovation. These items were developed to assess people's responses to green innovation while addressing their motivations and concerns. Several items employed in the survey include "The introduction of green innovation in my work has required adjustments and adaptations in my daily tasks.", and "I am confident that my skills and expertise will still be relevant and valuable in the context of green innovation." while the remaining ones are appended for reference. The items were derived and adjusted from the literature and the studies cited encompass the works of Singh et al. (2020), Jayaraman et al. (2023), Weng et al. (2015), Zhang et al. (2020),and Karimi Takalo et al. (2021)

Engagement Strategies (ES) in the context of Green Innovation (GI): The strategies employed by organizations to engage their internal stakeholders in green innovation initiatives were measured with 11 items. The items assess not only effective engagement strategies but also they are examining the impact of the selected tools on individuals' engagement towards the implemented green innovation practices. A selection of items utilized in the questionnaire comprises "The management actively sought and valued the opinions and ideas of employees during the implementation of green innovation in my project.", and "Workshops or brainstorming sessions were organised to generate innovative ideas and solutions related to the implementation of green innovation in my project." with the remaining entities being appended in the Appendix A.2 These items were adjusted and formulated based on the information extracted from the literature review and the studies cited consist of the research conducted by Kompaso and Sridevi (2010), Osborne and Hammoud (2017), Men (2014), Manetti (2011), Osborne and Hammoud (2017), and Wiradirja et al. (2020)

6.2 Mediator Variable

Implementation (GII) in the context of Green Innovation (GI): A subset of 7 dedicated items was carefully selected to investigate the role and influence of the mediator variable. In addition, the mediator variable was subjected to comprehensive testing using all 32 previously established items that examined the relationship of the respective variables. Within the questionnaire, a few representative examples of the items utilized are "The green innovation practices implemented in our project are replicable and scalable.", and "The project effectively monitors and evaluates the progress and performance of the green innovation initiatives." with the remaining ones provided in the Appendix A.2. The items were created using data taken and adjusted from the literature and the studies referenced include Ben Arfi et al. (2018), Shokri-Ghasabeh and Kavousi-Chabok (2009), and Tseng et al. (2013)

6.3 Dependent Variable

Project Success (PS) after the Green Innovation Implementation (GII): The relationship between green innovation implementation after the effect of the independent variables and its impact on project success is evaluated through 3 specific items. These measures provide insights into the extent of green innovation's influence on the overall project success. Several items employed in the questionnaire are "The organisation achieved a competitive advantage through the successful integration of green innovation practices" and "I think that integrating green innovation practices can lead to project success" whilst the rest are annexed within the Appendix A.2. The items were created using data taken and adjusted from the literature and the studies cited consist of the research conducted by Sun et al. (2020) and Tseng et al. (2013)

6.4 Control Variables

For the purpose of clarifying their influence on the research parameters, this thesis includes two control variables within the suggested model.

Process Industry Employer (PIE): The first control variable in this thesis focuses on the type of process industry, which is divided into three categories: batch, continuous, and hybrid. Including these categories is crucial because it allows for a thorough comparison and analysis of the distinct challenges faced by each type impacting the implementation and the project's success (Hock et al., 2021).

Shift Work (SW): The second control variable in this thesis focuses on whether the key experts in the process industry work in shifts, a feature commonly associated with continuous process industries. The working schedule, involving shifts, may introduce specific challenges or considerations that affect how the project is perceived and engaged with by the internal stakeholders impacting the project success (Dhande & Sharma, 2011).

7 Analysis and Findings

The analysis commenced with a comprehensive descriptive examination of the focused survey questions. This preliminary step was paramount in gaining a deeper understanding of the sampled population and their responses. By meticulously dissecting the survey data, key demographic patterns, preferences, and trends among the participants can be uncovered. This process not only provides a foundational snapshot of the sample but also serves as a critical precursor for subsequent inferential and exploratory analyses. Through this detailed exploration, the unique characteristics and insights that the survey data can offer were highlighted, setting the stage for a more nuanced and insightful examination of the research objective.

The demographic makeup of the sample was thoroughly explained, offering a complete view of the participants' characteristics. Additionally, the rank questions, which formed the core of the comparative analysis, were examined in detail to enable a comprehensive exploration of key ideas. Special attention was given to the individual items within the variables, as they held significant explanatory value. Furthermore, the open-ended questions were looked into, with the aim of uncovering the motivations behind the responses provided by the participants. This approach ensured a full understanding of the data, covering both the quantitative aspects and the qualitative details that enriched the analysis.

To ensure a comprehensive understanding of the research findings, the survey data collected were analyzed using the Statistical Package for the Social Sciences (SPSS). This analysis aimed to delve into the data, uncover patterns, and provide valuable insights into the research variables. Prior to conducting the analysis, the necessary data cleaning and standardization procedures were carried out, ensuring that all questions had the same direction.

The statistical analysis encompassed various techniques to gain deeper insights into the research variables. Firstly, descriptive statistics were utilized to summarize the key characteristics of the collected data. Secondly, reliability testing was conducted to assess the consistency of the measurement instruments employed. Furthermore, correlation and regression analysis were conducted to examine the linear relationships and causality effects between the variables. To enhance the analysis, the SPSS add-on tool called 'PROCESS,' developed by Andrew F. Hayes (Model 4), was utilized to perform mediation analysis (Hayes, 2013). Moreover, hypothesis testing was carried out to determine the significance of the research findings. Finally, control variable analysis was performed to investigate the potential impact of additional factors. All of the subsequent statistical analyses in this study are grounded in the methodology outlined in the book 'Discovering Statistics Using IBM SPSS Statistics' by Field (2013) .

In this study, self-developed scales were used, but a factor analysis was not carried out. This decision was based on the research context, the nature of the variables involved, and the limited sample size. It typically requires a larger sample size and clear underlying factors in the data, which may not have been present in this study due to the limited sample size or unclear factor structure. Instead, other statistical techniques were employed to investigate the relationships and patterns within the data, allowing for meaningful analysis and interpretation of the research findings.

7.1 Descriptive analysis

7.1.1 Sample Demographics

The Table 1 displays the demographics of the distributed survey. The process industry employer categories showed a diverse distribution, with the majority of responses (37.5%) falling under "Continuous Process." Noteworthy examples of other industries mentioned include Engineering contractors, which were identified three times. A significant majority of participants (79.17%) possessed over 16 years of professional experience in the process industry. The domain of activity also exhibited a wide range of choices, with Engineers and supply chain experts mentioned three and two times, respectively, under the "other" category. Regarding the question of whether key experts worked in shifts, the distribution was fairly even, leaning towards a negative response (58.33%). Lastly, it is worth mentioning that almost all participants had either been involved or were currently involved in green innovation practices (95.83%).

Table 1: Demographics

Characteristics	(N)	(%)
Process industry employer		
Batch Process	6	25
Continues Process	9	37.5
Hybrid Process	4	16.67
Other	5	20.83
Total	24	100
Years of experience		
Entry-Level: 0-2 years	1	4.17
Mid-Level: 3-7 years	2	8.33
Experienced: 8-15 years	2	8.33
Senior-Level: 16+ years	19	79.17
Total	24	100
Domain of activity		
Asset/Company Owner	2	8.33
Project Manager	5	20.83
Operation expert	2	8.33
Maintenance expert	2	8.33
Safety expert	2	8.33
Sustainability expert	3	12.50
Other	8	33.33
Total	24	100
Key experts in shifts		
Yes	10	41.66
No	14	58.33
Total	24	100
Involved with GI		
Yes	23	95.83
No	1	4.17
Total	24	100

In the Table 1, "N" represents the total frequency of the responses, while "%" denotes the rate of this frequency divided by the total number of responses.

7.1.2 Comparison analysis: Regular and Green Innovation based on rank questions

In the questionnaire for this study, participants were tasked with ranking the importance of experts in both regular innovation and green innovation contexts using a numerical scale, where the number one represented the most important expert and six denoted the least important expert. This additional descriptive analysis aimed to compare the obtained rankings in both contexts, with the goal of identifying any potential variations in the perceived significance of experts when considering environmentally sustainable practices. Some of the key findings from this analysis are depicted Table 2, while the remaining data can be found in the Appendix A.5.

Table 2: Rankings of Expert Importance in Regular and Green Innovation Contexts (Including Mean)

Innovation

Rank	Expert	Mean
1	Asset/Company Owner	1.33
2	Project Manager	2.29
3	Operation Expert	3.79
4	Safety Expert	4.00
5	Sustainability Expert	4.38
6	Maintenance Expert	5.21

Green Innovation

Rank	Expert	Mean
1	Asset/Company Owner	1.63
2	Sustainability Expert	2.58
3	Project Manager	2.67
4	Safety Expert	4.17
5	Operation Expert	4.54
6	Maintenance Expert	5.42

The analysis of the rankings reveals interesting insights. In both regular innovation and green innovation contexts, it is noteworthy that the asset/company owner consistently emerges as the most important expert to engage. Notably, when examining the rankings, it was observed that the mean ranking for asset/owners was 1.33 in the regular innovation context and 1.63 in the green innovation context.

When examining the rankings further, a significant difference becomes apparent. In the case of regular innovation, the sustainability expert is ranked second to last with mean 4.38, indicating relatively low importance. However, in the context of green innovation, the sustainability expert jumps to the second-place position and mean 2.58. This finding strongly suggests that the presence of a sustainability expert is not only necessary but almost mandatory when it comes to implementing green practices. It highlights the critical role that sustainability experts play in driving environmentally sustainable innovation within organizations, underlining the need to prioritize their involvement and expertise in green innovation initiatives.

7.1.3 Comparison analysis: Industry Challenges based on single scale items

Before delving into the analysis of industry challenges related to green innovation implementation, it is essential to mention that the participants were presented with Likert scale questions designed to evaluate the presence of specific challenges within their process industry. These questions sought to gauge the degree to which these challenges affected the green innovation initiatives. Subsequently, the outcomes of these Likert scale responses were collected and are presented in the Table 3.

Table 3: Assessment of Industry Challenges based on a 5-Point Likert Scale (Including Mean)

Green Innovation Implementation

Rank	**Industry Challenges**	**Mean**
1	The infrastructure and equipment	4.46
2	The big capital investment required	4.30
3	The nature of the production process	4.13
4	The complexity of the production process	3.38
5	The level of automatisation	3.25
6	The high time period required	3.04

Notably, the highest mean scores, namely 4.46 for infrastructure and equipment, and 4.30 for the substantial capital investment required, underscore the prominence of these challenges within the sphere of green innovation implementation. Conversely, challenges such as the complexity of the production process (with a mean score of 3.38), the level of automation (mean score of 3.25), and the extended time duration demanded (mean score of 3.04), received lower ratings on the Likert scale. These findings, where the mean scores consistently hover around 5 and 4, provide strong evidence that participants affirmed the presence of these challenges in the context of green innovation implementation.

From a broader perspective, it's important to underline that a significant portion of the participants acknowledged the challenges linked to implementing green innovation across various production methods, including batch, continuous, or hybrid. This recognition is evident in the mean score of 3.92, emphasizing the inherent complexities in adopting sustainable practices within the process industry. Moreover, the majority of respondents strongly believe in the crucial role of green innovation for sustainable development, as indicated by the mean score of 4.29. Most notably, participants recognize that integrating green innovation practices aligns seamlessly with our organization's long-term strategic goals, as reflected in the highest mean score of 4.71. These findings underscore the significance and strategic relevance of incorporating green innovation within the industry, both in the present and for future endeavors.

7.1.4 Comparison analysis: Internal Stakeholders' Perspectives & Worries based on single scale items

It is crucial to highlight that the participants in this study were presented with Likert scale questions designed to assess their perspectives and worries in the context of green innovation (GI). It's noteworthy that the questions referring to the worries were framed in a negative context. However, to ensure consistency and facilitate analysis, all the survey questions were processed in the same direction. In this case, negative statements were reversed to align with a positive evaluation. For instance, "The implementation of green innovation has increased my workload" was transformed into a positive statement: "No extra workload due to GI". The Table 4 presents the worries and worries of internal stakeholders.

Table 4: Assessment of Internal Stakeholders' Perspectives and Worries based on a 5-Point Likert Scale (Including Mean)

	Green Innovation	
Rank	**Prspectives**	**Mean**
1	Awareness of the company's GI projects	4.46
2	Personal interest in actively joining GI	4.38
3	Personal commitment to promote GI	4.21
4	Work motivation and engagement increase due to GI	3.71
5	Better awareness of sustainability through GI	3.70

	Green Innovation	
Rank	**Worries**	**Mean**
1	Confidence in skills and expertise in the context of GI	4.71
2	Willingness to embrace new approaches and technologies for GI	4.54
3	Job security confidence amid GI	4.46
4	No extra workload due to GI	3.29
5	No daily task adjustments needed for GI	3.25

The Perspectives side of the Table 4 indicates strong support and awareness of company GI initiatives, with a mean score of 4.46, reflecting effective communication and awareness-building strategies. Internal stakeholders also express significant interest (mean score of 4.38) and personal commitment (mean score of 4.21) to promoting GI. However, there is room for improvement in terms of motivation (mean score of 3.71) and enhancing awareness of sustainability through GI (mean score of 3.70).

The Worries side of the Table 4 demonstrates that stakeholders generally have high confidence in their skills, with a mean score of 4.71, and a strong willingness to embrace new approaches and technologies related to GI, with a mean score of 4.54. Importantly, they feel secure in terms of job stability (mean score of 4.46) despite GI implementation. However, there are moderate concerns regarding the potential extra workload (mean score of 3.29) and daily task adjustments (mean score of 3.25) required for successful GI adoption.

This contrast between the framing of the questions and the positive responses underscores the overall positive attitude and readiness of stakeholders to engage with and support GI initiatives. It suggests that while there may be concerns and challenges associated with GI implementation, stakeholders in this study are generally optimistic and willing to embrace the changes and opportunities it brings.

7.1.5 Comparison analysis: Engagement Strategies based on rank questions and single scale items

The comparison analysis between engagement tactics was conducted in two distinct ways. Firstly, participants were asked to rank the strategies in order of importance, from the most crucial to the least. Secondly, participants were individually presented with Likert scale questions to assess whether these six strategies were utilized by their respective process industry companies during the implementation of green innovation.

In the ranking exercise for engagement strategies related to the implementation of green innovation, participants assigned mean scores to each tactic, depicted in Table 5. The lower the mean score, the higher the rank of importance, indicating that tactics with lower mean scores received greater emphasis in the context of green innovation implementation. Notably, workshops emerged as the most important tactic, with a mean score of 2.04. This finding highlights the significance participants attributed to workshops as an effective means of engagement for promoting and driving green innovation practices. In contrast, the reward system received a lower mean score of 5.00, indicating comparatively less importance. Participants perceived the reward system as having a smaller impact on fostering engagement in green innovation initiatives.

Table 5: Rankings of Engagement Strategies for Successful Green Innovation Implementation (Including Mean)

Green Innovation Implementation

Rank of Importance	Engagement Strategies	Mean
1	Workshops	2.04
2	Team meetings	2.75
3	Training sessions	3.58
4	Informative e-mail/communication channels	3.63
5	Feedback mechanisms	4.00
6	Rewards	5.00

Based on the individual Likert scale questions, the results presented in Table 6 indicate that the utilized engagement strategies had mean scores that were notably high. The informative e-mail and communication channels received the highest mean score at 4.18, closely followed by workshops at 4.05 and team meetings at 3.92. Training sessions, with a mean score of 3.55, and feedback mechanisms and rewards, both with a mean score of 3.33, were also scored significantly above the neutral midpoint of the Likert scale. These results, with mean scores predominantly close to 5 and 4, strongly suggest that the participants verified that these tactics were indeed utilized when implementing green innovation.

Comparing the two methods and the tables associated with them, it becomes evident that one method consistently supports and verifies the other. This alignment is particularly noticeable given the congruence in the sequence of importance and utilization between the two tables. The primary distinction lies in the utilization of emails as the initial method of engagement, as indicated in Table 5, despite their relatively lower ranking in terms of importance according to Table 6.

Table 6: Assessment of Utilised Engagement Strategies based on a 5-Point Likert Scale (Including Mean)

	Green Innovation Implementation	
Rank of Utilisation	**Engagement Strategies**	**Mean**
1	Informative e-mail/communication channels	4.18
2	Workshops	4.05
3	Team meetings	3.92
4	Training sessions	3.55
5	Feedback mechanisms	3.33
6	Rewards	3.33

However, this discrepancy may be attributed to the practicality of emails as an initial communication tool. Moreover, the prominence of workshops, chosen as the most important tactic of engagement, likely reflects participants' firsthand experiences, as they overwhelmingly confirm it to be the second most utilized engagement tactic. It's possible that companies in the process industry are already aware of the pivotal role of workshops in engaging their employees, explaining their preference for this approach.

These results offer helpful data for businesses looking for efficient methods for engagement in their exploration of green innovation. The emphasis on workshops underscores the importance of hands-on, interactive approaches in promoting participation and generating enthusiasm for green innovation (Collins Dictionary, 2023b). Meanwhile, the limited significance placed on the reward system suggests the need for alternative strategies to motivate and engage stakeholders in green innovation practices.

7.1.6 Analysis of participant insights on Implemented Green Innovations based on open-ended question

In the analysis of responses to the open-ended question regarding implemented green innovation that is presented in Table 7, several recurring themes and patterns were identified. Reference was frequently made by participants to the adoption of renewable energy sources and green energy, indicating a commitment to the reduction of environmental energy-related impacts.

Additionally, a notable emphasis was placed on emission reduction strategies, including CO2 reduction initiatives and stakeholder education, demonstrating a proactive stance toward environmental responsibility. Sustainability practices were prominently featured, with mentions of sustainable supply chain choices, workplace safety enhancements through sustainable methods, and waste reduction strategies. Energy efficiency played a vital role, as some participants discussed the implementation of energy-efficient processes, the utilization of energy management systems, and the integration of renewable energy sources. Recycling, waste reduction, and environmental impact reduction initiatives showcased participants' dedication to responsible resource management. Technological innovation emerged as a pivotal aspect, with responses detailing innovative green solutions, novel technologies, and research projects focused on emissions reduction and future planning.

Table 7: Description of the implemented green innovation

Description of the Green Innovation	GI Process	GI Product	**Other GI**
"Could be the use of energy from renewable sources, Green energy"	X		
"I am involved with the Green H project for energy consumption reduction"	X		
"Mainly CO2 emission reduction strategy and stakeholder education"	X		
"Resource savings using sustainable supply chain choices for the good of the environment"	X		
"Workplace safety enhancement using sustainable practices"			X
"Energy management systems for carbon footprint reduction"	X		
"Recycling, waste reduction, environmental impact reduction"	X		
"Energy-efficient processes, renewable energy solutions, resource utilisation, carbon emissions reduction"	X		
"Projects aimed at enhancing the environment. Projects involving innovative green solutions to decrease CO2 emissions using novel technology. Evaluations focused on planning for the future of our company."	X		
"Retrofitting with Renewable Energy Integration"	X		
"Carbon Footprint Reduction, Conducting emissions assessments, implementing energy-saving initiatives"	X		
"More focus on optimising processes with green alternatives"	X		
"Waste Management and Recycling Initiatives, Recycling programs, waste-to-energy facilities, and waste-reduction strategies."	X		
"Green innovation mainly for hybrid working"			X
"Hydrogen was produced on-site with an electrolyser."	X		
"various: transition to H2, developing E-boilers and E-Furnaces, innovations in wind parks, research projects, new materials for biofuels, etc"	X	X	
"I am part of the Green H2 project development. The project is new with various new Green solutions required. Part of my job is to source new Green solution providers and engage them in projects and I am continuously doing so. We are in the middle of the project with various new solutions to be implemented further."	X		
"Change out of diesel generators to low-emissions gas generators.Try-pout of bio-diesel Electrification Low-impact facilities Use of solar panels to power navaids"	X		
"Green Hydrogen production and carbon reduction in feedstock"	X		
"Green hydrogen production Storage of renewable power"	X		
"Carbon capture, Hydrogen, Recovery of precious metals"	X		
"Looking at reducing the CO2 released for converting iron or to iron and in steel making"	X		
"In the steel industry we are working very hard to transition the core processes"	X		
"Carbon Footprint Reduction. Developing strategies to measure, monitor, and reduce carbon emissions throughout the supply chain."	X		

It is evident that a significant emphasis was placed on the process of green innovation. References consistently revolved around aspects such as the utilization of renewable energy sources, the implementation of emission reduction strategies, and engagement in recycling efforts. Conversely, specific mentions of green innovation products or alternative forms of green innovation were relatively infrequent and limited to just one or two participants. This aligns with the prevailing focus of the process industry on process-oriented sustainability and environmental responsibility approaches when implementing green innovation.

7.2 Statistical analysis

7.2.1 Reliability and Variables' Descriptive Statistics

Reliability analysis

The reliability analysis was conducted to assess the internal consistency of the variables in this study. The results indicate varying levels of reliability across the variables, as measured by Cronbach's alpha. It is important to note that the minimum acceptable limit of Cronbach's alpha stands at 0.7 (Nunnally, 1978).

Table 8: Reliability testing

Reliability analysis

Variable name	Number of items	Cronbach's aplha
PW	10	.609
DIC	10	.186
ES	10	.855
GII	7	.493
PS	3	.054

Firstly, the variable PW demonstrated a moderate level of internal consistency, with a Cronbach's alpha value of 0.609. On the other hand, the variable DIC showed a lower Cronbach's alpha value of 0.186, indicating weak internal consistency. In contrast, the variable ES exhibited high internal consistency, with a Cronbach's alpha value of 0.855. Additionally, the variable GII demonstrated a moderate level of reliability, with a Cronbach's alpha value of 0.493. Lastly, the variable PS showed a very low Cronbach's alpha value of 0.054, indicating poor internal consistency.

While some variables exhibit satisfactory internal consistency, others require attention. It's important to note that the stringent Cronbach's alpha requirement was fulfilled by only one item configuration. This underscores the challenge of maintaining sufficient data for meaningful analysis if variables were to be dropped. The study placed greater emphasis on the comprehensive evaluation of constructs and the conduct of analyses that hold significance, rather than solely pursuing heightened internal consistency. Although the SPSS suggested the Item Deletion procedure as a means to increase reliability, it was not pursued in this study, since all the items were deemed necessary for accurately measuring the constructs and the reliability wouldn't change notably enough if any items were removed. Therefore, no items were removed from the scales.

Variables' Descriptive Statistics

Table 9 displays the descriptive statistics, including Mean, Median, and Standard

Deviation, for all variables in the study, as presented in the previous section. To compute these statistics, a tactic was employed, where in the mean for each participant was calculated based on the items of each variable. Subsequently, the collective mean for each variable was determined. Notably, all the calculated means are consistently above 3 and lean towards the value of 5. This overall positive direction suggests that the experts in the process industry recognize the importance of implementing environmentally sustainable practices, fostering a culture of environmental responsibility and promoting innovation for a greener future recognising the practical difficulties that come hand in hand with the process industry environment.

Although some variables showed low reliability, they were still included due to their conceptual significance. The table provides valuable insights into the data distribution and central tendencies of the variables, allowing a comprehensive understanding of their characteristics, despite the reliability limitations.

Table 9: Descriptive Statistics

Descriptive Statistics of Variables

Variable name	**Mean**	**Median**	**Std. Deviaton**
PW	4.0778	4.0500	.44131
DIC	3.9940	3.9000	.34683
ES	3.6831	3.7889	.65966
GII	4.5580	4.5714	.31074
PS	4.6458	4.6667	.25210

The variable PW, with a Mean of 4.0778 and a Median of 4.0500, suggests that experts hold a positive personal attitude towards green innovation practices. The relatively small Standard Deviation of 0.44131 indicates that responses are closely clustered around the Mean, signifying a consistent agreement among participants regarding their positive personal interest and motivation in promoting green initiatives.

Regarding the variable DIC, with a Mean of 3.9940 and a Median of 3.9000, it implies that across the examined industry types, there is an overall difficulty at the practical level (time, cost, equipment) when it comes to implementing green practices. The moderate Standard Deviation of 0.34683 suggests a moderate level of dispersion, indicating some variability in participants' perceptions regarding the challenges faced in green innovation implementation.

For the variable ES, with a Mean of 3.6831 and a Median of 3.7889, it signifies that the engagement strategies used are perceived as useful, relevant, and present during the implementation of green innovation. The larger Standard Deviation of 0.65966 implies greater variability in the responses, reflecting diverse perspectives among participants concerning the effectiveness and relevance of engagement strategies in green innovation implementation.

Regarding the variable GII, the Mean of 4.5580 and the Median of 4.5714 indicate positive responses from participants, highlighting the successful integration and impact of green innovation practices within their projects. The relatively low Standard Deviation of 0.31074 suggests a high level of agreement among participants, showing that they generally share similar perceptions about their projects' effectiveness in driving environmentally sustainable practices within the process industry.

Finally, for the variable PS, with a Mean of 4.6458 and a Median of 4.6667, it is evident that the experts believe successful implementation leads to project success. The small Standard Deviation of 0.25210 further confirms that there is a strong consensus among participants concerning the positive impact of successful green innovation implementation on project outcomes.

7.2.2 Correlation and Regression analysis

Correlation analysis The correlation matrix revealed the relationships between the variables in the study. The data were analyzed using Spearman's rho, which measures the strength and direction of the correlations and the results are depicted in Table 10.

Table 10: Correlations

Spearman's rho		**PW**	**DIC**	**ES**	**PS**	**GII**
Correlation Coefficient	**PW**	1.000	-.011	.598**	.528**	.573**
Sig. (2-tailed)		.	.958	.002	.008	.003
Correlation Coefficient	**DIC**		1.000	.139	.267	.241
Sig. (2-tailed)			.	.518	.207	.256
Correlation Coefficient	**ES**			1.000	.273	.847**
Sig. (2-tailed)				.	.196	.000
Correlation Coefficient	**PS**				1.000	.428*
Sig. (2-tailed)					.	.037
Correlation Coefficient	**GII**					1.000
Sig. (2-tailed)						.

*. Correlation is significant at the 0.01 level (2-tailed).
**. Correlation is significant at the 0.05 level (2-tailed).

The results showed that there is a very weak and non-significant negative correlation between Internal Stakeholders' Perspectives & Worries PW and Diverse Industry Challenges DIC, indicating that the concerns and personal traits of internal stakeholders are not significantly influenced by the challenges faced in diverse industries. However, a strong and statistically significant positive correlation was found between PW and Engagement Strategies ES, implying that higher levels of internal stakeholders' perspectives and worries are associated with more engagement strategies in the project. Similarly, PW showed a strong positive correlation with both Project Success PS and Implementation GII, indicating that higher levels of internal stakeholders' perspectives and worries are associated with greater project success and successful implementation of green innovation practices within the process industry.

Regarding Diverse Industry Challenges DIC, it showed a very weak and non-significant positive correlation with Engagement Strategies ES, suggesting that the challenges faced in the types of process industries do not significantly impact the employed engagement strategies in the project. Additionally, DIC exhibited weak and non-significant positive correlations with both Project Success PS and Implementation GII, indicating that different industry challenges do not have a substantial influence on project success and the implementation of green innovation practices within the process industry.

Engagement Strategies ES displayed a very strong and statistically significant positive correlation with Implementation GII, highlighting the crucial role of engagement strategies in driving the successful implementation of green innovation practices within the process industry. On the other hand, ES showed weak and non-significant correlations with both Project Success PS and Diverse Industry Challenges DIC, suggesting that engagement strategies do not significantly impact project success or the challenges faced in diverse process industries.

Lastly, Project Success PS exhibited a moderate and statistically significant positive correlation with Implementation GII, indicating that successful implementation of green innovation practices is associated with project success within the process industry.

Regression analysis

In the regression analysis conducted to examine the relationship between the predictor variables DIC, PW, and ES and the dependent variable PS, the following results were obtained and presented in Table 11.

The initial model revealed a multiple correlation coefficient of 0.604, indicating a moderate positive association between the predictor variables and the dependent variable, Project Success PS. The R-square value, at 0.365, signifies that approximately 36.5% of the variance in PS can be accounted for by the predictor variables, namely DIC, PW, and ES. Taking into account the number of predictors and sample size, the adjusted R-square at 0.270 provides a more conservative estimate of the explained variance.

The standard error of the estimate at 0.21547 represents the average difference between observed and predicted values, indicating the regression model's accuracy in forecasting Project Success.

Moving to the analysis of variance (ANOVA) table, it reveals that the regression model is statistically significant with $F = 3.828$ and $p = 0.026$. This indicates that the predictor variables collectively contribute significantly to explaining the variability in Project Success. However, the R-square value suggests that a considerable portion of the variance remains unexplained, hinting at the possibility of other influential factors beyond the scope of this model.

Now, focusing on the coefficients table, valuable insights emerge regarding the relationships between each predictor variable and the dependent variable. The constant term in the model, at 2.629, represents the estimated value of Project Success when all predictor variables are zero. Among the predictors, PW exerts a statistically significant positive influence on Project Success, with a standardized beta coefficient of 0.533, indicating that increased Internal Stakeholders' Perspectives & Worries are associated with enhanced Project Success.

In contrast, Engagement Strategies ES exhibit a non-significant effect on Project Success, with a small standardized beta coefficient of -0.018. This implies that Engagement Strategies might not have a substantial impact on project success within the context of this analysis. Similarly, Diverse Industry Challenges DIC also demonstrate a non-significant effect on Project Success, with a standardized beta coefficient of 0.276. This suggests that the challenges faced in diverse industries may not be strong predictors of Project Success in this particular study.

Table 11: Regression results

Variables Entered /Removeda			
Model	Variables Entered	Variables Removed	Method
1	DIC,PW,ESb	.	Enter

a. Dependent Variable: PS
b. All requested variables entered.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.604a	.365	.270	.21547

a. Predictors: (Constant), DIC, PW, ES

ANOVAa						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.533	3	.178	3.828	.026b
	Residual	.929	20	.046		
	Total	1.462	23			

a. Dependent Variable: PS
b. Predictors: (Constant), DIC, PW, ES

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.629	.649		4.051	.001
	PW	.304	.116	.533	2.621	.016
	ES	-.007	.079	-.018	-.088	.930
	DIC	.201	.131	.276	1.530	.142

a. Dependent Variable :PS

7.2.3 Mediation effects analysis

To investigate the potential mediator effect, the SPSS analysis employed Model 4, simple mediation by Hayes (2013), utilizing the dependent variable Project Success PS and the independent variables Diverse Industry Challenges DIC, Internal Stakeholders' Perspectives & Worries PW, and Engagement Strategies ES, along with the mediator, Green Innovation Implementation GII. This approach allowed exploration of how the relationships between the predictor variables DIC, PW, and ES and the dependent variable PS were influenced by the presence of the mediator GII.

The paths that were investigated were: DIC-GII-PS, PW-GII-PS and ES-GII-PS. The only relevant path that provided value after the analysis was the PW-GII-PS and the first part of ES-GII-PS. Unfortunately due to low reliability, no safe conclusions can be drawn from this analysis. The rest of the analysis can be found in Appendix A.4.

Mediation path: DIC-GII-PS The results of the mediation analysis suggest that the relationship between DIC and PS was not statistically significant, both directly and indirectly through the mediator GII.

Mediation path: PW-GII-PS The results of the mediation analysis indicate that there is a statistically significant direct relationship between PW and both GII and PS. Furthermore, the total effect model reveals that PW has a significant overall effect on PS, considering both direct and indirect effects through the mediator GII.

Mediation path: ES-GII-PS The results of the mediation analysis suggest that there is a statistically significant direct relationship between ES and GII. However, the overall relationship between ES and PS, considering both direct and indirect effects through the mediator GII, was not statistically significant.

Hypothesis testing

Hypothesis 1 (H1) suggests that the presence of diverse industry challenges in the process industry negatively influences the implementation of green innovation and, as a result, project success. Based on the mediation analysis and hypothesis testing, it was found that the total effect of Diverse Industry Challenges DIC on Project Success PS was not statistically significant, with a coefficient of 0.2185 and a p-value of 0.1536. Therefore, the hypothesis that diverse industry challenges have a significant negative impact on green innovation implementation and project success could not be substantiated.

Hypothesis 2 (H2) supports that the presence of perspectives and concerns of internal stakeholders in the process industry positively influences the implementation of green innovation and, as a result, project success. The mediation analysis revealed a significant positive relationship between Internal Stakeholders' Perspectives & Worries PW and Green Innovation Implementation GII, with a coefficient of 0.3843, $p = 0.0058$. However, the direct effect of GII on Project Success PS was not statistically significant, coefficient = 0.1117, $p = 0.5335$. Nonetheless, the total effect of PW on PS, considering both direct and indirect effects through GII, was found to be statistically significant, coefficient = 0.3076, $p = 0.0066$. Thus, Hypothesis 2, stating that the presence of perspectives and concerns of internal stakeholders positively influences green innovation implementation and project success, was substantiated by the findings.

Hypothesis 3 (H3), which proposes that the presence of strategies employed to engage internal stakeholders positively influences the implementation of green innovation and, as a result, project success, the total effect coefficient was 0.1070, with a non-significant p-value of 0.1850. These results suggest that the overall relationship between ES and PS, considering both direct and indirect effects through GII, was not statistically significant. Therefore, based on the data, it appears that Hypothesis 3 was not substantiated.

7.2.4 Control Variables analysis

Process Industry Employer

The ANOVA results for the control variable Process Industry Employer PIE were examined in relation to the dependent variable, Project Success PS and other relevant variables in the study. The analysis aimed to determine whether the type of Process Industry Employer has a significant impact on the variables under investigation. The results depicted in Table 12 revealed that across the different Process Industry Employer groups, there were no statistically significant differences observed in the variables under investigation.

Table 12: ANOVA (Industry Type)

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
PW	Between Groups	550	3	.183	.934	.443
	Within Groups	3.929	20	.196		
	Total	4.479	23			
DIC	Between Groups	.579	3	.193	1.764	.186
	Within Groups	2.188	20	.109		
	Total	2.767	23			
ES	Between Groups	1.142	3	.381	.859	.478
	Within Groups	8.866	20	.443		
	Total	10.009	23			
PS	Between Groups	.308	3	.103	1.783	.183
	Within Groups	1.153	20	.058		
	Total	1.462	23			
GII	Between Groups	.302	3	.101	1.050	.392
	Within Groups	1.919	20	.096		
	Total	2.221	23			

Specifically, for Internal Stakeholders' Perspectives & Worries PW, the F-statistic was 0.934 with a p-value of 0.443, indicating no significant variation based on the type of Process Industry Employer. Similarly, for Diverse Industry Challenges DIC, the F-statistic was 1.764 with a p-value of 0.186, suggesting no significant differences among the groups. Likewise, Engagement Strategies ES exhibited a non-significant F-statistic of 0.859 with a p-value of 0.478, implying that the use of engagement strategies does not significantly vary with different Process Industry Employers. Additionally, the F-statistic for Project Success PS was 1.783 with a p-value of 0.183, and for Implementation GII, it was 1.050 with a p-value of 0.392, both indicating no significant impact of the type of Process Industry Employer on the respective variables.

In all cases, the p-values were greater than the conventional significance level of 0.05, suggesting that there were no statistically significant differences observed, and the type of Process Industry Employer may not be a significant factor influencing the outcomes of green innovation practices within the process industry.

Shift Work

The ANOVA analysis for the second control variable Shift Work (SW) in relation to the key variables related to green innovation practices is presented in Table 13. The purpose was to explore whether the presence of shift work has a significant impact on the variables under investigation.

Table 13: Independent Samples Test (shift work)

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2 -tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PW	Equal variances assumed	.498	.488	-.951	21	.352	-.18307	.19249	-.58338	.21724
	Equal variances not assumed			-.964	17.964	.348	-.18307	.18996	-.58221	.21607
DIC	Equal variances assumed	.589	.451	1.703	21	.103	.23968	.14078	-.05308	.53244
	Equal variances not assumed			1.639	15.073	.122	.23968	.14625	-.07190	.55127
ES	Equal variances assumed	.697	.413	1.155	21	.261	.33011	.28591	-.26448	.92470
	Equal variances not assumed			1.179	18.403	.253	.33011	.27991	-.25704	.91727
PS	Equal variances assumed	.039	.846	-2.012	21	.057	-.20767	.10319	-.42227	.00693
	Equal variances not assumed			-2.011	17.159	.060	-.20767	.10329	-.42545	.01010
GII	Equal variances assumed	.053	.820	-.210	21	.835	-.02920	.13879	-.31782	.25943
	Equal variances not assumed			-.208	16.664	.837	-.02920	.14013	-.32531	.26692

The results revealed that there were no statistically significant differences observed for Internal Stakeholders' Perspectives & Worries PW, t = -0.951, p = 0.352, Diverse Industry Challenges DIC, t = 1.703, p = 0.103, Engagement Strategies ES, t = 1.155, p = 0.261, Project Success PS, t = -2.012, p = 0.057, and Implementation GII, t = -0.210, p = 0.835, between participants working in shifts and those not working in shifts. Regarding green innovation Implementation GII, the t-test demonstrated no statistically significant difference between participants working in shifts and those not working in shifts,t = -0.210, p = 0.835.

The p-values for all variables were either greater than 0.05 or very close to this significance level. These findings suggest that the presence of shift work may not have a significant impact on the outcomes of green innovation practices within the process industry.

8 Discussion

8.1 Overview of Findings

The study explored the relationship between the implementation of green innovation practices, project success, and various influencing factors in the process industry. All the conducted statistical analyses that have contributed to the findings of this study are based on the book 'Discovering Statistics Using IBM SPSS Statistics' authored by Field (2013).

The demographic analysis of the distributed survey highlighted the diverse distribution of process industry employer categories, with a majority falling under "Continuous Process." Participants possessed considerable professional experience, and almost all had been involved or were currently involved in green innovation practices.

The comparison analysis at first focused on ranking the importance of experts in regular and green innovation contexts. Notably, sustainability experts were ranked higher in green innovation, emphasizing their critical role in driving environmentally sustainable practices. Moreover, the assessment of industry challenges was accomplished through the ranking of single-item scales, highlighting infrastructure and equipment as the primary significant hurdle in the context of GII. Additionally, an evaluation of internal stakeholders' Perspectives and Worries was conducted using single-scale items, revealing their positive disposition towards GII. Participants indicated personal interest in GI, while also recognizing the potential for increased workload and the need to adapt daily tasks.

The evaluation of Engagement Strategies involved two distinct approaches. Firstly, the strategies' importance was ranked through a ranking question, with the emergence of workshops as the most crucial strategy. Subsequently, participants shared their views on the utilisation of these strategies in the current GII landscape. It was unanimously agreed that emails were the most frequently employed, followed by workshops. Remarkably, the ranking sequence remained consistent across both methods, reinforcing the validity and alignment between them. The analysis of responses to the open-ended question on green innovation revealed recurring themes. Participants highlight renewable energy adoption, emission reduction, and sustainability practices, demonstrating commitment to environmental impact reduction. Energy efficiency, waste reduction, and technological innovation also play crucial roles. While green innovation processes receive significant attention, specific product mentions are rare, aligning with the process industry's focus on sustainability and environmental responsibility.

The correlation matrix revealed various relationships between the variables. Internal Stakeholders' Perspectives & Worries PW showed a strong positive correlation with GII and PS, while DIC exhibited weak correlations with other variables. ES demonstrated a strong positive correlation with GII. The regression analysis indicated that PW had a significant positive influence on PS, while ES and DIC did not have statistically significant effects on PS. The conducted regression analysis explored how predictor variables DIC, PW, and, ES relate to the dependent variable PS. The initial model showed a moderate positive link between predictors and PS. The regression model was statistically significant, signifying the combined influence of predictors on Project Success. However, a notable portion of variance remained unexplained, hinting at other influential factors. Among predictors, PW had a significant positive impact on PS, whereas ES and DIC did not significantly predict PS.

The mediation analysis explored the role of GII as a mediator between predictor variables DIC, PW, ES and PS. The results showed that GII partially mediated the relationship between PW and PS, but it did not mediate the relationships between DIC and PS or ES and PS. Consequently, the hypothesis stating that diverse industry challenges negatively influence green innovation and project success was not substantiated. However, the hypothesis suggesting that perspectives and concerns of internal stakeholders positively influence green innovation and project success was supported. The hypothesis proposing that strategies to engage internal stakeholders positively impact green innovation and project success was not substantiated.

Control variables analysis did not reveal statistically significant differences based on the type of Process Industry Employer or the presence of Shift Work, suggesting that these factors may not significantly influence green innovation outcomes within the process industry.

8.2 Updated Green Innovation implementation model

The evolution of our Green Innovation implementation model Figure 5 presents several notable distinctions from the original version Figure 4. These adaptations reflect a deeper understanding of the dynamics within the Dutch process industry context and its specific characteristics. The modified model underscores the nuanced interactions between variables and highlights the exclusive relationship between them, resulting in a more refined representation of the extent of the implementation process.

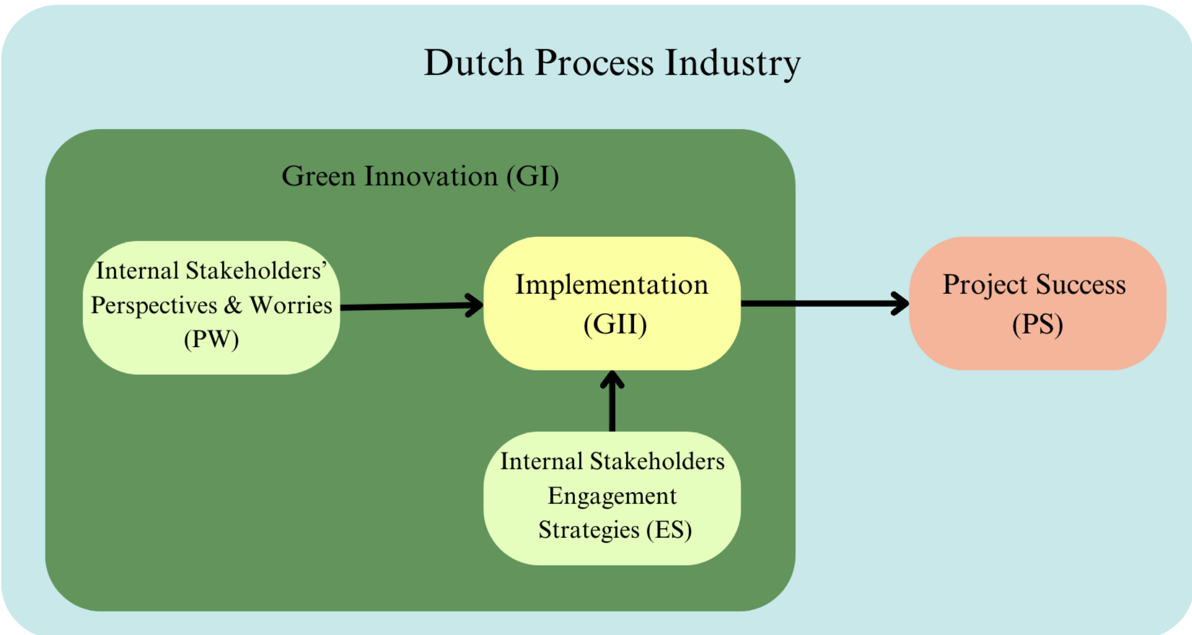

Figure 5: Updated Green Innovation implementation model

In contrast to the initial model, where the variable Diverse Industry Challenges DIC occupies a significant position, the updated model omits this variable. After further analysis and careful consideration, it became evident that DIC lacks significant relevance and influence within the scope of the Dutch process industry. The inherent complexities and unique characteristics of this industry make the DIC variable less pertinent, leading to its exclusion from the model. This adjustment highlights the necessity of refining the model to better capture the nuanced dynamics of the Dutch process industry.

A fundamental adaptation in the model pertains to its contextual backdrop. While the original model operated within a broad industrial context, the refined version focuses exclusively on the Dutch process industry. It is crucial to acknowledge that this research does not offer a universal solution for the global process industry due to the relatively modest sample size. Instead, it serves as an indicator of the intricate dynamics within the Dutch process industry. With a specific emphasis on batch and continuous processes, insights are provided by the model that caters to this unique subset of industrial practices.

A significant change in the model concerns the position of the variable Engagement Strategies ES. In the original model, this variable was aligned with the rest of the independent variables. In the updated version, Engagement Strategies (ES) have been moved directly below the mediator. This change highlights the unique and crucial interaction between the variables ES and GII. The analysis reveals a distinct interdependence between these two variables—one acting independently, while the other serves as its dependent counterpart. Notably, it's important to mention that the variable ES does not exert a significant influence on the original model's dependent variable, Project Success (PS).

This refined Green Innovation implementation model clarifies the intricate aspects of the Dutch process industry, particularly concerning batch and continuous processes. By removing unnecessary variables, adjusting the context, and reconfiguring variable relationships, the updated model provides a clearer understanding of the factors that shape the dynamics of Green Innovation implementation within the Dutch process industry.

8.3 Addressing the Research Question

This study focused on addressing the main research question: "How can different types of process industries effectively engage with their internal stakeholders to ensure the successful implementation of green innovation?" To comprehensively explore this question, it was broken down into four sub-questions, allowing for a detailed examination of various aspects related to fostering a culture of sustainability and environmentally responsible practices within each process industry type, with a special focus on Butch and Continuous (Malhotra, 2005).

The literature review, combined with the findings from the questionnaire, provided insights into the challenges encountered in the process industry as a whole, particularly within batch process industries and continuous process industries when it comes to implementing green innovation practices. This information pertains to the first sub-question, which explores the specific challenges associated with adopting environmentally friendly innovation practices in these industries.

The study examined the challenges specific to batch process industries and continuous process industries when implementing green innovation practices. In the literature review, various generic challenges in this regard have been identified as described by Hock et al. (2021), Benavides et al. (2013) and Malhotra (2005), and the survey sought to verify their impact on green innovation implementation and project success. Surprisingly, the findings indicated that these challenges did not seem to significantly affect the implementation of green innovation practices and project success but it's essential to highlight that the variable did not attain the required degree of reliability.

One plausible explanation for this unexpected result could be attributed to the expertise and confidence of the participants who responded to the survey. The majority of participants had extensive professional experience in the process industry and may have been well-equipped to handle the challenges. Their experience and confidence might have outweighed the potential hindrances posed by industry-specific challenges, enabling them to effectively implement green innovation practices (Wallin, Nokelainen, & Mikkonen, 2019).

Furthermore, the study explored potential differences in Green Innovation Implementation among different types of process industries and considered the influence of shift work. Literature findings suggest that Continuous manufacturing employees are concerned about the potential disruption of predictable shift schedules due to green innovations (Dhande & Sharma, 2011), while batch manufacturing workers focus on the broader impact of these innovations on production flow (Puigjaner & Espuña, 1998). Interestingly, the statistical analysis did not uncover any significant variations in GII across the diverse industry types or shift work arrangements. This finding supports the notion that the identified challenges specific to batch process industries and continuous process industries as well as the work schedules of key experts (whether in shifts or not), did not substantially influence the implementation of green innovation practices.

The analysis of literature sources, as well as the feedback obtained from the questionnaire, addressed the second sub-question, which focuses on understanding the concerns and perspectives of internal stakeholders within the process industry. These findings specifically address the second sub-question, which explores the specific perspectives and apprehensions held by internal stakeholders in relation to green innovation practices.

The literature analysis revealed a broad spectrum of perspectives, concerns and motivations of internal stakeholders in the process industry regarding green innovation practices. The findings showcased a diverse landscape of views, encompassing positive outlooks that underscored the significance of environmental sustainability (Weng et al., 2015), (Jayaraman et al., 2023), and (Zhang et al., 2020), as well as more cautious perspectives highlighting potential challenges, such as increased workload and concerns about job security (Karimi Takalo et al., 2021).

The survey responses provided valuable insights into how these stakeholders perceive and prioritize various aspects of green innovation. The internal stakeholders in both batch and continuous processes demonstrated a positive attitude towards green innovation practices. An important point to highlight is that the variable has indeed achieved the required level of reliability.

The data indicated that they recognized the importance of environmentally sustainable initiatives and were motivated to promote such practices within their organizations. The presence of a sustainability expert emerged as a crucial factor in driving green innovation implementation, particularly in the context of batch processes.

This finding suggests that stakeholders place considerable value on the expertise and guidance of sustainability experts when it comes to adopting green practices (Weng et al., 2015).

The third sub-question,, which examines the key strategies employed by process industry businesses to actively engage internal stakeholders in green innovation practices, was supported by the gathered literature information, along with the verification from the questionnaire. It's deserving of attention that the variable's reliability has been sufficiently established.

Process industry businesses employ essential strategies to engage internal stakeholders in green innovation practices. The literature suggests methods such as e-mails (Men, 2014), team meetings (Osborne & Hammoud, 2017), rewards(Osborne & Hammoud, 2017), training (Kompaso & Sridevi, 2010), workshops (Manetti, 2011) and more. The data analysis revealed that workshops emerged as a highly effective tactic for fostering participation and enthusiasm among employees. Through interactive and hands-on approaches, workshops provide practical training and encourage collaboration, creating a sense of ownership and commitment towards sustainability goals (Collins Dictionary, 2023b).

In contrast, the reliance on the reward system as an engagement strategy showed comparatively less significance. Financial incentives or rewards may not be the most influential factor in driving internal stakeholder engagement in green innovation. Instead, businesses should prioritize participatory approaches aligned with employees' values and motivations to instil a sense of purpose and shared responsibility for sustainable practices (Fazal-e-Hasan et al., 2023) .

The literature review and questionnaire findings effectively addressed the fourth and final sub-question, which pertains to understanding the impact of successfully implementing green innovation practices on project success.

Drawing from the literature, green innovation stands as a cornerstone of project success, offering competitive advantage and enhanced outcomes (Albort-Morant et al., 2016). Effective monitoring (Shokri-Ghasabeh & Kavousi-Chabok, 2009), top management support (Shokri-Ghasabeh & Kavousi-Chabok, 2009), and standardized frameworks are vital (Ben Arfi et al., 2018). Clear green innovation targets foster environmental solutions, yet stakeholder engagement varies in significance (Tseng et al., 2013).

According to the statistical analysis, the data suggests that the successful implementation of green innovation practices positively impacts project success within the process industry. The perspectives and concerns of internal stakeholders are crucial for driving successful green innovation initiatives. While the analysis of the data revealed that the engagement strategies used by process industry businesses positively impacted the implementation of green practices, it is important to note that these strategies may not necessarily lead to project success. However, the presence of diverse industry challenges and the use of engagement strategies may not significantly influence project success. Additionally, the type of Process Industry Employer PIE and the presence of Shift Work SW may not have a substantial impact on the outcomes of green innovation practices within the process industry. It's essential to highlight that the variable PS did not attain the required degree of reliability.

9 Conclusions

The concept of Green practices has globally changed how businesses approach innovation, inspiring the process industry to embrace cutting-edge environmentally friendly methods and continuously develop their green initiatives in order to better the environment and their bottom line (Lin & Chen, 2017). This study provides insight into effective stakeholder engagement strategies, which can enable process industry organizations to secure project success and enhance their green innovation management processes.

First off, this study ranks among the first to offer a thorough analysis of the impacts of the key internal stakeholders on green innovation practices specifically in the process industry, based on the idea of stakeholder engagement theory.

The present study aimed to investigate the impact of successful green innovation practices on project success within the process industry, with a specific focus on three key variables: Diverse Industry Challenges DIC, Internal Stakeholders' Perspectives & Worries PW, and Engagement Strategies ES. The findings derived from the data analysis shed light on the crucial role of green innovation practices in driving project success and promoting environmentally sustainable initiatives in the process industry.

Key findings from the study revealed a positive perception among experts in the process industry regarding the successful implementation of green innovation practices Green Innovation Implementation GII. This positive impact on project success highlights the importance of prioritizing environmentally sustainable practices and fostering a culture of environmental responsibility within organizations (Ben Arfi et al., 2018).

Internal Stakeholders' Perspectives & Worries PW emerged as a significant factor influencing green innovation practices and project success. The study demonstrated that higher levels of internal stakeholders' positive attitudes towards green innovation were associated with enhanced project success. It's worth highlighting that the variable showed satisfactory reliability. These perspectives and concerns play a pivotal role in motivating stakeholders and encouraging their active involvement in green innovation initiatives (Jayaraman et al., 2023).

Moreover, the study underscored the significance of effective Engagement Strategies ES in driving the successful implementation of green innovation practices within the process industry. It's important to note that the variable had achieved a satisfactory level of reliability. Workshops, in particular, were found to be highly influential in promoting participation and generating enthusiasm for green innovation. This highlights the need for interactive and hands-on approaches to engage stakeholders effectively (Collins Dictionary, 2023b).

While Diverse Industry Challenges DIC were recognized as part of the process industry environment, they were not found to have a significant impact on green innovation practices or project success. This suggests that despite the challenges faced in diverse industries, organizations have been successful in integrating green innovation practices effectively. However, it's of significance to recognize that the variable had not met the desired level of reliability.

The regression analysis and mediation effects analysis revealed that the three key variables, DIC, PW, and ES, collectively contribute to explaining project success, with PW playing a significant mediating role through GII. This indicates that the positive attitudes and concerns of internal stakeholders are instrumental in driving green innovation practices, thus influencing project success within the process industry (Weng et al., 2015).

Control variables, such as Process Industry Employer and Shift Work, were not found to have a significant impact on green innovation practices, further supporting the importance of the key variables examined in the study.

In conclusion, this study reinforces the importance of successful green innovation practices in promoting project success and sustainability within the process industry (Ben Arfi et al., 2018). The positive perceptions of experts and their recognition of the significance of internal stakeholders' perspectives and engagement strategies underscore the need for continuous efforts to drive innovation for a greener future (Jayaraman et al., 2023). Understanding these requirements can help businesses in the process industry improve their green innovation practices and achieve successful outcomes in their sustainability initiatives (Weng et al., 2015).

Research limitations

The research conducted in this study is subject to a limitation arising from the vastness of the existing literature in the field. It is highly likely that some relevant papers, despite their potential significance, have not been discovered or included in the review. The vastness of the literature combined with the niche nature of the topic makes it challenging to ensure comprehensive coverage of all relevant studies, resulting in the possibility of overlooking valuable insights or alternative perspectives. Additionally, there may be bias in the selection of studies, particularly if certain studies are excluded due to language barriers or accessibility issues (Ellenberg, 1994).

The influence of the researcher is an important aspect to consider when examining the limitations of this study. The researcher's individual biases, beliefs, and experiences may have influenced various stages of the research process, including the choice of methodology, data collection, and interpretation of findings. While efforts were made to minimize personal bias through rigorous data analysis and by seeking diverse perspectives, it is important to acknowledge that the researcher's subjectivity may have influenced the outcomes to some extent (Wilholt, 2009).

One of the primary limitations of my research is that it is impossible to accurately determine the reach of the survey conducted. The survey was initially sent to five key experts within the NAP council, and it was subsequently distributed to an unknown number of participants. As a result, only the amount of replies that were given can be known, while information regarding the total number of individuals who had access to the survey remains unknown. While conducting the research, certain constraints were observed, including limitations in sample size and response rate. It is important to acknowledge the presence of sampling bias and self-selection bias, which should be taken into consideration when interpreting the findings.

To calculate the ideal sample size based on a confidence level of 90%, a margin of error of 5%, and a population proportion of 50%, the formula $n = (Z\hat{2} * p * (1-p)) / E\hat{2}$ can be used (Field, 2013). By plugging in the provided values, the ideal sample size for the study is $n = 270.6025$. Rounding up to the nearest whole number, the ideal sample size would be approximately 271 participants. The population for this calculation consisted of the employees of affiliated companies within the NAP network in the Netherlands, which collectively amounts to approximately 120,000 individuals.

One research limitation that should be considered is the varying levels of internal consistency observed among the study variables such as DIC with a Cronbach's alpha value of 0.186 and PS with a very low value of 0.054 (Hayes, 2013). Furthermore, it is essential to acknowledge that the SPSS suggested the Item Deletion procedure to potentially improve reliability; however, this approach was not pursued in the study. All items were retained as they were considered necessary for accurately measuring the constructs (Field, 2013). Given these, caution should be exercised when drawing conclusions based on variables with weaker internal consistency.

Another limitation of this study is the reliance on self-reported data, specifically survey answers. This introduces the potential for response bias or social desirability bias, which can impact the validity of the findings. Response bias occurs when participants provide responses they believe are expected or socially desirable, leading to distorted data (Wilholt, 2009).

Despite these limitations, the findings provide valuable insights that can serve as a foundation for future research. Therefore, it is recommended to approach these findings as a starting point for further investigation rather than as definitive outcomes.

Generalisability

This section discusses the steps taken to enhance the generalisability of the study and the implications of the findings for wider applicability.

The generalizability of the findings presented in this thesis should be considered within the context of the aforementioned limitations, namely the sample size and response rate. This smaller sample size may affect the extent to which the findings can be generalized to the entire population of NAP network participants. Furthermore, it is crucial to recognize that the preliminary nature of the findings necessitates caution in drawing definitive conclusions. Instead, they should be viewed as indicative of trends and patterns. Replicating the research with a larger and more diverse sample would enhance the generalizability of the results.

On the other hand, a diverse range of perspectives was gathered through an extensive literature review that included studies from researchers. This thorough review aimed to gather a wide range of perspectives and insights related to internal stakeholder engagement and green innovation implementation in the process industry. This process allowed for a comprehensive understanding of the subject matter, incorporating the most up-to-date information available. By integrating insights from various sources, the study aimed to increase generalizability.

Additionally, the primary data collection involved a questionnaire/survey administered to the participants, employing a quantitative approach and standardized measurement scales. Rigorous quantitative analysis was conducted to verify the findings, using appropriate statistical techniques to identify patterns and relationships. The use of a quantitative approach allowed for systematic analysis of the collected data and the derivation of meaningful insights.

Finally, to ensure a diverse range of strategies and experiences, participants were selected from one of the largest process industry networks in the Netherlands. By including individuals from different backgrounds and positions, the study aimed to improve the generalizability of its findings and make them applicable to various contexts. However, it is important to acknowledge that the small sample size introduces some uncertainty regarding the representatives of the responses (Sekaran & Bougie, 2016).

10 Recommendations and Implications

The study's research findings can be utilized to provide advice to the process industry which is interested in internal stakeholders' influence. This is especially important because internal stakeholders are crucial to the development of operational procedures and the adoption of green innovation, both of which have a significant bearing on the project's overall success.

10.1 Recommendations

Recommendations for implementation of this research in practice

In the context of the process industry, the successful implementation of green innovation practices is crucial for driving project success and fostering environmental sustainability (Karimi Takalo et al., 2021). To achieve this, organizations should focus on increasing awareness (Fazal-e-Hasan et al., 2023) and understanding of sustainability initiatives among employees and stakeholders (Ben Arfi et al., 2018). Education and training programs should be implemented to equip experts in the process industry with the knowledge and skills needed to effectively implement green innovation.

Organizations should set clear and measurable sustainability goals that align with their overall business objectives. These goals should be communicated across the organization to ensure that everyone understands their role in achieving the organization's green vision (Tseng et al., 2013). Regular progress tracking and reporting will help monitor the success of green innovation practices and drive continuous improvement.

Workshops have been identified as highly effective engagement strategies for promoting green innovation practices (Collins Dictionary, 2023b). Organizations should leverage workshops to bring together cross-functional teams, internal stakeholders, and external experts (Ben Arfi et al., 2018). Through interactive sessions, participants can brainstorm ideas, share best practices, and develop innovative solutions to sustainability challenges. Collaborative workshops foster creativity and teamwork, leading to the identification of practical and actionable green initiatives (Manetti, 2011).

Periodic assessments and evaluations of green innovation practices are essential to track progress, identify areas for improvement, and adapt strategies as needed. Continuous learning and adaptation based on feedback and outcomes will help organizations refine their approach to green innovation and maximize its positive impact on project success and environmental sustainability (Shokri-Ghasabeh & Kavousi-Chabok, 2009).

By incorporating these practical recommendations, organizations in the process industry can effectively integrate green innovation practices into their operations, foster a sustainable culture, and drive project success while contributing to a greener and more sustainable future.

Recommendations for the future

For future research on the topic, several recommendations can be made to further expand our understanding of this area. First, future research should consider replicating the initial research with a larger sample size. By increasing the number of participants, a more representative and diverse range of perspectives can be captured, thereby improving the generalizability of the findings to the entire population of NAP network participants. A larger sample size would also enable researchers to conduct more robust statistical analyses, increasing the reliability and validity of the results (Sekaran & Bougie, 2016).

Additionally, expanding this study, future research endeavours can focus on the advancement of specific key performance indicators (KPIs) that demonstrate a direct association with the financial aspects of effective implementation (García-Granero, Piedra-Muñoz, & Galdeano-Gómez, 2018). Furthermore, investigating the enduring financial consequences of the successful adoption of green innovation can be undertaken by comparing the financial performance of batch and continuous process industries. This comparative analysis can shed light on the long-term financial implications of implementing environmentally friendly practices (Huang, Chen, Lei, & Zhang, 2022).

Moreover, future studies could consider narrowing their focus. Researchers could explore specific types of process industries such as pharmaceutical, chemical, gas production, and food production, within the context of green innovation implementation, delving into the unique challenges and strategies relevant to each industry (*Process Industries | AFRY*, 2023).

Additionally, future research could think about concentrating on a smaller area to either green product innovation or green process innovation, examining the distinct approaches and considerations associated with each type of innovation (Xie, Huo, & Zou, 2019). This would give a more complex picture of how different internal stakeholder engagement tactics rely on the type of innovation being pursued.

Finally, a potential avenue for future research could involve replicating this study while emphasizing the involvement of external stakeholders (Fauzi Rahman Jayaraman et al., 2020). By comparing the results, researchers can attempt to identify the specific group that exerts a greater influence on the successful implementation of green innovation practices in the process industry.

This study made a significant contribution to the body of knowledge on stakeholder participation in innovation implementation in the process industry, while also offering insightful advice to businesses looking to advance their innovation management procedures.

10.2 Theoretical and Practical Implications

In this thesis, a comprehensive review of the existing literature on internal stakeholder engagement in successful green innovation implementation within the process industry was conducted. Extensive research was undertaken to gather and centralize the available literature on this intriguing topic. By synthesizing and consolidating the relevant studies, a solid foundation was established, allowing for a deeper understanding of the subject matter. This literature review served as a crucial starting point for identifying key challenges, variables associated with green innovation, and the theoretical aspects surrounding stakeholder engagement. Additionally, this study thoroughly analyzed variables involved in engaging internal stakeholders for green innovation implementation. Through a literature review and quantitative survey, data was collected to gain insights into the specific challenges faced by organizations. This cross-referencing of theoretical concepts with quantitative data enhanced the validity and applicability of the findings, allowing for a more comprehensive analysis of the stakeholder engagement challenges in the context of green innovation.

This thesis introduces a comprehensive Green Innovation Implementation Model that focuses on engaging internal stakeholders This model offers a realistic way for businesses across process industry sectors to execute green innovation projects, recognizing the crucial role of internal stakeholders in driving sustainability practices. Additionally, various strategies are identified to facilitate internal stakeholder engagement and enhance the implementation of green innovation initiatives across different industries. Moreover, a proposed leverage method offers organizations a strategic approach to leverage their green innovation efforts for maximum impact and positive sustainability outcomes. By introducing the model, identifying strategies for internal stakeholder engagement, and proposing the leverage method, this thesis offers practical contributions that can assist organizations in successfully implementing green innovation practices and fostering a culture of sustainability.

10.3 Reflection

My thesis, was the result of extensive study and writing that allowed me to obtain insightful knowledge and grow professionally. This study's goals were to highlight the difficulties the process industry has, particularly when it comes to successfully involving internal stakeholders, and to offer suggestions for successful green innovation implementation.

My awareness of the significance of internal stakeholder involvement in fostering effective green innovation efforts has grown as a result of working on this thesis. I discovered that it might be difficult for firms to include internal stakeholders in decision-making procedures and win their support for sustainable practices. I learned tactics that can assist companies in overcoming obstacles and fostering a culture of collaboration and support by investigating and tackling these issues.

My perspective was also widened by doing a comparison of batch and continuous processes. I learned that the difficulties each process type faced varied, underscoring the necessity for specialized strategies to successfully involve stakeholders. This insight highlighted the significance of context-specific methods and the capacity to modify and personalize engagement initiatives in light of the distinctive features of each process. Additionally, I discovered that open lines of communication are essential for addressing issues, creating trust, and promoting active involvement in green innovation activities.

This thesis also emphasized the crucial role management backing and organizational dedication play in promoting green innovation. I improved my understanding of the importance of committed management, distributing assets, and the development of supportive environments. These elements help organizations develop a culture of environmental responsibility and create a sustainable foundation.

Moving forward, I'm dedicated to putting these ideas into reality while advancing them further in order to promote improvement and support environmentally friendly behaviour within the process industry and beyond.

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A Appendix

A.1 INFORMED CONSENT (QUESTIONNAIRE) – opening statement

Dear Participant, You are being invited to participate in a research study titled "Bridging the Gap: A Comparative Study of Internal Stakeholder Engagement Strategies in Batch and Continuous Processes for Successful Green Innovation Implementation." This study is being conducted by Anastasia Pritsa a master's student from TU Delft and supervised by Dr. W.W. (Wijnand) Veeneman and Dr. N. (Nikos) Pachos-Fokialis from TU Delft.

The purpose of this research study is to gather data regarding the internal stakeholder engagement strategies when implementing a green innovation in the process industry, specifically in batch and continuous process projects and the data collected will be used to identify themes and patterns that emerge from the participants' responses. The questions that you should expect during this questionnaire will ask you to share your experience and view on the engagement process regarding your project and your position. The study's findings will be presented in a clear and concise manner with appropriate citations and references to support the study's conclusions. The data will be used for the master's thesis and the thesis will be published at the TU Delft Educational repository.

To the best of our ability, your answers in this study will remain confidential. The following measures will be followed to minimize risks:

• The survey is anonymous.

• Personal data such as email addresses, which are used solely for administrative purposes, will not be shared and will be securely deleted upon the completion of the research project.

• If the employing company is mentioned by the participant, its identity will remain anonymous, and any information that could potentially reveal its identity will be kept deliberately vague. Specifically, only the type of processes industry (batch or continuous) in which the company operates will be disclosed.

• Anonymised data (the answers of the questionnaire, excluding free text answers) will be shared with others, as part of the thesis in the TU Delft Educational repository.

• Free text questions may be quoted or paraphrased as part of the resulting MSc thesis. The answers will be reviewed to ensure they do not contain personally identifiable information.

• All the data collected will be safely stored and backed up only in TU Delft-approved databases with access given only to the 1st and 2nd supervisor.

Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any questions. Your data provided can also be withdrawn within one month after completing this questionnaire. The e-mail of the corresponding researcher is a.pritsa@student.tudelft.nl and the responsible researcher is w.w.veeneman@tudelft.nl.

By clicking through to this questionnaire, you agree to this Opening Statement.

A.2 QUESTIONNAIRE

The survey consists of 50 questions and takes approximately 15 minutes to complete.

1. Process industry employer (generic description):

• Batch Process The manufacturing or production activities are carried out in discrete batches or lots, where each batch undergoes a series of predefined operations before progressing to the next stage.

• Continues Process 24/7 manufacturing or production activities, steady and ongoing flow of materials through various stages of production.

• Hybrid Process Certain stages involve batch processing and other stages within the same production system operate continuously

• Other Describe

2. Years of experience in the process industry in ranges:

• Entry-Level: 0-2 years

• Mid-Level: 3-7 years

• Experienced: 8-15 years

• Senior-Level: 16+ years

3. The domain of activity:

• Asset/Company Owner

• Project Manager

• Operation expert

• Maintenance expert

• Safety expert

• Sustainability expert

• Other Describe

4. Are the key experts in the process industry working in shifts?

• Yes

• No

5. Provide a brief job description using up to 10 keywords (activities & responsibilities):

Green innovation in the process industry involves developing and implementing environmentally friendly practices and technologies to reduce environmental impact and promote sustainability in industrial processes. Often includes the adoption of renewable energy sources, the reduction of greenhouse gas emissions, the efficient use of resources, the implementation of recycling and waste reduction measures, and the utilization of eco-friendly materials.

6. Have you been involved in any green innovation projects, either currently or in the past? If not, please answer the following questions to the best of your

understanding/ability.

- Yes
- No

7. Please rank the internal stakeholders mentioned below in terms of their priority and importance for involvement and engagement when implementing innovation within the organisation. Use numbers from 1 to 6, with 1 being the most important and 6 being the least important:

- Asset/Company Owner
- Project Manager
- Operation expert
- Maintenance expert
- Safety expert
- Sustainability expert

8. Please rank the internal stakeholders mentioned below in terms of their priority and importance for involvement and engagement when implementing green innovation within the organisation. Use numbers from 1 to 6, with 1 being the most important and 6 being the least important:

- Asset/Company Owner
- Project Manager
- Operation expert
- Maintenance expert
- Safety expert
- Sustainability expert

SET-A - Green Innovation: & General Understanding / Personal traits

A1) I am aware of the green innovation projects that my company is involved in.

A2) I am interested in actively participating in green innovation projects at my workplace.

A3) I personally care about promoting green innovation in my work environment.

A4) The introduction of green innovation in my work has required adjustments and adaptations in my daily tasks.

A5) The implementation of green innovation has increased my workload.

A6) I am willing to adopt new approaches and technologies to support green innovation in my work.

A7) The green innovation implemented in my project has increased my motivation and engagement in my work.

A8) I am confident that my skills and expertise will still be relevant and valuable in the context of green innovation.

A9) I feel that my job security is at risk due to the emphasis on green innovation.

A10) Working on a project that incorporates green innovation has made me more conscious of sustainable practices in my work.

9. Please provide a brief description of the green innovation that was implemented in your project and that you had in mind when answering the previous questions. Use approximately 10 keywords to describe it.

SET-B - Green Innovation: Differences Between Industries

B1) Implementing green innovation in our production process is challenging.

B2) The complexity of our production process poses obstacles to the implementation of green innovation.

B3) The infrastructure and equipment in our process are suitable for implementing green innovation.

B4) The level of automatisation of our process poses challenges when implementing green innovation.

B5) The implementation of green innovation in our processes requires big capital investment.

B6) The time required to implement green innovation in our processes is generally low.

B7) Safety considerations are adequately addressed and prioritised during the implementation of green innovation in my workplace.

B8)The successful implementation of green innovation in our industry is dependent on the nature of our production process.

B9)I believe that implementing green innovation in our industry is crucial for sustainable development.

B10) The implementation of green innovation practices in our industry aligns with our organisation's long-term strategic goals.

SET-C - Green Innovation: Engagement

C1) I felt actively engaged and involved in the implementation of green innovation in my project.

C2) The management actively sought and valued the opinions and ideas of employees during the implementation of green innovation in my project.

C3) I received clear and effective briefings regarding the goals and objectives of the green innovation project through email or other communication channels.

C4) Team meetings were conducted regularly to discuss and address issues related to the implementation of green innovation in my project.

C5) Training sessions were provided to enhance the knowledge and skills of employees regarding green innovation and its implementation in my project.

C6) Workshops or brainstorming sessions were organised to generate innovative ideas and solutions related to the implementation of green innovation in my project.

C7) The organisation utilised feedback mechanisms to enhance engagement during the implementation of green innovation in my project.

C8) The organisation recognised and rewarded contributions and efforts made by stakeholders towards the successful implementation of green innovation in my project.

C9) The organisation conducts regular evaluations to assess the effectiveness of engagement strategies implemented during the green innovation project.

C10) I am satisfied with the level of engagement for the implementation of green innovation in the project.

10. Please rank the following engagement strategies in order of importance and usefulness for the successful implementation of green innovation. Use numbers from 1 to 6, with 1 being the most important/useful and 6 being the least important/useful:

- Workshops
- Training sessions
- Team meetings
- Feedback mechanisms
- Rewards
- Informative e-mail/communication channels

SET-D- Green Innovation: Success

D1) The green innovation practices were effectively integrated into the project.

D2) The project has successfully achieved its goals related to green innovation implementation.

D3) I believe that the implemented green innovation practices effectively address environmental challenges.

D4) The green innovation practices implemented in our project are replicable and scalable.

D5) The project effectively monitors and evaluates the progress and performance of the green innovation initiatives.

D6) The engagement strategies used in the project improved the implementation of green innovation.

D7) The implemented green innovation practices are sustainable in the long term.

D8)The organisation achieved a competitive advantage through the successful integration of green innovation practices.

D9)I think that integrating green innovation practices can lead to project success.

D10) I believe that green innovation is important for the successful future of our industry.

A.3 HREC Approval letter

Date 06-Jul-2023
Contact person Grace van Arkel, Policy Advisor
Academic Integrity
E-mail E.G.vanArkel@tudelft.nl

TU Delft Delft University of Technology

Human Research Ethics
Committee TU Delft
(http://hrec.tudelft.nl)

Visiting address
Jaffalaan 5 (building 31)
2628 BX Delft

Postal address
P.O. Box 5015 2600 GA Delft
The Netherlands

Ethics Approval Application: Bridging the Gap: A Comparative Study of Internal Stakeholder Engagement Strategies in Batch and Continuous Processes for Successful Green Innovation Implementation.
Applicant: PRITSA, ANASTASIA

Dear ANASTASIA PRITSA,

It is a pleasure to inform you that your application mentioned above has been approved.

Thanks very much for your submission to the HREC which has been conditionally approved. Please note that this approval is subject to your ensuring that the following condition/s is/are fulfilled:

i: Please have more reflection on point 31: what are the "appropriate steps" that will be taken - particularly given the research subjects are employees - eg: how will the data be anonymised during analysis and when will it be deleted. All this should be clear in the IC (if not already).

In addition to any specific conditions or notes, the HREC provides the following standard advice to all applicants:
• In light of recent tax changes, we advise that you confirm any proposed remuneration of research subjects with your faculty contract manager before going ahead.
• Please make sure when you carry out your research that you confirm contemporary covid protocols with your faculty HSE advisor, and that ongoing covid risks and precautions are flagged in the informed consent - with particular attention to this where there are physically vulnerable (eg: elderly or with underlying conditions) participants involved.
• Our default advice is not to publish transcripts or transcript summaries, but to retain these privately for specific purposes/checking; and if they are to be made public then only if fully anonymised and the transcript/summary itself approved by participants for specific purpose.
• Where there are collaborating (including funding) partners, appropriate formal agreements including clarity on responsibilities, including data ownership, responsibilities and access, should be in place and that relevant aspects of such agreements (such as access to raw or other data) are clear in the Informed Consent.

A.4 Mediation effects analysis

In this analysis, the direct, indirect, and total effects were carefully calculated. The direct effects were examined, representing the direct relationships between the independent variables and PS in the presence of GII (c'). The indirect effects were also considered, referring to the relationship that flows from an independent variable to the mediator and then to the dependent variable (ab). Specifically, in this analysis, the indirect effects of DIC, PW, and ES on PS were examined through GII, demonstrating how the independent variables indirectly influenced PS through the mediator (ab). Additionally, the total effect was taken into account, encompassing both the direct and indirect effects (c = c' + ab).

Mediation path: DIC-GII-PS

The mediation analysis explored first the relationships between the independent variable, Diverse Industry Challenges DIC, the dependent variable, Project Success PS, and the mediator, Green Innovation Implementation GII.

The results revealed that the model's R-squared values for GII and PS were 0.0658 and 0.1955, respectively. This suggests that approximately 6.58% of the variance in GII can be explained by DIC, while around 19.55% of the variance in PS can be explained by both DIC and GII.

Regarding the direct effects, the coefficient for DIC on GII was 0.2299, with a non-significant p-value of 0.2262, indicating that the relationship between DIC and GII was not statistically significant. Similarly, the coefficients for DIC and GII on PS were 0.1559 and 0.2722, respectively, both with non-significant p-values of 0.3016 and 0.1125. These results suggest that the direct relationships between DIC, GII, and PS were not statistically significant.

In the total effect model (considering both DIC and GII), the coefficient for DIC on PS was 0.2185, with a non-significant p-value of 0.1536. This suggests that the overall relationship between DIC and PS, considering both direct and indirect effects through GII, was not statistically significant.

Additionally, the analysis assessed the indirect effect of DIC on PS through GII, which was estimated as 0.0626, with a bootstrap-based confidence interval ranging from -0.0620 to 0.2358. The completely standardized indirect effect of DIC on PS through GII was estimated as 0.0861, with a bootstrap-based confidence interval ranging from -0.0832 to 0.3155.

The results of the mediation analysis suggest that the relationship between DIC and PS was not statistically significant, both directly and indirectly through the mediator GII.

Mediation path: PW-GII-PS

The mediation analysis secondly explored the relationships between the independent variable, Internal Stakeholders' Perspectives & Worries PW, the dependent variable, Project Success PS, and the mediator, Green Innovation Implementation GII. The results revealed that the model's R-squared values for GII and PS were 0.2979 and 0.3032, respectively. This indicates that approximately 29.79% of the variance in GII can be explained by PW, while around 30.32% of the variance in PS can be explained by both PW and GII.

Looking at the direct effects, the coefficient for PW on GII was 0.3843, with a significant p-value of 0.0058, suggesting that the relationship between PW and GII was statistically significant. The standardized coefficient for PW was 0.5458, representing the standardized effect size of PW on GII.

Similarly, the coefficient for PW on PS was 0.2647, with a significant p-value of 0.0450, indicating a statistically significant relationship between PW and PS. The coefficient for GII on PS was 0.1117, with a non-significant p-value of 0.5335, suggesting that the direct relationship between GII and PS was not statistically significant. The standardized coefficients for PW and GII on PS were 0.4633 and 0.1376, respectively, representing the standardized effect sizes of these variables on PS.

In the total effect model (considering both PW and GII), the coefficient for PW on PS was 0.3076, with a significant p-value of 0.0066, indicating that the overall relationship between PW and PS, considering both direct and indirect effects through GII, was statistically significant. The standardized coefficient for PW was 0.5384, representing the standardized effect size of PW on PS.

Additionally, the analysis assessed the indirect effect of PW on PS through GII, which was estimated as 0.0429, with a bootstrap-based confidence interval ranging from -0.0746 to 0.2170. The completely standardized indirect effect of PW on PS through GII was estimated as 0.0751, with a bootstrap-based confidence interval ranging from -0.1262 to 0.3775.

The results of the mediation analysis indicate that there is a statistically significant direct relationship between PW and both GII and PS. Furthermore, the total effect model reveals that PW has a significant overall effect on PS, considering both direct and indirect effects through the mediator GII.

Mediation path: ES-GII-PS

The mediation analysis lastly investigated the relationships between the independent variable, Engagement Strategies ES, the dependent variable, Project Success PS, and the mediator, Green Innovation Implementation GII. The results revealed that the model's R-squared values for GII and PS were 0.6607 and 0.1566, respectively. This indicates that approximately 66.07% of the variance in GII can be explained by ES, while around 15.66% of the variance in PS can be explained by both ES and GII.

Regarding the direct effects, the coefficient for ES on GII was 0.3829, with a significant p-value of 0.0000, indicating that the relationship between ES and GII was statistically significant. The standardized coefficient for ES was 0.8129, representing the standardized effect size of ES on GII.

Similarly, the coefficient for ES on PS was -0.0421, with a non-significant p-value of 0.7520, suggesting that the direct relationship between ES and PS was not statistically significant. The coefficient for GII on PS was 0.3895, also with a non-significant p-value of 0.1775, indicating that the direct relationship between GII and PS was not statistically significant. The standardized coefficients for ES and GII on PS were -0.1102 and 0.4801, respectively, representing the standardized effect sizes of these variables on PS.

In the total effect model (considering both ES and GII), the coefficient for ES on PS was 0.1070, with a non-significant p-value of 0.1850, suggesting that the overall relationship between ES and PS, considering both direct and indirect effects through

GII, was not statistically significant. The standardized coefficient for ES was 0.2800, representing the standardized effect size of ES on PS.

Additionally, the analysis assessed the indirect effect of ES on PS through GII, which was estimated as 0.1491, with a bootstrap-based confidence interval ranging from -0.0473 to 0.4224. The completely standardized indirect effect of ES on PS through GII was estimated as 0.3902, with a bootstrap-based confidence interval ranging from -0.1201 to 0.9637.

The results of the mediation analysis suggest that there is a statistically significant direct relationship between ES and GII. However, the overall relationship between ES and PS, considering both direct and indirect effects through the mediator GII, was not statistically significant.

Model path coefficient

Based on the mediation analysis results, the model with the path coefficients is depicted in Figure 6. The figure presents the significant and insignificant paths between the variables.

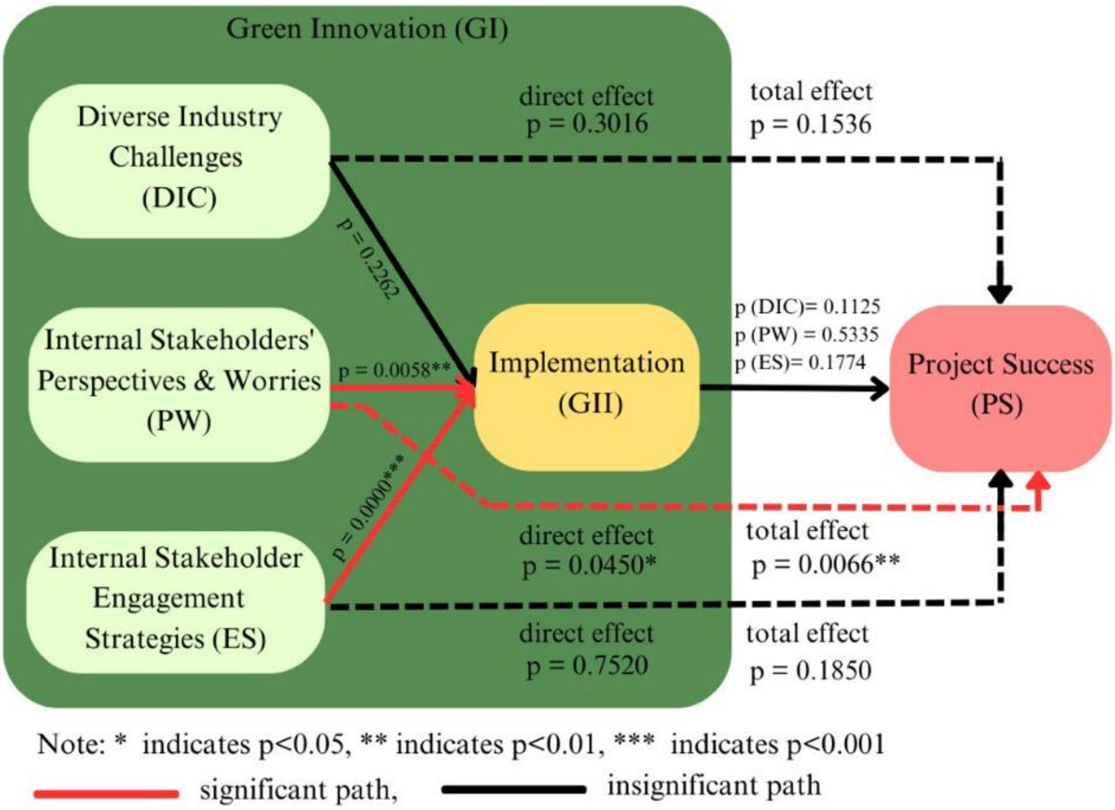


Figure 6: Model and path coefficients

A.5 Questionnaire Data & SPSS Analysis

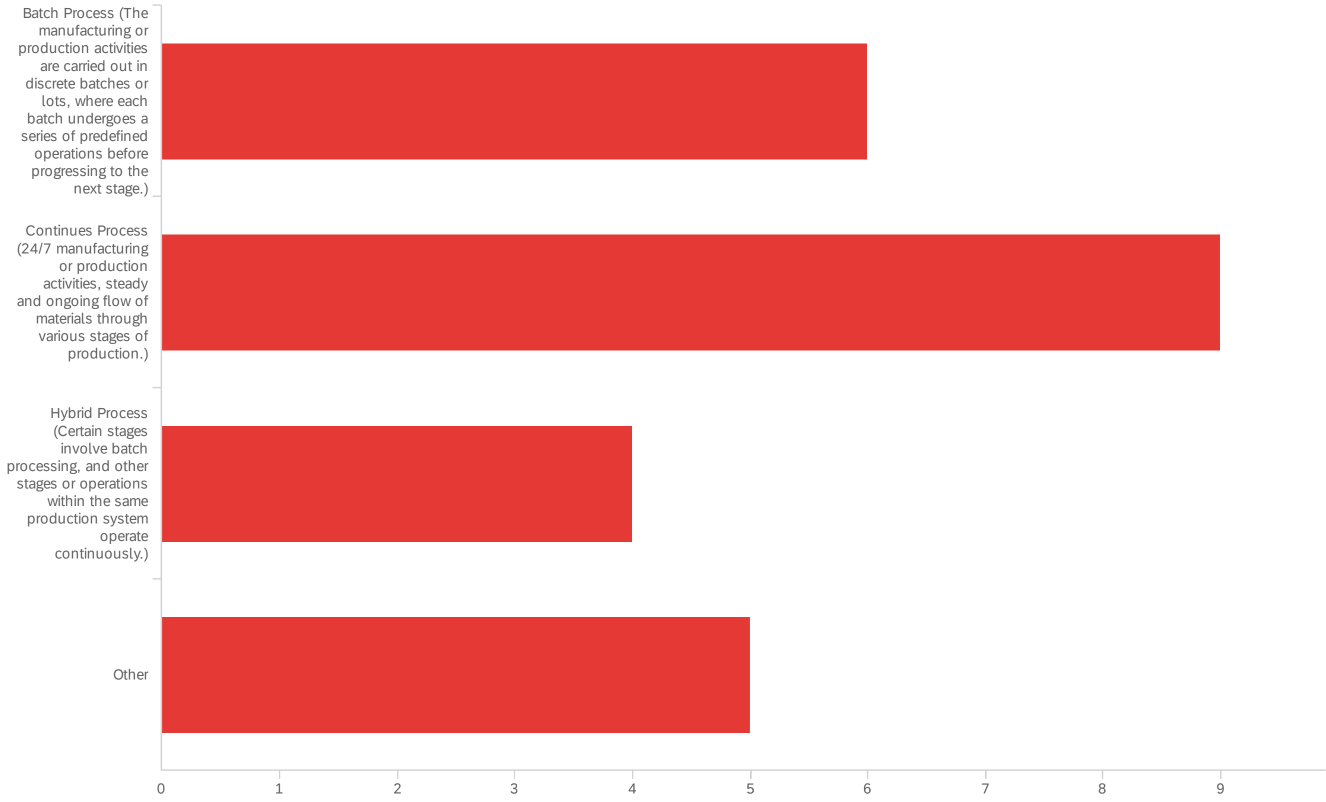
In this section, both the core dataset and graphs sourced from the Qualtrics survey platform, as well as the analysis conducted using SPSS, are encompassed. The dataset and visuals present the raw survey data in its original state, while the SPSS analysis provides a deeper examination of the collected information. The graphs and visuals aid in visually comprehending the quantitative insights drawn from participants' responses, and the SPSS analysis offers a more detailed understanding of the data trends and patterns. This section's significance stems from its role in forming the factual basis for our research, ensuring the accuracy and credibility of our data analysis.

Default Report

Final-Master Thesis - NAP

August 17, 2023 7:57 AM MDT

Q1 - 1) Process industry employer (generic description):



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	1) Process industry employer (generic description): - Selected Choice	1.00	4.00	2.33	1.07	1.14	24

#	Field	Choice Count	
1	Batch Process (The manufacturing or production activities are carried out in discrete batches or lots, where each batch undergoes a series of predefined operations before progressing to the next stage.)	25.00%	6
2	Continues Process (24/7 manufacturing or production activities, steady and ongoing flow of materials through various stages of production.)	37.50%	9
3	Hybrid Process (Certain stages involve batch processing, and other stages or operations within the same production system operate continuously.)	16.67%	4
4	Other	20.83%	5

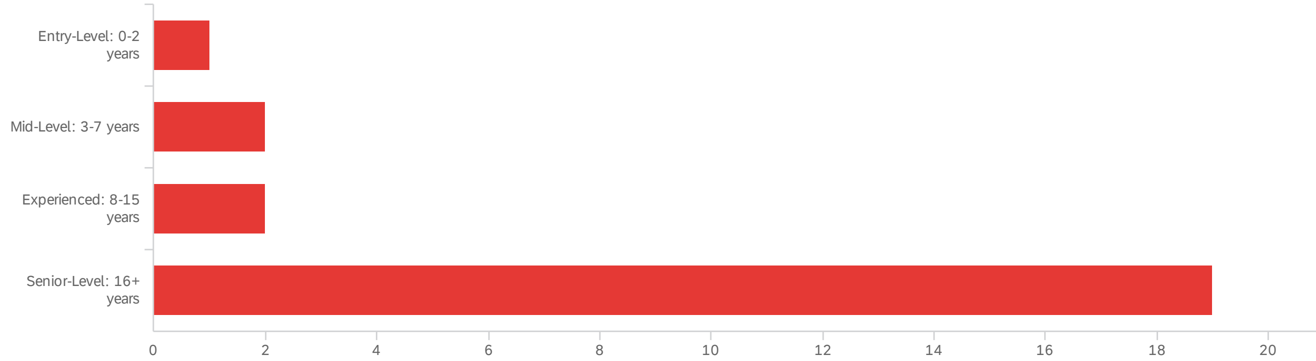
#	Field	Choice Count
		24

Showing rows 1 - 5 of 5

Q1_4_TEXT - Other

Other
Engineering Contractor
Engineering contractor
Engineering and Construction
Working in projects for all types of processes

Q2 - 2) Years of experience in the process industry in ranges:

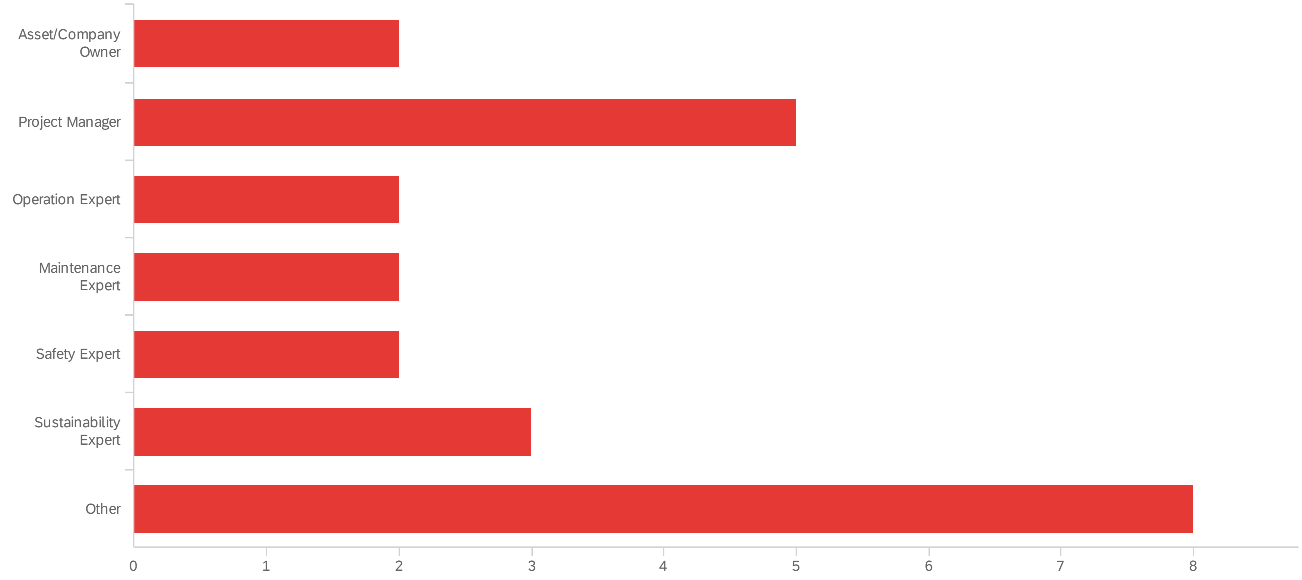


#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	2) Years of experience in the process industry in ranges:	1.00	4.00	3.63	0.81	0.65	24

#	Field		Choice Count
1	Entry-Level: 0-2 years	4.17%	1
2	Mid-Level: 3-7 years	8.33%	2
3	Experienced: 8-15 years	8.33%	2
4	Senior-Level: 16+ years	79.17%	19
			24

Showing rows 1 - 5 of 5

Q3 - 3) The domain of activity:



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	3) The domain of activity: - Selected Choice	1.00	7.00	4.58	2.22	4.91	24

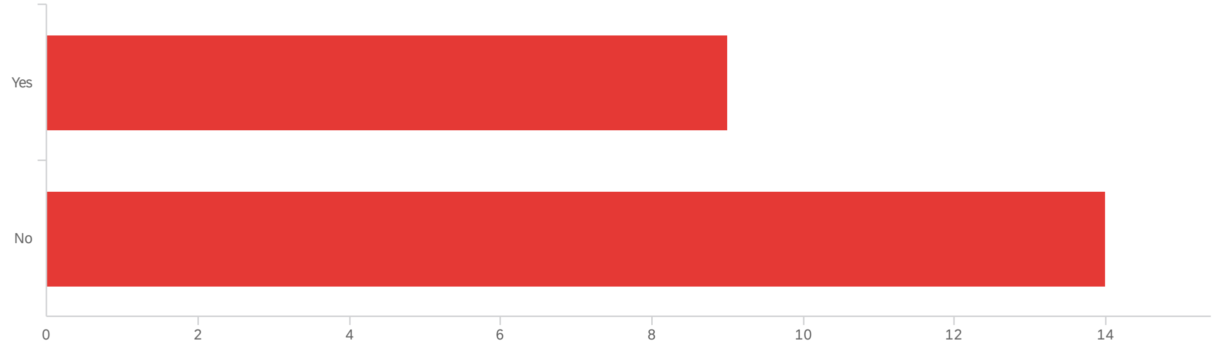
#	Field		Choice Count
1	Asset/Company Owner	8.33%	2
2	Project Manager	20.83%	5
3	Operation Expert	8.33%	2
4	Maintenance Expert	8.33%	2
5	Safety Expert	8.33%	2
6	Sustainability Expert	12.50%	3
7	Other	33.33%	8
			24

Showing rows 1 - 8 of 8

Q3_7_TEXT - Other

Other
Engineer
Engineer
Principal Estimator
Engineering
Manager of technical specialists
Supply Chain Management
Monitoring
Supply chain expert

Q4 - 4) Are the key experts in the process industry working in shifts?



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	4) Are the key experts in the process industry working in shifts?	1.00	2.00	1.61	0.49	0.24	23

#	Field	Choice Count	
1	Yes	39.13%	9
2	No	60.87%	14
			23

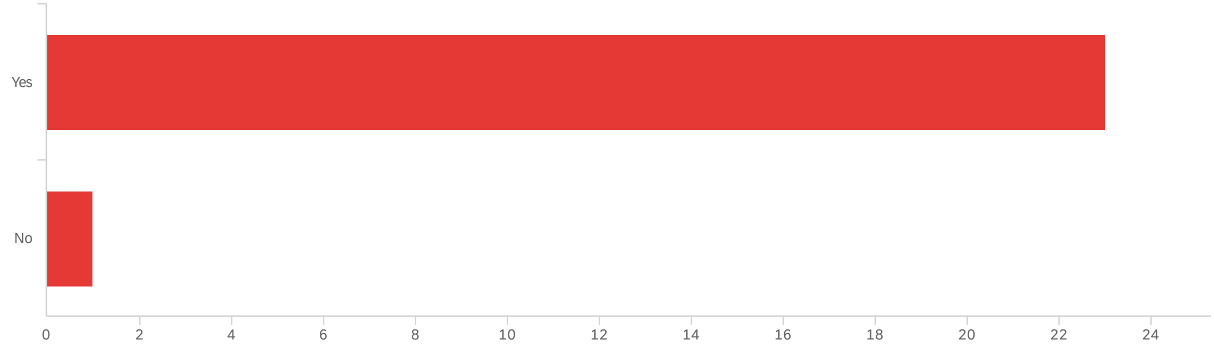
Showing rows 1 - 3 of 3

Q5 - 5) Provide a brief job description using up to 10 key words (activities & responsibilities):

5) Provide a brief job description using up to 10 key words (activities &...
Process engineering and optimization
I coordinate with stakeholders and adhere to timelines.
Development of sustainability strategy and assessing & monitor the company's environmental performance
Sustainable practices developement for supply chain sustainability
Safety protocols and general risk assessment. Mainly occupied with workplace safety
Production process optimization, lean manufacturing, usually operational efficiency and quality control
Predictive maintenance, IoT integration, equipment performance optimization, downtime reduction
Asset management, strategic planning, operational efficiency, cost optimization
Process safety engineer, Technical Authority process safety in projects.
Equipment Upgrades and Retrofitting
Operational Efficiency,Process Optimization
Manufacturing Energy & Process engineering
Principal Estimator for large capital projects, cost
Design and engineering of process installations for various industries ranging from pharmaceuticals to refineries
Design and development of industrial plants in the energy transition (recycling factory, geothermal energy, hydrogen plant, ...)
Manager of technical specialists. My company is an asset owner, my job is in technical support.
Manage Procurement, Logistic, and Contracts in dealing with suppliers Lead contract negotiations Supervise package production and expedite deliveries Maintain relationships
Production of oil and gas in remote offshore locations; offshore workers are required to monitor the plant, and perform light maintenance activities. For more complex projects and maintenance activities external parties are brought in, including in-house audits and 3rd parties audits/inspections
Account manager for key accounts in the refinery and chemical industry
Project management Project Implementation Safety Quality Cost Schedule

5) Provide a brief job description using up to 10 key words (activities &...
Manage cost, schedule and scope Control progress and deliverables Oversight on design and construction activities
Project Management of Capital Projects of all types including sustainability and greener energy projects
General Manager responsible for Capex investments from study to commissioning
Demand forecasting, Inventory management, Procurement and sourcing

Q6 - 6) Have you been involved in any green innovation projects, either currently or in the past? If not, please answer the following questions to the best of your understanding/ability.



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	6) Have you been involved in any green innovation projects, either currently or in the past? If not, please answer the following questions to the best of your understanding/ability.	1.00	2.00	1.04	0.20	0.04	24

#	Field	Choice Count	
1	Yes	95.83%	23
2	No	4.17%	1
			24

Showing rows 1 - 3 of 3

Q7 - 7) Please rank the internal stakeholders mentioned below in terms of their priority and importance for involvement and engagement when implementing innovation within the organisation. Use numbers from 1 to 6, with 1 being the most important and 6 being the least important:

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Asset/Company Owner	1.00	4.00	1.33	0.75	0.56	24
2	Project Manager	1.00	4.00	2.29	0.73	0.54	24
3	Operation Expert	1.00	6.00	3.79	1.32	1.75	24
4	Maintenance Expert	3.00	6.00	5.21	0.96	0.91	24
5	Safety Expert	2.00	6.00	4.00	0.96	0.92	24
6	Sustainability Expert	1.00	6.00	4.38	1.63	2.65	24

#	Field	1		2		3		4		5		6		Total
1	Asset/Company Owner	79.17%	19	12.50%	3	4.17%	1	4.17%	1	0.00%	0	0.00%	0	24
2	Project Manager	12.50%	3	50.00%	12	33.33%	8	4.17%	1	0.00%	0	0.00%	0	24
3	Operation Expert	4.17%	1	16.67%	4	16.67%	4	29.17%	7	25.00%	6	8.33%	2	24
4	Maintenance Expert	0.00%	0	0.00%	0	12.50%	3	0.00%	0	41.67%	10	45.83%	11	24
5	Safety Expert	0.00%	0	8.33%	2	16.67%	4	45.83%	11	25.00%	6	4.17%	1	24
6	Sustainability Expert	4.17%	1	12.50%	3	16.67%	4	16.67%	4	8.33%	2	41.67%	10	24

Showing rows 1 - 6 of 6

Q8 - 8) Please rank the internal stakeholders mentioned below in terms of their priority and importance for involvement and engagement when implementing green innovation within the organisation. Use numbers from 1 to 6, with 1 being the most important and 6 being the least important:

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Asset/Company Owner	1.00	6.00	1.63	1.15	1.32	24
2	Project Manager	1.00	5.00	2.67	0.99	0.97	24
3	Operation Expert	2.00	6.00	4.54	1.00	1.00	24
4	Maintenance Expert	3.00	6.00	5.42	0.81	0.66	24
5	Safety Expert	2.00	6.00	4.17	1.14	1.31	24
6	Sustainability Expert	1.00	6.00	2.58	1.41	1.99	24

#	Field	1		2		3		4		5		6		Total
1	Asset/Company Owner	66.67%	16	16.67%	4	12.50%	3	0.00%	0	0.00%	0	4.17%	1	24
2	Project Manager	12.50%	3	29.17%	7	41.67%	10	12.50%	3	4.17%	1	0.00%	0	24
3	Operation Expert	0.00%	0	4.17%	1	12.50%	3	20.83%	5	50.00%	12	12.50%	3	24
4	Maintenance Expert	0.00%	0	0.00%	0	4.17%	1	8.33%	2	29.17%	7	58.33%	14	24
5	Safety Expert	0.00%	0	8.33%	2	16.67%	4	41.67%	10	16.67%	4	16.67%	4	24
6	Sustainability Expert	20.83%	5	41.67%	10	12.50%	3	16.67%	4	0.00%	0	8.33%	2	24

Showing rows 1 - 6 of 6

Set 1- Q10 - Set.A) Please indicate to what extent you agree or disagree with each statement based. If you feel that you do not have enough knowledge or information to respond to a particular statement, you may choose the 'Don't Know' option.

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	A1) I am aware of the green innovation projects that my company is involved in.	2.00	5.00	4.46	0.71	0.50	24
2	A2) I am interested in actively participating in green innovation projects at my workplace.	2.00	5.00	4.38	0.70	0.48	24
3	A3) I personally care about promoting green innovation in my work environment.	2.00	5.00	4.21	1.00	1.00	24
4	A4) The introduction of green innovation in my work has required adjustments and adaptations in my daily tasks.	1.00	5.00	2.75	1.05	1.10	24
5	A5) The implementation of green innovation has increased my workload.	1.00	5.00	2.71	0.98	0.96	24
6	A6) I am willing to adopt new approaches and technologies to support green innovation in my work.	3.00	5.00	4.54	0.58	0.33	24
7	A7) The green innovation implemented in my project has increased my motivation and engagement in my work.	1.00	5.00	3.71	1.06	1.12	24
8	A8) I am confident that my skills and expertise will still be relevant and valuable in the context of green innovation.	3.00	5.00	4.75	0.52	0.27	24
9	A9) I feel that my job security is at risk due to the emphasis on green innovation.	1.00	5.00	1.54	1.08	1.16	24
10	A10) Working on a project that incorporates green innovation has made me more conscious of sustainable practices in my work.	1.00	5.00	3.70	1.00	0.99	23

#	Field	Strongly Disagree		Disagree		Neither agree nor disagree		Agree		Strongly Agree		Total
1	A1) I am aware of the green innovation projects that my company is involved in.	0.00%	0	4.17%	1	0.00%	0	41.67%	10	54.17%	13	24
2	A2) I am interested in actively participating in green innovation projects at my workplace.	0.00%	0	4.17%	1	0.00%	0	50.00%	12	45.83%	11	24

#	Field	Strongly Disagree		Disagree		Neither agree nor disagree		Agree		Strongly Agree		Total
3	A3) I personally care about promoting green innovation in my work environment.	0.00%	0	12.50%	3	4.17%	1	33.33%	8	50.00%	12	24
4	A4) The introduction of green innovation in my work has required adjustments and adaptations in my daily tasks.	4.17%	1	50.00%	12	20.83%	5	16.67%	4	8.33%	2	24
5	A5) The implementation of green innovation has increased my workload.	4.17%	1	45.83%	11	33.33%	8	8.33%	2	8.33%	2	24
6	A6) I am willing to adopt new approaches and technologies to support green innovation in my work.	0.00%	0	0.00%	0	4.17%	1	37.50%	9	58.33%	14	24
7	A7) The green innovation implemented in my project has increased my motivation and engagement in my work.	8.33%	2	0.00%	0	25.00%	6	45.83%	11	20.83%	5	24
8	A8) I am confident that my skills and expertise will still be relevant and valuable in the context of green innovation.	0.00%	0	0.00%	0	4.17%	1	16.67%	4	79.17%	19	24
9	A9) I feel that my job security is at risk due to the emphasis on green innovation.	75.00%	18	8.33%	2	8.33%	2	4.17%	1	4.17%	1	24
10	A10) Working on a project that incorporates green innovation has made me more conscious of sustainable practices in my work.	4.35%	1	4.35%	1	30.43%	7	39.13%	9	21.74%	5	23

Showing rows 1 - 10 of 10

Q9 - 9) Please provide a brief description of the green innovation that was implemented in your project and that you had in mind when answering the previous questions. Use approximately 10 keywords to describe it.

9) Please provide a brief description of the green innovation that was impl...
Could be the use of energy from renewable sources, Green energy
I am involved with the Green H project for energy consumption reduction
Mainly CO2 emission reduction strategy and stakeholder education
Resource savings using sustainable supply chain choices for the good of the environment
Workplace safety enhancement using sustainable practices
Energy management systems for carbon footprint reduction
Recycling, waste reduction, environmental impact reduction
Energy-efficient processes, renewable energy solutions, resource utilization, carbon emissions reduction
Projects aimed at enhancing the environment. Projects involving innovative green solutions to decrease CO2 emissions using novel technology. Evaluations focused on planning for the future of our company.
Retrofitting with Renewable Energy Integration
Carbon Footprint Reduction, Conducting emissions assessments, implementing energy-saving initiatives
More focus on optimising processes with green alternatives
Waste Management and Recycling Initiatives, Recycling programs, waste-to-energy facilities, and waste reduction strategies.
Green innovation mainly for hybrid working
Hydrogen was produced on-site with an electrolyser.
various: transition to H2, developing E-boilers and E-Furnaces, innovations in wind parks, research projects, new materials for biofuels, etc
I am part of the Green H2 project development. The project is new with various new Green solutions required. Part of my job is to source new Green solution providers and engage them in projects and I am continuously doing so. We are in the middle of the project with various new solutions to be implemented further.

9) Please provide a brief description of the green innovation that was impl...

Change out of diesel generators to low emissions gas generators Try-pout of bio-diesel Electrification Low-impact facilities Use of solar panels to power navaids
Green Hydrogen production and carbon reduction in feedstock
Green hydrogen production Storage of renewable power
Carbon capture, Hydrogen, Recovery of precious metals
Looking at reducing the CO2 released for converting iron ore to iron and in steel making
In the steel industry we are working very hard to transition the core processes
Carbon Footprint Reduction. Developing strategies to measure, monitor, and reduce carbon emissions throughout the supply chain.

Set 2 - Q10 - Set.B) Please indicate to what extent you agree or disagree with each statement based. If you feel that you do not have enough knowledge or information to respond to a particular statement, you may choose the 'Don't Know' option.

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	B1) Implementing green innovation in our production process is challenging.	1.00	5.00	3.92	1.19	1.41	24
2	B2) The complexity of our production process poses obstacles to the implementation of green innovation.	1.00	5.00	3.38	1.18	1.40	24
3	B3) The infrastructure and equipment in our process are suitable for implementing green innovation.	1.00	4.00	2.96	0.84	0.71	24
4	B4) The level of automatisation of our process poses challenges when implementing green innovation.	1.00	5.00	3.25	1.27	1.60	24
5	B5) The implementation of green innovation in our processes requires big capital investment.	2.00	5.00	4.30	0.95	0.91	23
6	B6) The time required to implement green innovation in our processes is generally low.	1.00	5.00	2.17	1.07	1.14	24
7	B7) Safety considerations are adequately addressed and prioritised during the implementation of green innovation in my workplace.	3.00	5.00	4.50	0.58	0.33	24
8	B8)The successful implementation of green innovation in our industry is dependent on the nature of our production process.	2.00	5.00	4.13	0.88	0.78	24
9	B9) I believe that implementing green innovation in our industry is crucial for sustainable development.	2.00	5.00	4.29	0.89	0.79	24
10	B10) The implementation of green innovation practices in our industry aligns with our organisation's long-term strategic goals.	4.00	5.00	4.71	0.45	0.21	24

#	Field	Strongly Disagree		Disagree		Neither agree nor disagree		Agree		Strongly Agree		Total
1	B1) Implementing green innovation in our production process is challenging.	4.17%	1	16.67%	4	0.00%	0	41.67%	10	37.50%	9	24
2	B2) The complexity of our production process poses obstacles to the implementation of green innovation.	4.17%	1	29.17%	7	8.33%	2	41.67%	10	16.67%	4	24

#	Field	Strongly Disagree		Disagree		Neither agree nor disagree		Agree		Strongly Agree		Total
3	B3) The infrastructure and equipment in our process are suitable for implementing green innovation.	4.17%	1	25.00%	6	41.67%	10	29.17%	7	0.00%	0	24
4	B4) The level of automatisation of our process poses challenges when implementing green innovation.	8.33%	2	25.00%	6	20.83%	5	25.00%	6	20.83%	5	24
5	B5) The implementation of green innovation in our processes requires big capital investment.	0.00%	0	8.70%	2	8.70%	2	26.09%	6	56.52%	13	23
6	B6) The time required to implement green innovation in our processes is generally low.	20.83%	5	62.50%	15	4.17%	1	4.17%	1	8.33%	2	24
7	B7) Safety considerations are adequately addressed and prioritised during the implementation of green innovation in my workplace.	0.00%	0	0.00%	0	4.17%	1	41.67%	10	54.17%	13	24
8	B8)The successful implementation of green innovation in our industry is dependent on the nature of our production process.	0.00%	0	4.17%	1	20.83%	5	33.33%	8	41.67%	10	24
9	B9) I believe that implementing green innovation in our industry is crucial for sustainable development.	0.00%	0	4.17%	1	16.67%	4	25.00%	6	54.17%	13	24
10	B10) The implementation of green innovation practices in our industry aligns with our organisation's long-term strategic goals.	0.00%	0	0.00%	0	0.00%	0	29.17%	7	70.83%	17	24

Showing rows 1 - 10 of 10

Set 3 - Q10 - Set.C) Please indicate to what extent you agree or disagree with each statement based. If you feel that you do not have enough knowledge or information to respond to a particular statement, you may choose the 'Don't Know' option.

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	C1) I felt actively engaged and involved in the implementation of green innovation in my project.	3.00	5.00	4.21	0.64	0.41	24
2	C2) The management actively sought and valued the opinions and ideas of employees during the implementation of green innovation in my project.	1.00	5.00	3.70	1.00	0.99	23
3	C3) I received clear and effective briefings regarding the goals and objectives of the green innovation project through email or other communication channels.	1.00	5.00	4.18	1.11	1.24	22
4	C4) Team meetings were conducted regularly to discuss and address issues related to the implementation of green innovation in my project.	1.00	5.00	3.92	1.11	1.24	24
5	C5) Training sessions were provided to enhance the knowledge and skills of employees regarding green innovation and its implementation in my project.	2.00	5.00	3.55	1.08	1.16	22
6	C6) Workshops or brainstorming sessions were organised to generate innovative ideas and solutions related to the implementation of green innovation in my project.	2.00	5.00	4.05	0.93	0.86	22
7	C7) The organisation utilised feedback mechanisms to enhance engagement during the implementation of green innovation in my project.	2.00	5.00	3.33	0.99	0.98	21
8	C8) The organisation recognised and rewarded contributions and efforts made by stakeholders towards the successful implementation of green innovation in my project.	2.00	5.00	3.30	1.04	1.08	23
9	C9) The organisation conducts regular evaluations to assess the effectiveness of engagement strategies implemented during the green innovation project.	1.00	5.00	2.91	1.02	1.04	23
10	C10) I am satisfied with the level of engagement for the implementation of green innovation in the project.	1.00	5.00	3.70	1.16	1.34	23

#	Field	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total

#	Field	Strongly Disagree		Disagree		Neither agree nor disagree		Agree		Strongly Agree		Total
1	C1) I felt actively engaged and involved in the implementation of green innovation in my project.	0.00%	0	0.00%	0	12.50%	3	54.17%	13	33.33%	8	24
2	C2) The management actively sought and valued the opinions and ideas of employees during the implementation of green innovation in my project.	4.35%	1	4.35%	1	30.43%	7	39.13%	9	21.74%	5	23
3	C3) I received clear and effective briefings regarding the goals and objectives of the green innovation project through email or other communication channels.	4.55%	1	4.55%	1	13.64%	3	22.73%	5	54.55%	12	22
4	C4) Team meetings were conducted regularly to discuss and address issues related to the implementation of green innovation in my project.	4.17%	1	12.50%	3	4.17%	1	45.83%	11	33.33%	8	24
5	C5) Training sessions were provided to enhance the knowledge and skills of employees regarding green innovation and its implementation in my project.	0.00%	0	22.73%	5	22.73%	5	31.82%	7	22.73%	5	22
6	C6) Workshops or brainstorming sessions were organised to generate innovative ideas and solutions related to the implementation of green innovation in my project.	0.00%	0	9.09%	2	13.64%	3	40.91%	9	36.36%	8	22
7	C7) The organisation utilised feedback mechanisms to enhance engagement during the implementation of green innovation in my project.	0.00%	0	28.57%	6	19.05%	4	42.86%	9	9.52%	2	21
8	C8) The organisation recognised and rewarded contributions and efforts made by stakeholders towards the successful implementation of green innovation in my project.	0.00%	0	26.09%	6	34.78%	8	21.74%	5	17.39%	4	23
9	C9) The organisation conducts regular evaluations to assess the effectiveness of engagement strategies implemented during the green innovation project.	4.35%	1	39.13%	9	21.74%	5	30.43%	7	4.35%	1	23
10	C10) I am satisfied with the level of engagement for the implementation of green innovation in the project.	4.35%	1	13.04%	3	21.74%	5	30.43%	7	30.43%	7	23

Showing rows 1 - 10 of 10

Q10 - 10) Please rank the following engagement strategies in order of importance and usefulness for successful the implementation of green innovation. Use numbers from 1 to 6, with 1 being the most important/useful and 6 being the least important/useful:

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Workshops	1.00	5.00	2.04	1.17	1.37	24
2	Training sessions	1.00	6.00	3.58	1.38	1.91	24
3	Team meetings	1.00	6.00	2.75	1.42	2.02	24
4	Feedback mechanisms	1.00	6.00	4.00	1.19	1.42	24
5	Rewards	1.00	6.00	5.00	1.50	2.25	24
6	Informative e-mail/communication channels	1.00	6.00	3.63	1.82	3.32	24

#	Field	1		2		3		4		5		6		Total
1	Workshops	41.67%	10	33.33%	8	8.33%	2	12.50%	3	4.17%	1	0.00%	0	24
2	Training sessions	8.33%	2	12.50%	3	33.33%	8	8.33%	2	33.33%	8	4.17%	1	24
3	Team meetings	20.83%	5	33.33%	8	12.50%	3	20.83%	5	8.33%	2	4.17%	1	24
4	Feedback mechanisms	4.17%	1	8.33%	2	16.67%	4	29.17%	7	37.50%	9	4.17%	1	24
5	Rewards	4.17%	1	4.17%	1	12.50%	3	8.33%	2	8.33%	2	62.50%	15	24
6	Informative e-mail/communication channels	20.83%	5	8.33%	2	16.67%	4	20.83%	5	8.33%	2	25.00%	6	24

Showing rows 1 - 6 of 6

End of Report

```
RELIABILITY
/VARIABLES=A_Set_1__Q10_1 A_Set_1__Q10_2 A_Set_1__Q10_3 A_Set_1__Q10_4 A_Set_1__Q10_5
A_Set_1__Q10_6 A_Set_1__Q10_7 A_Set_1__Q10_8 A_Set_1__Q10_9 A_Set_1__Q10_10
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA.
```

Reliability

Notes

Output Created		20-JUL-2023 12...
Comments		
Input	Data	C: \Users\Spyros\Downloads\Final-Master+Thesis+-+NAP_July+18,+2023_07.53.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Notes

Syntax		RELIABILITY /VARIABLES=A_Set_1__Q10_1 A_Set_1__Q10_2 A_Set_1__Q10_3 A_Set_1__Q10_4 A_Set_1__Q10_5 A_Set_1__Q10_6 A_Set_1__Q10_7 A_Set_1__Q10_8 A_Set_1__Q10_9 A_Set_1__Q10_10 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	23	95,8
	Excluded[a]	1	4,2
	Total	24	100,0

a. Listwise deletion based on all variables in the ...

Reliability Statistics

Cronbach's Alpha	N of Items
,609	10

Reliability

Notes

Output Created		20-JUL-2023 12...
Comments		
Input	Data	C: \Users\Spyros\Downloads\Final-Master+Thesis+-+NAP_July+18,+2023_07.53.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=Set_2___Q10_1 Set_2___Q10_2 Set_2___Q10_3 Set_2___Q10_4 Set_2___Q10_5 Set_2___Q10_6 Set_2___Q10_7 Set_2___Q10_8 Set_2___Q10_9 Set_2___Q10_10 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.01

Scale: ALL VARIABLES

Reliability Statistics

Cronbach's Alpha	N of Items
,186	10

Reliability

Notes

Output Created		20-JUL-2023 12...
Comments		
Input	Data	C: \Users\Spyros\Downloads\Final-Master+Thesis+-+NAP_July+18,+2023_07.53.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Notes

Syntax		RELIABILITY /VARIABLES=Set_3___Q10_1 Set_3___Q10_2 Set_3___Q10_3 Set_3___Q10_4 Set_3___Q10_5 Set_3___Q10_6 Set_3___Q10_7 Set_3___Q10_8 Set_3___Q10_9 Set_3___Q10_10 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.02

Scale: ALL VARIABLES

Reliability Statistics

Cronbach's Alpha	N of Items
,855	10

```
RELIABILITY
/VARIABLES=Set_4__Q10_1 Set_4__Q10_2 Set_4__Q10_3 Set_4__Q10_4 Set_4__Q10_5
Set_4__Q10_6
Set_4__Q10_7
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA.
```

Reliability

Notes

Output Created		20-JUL-2023 12...
Comments		
Input	Data	C: \Users\Spyros\Downloads\Final-Master+Thesis+-+NAP_July+18,+2023_07.53.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=Set_4__Q10_1 Set_4__Q10_2 Set_4__Q10_3 Set_4__Q10_4 Set_4__Q10_5 Set_4__Q10_6 Set_4__Q10_7 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.01

Scale: ALL VARIABLES

Reliability Statistics

Cronbach's Alpha	N of Items
,493	7

```
RELIABILITY
/VARIABLES=Set_4__Q10_8 Set_4__Q10_9 Set_4__Q10_10
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA.
```

Reliability

Notes

Output Created		20-JUL-2023 12...
Comments		
Input	Data	C:\Users\Spyros\Downloads\Final-Master+Thesis+-+NAP_July+18,+2023_07.53.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Notes

Syntax		RELIABILITY /VARIABLES=Set_4__Q10_8 Set_4__Q10_9 Set_4__Q10_10 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.01

Warnings

Scale has zero variance items.

Scale: ALL VARIABLES

Reliability Statistics

Cronbach's Alpha	N of Items
,054	3

Reliability

Notes

Output Created		20-JUL-2023 12...
Comments		
Input	Data	C: \Users\Spyros\Downloads\Final-Master+Thesis+-+NAP_July+18,+2023_07.53.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=Set_4__Q10_8 Set_4__Q10_9 Set_4__Q10_10 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.01

Means

Notes

Output Created		20-JUL-2023 12...
Comments		
Input	Data	C: \Users\Spyros\Downloads\Final-Master+Thesis+-+NAP_July+18,+2023_07.53.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24
Missing Value Handling	Definition of Missing	For each dependent variable in a table, user-defined missing values for the dependent and all grouping variables are treated as missing.
	Cases Used	Cases used for each table have no missing values in any independent variable, and not all dependent variables have missing values.
Syntax		MEANS TABLES=pw dic es ps gii /CELLS=MEAN MEDIAN STDDEV.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.01

Report

	pw	dic	es	ps	gii
Mean	4,0778	3,9940	3,6831	4,6458	4,5580
Median	4,0500	3,9000	3,7889	4,6667	4,5714
Std. Deviation	,44131	,34683	,65966	,25210	,31074

```
FREQUENCIES VARIABLES=pw dic es ps gii
/FORMAT=NOTABLE
/HISTOGRAM
/ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		20-JUL-2023 12...
Comments		
Input	Data	C: \Users\Spyros\Downloads\Final-Master+Thesis+-+NAP_July+18,+2023_07.53.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=pw dic es ps gii /FORMAT=NOTABLE /HISTOGRAM /ORDER=ANALYSIS.

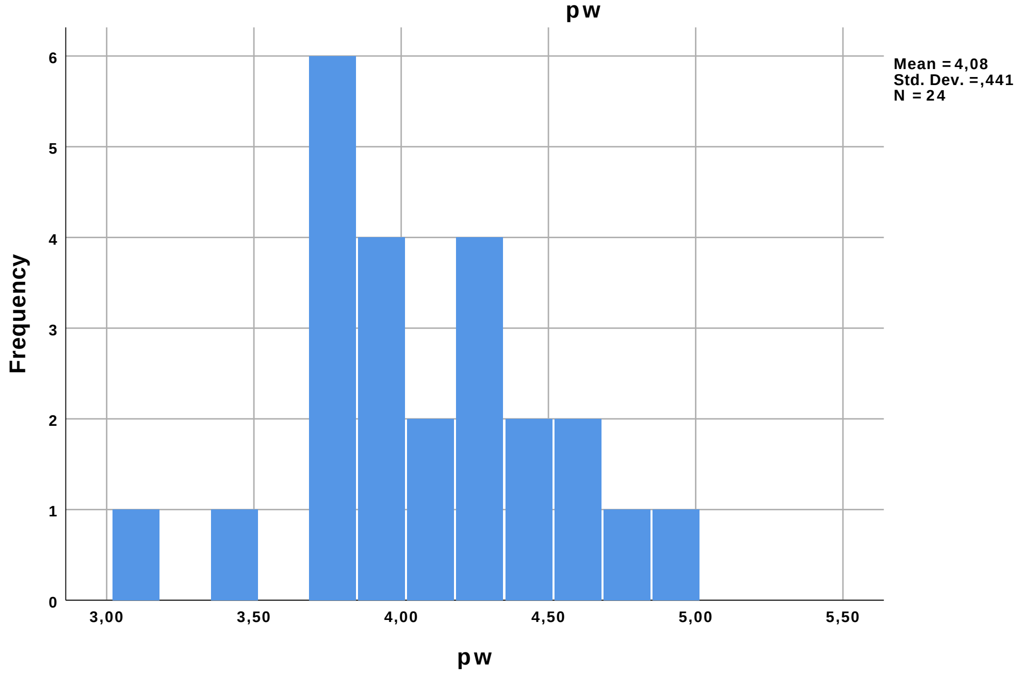
Notes

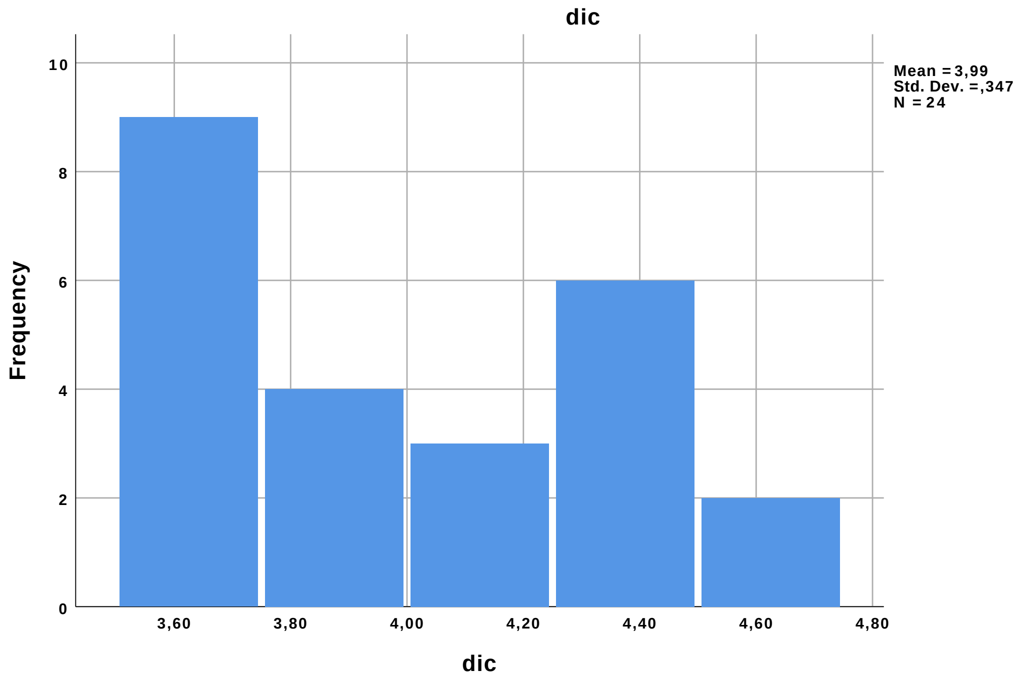
Resources	Processor Time	00:00:02.61
	Elapsed Time	00:00:02.36

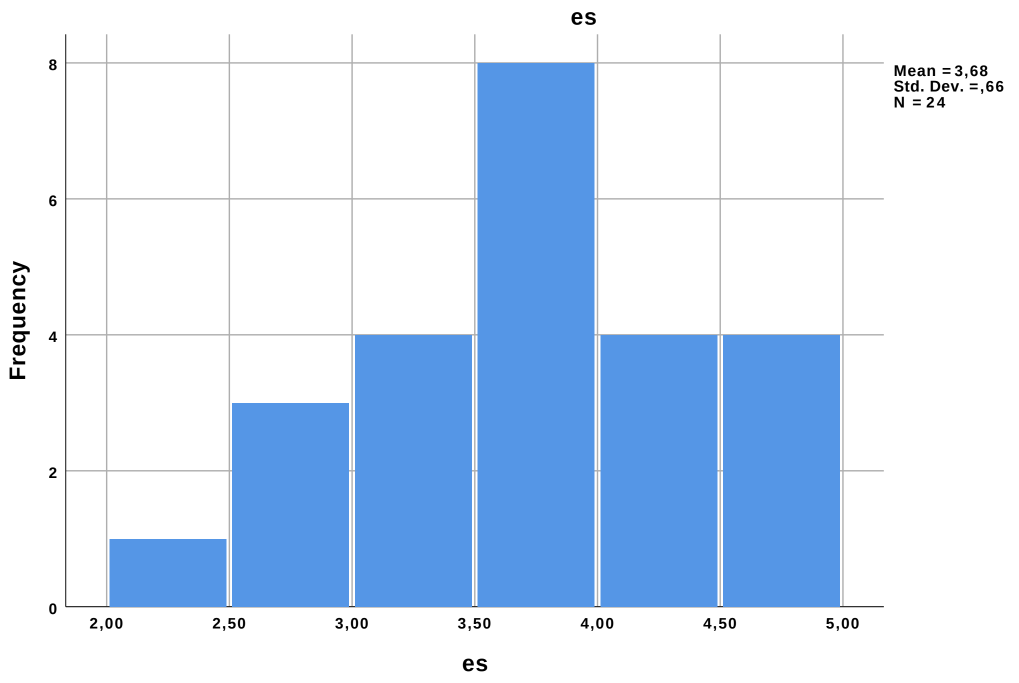
Statistics

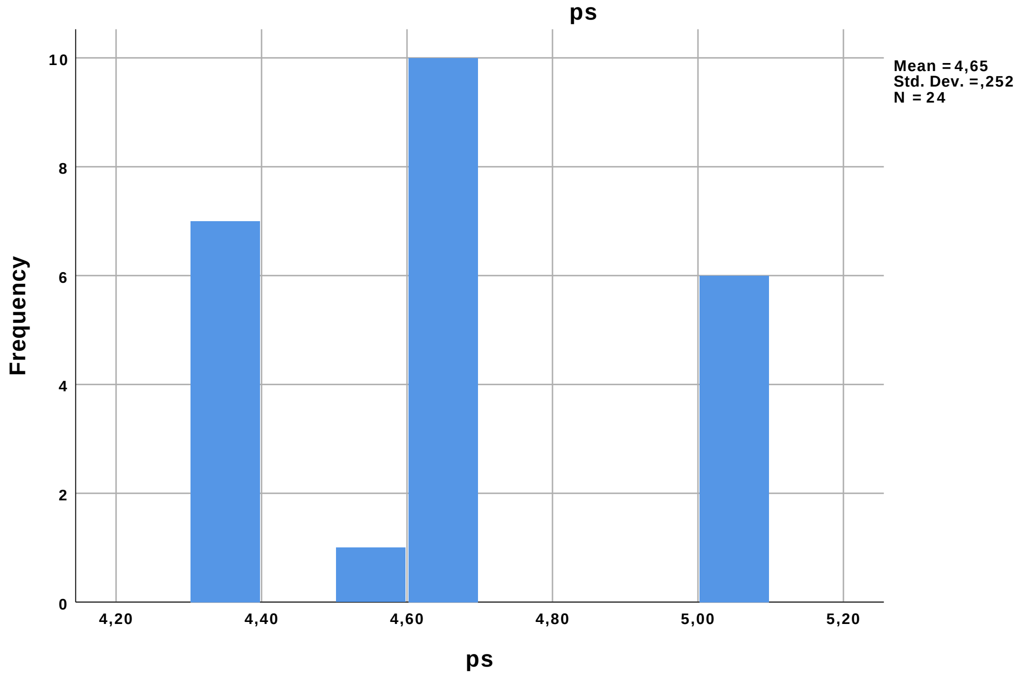
		pw	dic	es	ps	gii
N	Valid	24	24	24	24	24
	Missing	0	0	0	0	0

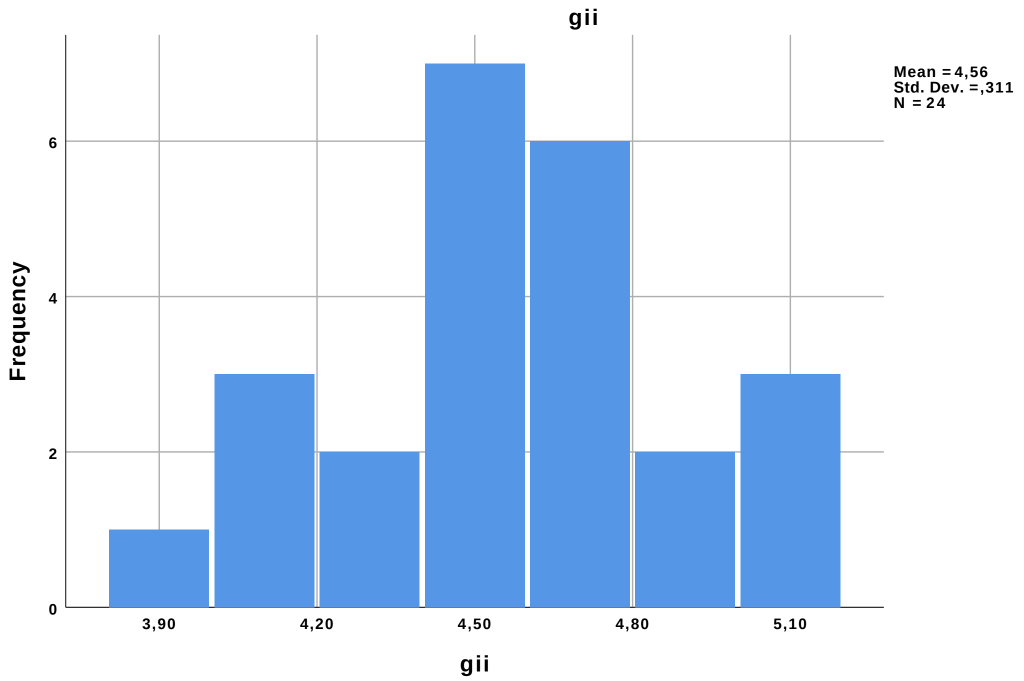
Histogram




dic
Mean = 3,99
Std. Dev. = ,347
N = 24
Frequency
0
2
4
6
8
10
3,60
3,80
4,00
4,20
4,40
4,60
4,80
dic


es
Mean = 3,68
Std. Dev. = ,66
N = 24
Frequency
0
2
4
6
8
2,00
2,50
3,00
3,50
4,00
4,50
5,00
es






```
NONPAR CORR
/VARIABLES=pw dic es ps gii
/PRINT=SPEARMAN TWOTAIL NOSIG
/MISSING=PAIRWISE.
```

Nonparametric Correlations

Notes

Output Created		20-JUL-2023 12...
Comments		
Input	Data	C:\Users\Spyros\Downloads\Final-Master+Thesis+-+NAP_July+18,+2023_07.53.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each pair of variables are based on all the cases with valid data for that pair.
Syntax		NONPAR CORR /VARIABLES=pw dic es ps gii /PRINT=SPEARMAN TWOTAIL NOSIG /MISSING=PAIRWISE.
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.01
	Number of Cases Allowed	209715 cases[a]

a. Based on availability of workspace memory

Correlations

			pw	dic	es
Spearman's rho	pw	Correlation Coefficient	1,000	-,011	,598**
		Sig. (2-tailed)	.	,958	,002
		N	24	24	24
	dic	Correlation Coefficient	-,011	1,000	,139
		Sig. (2-tailed)	,958	.	,518
		N	24	24	24
	es	Correlation Coefficient	,598**	,139	1,000
		Sig. (2-tailed)	,002	,518	.
		N	24	24	24
	ps	Correlation Coefficient	,528**	,267	,273
		Sig. (2-tailed)	,008	,207	,196
		N	24	24	24
	gii	Correlation Coefficient	,573**	,241	,847**
		Sig. (2-tailed)	,003	,256	,000
		N	24	24	24

Correlations

			ps	gii
Spearman's rho	pw	Correlation Coefficient	,528**	,573**
		Sig. (2-tailed)	,008	,003
		N	24	24
	dic	Correlation Coefficient	,267	,241
		Sig. (2-tailed)	,207	,256
		N	24	24
	es	Correlation Coefficient	,273	,847**
		Sig. (2-tailed)	,196	,000
		N	24	24
	ps	Correlation Coefficient	1,000	,428*
		Sig. (2-tailed)	.	,037
		N	24	24
	gii	Correlation Coefficient	,428*	1,000
		Sig. (2-tailed)	,037	.
		N	24	24

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

```
REGRESSION
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT ps
/METHOD=ENTER pw es dic.
```

Regression

Notes

Output Created		20-JUL-2023 12...
Comments		
Input	Data	C: \Users\Spyros\Downloads\Final-Master+Thesis+-+NAP_July+18,+2023_07.53.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.
Syntax		REGRESSION /MISSING LISTWISE /STATISTICS COEFF OUTS R ANOVA /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT ps /METHOD=ENTER pw es dic.
Resources	Processor Time	00:00:00.05
	Elapsed Time	00:00:00.06
	Memory Required	68508 bytes
	Additional Memory Required for Residual Plots	0 bytes

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	dic, pw, es[b]	.	Enter

a. Dependent Variable: ps

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,604[a]	,365	,270	,21547

a. Predictors: (Constant), dic, pw, es

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,533	3	,178	3,828	,026[b]
	Residual	,929	20	,046		
	Total	1,462	23			

a. Dependent Variable: ps

b. Predictors: (Constant), dic, pw, es

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,629	,649		4,051	,001
	pw	,304	,116	,533	2,621	,016
	es	-,007	,079	-,018	-,088	,930
	dic	,201	,131	,276	1,530	,142

a. Dependent Variable: ps

```
ONEWAY pw dic es ps gii BY Q1
```

Oneway

Notes

Output Created		20-JUL-2023 12...
Comments		
Input	Data	C: \Users\Spyros\Downloads\Final-Master+Thesis+-+NAP_July+18,+2023_07.53.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on cases with no missing data for any variable in the analysis.
Syntax		ONEWAY pw dic es ps gii BY Q1 /MISSING ANALYSIS.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.02

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
pw	Between Groups	,550	3	,183	,934	,443
	Within Groups	3,929	20	,196		
	Total	4,479	23			
dic	Between Groups	,579	3	,193	1,764	,186
	Within Groups	2,188	20	,109		
	Total	2,767	23			
es	Between Groups	1,142	3	,381	,859	,478
	Within Groups	8,866	20	,443		
	Total	10,009	23			
ps	Between Groups	,308	3	,103	1,783	,183
	Within Groups	1,153	20	,058		
	Total	1,462	23			
gii	Between Groups	,302	3	,101	1,050	,392
	Within Groups	1,919	20	,096		
	Total	2,221	23			

```
T-TEST GROUPS=Q4(1 2)
/MISSING=ANALYSIS
/VARIABLES=pw dic es ps gii
/CRITERIA=CI(.95).
```

T-Test

Notes

Output Created		20-JUL-2023 12...
Comments		
Input	Data	C:\Users\Spyros\Downloads\Final-Master+Thesis+-+NAP_July+18,+2023_07.53.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on the cases with no missing or out-of-range data for any variable in the analysis.
Syntax		T-TEST GROUPS=Q4(1 2) /MISSING=ANALYSIS /VARIABLES=pwdic es ps gii /CRITERIA=CI(.95).
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.02

Group Statistics

	4) Are the key experts in the process industry working in shifts?	N	Mean	Std. Deviation	Std. Error Mean
pw	Yes	9	3,9741	,43422	,14474
	No	14	4,1571	,46029	,12302
dic	Yes	9	4,1222	,36324	,12108
	No	14	3,8825	,30689	,08202
es	Yes	9	3,8877	,63029	,21010
	No	14	3,5575	,69206	,18496
ps	Yes	9	4,5185	,24216	,08072
	No	14	4,7262	,24114	,06445
gii	Yes	9	4,5397	,33333	,11111
	No	14	4,5689	,31951	,08539

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	df
pw	Equal variances assumed	,498	,488	-,951	21
	Equal variances not assumed			-,964	17,964
dic	Equal variances assumed	,589	,451	1,703	21
	Equal variances not assumed			1,639	15,073
es	Equal variances assumed	,697	,413	1,155	21
	Equal variances not assumed			1,179	18,403
ps	Equal variances assumed	,039	,846	-2,012	21
	Equal variances not assumed			-2,011	17,159
gii	Equal variances assumed	,053	,820	-,210	21
	Equal variances not assumed			-,208	16,664

Independent Samples Test

		t-test for Equality of Means			
		Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of . Lower
pw	Equal variances assumed	,352	-,18307	,19249	-,58338
	Equal variances not assumed	,348	-,18307	,18996	-,58221
dic	Equal variances assumed	,103	,23968	,14078	-,05308
	Equal variances not assumed	,122	,23968	,14625	-,07190
es	Equal variances assumed	,261	,33011	,28591	-,26448
	Equal variances not assumed	,253	,33011	,27991	-,25704
ps	Equal variances assumed	,057	-,20767	,10319	-,42227
	Equal variances not assumed	,060	-,20767	,10329	-,42545
gii	Equal variances assumed	,835	-,02920	,13879	-,31782
	Equal variances not assumed	,837	-,02920	,14013	-,32531

Independent Samples Test

		t-test for Equality of .. 95% Confidence Interval of .. Upper
pw	Equal variances assumed	,21724
	Equal variances not assumed	,21607
dic	Equal variances assumed	,53244
	Equal variances not assumed	,55127
es	Equal variances assumed	,92470
	Equal variances not assumed	,91727
ps	Equal variances assumed	,00693
	Equal variances not assumed	,01010
gii	Equal variances assumed	,25943
	Equal variances not assumed	,26692

Matrix

Notes

Output Created		21-JUL-2023 19:06:56
Comments		
Input	Data	/Users/anastasiapritsa/Downloads/Final-Master+Thesis+-+NAP_July+18,+2023_07.53().sav
	Active Dataset	DataSet3
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24

Notes

Syntax	MATRIX. compute wnames='xxxxx'. compute znames='xxxxx'. compute mcerpt=0. compute wiscov=0. compute ziscov=0. compute tooman=0. compute errcode=make (100,1,0). compute notecode=make (100,1,0). compute model = trunc(4). compute iterate = abs (trunc(100)). compute converge = abs(0.00001). compute itprobtg=0. compute v2tag=0. compute ydich=0. compute maxwwarn=0. compute minwwarn=0. compute maxzwarn=0. compute minzwarn=0. compute toomany=0. compute wdich=0. compute zdich=0. compute wnotev=0. compute znotev=0. compute nxpval=1. compute nwpval=1. compute nzpval=1. compute errs=1. compute notes=1. compute criterr=0. compute novar=0. compute adjust=0. compute ncs=0. compute serial=0. compute sobelok=0. compute hasw=0. compute hasz=0. compute printw=0. compute printz=0. compute xmint=(0 =1). compute wmodcust=0. compute zmodcust=0. compute booting=0. compute bootiter=0. compute iterrmod=0. compute cov = 'xxxxx'. compute varorder=(0 <> 0). compute nws=0. compute w= 'xxxxx'. compute nzs=0. compute z = 'xxxxx'. compute nms=0. compute m = 'gii'. compute nys=0. compute y = 'ps'. compute nxs=0. compute x = 'pw'. compute effsize=(0 =1). compute stand=(1 =1). compute intprobe = 1. compute xrefvals={ 999 }. compute center=trunc(0). compute xcontcf=0. compute xscaling=1.

Notes

Resources	Processor Time	00:00:04.57
	Elapsed Time	00:00:04.00

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.2 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 4
    Y  : ps
    X  : pw
    M  : gii

Sample
Size:  24

**************************************************************************
OUTCOME VARIABLE:
 gii

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .5458      .2979      .0709     9.3338     1.0000    22.0000      .0058

Model
              coeff         se          t          p       LLCI       ULCI
constant     2.9909      .5158     5.7983      .0000     1.9211     4.0607
pw            .3843      .1258     3.0551      .0058      .1234      .6452

Standardized coefficients
        coeff
pw      .5458

**************************************************************************
OUTCOME VARIABLE:
 ps

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .5506      .3032      .0485     4.5691     2.0000    21.0000      .0225

Model
              coeff         se          t          p       LLCI       ULCI
constant     3.0576      .6785     4.5065      .0002     1.6465     4.4686
pw            .2647      .1242     2.1313      .0450      .0064      .5230
gii           .1117      .1764      .6332      .5335     -.2551      .4785

Standardized coefficients
         coeff
pw       .4633
gii      .1376

************************** TOTAL EFFECT MODEL ****************************
OUTCOME VARIABLE:
 ps
```

```
Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .5384      .2899      .0472     8.9820     1.0000    22.0000      .0066

Model
              coeff         se          t          p       LLCI       ULCI
constant     3.3915      .4209     8.0587      .0000     2.5187     4.2644
pw            .3076      .1026     2.9970      .0066      .0947      .5204

Standardized coefficients
        coeff
pw      .5384


************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************

Total effect of X on Y
     Effect         se          t          p       LLCI       ULCI       c_cs
      .3076      .1026     2.9970      .0066      .0947      .5204      .5384

Direct effect of X on Y
     Effect         se          t          p       LLCI       ULCI      c'_cs
      .2647      .1242     2.1313      .0450      .0064      .5230      .4633

Indirect effect(s) of X on Y:
        Effect     BootSE   BootLLCI   BootULCI
gii      .0429      .0741     -.0746      .2170

Completely standardized indirect effect(s) of X on Y:
        Effect     BootSE   BootLLCI   BootULCI
gii      .0751      .1255     -.1262      .3775

*********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

------ END MATRIX -----
```

Matrix

Notes

Output Created		21-JUL-2023 19:08:24
Comments		
Input	Data	/Users/anastasiapritsa/Downloads/Final-Master+Thesis+-+NAP_July+18,+2023_07.53().sav
	Active Dataset	DataSet3
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24

Notes

Syntax	MATRIX. compute wnames='xxxxx'. compute znames='xxxxx'. compute mcerpt=0. compute wiscov=0. compute ziscov=0. compute tooman=0. compute errcode=make (100,1,0). compute notecode=make (100,1,0). compute model = trunc(4). compute iterate = abs (trunc(100)). compute converge = abs(0.00001). compute itprobtg=0. compute v2tag=0. compute ydich=0. compute maxwwarn=0. compute minwwarn=0. compute maxzwarn=0. compute minzwarn=0. compute toomany=0. compute wdich=0. compute zdich=0. compute wnotev=0. compute znotev=0. compute nxpval=1. compute nwpval=1. compute nzpval=1. compute errs=1. compute notes=1. compute criterr=0. compute novar=0. compute adjust=0. compute ncs=0. compute serial=0. compute sobelok=0. compute hasw=0. compute hasz=0. compute printw=0. compute printz=0. compute xmint=(0 =1). compute wmodcust=0. compute zmodcust=0. compute booting=0. compute bootiter=0. compute iterrmod=0. compute cov = 'xxxxx'. compute varorder=(0 <> 0). compute nws=0. compute w= 'xxxxx'. compute nzs=0. compute z = 'xxxxx'. compute nms=0. compute m = 'gii'. compute nys=0. compute y = 'ps'. compute nxs=0. compute x = 'dic'. compute effsize=(0 =1). compute stand=(1 =1). compute intprobe = 1. compute xrefvals={ 999 }. compute center=trunc(0). compute xcontcf=0. compute xscaling=1.

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Notes

Resources	Processor Time	00:00:04.70
	Elapsed Time	00:00:05.00

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.2 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 4
    Y  : ps
    X  : dic
    M  : gii

Sample
Size:  24

**************************************************************************
OUTCOME VARIABLE:
 gii

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .2566      .0658      .0943     1.5505     1.0000    22.0000      .2262

Model
              coeff         se          t          p       LLCI       ULCI
constant     3.6399      .7400     4.9185      .0001     2.1050     5.1747
dic           .2299      .1846     1.2452      .2262     -.1530      .6128

Standardized coefficients
         coeff
dic      .2566

**************************************************************************
OUTCOME VARIABLE:
 ps

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .4421      .1955      .0560     2.5510     2.0000    21.0000      .1019

Model
              coeff         se          t          p       LLCI       ULCI
constant     2.7826      .8264     3.3673      .0029     1.0640     4.5012
dic           .1559      .1472     1.0590      .3016     -.1503      .4620
gii           .2722      .1643     1.6566      .1125     -.0695      .6139

Standardized coefficients
         coeff
dic      .2145
gii      .3355

************************** TOTAL EFFECT MODEL ****************************
OUTCOME VARIABLE:
 ps
```

```
Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .3005      .0903      .0604     2.1844     1.0000    22.0000      .1536

Model
              coeff         se          t          p       LLCI       ULCI
constant     3.7733      .5925     6.3688      .0000     2.5445     5.0021
dic           .2185      .1478     1.4780      .1536     -.0881      .5250

Standardized coefficients
         coeff
dic      .3005


************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************

Total effect of X on Y
     Effect         se          t          p       LLCI       ULCI       c_cs
      .2185      .1478     1.4780      .1536     -.0881      .5250      .3005

Direct effect of X on Y
     Effect         se          t          p       LLCI       ULCI      c'_cs
      .1559      .1472     1.0590      .3016     -.1503      .4620      .2145

Indirect effect(s) of X on Y:
        Effect     BootSE   BootLLCI   BootULCI
gii      .0626      .0739     -.0620      .2358

Completely standardized indirect effect(s) of X on Y:
        Effect     BootSE   BootLLCI   BootULCI
gii      .0861      .0983     -.0832      .3155

********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

------ END MATRIX -----
```

Matrix

Notes

Output Created		21-JUL-2023 19:09:02
Comments		
Input	Data	/Users/anastasiapritsa/Downloads/Final-Master+Thesis+-+NAP_July+18,+2023_07.53().sav
	Active Dataset	DataSet3
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	24

Notes

Syntax	MATRIX. compute wnames='xxxxx'. compute znames='xxxxx'. compute mcerpt=0. compute wiscov=0. compute ziscov=0. compute tooman=0. compute errcode=make (100,1,0). compute notecode=make (100,1,0). compute model = trunc(4). compute iterate = abs (trunc(100)). compute converge = abs(0.00001). compute itprobtg=0. compute v2tag=0. compute ydich=0. compute maxwwarn=0. compute minwwarn=0. compute maxzwarn=0. compute minzwarn=0. compute toomany=0. compute wdich=0. compute zdich=0. compute wnotev=0. compute znotev=0. compute nxpval=1. compute nwpval=1. compute nzpval=1. compute errs=1. compute notes=1. compute criterr=0. compute novar=0. compute adjust=0. compute ncs=0. compute serial=0. compute sobelok=0. compute hasw=0. compute hasz=0. compute printw=0. compute printz=0. compute xmint=(0 =1). compute wmodcust=0. compute zmodcust=0. compute booting=0. compute bootiter=0. compute iterrmod=0. compute cov = 'xxxxx'. compute varorder=(0 <> 0). compute nws=0. compute w= 'xxxxx'. compute nzs=0. compute z = 'xxxxx'. compute nms=0. compute m = 'gii'. compute nys=0. compute y = 'ps'. compute nxs=0. compute x = 'es'. compute effsize=(0 =1). compute stand=(1 =1). compute intprobe = 1. compute xrefvals={ 999 }. compute center=trunc(0). compute xcontcf=0. compute xscaling=1.

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Notes

Resources	Processor Time	00:00:04.54
	Elapsed Time	00:00:04.00

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.2 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 4
    Y  : ps
    X  : es
    M  : gii

Sample
Size:  24

**************************************************************************
OUTCOME VARIABLE:
 gii

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .8129      .6607      .0342    42.8454     1.0000    22.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     3.1478      .2187    14.3905      .0000     2.6941     3.6014
es            .3829      .0585     6.5456      .0000      .2616      .5042

Standardized coefficients
        coeff
es      .8129

**************************************************************************
OUTCOME VARIABLE:
 ps

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .3957      .1566      .0587     1.9498     2.0000    21.0000      .1672

Model
              coeff         se          t          p       LLCI       ULCI
constant     3.0257      .9241     3.2740      .0036     1.1037     4.9476
es           -.0421      .1315     -.3202      .7520     -.3156      .2314
gii           .3895      .2791     1.3953      .1775     -.1910      .9700

Standardized coefficients
         coeff
es      -.1102
gii      .4801

************************** TOTAL EFFECT MODEL ****************************
OUTCOME VARIABLE:
 ps
```

```
Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .2800      .0784      .0612     1.8722     1.0000    22.0000      .1850

Model
              coeff         se          t          p       LLCI       ULCI
constant     4.2516      .2925    14.5364      .0000     3.6450     4.8582
es            .1070      .0782     1.3683      .1850     -.0552      .2692

Standardized coefficients
        coeff
es      .2800


************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************

Total effect of X on Y
     Effect         se          t          p       LLCI       ULCI       c_cs
      .1070      .0782     1.3683      .1850     -.0552      .2692      .2800

Direct effect of X on Y
     Effect         se          t          p       LLCI       ULCI      c'_cs
     -.0421      .1315     -.3202      .7520     -.3156      .2314     -.1102

Indirect effect(s) of X on Y:
        Effect     BootSE   BootLLCI   BootULCI
gii      .1491      .1146     -.0473      .4224

Completely standardized indirect effect(s) of X on Y:
        Effect     BootSE   BootLLCI   BootULCI
gii      .3902      .2714     -.1201      .9637

********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

------ END MATRIX -----
```

Word Counts main

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File: main.tex
Encoding: utf8
Sum count: 23324
Words in text: 22972
Words in headers: 238
Words outside text (captions, etc.): 114
Number of headers: 62
Number of floats/tables/figures: 7
Number of math inlines: 0
Number of math displayed: 0
Subcounts:
  text+headers+captions (#headers/#floats/#inlines/#displayed)
  0+19+0 (1/0/0/0) _top_
  565+1+0 (1/0/0/0) Section: Acknowledgments
  516+2+0 (1/0/0/0) Section: Executive Summary
  424+1+0 (1/0/0/0) Section: Introduction
  454+2+0 (1/0/0/0) Subsection: Problem Statement
  625+6+2 (1/1/0/0) Subsection: Significance and Relevance to MOT Program
  0+2+0 (1/0/0/0) Section: Research design
  72+2+0 (1/0/0/0) Subsection: Research Objective
  246+2+0 (1/0/0/0) Subsection: Research Questions
  0+2+0 (1/0/0/0) Section: Literature review
  906+9+12 (3/2/0/0) Subsection: The process industry
  467+11+0 (2/0/0/0) Subsection: Green Innovation
  1559+29+0 (5/0/0/0) Subsection: Stakeholders Identification
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  452+2+0 (1/0/0/0) Subsection: Research Design
  187+1+0 (1/0/0/0) Subsection: Sampling
  128+2+0 (1/0/0/0) Subsection: Selection Criteria
  659+3+0 (1/0/0/0) Subsection: Data Collection Procedures
  319+1+0 (1/0/0/0) Section: Measurement
  369+2+0 (1/0/0/0) Subsection: Independent Variables
  115+2+0 (1/0/0/0) Subsection: Mediator Variable
  112+2+0 (1/0/0/0) Subsection: Dependent Variable
  133+2+0 (1/0/0/0) Subsection: Control Variables
  497+3+0 (1/0/0/0) Section: Analysis and Findings
  2293+58+70 (7/0/0/0) Subsection: Descriptive analysis
  2924+17+15 (5/0/0/0) Subsection: Statistical analysis
  0+1+0 (1/0/0/0) Section: Discussion
  618+3+0 (1/0/0/0) Subsection: Overview of Findings
  412+5+5 (1/1/0/0) Subsection: Updated Green Innovation implementation model
  1040+4+0 (1/0/0/0) Subsection: Addressing the Research Question
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1491+1+0 (1/0/0/0) Section: Conclusions
54+3+0 (1/0/0/0) Section: Recommendations and Implications
621+1+0 (1/0/0/0) Subsection: Recommendations
277+4+0 (1/0/0/0) Subsection: Theoretical and Practical Implications
285+1+0 (1/0/0/0) Subsection: Reflection
0+1+0 (1/0/0/0) Section: Appendix
434+5+0 (1/0/0/0) Subsection: INFORMED CONSENT (QUESTIONNAIRE) - opening statement
1114+1+0 (1/0/0/0) Subsection: QUESTIONNAIRE
0+3+0 (1/1/0/0) Subsection: HREC Approval letter
1129+3+4 (1/1/0/0) Subsection: Mediation effects analysis
107+4+0 (1/0/0/0) Subsection: Questionnaire Data \& SPSS Analysis
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