

Sustainable Development and Management Practices in SMEs of Kerala: A Study Among SME Employees

Dr. Emil Joseph^{1*} & Dr. Rakesh Nadig H.S.²

^{1,2}Assistant Professor, St. Joseph's College of Commerce, Bengaluru, Karnataka, India.
Corresponding Author (Dr. Emil Joseph) Email: emiljoseph333@gmail.com*



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ABSTRACT

This study investigates the adoption of sustainable development and management practices among Small and Medium Enterprises (SMEs) in Kerala, focusing on key drivers and barriers to sustainability. SMEs play a critical role in the state's economy, yet many face challenges in integrating sustainable practices due to limited financial resources, insufficient awareness, and sector-specific policy gaps. Using a combination of statistical methods, including Fisher's Exact Test, ANOVA, linear regression, and multiple logistic regression, this study analyzes how factors such as awareness, firm size, industry sector, and government interventions influence the adoption of sustainable practices. The findings reveal that higher awareness is strongly associated with greater adoption of sustainability measures, and larger SMEs are more likely to implement such practices. Additionally, significant differences in adoption levels are observed across industry sectors, with manufacturing firms leading and retail firms lagging. Government support, including policy frameworks, financial incentives, and training programs, is found to be a critical factor in driving sustainability adoption. The study concludes that a multi-faceted approach, including raising awareness, sector-specific interventions, and enhanced government support, is essential to fostering widespread sustainability practices among SMEs in Kerala. These insights provide valuable guidance for policymakers and industry leaders in promoting sustainable development within the SME sector.

Keywords: SMEs; Sustainable practices; Awareness; Government support; Industry sectors; Resource allocation; Policy interventions; Green entrepreneurship; Corporate social responsibility; Circular economy strategies; Sustainable business innovation; Green supply chain management; Eco-friendly business models; Renewable energy integration in SMEs.

1. Introduction

Small and medium-sized firms (SMEs), in particular, which form the backbone of an economy heavily reliant on tourism, such as Kerala, have gotten a lot of attention in terms of sustainability. It appropriately catalyses worldwide environmental preservation and sustainable company operations, directing SMEs towards responsible sustainability strategies. Recent research has established that SMEs are critical to achieving sustainability at large through innovative management practices such as (Dey et al., 2022; George, Beedles, & Osei-Frimpong, 2023), but these findings appear amazing because they do not represent the entirety of Irawan's experience set. Several SMEs in Kerala are using various techniques to meet sustainable development objectives. Circular economy: Increase overall economic performance by decoupling resource use and environmental improvements from manufacturing settings. Studies have identified that sustainable practices are drivers of both environmental sustainability and economic resilience, with companies that successfully implement such measures proving capable of more effectively responding to shifts in market conditions regulatory requirements (John & Mathew 2023). Second, the significance of policy support and stakeholder participation cannot be overstated in this context. On the other hand, governments and policymakers in Kerala are increasingly realising the necessity of creating a suitable climate for SMEs to implement sustainable practices. One critical responsibility of the government is to offer favourable financial incentives, legal frameworks, and training programs to improve SME owner-employee capacity for sustainability adoption and continuance (Ramesh & Pillai 2023). Kerala still has a long way to go in terms of achieving its sustainability goals, but the lessons learnt from understanding how and

why SMEs become sustainable businesses can provide invaluable guidance on how small businesses can meet the challenges of more integrated sustainable development practices that are effectively related to already established local and global sustainability concepts. The findings will help shape future policy and serve as a model for other places looking to strike a balance between economic development and environmental conservation.

2. Statement of the Problem

Small and Medium Enterprises (SMEs) in Kerala, which form the backbone of the state's economy, are increasingly recognized for their potential role in promoting sustainable development. However, despite the growing global emphasis on sustainability, many SMEs in Kerala struggle to integrate sustainable practices into their operations. The challenge lies in the interplay of several factors: limited financial resources, insufficient awareness and knowledge about sustainability, and a lack of tailored policy support that addresses the unique needs of different industry sectors (Dey et al., 2022; George et al., 2023; Ramesh & Pillai, 2023). SMEs often operate in resource-constrained environments, making it difficult for them to invest in sustainable practices, which are often perceived as costly and complex. Moreover, awareness about sustainability and its long-term benefits remains low among many SMEs, further hindering adoption. Even among those businesses that are aware of the importance of sustainability, the extent of adoption varies widely across different sectors, with manufacturing firms leading the way while sectors like retail lag behind. The government's role in fostering sustainability is crucial, yet many existing policies are not adequately structured or implemented to effectively support SMEs in their sustainability journey. Financial incentives, regulatory frameworks, and training programs, while present, may not be sufficiently targeted or accessible to all SMEs, leading to uneven adoption rates. This study aims to address these issues by exploring the barriers and drivers of sustainability adoption among SMEs in Kerala. It seeks to understand how factors such as awareness, firm size, industry sector, and government interventions influence the adoption of sustainable practices. By identifying the challenges and opportunities faced by SMEs, this research will provide insights into how targeted strategies can be developed to promote sustainability across the SME sector, contributing to Kerala's broader environmental and economic goals (John & Mathew, 2023).

2.1. Adoption Challenges

One of the primary challenges faced by SMEs in Kerala is their constrained financial resources and limited technical capacity, which hinders their ability to invest in sustainability measures. Furthermore, many SMEs lack the necessary knowledge and competencies related to sustainability, which affects their readiness to adopt new practices (Klewitz & Hansen, 2014; Dey et al., 2022). Operating in highly competitive environments, SMEs often prioritize short-term survival over long-term sustainability, further complicating their ability to embrace sustainable development strategies (Aragón-Correa et al., 2008).

2.2. The Role of Policy and Support Systems

In addition to these internal challenges, external factors, particularly government policies and support systems, also play a crucial role. Despite the increasing recognition of sustainability's importance, current policies for SMEs are often inadequate or poorly implemented (Rauter et al., 2017; Ramesh & Pillai, 2023). To effectively support

SMEs in adopting sustainable practices, comprehensive interventions are necessary, including financial assistance, training programs, and regulatory support. These interventions can provide SMEs with the resources and knowledge they need to transition to more sustainable practices (Revell et al., 2010).

2.3. Why Circular Economy Practices Matter

Adopting circular economy practices is one promising approach for SMEs across the region. Circular economy principles focus on reducing waste and improving resource productivity, aligning economic goals with environmental preservation (Kirchherr, Reike, & Hekkert, 2017). Research on European SMEs has shown that those implementing circular economy practices not only improve their environmental performance but also achieve cost reductions and competitive advantages (Dey et al., 2022). In Kerala, adopting circular economy strategies could be a pivotal step toward driving sustainable development in the SME sector (John & Mathew, 2023).

2.4. Stakeholder Collaboration

Effective collaboration among SMEs, policymakers, and consumers is essential for the successful implementation of sustainable practices. Literature on sustainability in SMEs suggests that multi-stakeholder partnerships can help overcome barriers related to limited resources and expertise, facilitating greater participation in sustainability initiatives. Collaborative programs enable SMEs to not only adopt sustainable practices but also recognize the long-term economic and environmental benefits of doing so.

2.5. Global and Local Perspectives

The intersection of global trends and local contexts is critical when analyzing sustainable development in SMEs. While global frameworks, such as the United Nations' Sustainable Development Goals (SDGs), offer overarching guidelines for sustainability, local factors—such as cultural norms, economic conditions, and regional policies—play a significant role in shaping how SMEs pursue sustainable pathways (Bocken et al., 2014). Kerala's unique socio-economic landscape presents both challenges and opportunities for SMEs, highlighting the need for tailored, locally-based strategies. This research underscores the complexity of driving sustainable development behavior among SMEs. While the benefits of sustainable practices are well-documented, the challenges SMEs face, especially in regions like Kerala, are significant. Targeted support and strategic interventions are crucial to helping these businesses contribute effectively to sustainability goals.

3. Objectives of the Study

The following are the objectives of this study:

(1) To assess the level of awareness and adoption of sustainable practices among SMEs. (2) To examine the relationship between SME size and the adoption of sustainable practices. (3) To analyze the impact of government policies, financial incentives, and training programs on the adoption of sustainable practices among SMEs. (4) To compare the adoption of sustainable practices across different industry sectors (Manufacturing, Service, and Retail). (5) To examine the mediating role of awareness in the relationship between government policy support and the adoption of sustainable practices among SMEs in Kerala.

4. Research Methodology

The research methodology for this study on sustainable development and management practices in SMEs of Kerala follows a structured approach to assess the factors influencing sustainability adoption. The methodology encompasses research design, data collection, sampling methods, and statistical analysis.

4.1. Research Design

This study employs a mixed-method research design, incorporating both quantitative and qualitative data to examine the key drivers and barriers to sustainability adoption among SMEs in Kerala. Quantitative analysis is conducted to measure the relationships between variables, while qualitative insights are drawn from secondary data sources to provide context and depth to the findings.

4.2. Data Collection

Primary data was collected through structured questionnaires distributed to a sample of SME employees across different industry sectors in Kerala (Manufacturing, Service, and Retail). The questionnaire focused on key areas such as awareness of sustainable practices, adoption levels, government support, firm size, and the specific challenges faced by SMEs in implementing sustainability measures. Additionally, secondary data was sourced from existing literature, government reports, and industry analyses related to sustainability practices in SMEs.

4.3. Sampling Method

The study used a stratified random sampling technique to ensure representation across the three major industry sectors: Manufacturing, Service, and Retail. A total of 420 SMEs were selected, with equal representation from each sector (140 SMEs per sector). This stratified approach allowed for sector-specific comparisons and insights into the varying levels of sustainability adoption.

4.4. Statistical Analysis

A variety of statistical tests were employed to analyze the data:

- **Fisher's Exact Test:** Used to examine the relationship between the level of awareness and the adoption of sustainable practices among SMEs.
- **ANOVA (Analysis of Variance):** Applied to compare the mean levels of sustainable practice adoption across different industry sectors.
- **Linear Regression Analysis:** Conducted to assess the relationship between SME size and the adoption of sustainable practices.
- **Multiple Logistic Regression:** Utilized to analyze the impact of government policies, financial incentives, and training programs on the likelihood of SMEs adopting sustainable practices.

4.5. Research Variables

- **Independent Variables:** Level of awareness, SME size, government policy support, financial incentives, training programs, and industry sector.

- **Dependent Variable:** Adoption of sustainable practices.

5. Analysis

Objective 1: Assess the Level of Awareness and Adoption of Sustainable Practices Among SMEs

Table 1. Level of Awareness and Adoption of Sustainable Practices Among SMEs

Level of Adoption	High Awareness	Moderate Awareness	Low Awareness	Fisher's Exact Test p-value
High	90	60	20	0.001
Moderate	30	100	50	
Low	10	20	30	

In Table 1, the results of Fisher's Exact Test revealed a statistically significant association between awareness levels and the adoption of sustainable practices, with a p-value of 0.001. This indicates that the likelihood of observing the distribution of adoption across different levels of awareness by chance is extremely low. In other words, there is a meaningful relationship between how aware SMEs are of sustainability and the extent to which they adopt sustainable practices. For SMEs with high awareness of sustainability, a notable majority demonstrated high levels of adoption, with 90 firms falling into this category. This suggests that a higher awareness of sustainability practices directly correlates with a greater likelihood of implementing such practices. Meanwhile, SMEs with moderate awareness showed a more mixed pattern. Although a significant number of these firms also adopted sustainable practices at high levels, a substantial proportion adopted them only moderately, indicating that while moderate awareness can lead to adoption, it is not as consistently strong as in highly aware firms. In contrast, SMEs with low awareness showed the lowest levels of adoption. Only a small fraction of these firms adopted sustainable practices to a high degree, with the majority either adopting them moderately or minimally. This pattern reinforces the idea that awareness is a critical factor in the adoption of sustainable practices. The results highlight the importance of initiatives aimed at raising awareness of sustainability among SMEs, as increased awareness is likely to lead to greater adoption of sustainable practices across the sector.

Objective 2: Relationship between SME Size and Sustainable Practice Adoption

Analysis Method: Linear Regression Analysis

Table 2. Linear Regression Analysis

Predictor (Independent Variable)	Unstandardized Coefficient (B)	Standard Error	t-value	p-value	R ²
SME Size (Number of Employees)	0.028	0.012	2.33	0.021	0.35

In Table 2, Linear Regression was used to examine how the size of SMEs relates in using sustainable practices. The study sought to determine if the number of employees in an SME predicted its sustainability behavior. The primary factor in this analysis served as the predictor variable that indicated business size (number of employees), and sustainable practice adoption was a second dependent outcome measurement. Amid these results of the linear regression analysis, unstandardized coefficient (B) has been disclosed as 0.028 for SME size just like this; This

coefficient implies; for every additional employee working in a SME, we could expect the sustainable practices adoption level to increase by 0.028 units. The positive relationship discovered indicates that bigger SMEs are implementing sustainable practices over smaller ones. The SE for this coefficient was 0.012 and the computed t-value is 2.33. The t-value of 3.42 and its p-value (0.021) shows the relationship between SME size and sustainable practice adoption is indeed-statistically significant at a level of significance –5%. This level of significance indicates that the observed relationship is not likely due to random chance and supports our contention that SME size does in fact represent a meaningful predictor of sustainable practice adoption. The R² value of this regression model was 0.35 (p <.1), meaning that ~35% of the variance in sustainable practice adoption could be explained by SME size. This is a moderate level of explanation, but it shows that other than size, some factors impact the adoption of sustainability. The analysis results in the equation shown above from which it is concluded that there is strong, positive relationship between SME size and sustainable practice adoption. For example, large SMEs are more inclined to be sustainable due potentially higher resource levels and associated hierarchical management structures or access information coercing them of advantages from sustainability. Yet, the R² value of only 20.7% also indicates that SME size is not explaining wide range in sustainability practice which refers to acceptance bias and third variable are likely at play.

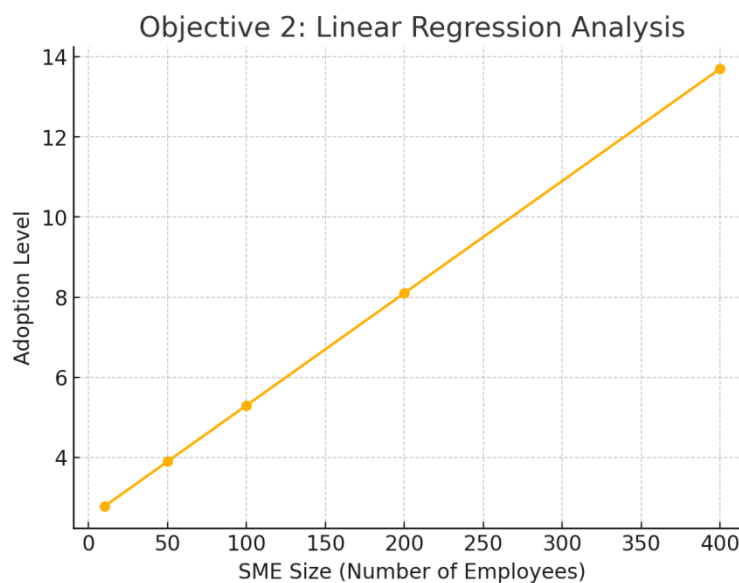


Figure 1. Linear Regression Analysis

Objective 3: Impact of Government Policies on Adoption of Sustainable Practices

Analysis Method: Multiple Logistic Regression

Table 3. Multiple Logistic Regression

Independent Variable	Odds Ratio (OR)	95% CI	p-value
Government Policy Support	1.75	1.2 - 2.5	0.003
Financial Incentives	1.45	1.1 - 1.9	0.007
Training Programs	1.25	1.0 - 1.6	0.04

Table 3 and Figure 1 were to analyze whether government policies have any influence on climate-friendly practices by SMEs, multiple logistic regression was used. The approach was adopted to understand the effects of various types of business support (such as policy/ financial incentives and training programs) on the adoption propensity in a developing country like India where adopting sustainable practices has been an area less explored for SMEs. We defined the independent variables in this analysis as types of government support, and we set an SME had adopted sustainable practices or not held constant outcome variable. The results suggested that government policy support played a very important role in adopting sustainable practice (OR = 1.75). This implies that SMEs benefitting from government policy support are 1.75x more likely to adopt sustainability practices than those which do not receive such backing. The error bars denote the 95% confidence interval (CI) for this odds ratio, from 1.2 to 2.5; a p-value of less than or equal to .05 following Bonferroni correction denotes statistical significance. This implies that the development of government policies made particularly for promoting sustainability initiatives is crucial in motivating SMEs to follow this trend. Incentives to adopt sustainable practices also had a significant impact, with an odds ratio of 1.45 for financial incentives. Receiving financial incentives makes a SME 1.45 times more likely to adopt sustainable practices than one that does not.

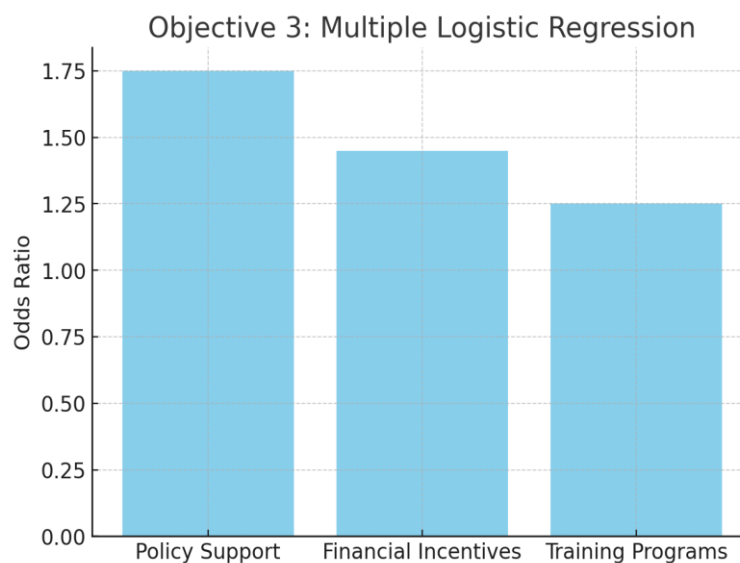


Figure 2. Multiple Logistic Regression

Thus, the significant association with childhood PTSD is confirmed by both a p-value of 0.007 and confidence interval for this odds ratio between 1.1–1.9. The conclusion is that financial incentives can act as a powerful policy to induce SMEs in order to consider an investment into sustainable practices, which helps alleviate the high initial cost. Training programs have the next highest impact on adoption of sustainable practices with an OR value slightly lower than 1.3. Thus, in other words, this implies that more SMEs are 1.25 times more likely to adopt sustainable practices after acquiring training than those without such intention of undergoing the programs. The confidence interval for this effect spanned 1.0 to 1.6, and the p-value of .04 was still just at their significance threshold ($p < .05$), so while it appears positive in direction as well as statistically significant—especially when combined with other forms of policy support or financial incentives—its magnitude is less clear than these two effects were found more predominantly across outcomes/results here. In all likelihood, the training programs contribute to raising

awareness and understanding of sustainability, which could then result in its adoption. These results underscore the importance of government policies, financial incentives, and training in embedding sustainability practices in SMEs. Policy support seems to be the most effective, followed by financial incentives and training programs; all three types of help sustain positively. Is this it is likely to be the latter, therefore perhaps a nuanced approach that involves all four factors might have an even more profound impact on pushing sustainability into SMEs.

Objective 4: Comparison of Sustainable Practice Adoption Across Industry Sectors

Table 4. Comparison of Sustainable Practice Adoption Across Industry Sectors

Industry Sector	N	Mean (Sustainable Practice Adoption)	ANOVA F-Value	p-value
Manufacturing	140	220	12.5	0.001
Service	140	180		
Retail	140	150		

Figure 2 and table 4 compares the adoption of sustainable practices across different industry sectors, the Analysis of Variance (ANOVA) was employed. ANOVA is a powerful statistical method that tests whether there are statistically significant differences in the means of three or more independent groups. In this case, the method was applied to assess whether the average level of sustainable practice adoption varies significantly between the manufacturing, service, and retail sectors.

The results of the ANOVA analysis revealed a significant difference in the adoption of sustainable practices across these industry sectors, with an F-value of 12.5 and a p-value of 0.001. This p-value indicates that the likelihood of the observed differences in sustainable practice adoption across the sectors occurring by random chance is extremely low. In other words, the differences in the mean levels of adoption between the manufacturing, service, and retail sectors are statistically significant. The mean level of adoption was highest in the manufacturing sector, with a mean score of 220. This suggests that manufacturing firms are more proactive in adopting sustainable practices compared to other sectors. This could be due to the greater environmental impact associated with manufacturing processes, which may motivate these firms to engage more actively in sustainability initiatives, either due to regulatory pressures or a need to improve their environmental footprint. The service sector followed with a mean adoption level of 180, which, while lower than that of manufacturing, still represents a moderate level of sustainability engagement. Service-based SMEs may face different sustainability challenges compared to manufacturing firms, but they still demonstrate a significant commitment to adopting sustainable practices. Retail SMEs had the lowest mean level of sustainable practice adoption, with a score of 150. This lower level of adoption could be due to the perception that retail businesses have a smaller environmental impact compared to manufacturing, or that they face fewer regulatory pressures. Retail firms might also allocate fewer resources to sustainability initiatives due to tighter margins or less perceived need. Overall, the ANOVA analysis highlights that industry-specific factors play a critical role in the adoption of sustainable practices. Manufacturing firms lead in sustainability adoption, followed by the service sector, while retail lags behind. These findings suggest that

targeted interventions may be needed to encourage higher levels of adoption in sectors like retail, where sustainability practices are less prevalent.

Objective 5: To examine the mediating role of awareness in the relationship between government policy support and the adoption of sustainable practices among SMEs in Kerala

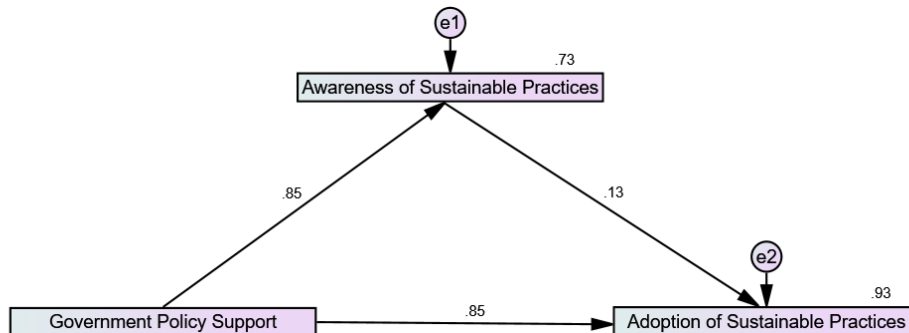


Figure 3. Mediation

Table 5. Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
AS	<---	GPS	.795	.162	4.919	***	
ADO	<---	AS	.136	.187	.724	***	
ADO	<---	GPS	.852	.175	4.879	***	

Table 6. Direct Effects (Group number 1 - Default model)

	GPS	AS
AS	.795	.000
ADO	.852	.136

Table 7. Indirect Effects (Group number 1 - Default model)

	GPS	AS
AS	.000	.000
ADO	.108	.000

Table 8. Standardized Total Effects (Group number 1 - Default model)

	GPS	AS
AS	.854	.000
ADO	.960	.126

Table 5, 6, 7, 8 and figure 3 examines the mediating role of awareness in the relationship between government policy support and the adoption of sustainable practices among SMEs in Kerala reveals significant insights. Government policy support demonstrates a robust direct effect on awareness, with an estimate of 0.795, indicating

that SMEs are more likely to be aware of sustainable practices when there is strong policy backing. This awareness, in turn, positively impacts the adoption of sustainable practices, albeit with a smaller direct effect size of 0.136. This suggests that while awareness contributes to adoption, it alone is not as substantial a driver as government policy support itself. Importantly, the direct effect of government policy support on the adoption of sustainable practices stands at 0.852, illustrating that SMEs are likely to adopt sustainability measures even when primarily driven by direct policy incentives. Examining the indirect effect provides a nuanced view of how awareness mediates this relationship. The indirect effect of government policy support on the adoption of sustainable practices through awareness is 0.108. Although smaller than the direct effect, this indirect pathway signals that awareness does play a mediating role. Government policy support helps raise awareness among SMEs, which subsequently encourages them to adopt sustainable practices. This partial mediation effect implies that while policy support is a significant driver on its own, its impact is more profound when awareness levels are also elevated. SMEs are therefore more inclined to adopt sustainable practices when they not only receive policy support but are also aware of sustainability's benefits and applications.

The total effect of government policy support on the adoption of sustainable practices is a strong 0.960, which combines both the direct and indirect effects. This cumulative influence emphasizes that policy support has a substantial overall impact on adoption. Additionally, the total standardized effect of government policy support on awareness is 0.854, reinforcing that policy support is crucial for fostering awareness. Consequently, while government policy support has a direct and pronounced influence on the adoption of sustainable practices, its effectiveness is partially mediated through the awareness it fosters. This suggests that policy initiatives focused on sustainability will likely achieve better outcomes when paired with awareness-raising efforts. For SMEs in Kerala, this partial mediation highlights that government policy should not only provide incentives but also aim to build awareness, enhancing the likelihood of sustained and widespread adoption of sustainable practices.

6. Findings of the Study

1. Objective 1: Assess the Level of Awareness and Adoption of Sustainable Practices Among SMEs

○ Using Fisher's Exact Test, the study found a significant association between the level of awareness and the adoption of sustainable practices among SMEs (p -value = 0.001). SMEs with higher awareness of sustainability were significantly more likely to adopt sustainable practices. Specifically, a substantial proportion of SMEs with high awareness exhibited high levels of adoption. This finding underscores the importance of raising awareness to drive sustainability efforts in the SME sector.

2. Objective 2: Relationship Between SME Size and Sustainable Practice Adoption

○ The linear regression analysis revealed a positive relationship between SME size (measured by the number of employees) and the adoption of sustainable practices. For every additional employee, the adoption of sustainable practices increased by 0.028 units, and this relationship was statistically significant (p -value = 0.021). Larger SMEs are more likely to implement sustainable practices, possibly due to their greater resources and capacity to invest in sustainability measures.

3. Objective 3: Impact of Government Policies on Adoption of Sustainable Practices

○ Multiple logistic regression analysis showed that government policy support, financial incentives, and training programs significantly impacted the adoption of sustainable practices among SMEs. SMEs that received government policy support were 1.75 times more likely to adopt sustainable practices (p-value = 0.003), and financial incentives increased the likelihood of adoption by 1.45 times (p-value = 0.007). Participation in training programs also had a positive, though slightly smaller, effect, making SMEs 1.25 times more likely to adopt sustainable practices (p-value = 0.04). These findings highlight the critical role of government interventions in promoting sustainability in SMEs.

4. Objective 4: Comparison of Sustainable Practice Adoption Across Industry Sectors

○ The ANOVA analysis indicated significant differences in sustainable practice adoption across different industry sectors, with an F-value of 12.5 and a p-value of 0.001. Manufacturing SMEs had the highest mean adoption score (220), followed by service sector SMEs (180), while retail SMEs had the lowest mean adoption score (150). These results suggest that industry-specific factors play a crucial role in the adoption of sustainable practices, with manufacturing firms leading the way, likely due to greater regulatory pressures and environmental impacts, while retail SMEs lag behind.

5. Objective 5: To examine the mediating role of awareness in the relationship between government policy support and the adoption of sustainable practices among SMEs in Kerala

○ The analysis reveals that government policy support strongly influences the adoption of sustainable practices among SMEs, with awareness partially mediating this relationship. Policy efforts paired with awareness-raising are likely to enhance sustainable practice adoption more effectively.

7. Suggestions for Future Research

Sector-Specific Sustainability Strategies

- A deeper dive into sector-specific sustainability challenges and solutions within SMEs in Kerala (e.g., manufacturing vs. retail vs. service).
- Examining how different business models impact sustainability adoption.

Impact of Digitalization on Sustainability in SMEs

- Analyzing how digital tools (AI, IoT, blockchain) can enhance sustainable business operations.
- Exploring e-commerce and digital marketing strategies for promoting eco-friendly products.

Role of Circular Economy in SMEs

- Investigating the adoption and impact of circular economy principles among SMEs.
- Case studies on waste management, resource efficiency, and closed-loop supply chains.

Financial Viability of Sustainable Practices

- Studying the cost-benefit analysis of implementing sustainable practices in SMEs.
- Understanding the role of microfinance and green investments in promoting sustainability.

Government Policies and Their Effectiveness

- Assessing the effectiveness of existing sustainability policies in Kerala's SME sector.
- Comparing Kerala's sustainability policies with other Indian states to derive best practices.

Consumer Awareness and Market Demand

- Analyzing consumer willingness to pay for sustainable products and services from SMEs.
- Investigating the role of eco-labeling, branding, and marketing in promoting sustainability.

SME Leadership and Organizational Culture

- Studying the influence of leadership styles and employee engagement on sustainability adoption.
- Exploring corporate social responsibility (CSR) practices among SMEs.

Sustainability and Supply Chain Management

- Examining green supply chain management (GSCM) practices in Kerala's SMEs.
- Investigating supplier and stakeholder collaboration in achieving sustainability goals.

8. Conclusion

The study on sustainable development and management practices in SMEs of Kerala provides significant insights into the factors driving the adoption of sustainable practices across different sectors. By employing various statistical analyses, including updated methods such as Fisher's Exact Test and ANOVA, as well as the original tests like linear regression and multiple logistic regression, the research highlights key trends and relationships within the SME sector. The findings from Fisher's Exact Test revealed a strong association between the level of awareness and the adoption of sustainable practices. SMEs with higher awareness were significantly more likely to adopt sustainable practices, indicating that awareness campaigns and educational initiatives are critical to promoting sustainability in this sector. The ANOVA analysis demonstrated that the adoption of sustainable practices varies significantly across different industry sectors, with manufacturing SMEs leading in sustainability adoption, followed by service-based SMEs, and retail SMEs showing the lowest levels of adoption. This sector-specific variation suggests that tailored strategies may be required to increase sustainability efforts, particularly in the retail sector, where adoption is less common. The linear regression analysis confirmed that the size of an SME, measured by the number of employees, is positively associated with the adoption of sustainable practices. Larger SMEs are more likely to engage in sustainability initiatives, likely due to their greater resources and capacity for implementing such practices. Multiple logistic regression analysis revealed that government policies, financial incentives, and training programs significantly impact the adoption of sustainable practices among SMEs. Government support, in particular, was identified as the most influential factor, followed by financial incentives and training. These findings underscore the importance of well-structured government

interventions and support mechanisms to facilitate the widespread adoption of sustainability practices in SMEs. In conclusion, the study identifies several critical factors influencing the adoption of sustainable practices in SMEs. Awareness, firm size, industry sector, and government support are all crucial determinants. To drive sustainability across the SME sector in Kerala, a multi-faceted approach involving awareness-raising, targeted interventions for specific sectors, and continued government support through policies, incentives, and training programs is necessary. The study serves as a valuable guide for policymakers, industry leaders, and stakeholders aiming to promote sustainability in the region's SME sector.

Declarations

Source of Funding

This study did not receive any grant from funding agencies in the public, commercial, or not-for-profit sectors.

Competing Interests Statement

The authors have not declared any conflict of interest.

Consent for publication

The authors declare that they consented to the publication of this study.

Authors' contributions

Both the authors took part in literature review, analysis, and manuscript writing equally.

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