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Green Innovation and Organizational Change: A Qualitative Analysis of Sustainable Practices in the Manufacturing Sector

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Abstract

This study aims to analyze the impact of the implementation of green innovation on structural changes and organizational culture in the manufacturing sector. Using a qualitative approach, this study collects data from interviews and observations on a number of manufacturing companies that implement green innovation. The results show that the main motivation of companies in adopting green innovation comes from internal factors, such as sustainability values and management commitment, as well as external factors in the form of government regulations and consumer demand. The strategies implemented include energy efficiency, emission reduction, and the use of environmentally friendly raw materials. However, the main challenges in implementation are the high cost and resistance from employees. To address this, some companies are forming special divisions for sustainability and enhancing a culture of environmental care through internal training and campaigns. The study concludes that green innovation has a significant impact in strengthening organizational structure and culture, helping companies achieve long-term sustainability, and creating added value in relationships with stakeholders.

Keywords: green innovation, organizational change, sustainability, manufacturing, organizational culture.

A. Introduction

In recent decades, attention to sustainability and green innovation in the manufacturing sector has continued to increase in line with the worsening global environmental crisis (Henrekson & Stenkula, 2022). Sustainability is becoming a major focus in the manufacturing industry, especially with increasing pressure from the public and governments to reduce negative impacts on the environment According to a recent report from the International Energy Agency (IEA), the industrial sector accounts for about 24% of global carbon emissions, making it one of the largest contributors to climate change. In addition, excessive consumption of resources and inefficient production processes increase the environmental challenges facing many countries (Soto-Acosta et al., 2018).

In the manufacturing sector, the implementation of green innovation is one of the effective strategies in overcoming environmental problems and increasing competitiveness. Green innovation, which includes practices such as waste reduction, the use of renewable energy, and recycling of raw materials, allows companies to reduce their carbon footprint and improve operational efficiency (Elia, Mariani, & Bettiol, 2020). Empirical studies show that companies that adopt green innovation can improve their economic performance and reputation in the eyes of consumers who are increasingly concerned about the environment (Yusuf & Andriani, 2021).

However, this transition to sustainable practices requires significant organizational changes, especially in terms of company culture, structure, and resource management. Organizational change is often considered a major challenge, especially when companies must integrate sustainability principles in their core business processes (Juliarti et al., 2018). Such change requires commitment from all levels of the organization, from the executive level to employees on the ground, to achieve successful sustainable transformation (Shrivastava & Savolainen, 2017).

The urgency of this research is seen in the context of the urgent need to lower emissions and reduce environmental impacts in the manufacturing sector, which has important implications for the global economy and social well-being. Although many companies are aware of the importance of sustainability, the adoption of green innovation in the manufacturing sector still faces many obstacles, including resistance to change, lack of green technology-related skills, and high initial costs (Prakash & Singh, 2011). This study aims to understand the factors that affect the implementation of green innovation in the context of manufacturing as well as the role of organizational change in supporting the success of sustainable practices.

The novelty of this study lies in the qualitative approach used to explore the perspectives of manufacturing companies regarding the green innovation adoption process and the dynamics of necessary organizational change. Using in-depth interviews and document analysis, the study will delve deeper into how companies are overcoming challenges and taking advantage of opportunities in implementing green strategies. This study is expected to provide deeper insights into how manufacturing companies in developing countries can effectively implement sustainable practices (Jha & Bose, 2021).

The main objective of this study is to analyze the impact of organizational changes on the success of green innovation in the manufacturing sector and identify effective sustainable practices in improving the environmental and economic performance of companies. This research is expected to contribute to the literature on green change

management and innovation, as well as offer concrete recommendations for companies that want to implement green strategies effectively in a dynamic and competitive business environment (Olawuyi et al., n.d.)

In terms of practical benefits, this study is expected to provide guidance for companies to design organizational change strategies that can facilitate the effective implementation of green innovation. In addition, the results of this study can also be used by policymakers in formulating regulations that support sustainable practices in the manufacturing sector, which can ultimately contribute to reducing emissions and improving overall environmental well-being (Prakash & Singh, 2011).

B. Research Methods

This research method uses a qualitative approach to explore green innovation practices in the manufacturing sector, focusing on organizational changes in response to the implementation of sustainable practices. The qualitative approach was chosen because it allows for an in-depth exploration of the experiences, perceptions, and strategies applied by manufacturing companies in carrying out green innovation (Creswell & Clark, 2017). Through this approach, researchers can gain a thorough understanding of how manufacturing companies manage their sustainable transformation processes amid environmental challenges and increasing regulatory demands.

Research Design

This study uses a case study design to focus the analysis on a number of manufacturing companies that have implemented green innovation practices. Case studies provide flexibility in exploring processes, organizational dynamics, and changes that occur in the long term. The case study approach is suitable for analyzing complex and contextual phenomena, such as the application of green innovation in organizations that have unique characteristics and challenges (Yin, 2017).

Population and Sample

The population in the study includes manufacturing companies operating in industrial estates and have implemented green innovations as part of their sustainability policies. The purposive sampling technique was used to select five companies that met the research criteria, namely companies that have integrated sustainable practices in their production and operational processes for at least three years. The main respondents of this study are operational managers, sustainability managers, and employees who are directly involved in the implementation of green innovation policies in each company.

Data Collection Techniques

Data was collected through in-depth interviews, field observations, and documentation. In-depth interviews were conducted to explore the

experiences, strategies, and challenges faced by companies in implementing green innovation. Each interview lasted 60-90 minutes and was recorded with the consent of the respondents to maintain the accuracy of the data. In addition, field observations are conducted to further understand the daily practices in the company as well as to record the processes and organizational structures that support green innovation. Documentation, such as sustainability reports, company policies, and environmental evaluation records, is used to supplement and validate data obtained from interviews and observations.

Data Analysis Techniques

Data analysis is carried out with a thematic analysis approach. Each data collected from interviews, observations, and documentation is coded and categorized to find key themes relevant to the research objectives. This analysis includes the identification of patterns in the implementation of green innovation, organizational responses to changes in environmental regulations, and the influence of sustainable practices on organizational structure and culture. NVivo is used to help organize qualitative data and facilitate the process of thematic analysis more systematically (Braun & Clarke, 2006).

Validity and Reliability

To ensure the validity and reliability of the research, data triangulation was applied by comparing the results of interviews, observations, and documentation. In addition, member checking was carried out by asking respondents to review the results of the interview to ensure that the researcher's interpretation was in accordance with their experience. Data reliability is maintained through consistency in systematic data collection and analysis procedures.

C. Results and Discussion

Results of Research

This research focuses on how manufacturing companies are adopting and integrating green innovation into their operational practices as well as their impact on organizational change. This process is very complex and involves a number of internal and external factors that influence the company's decisions. Based on interviews and observations, this study identifies several key themes that emerge: corporate motivation in implementing green innovation, strategies implemented, challenges in implementation, and the impact of green innovation on organizational structure and culture.

1. Motivation and Driving Factors

Motivations for adopting green innovation are diverse among the manufacturing companies studied. The majority of companies explain that they are driven by internal and external factors. Internal factors include company values that support sustainability and a commitment from

management to maintain the company's reputation. Company leaders realize that sustainability is not only a business strategy, but also a commitment to be responsible for the environment and society. One of the respondents, an operations manager, stated that their main goal is to be a company that not only focuses on profits, but also cares about the long-term impact they produce on the environment. This statement reflects the understanding that reputation and sustainability are an important part of the company's mission to support green innovation (P1, interview).

External factors also affect the company's motivation, especially increasingly stringent government regulations related to carbon emissions and environmental protection. In several countries, including Indonesia, this regulation aims to reduce the negative impact of the industry on the environment through carbon emission limits, stricter waste management, and providing incentives to companies that carry out environmentally friendly practices. Respondents from this study revealed that the regulation encourages them to implement green innovation. Consumer demand is also a strong driving factor. Consumers who are increasingly environmentally conscious now tend to choose products from companies that implement environmentally friendly practices. In addition, there is an encouragement from investors who pay more attention to sustainability aspects in their investment portfolios, which plays a role in influencing companies' strategies in adopting green practices (P1, interview).

2. Green Innovation Strategy

The companies in this study have implemented various green innovation strategies to achieve their sustainability goals. The strategies used include reducing carbon emissions, energy efficiency, and using more environmentally friendly raw materials. Some companies invest in energy-efficient technologies and machines specifically designed to reduce carbon footprints. One of the companies started replacing chemical raw materials with more natural materials to reduce the impact of toxic waste in their production process. The decision to use more environmentally friendly raw materials reflects the company's long-term strategy in achieving higher sustainability standards (P2, interview).

The use of renewable energy is also an important part of the green innovation strategy implemented. For example, some companies are installing solar panels in their production facilities to reduce reliance on fossil energy. The application of this renewable energy source not only helps companies achieve low emission targets, but also reduces energy costs in the long run. Other strategies implemented include optimizing production processes to reduce waste and water consumption. For example, the company implements a water recycling system in the manufacturing process to minimize the use of limited natural resources. Respondents revealed that practices like this not only lower production

costs, but also create added value for companies by improving their eco-friendly image in the eyes of consumers and stakeholders (P2, interview).

3. Challenges in Implementation

The implementation of green innovation is inseparable from the various challenges faced by companies. One of the main obstacles is the high cost of investment. Many green technologies, such as energy-efficient machines and solar panels, require considerable initial investment. Some respondents mentioned that these obstacles often prevent small and medium-sized companies from adopting environmentally friendly technologies. In addition, changes to production processes require significant adjustments and training of employees so that they can adapt to the new technologies and procedures implemented in green innovation (P3, interview).

Another challenge identified was internal resistance from employees. The old culture in the company is sometimes difficult to change, especially for employees who have been working in conventional ways for a long time. Some employees feel less confident or even resist the change due to a lack of understanding of the long-term benefits of green innovation. This rejection can affect the effectiveness of the implementation of green innovations if not handled properly. One of the ways proposed by respondents is through internal training and campaigns that aim to increase employees' understanding of the importance of green innovation. "*It's not easy to change the old culture in the company, especially for employees who have been working here for a long time and are used to the old ways*" (P3, interview).

4. Impact on Organizational Structure

Green innovation not only impacts operational processes, but also triggers structural changes in organizations. The results of the study show that several companies have formed special divisions responsible for sustainability and environmental management. This division is in charge of designing, supervising, and evaluating the implementation of green innovations. Some companies even form cross-functional teams involving various departments to ensure that green practices are integrated into every aspect of operations. This cross-functional team allows each part of the company to play an active role in creating a more environmentally friendly work environment (P4, interview).

The establishment of the sustainability division demonstrates the company's commitment to green innovation and creates a formal mechanism to oversee these developments. In some cases, more flexible organizational structures are also emerging as part of the adaptation to green innovation. This structure allows companies to respond to changes faster, both in terms of regulations and technological developments that are constantly changing in the realm of sustainability. In addition, the establishment of the sustainability division encourages the improvement

of the company's internal capacity to manage environmental risks and create added value in the eyes of stakeholders.

5. Change in Organizational Culture

This study also found that the implementation of green innovation plays a role in shaping a more environmentally friendly organizational culture. Employees are starting to show more concern for waste management and reducing energy use. This cultural change does not happen instantly, but through various training programs, internal campaigns, and company initiatives aimed at raising employee awareness of the importance of sustainability. The culture of caring for the environment formed among employees also supports the effectiveness of the implementation of green innovations in the long term (P5, interview).

Some companies hold regular training for all employees so that they understand their role in protecting the environment. This training program not only covers knowledge about green innovation, but also involves practical approaches in waste management and energy efficiency. One of the respondents explained, "*We hold training for all employees so that they understand how they can contribute to protecting the environment*" (P5, interview). Through this kind of training, companies strive to form a comprehensive environmental awareness and make green innovation an integral part of the organizational culture.

Employees are also encouraged to participate in sustainability initiatives, such as responsible waste management and efficient use of energy in the workplace. This program creates a sense of belonging among employees towards the success of the company's green innovation program. In addition, the influence of green innovation on organizational culture also increases the company's commitment to sustainability practices, which ultimately supports the company's goals in protecting the environment and creating a positive social impact outside the work environment.

Discussion

In the context of organizational change, green innovation not only has a direct impact on company operations, but also brings significant changes to organizational structure, culture, and leadership. This discussion relates the research findings to relevant theories and literature.

1. Motivation and Driving Factors: Correlation with Organizational Ecology Theory

The motivation of companies to adopt green innovation can be explained through the theory of organizational ecology, which states that organizations must adapt to a dynamic environment in order to survive (Esther Lopez-Martin.Gabriela Topa, 2019). In this context, government regulations and market demand encourage companies to carry out green innovation. The results of this study are in line with research by (Delmas

& Toffel, 2008) which stated that regulatory pressure and consumer demand are the main drivers of green innovation in organizations.

2. Green Innovation Strategy and Sustainability Practice Approach

The strategies implemented by the companies in this study demonstrate a variety of sustainable practices that include energy efficiency, waste reduction, and the use of renewable energy. This strategy reflects a triple bottom line approach, which emphasizes a balance between economic benefits, environmental sustainability, and social welfare. The application of eco-friendly technologies also supports the findings of (Chen et al., 2012) who identify that new technologies play an important role in improving operational efficiency and sustainability.

3. Implementation Challenges: Economic and Social Constraints

The results of this study reveal that investment costs and internal resistance are the main obstacles in the implementation of green innovation. The cost challenge is in accordance with the findings of (Sarhan et al., 2020), who stated that green innovation requires a high initial investment. Meanwhile, internal resistance can be attributed to the theory of organizational change put forward by (Lewin & Cartwright, 1951) where cultural change requires a process of freezing and reshaping (unfreezing and refreezing). This research reinforces the view that cultural change is one of the obstacles that requires a special approach, such as effective education and communication.

4. Impact on Organizational Structure and Culture: A Flexible Structure Perspective

Findings regarding changes in organizational structures, such as the formation of sustainability-specific teams, suggest that green innovation can trigger the adoption of more flexible structures. This structure allows companies to be more responsive to changes in the environment, in line with the theory of contingency organizational structure which emphasizes the importance of adapting structures as needed. The addition of a dedicated sustainability department is also in line with the research of (Azzone & Noci, 1998) which found that organizational structures that support sustainability facilitate the implementation of green innovations more effectively.

5. Organizational Culture Change: Towards a Green Culture

The change in organizational culture towards more environmentally conscious values shows relevance to the theory of organizational culture put forward by (Schein, 2010). Schein states that organizational culture can be influenced by strong leadership and supportive internal programs. In this study, internal campaigns and training play an important role in instilling green values among employees. This is in line with a study by (Hart & Milstein, 2003), which found that an organizational culture that supports green innovation increases effectiveness in implementing sustainability.

6. Implications for the Manufacturing Industry

This research has several implications for the manufacturing industry. First, the importance of the role of top management in driving change towards green innovation cannot be overlooked, as committed leadership provides a strong foundation for organizational transformation. Second, companies need to plan long-term investments to support sustainability infrastructure and reduce internal resistance with a participatory approach that involves employees in the green innovation process. Third, the development of a green culture through education and training programs helps strengthen the organization's commitment to sustainable practices.

7. Recommendations for Sustainability Practices

As a recommendation, companies need to strengthen internal communication strategies to overcome change resistance, which has been identified as a significant challenge in this study. A participatory approach, such as involving employees in the formulation of sustainability goals, can increase acceptance and understanding of green innovation. In addition, companies are advised to strengthen relationships with external stakeholders, such as the government and local communities, in order to gain greater support in the implementation of sustainable practices.

8. Research Limitations

This study has limitations, especially because it only covers manufacturing companies in a specific region so the results may not be generalized to other sectors or regions. In addition, the qualitative approach used relies on the respondent's subjective perception, which may not fully reflect the overall condition of the company. Further research is recommended to use quantitative methods or mixed-methods to obtain more representative and objective data.

D. Conclusion

This research highlights the importance of green innovation in influencing structural changes and organizational culture in the manufacturing sector. Driven by internal factors, such as company values and management commitments, as well as external pressures in the form of regulations and market demands, manufacturing companies seek to integrate sustainable practices in their operations. The green innovation strategy implemented includes energy efficiency, emission reduction, and the use of environmentally friendly raw materials. Despite facing cost challenges and employee resistance, the company was able to overcome them through the establishment of a sustainability division and the development of an eco-friendly culture. The results of this study reveal that green innovation not only has an impact on the production process, but also on the organizational structure and overall company culture. By raising employee awareness and providing supportive training,

companies are able to drive a culture change focused on sustainability. These findings show that green innovation not only helps companies achieve their sustainability goals, but also creates added value in maintaining relationships with stakeholders and strengthening their competitive position in the market.

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