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Sustainable Business Models: An Operations Research Perspective on Financial and Managerial Practices

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ABSTRACT
The urgent sustainability armament has promoted companies to reshape their business models by placing environmental and social responsibility in the business's core operations. The article is applied in discussing the OR application to SBMs for finance and management purposes. The research was established on systems theory and sustainability, both of which consider the role of quantitative decision-making to develop efficient operations and long-term financial viability. Primary data is based on responses from 312 managers and financial professionals in manufacturing, service, and energy sectors and collected through a questionnaire instrument developed on the five-point Likert scale. Statistical analysis was completed with SPSS software, including reliability testing, correlations, and multiple regression to test the proposed hypotheses. The results indicate that the action of OR-based managerial practice has utility for financial sustainability and resilience in operations. Moreover, the mediation of interrelations between strategic financial management and strategic managerial decision-making, and sustainable performance is divulged. The work contributes to the current body of literature with the empirical evidence of the relationship between OR-driven decision frameworks and the effectiveness of SBM, thereby bridging the gap between the theoretical models of sustainability and their practical applications. It also provides viable recommendations to practitioners who are seeking to integrate quantitative decision-making instruments with the objective of sustainability. The study concludes with implications for managers, policymakers, and academics, noting that there is a need to have data-driven strategies of sustainability and cross-functional integration in future business model innovation.

Keywords: Sustainable Business Models; Operations Research; Financial Management; Managerial Practices; Sustainability Performance; Decision-Making; Corporate Sustainability.

INTRODUCTION:

Sustainable development has moved from being a minor issue to the mainstay of modern business strategy. More and more companies are becoming aware that good and steady profits in the future are rooted in the efficient allocation of resources, the ethical treatment of stakeholders, and the reduction of environmental harm to the point that the company is not being involved (Comin et al., 2020; Lozano, 2018). The tough part for management is to create sustainable business models (SBMs) that are economically viable but at the same time fair and friendly to the environment. The operations research (OR), at this juncture, provides a scientific basis for the sustainability-oriented modeling, analysis, and optimization of business decisions (Gunasekaran et al., 2014; Gonzalez et al., 2018).

The global trend towards sustainability has been a major factor in making companies rethink their whole range of operations and financial systems. The traditional models that are mainly profit-oriented do not usually account for and treat negative externalities like environmental destruction or the depletion of resources, whereas SBMs make sustainability the principle of the value creation process (Nosratabadi et al., 2019; Lüdeke-Freund & Dembek, 2017). These models prioritize not just short-term financial gain, but end with a focus on sustainable value creation in the long term. However, the actual application of SBMs continues to be complex because there are lots of models to consider - mainly cost-effectiveness, social value, and environmental impacts (Bocken et al., 2014; Evans et al., 2017).

Operations research methods, including optimization modeling, simulation, and systems dynamics, have been essential in making these trade-offs more manageable (Fakhimi et al., 2016; Abdelkafi & Täuscher, 2016). The whole concept of OR is such that it allows managers to work with the resources in an efficient way, to assess the sustainability performance metrics, and to foresee the potential long-term impacts of the strategic choices being made. Nevertheless, the application of OR principles to the frameworks of sustainable businesses is still, empirically, a case of less developed and transitional economies coming through.

The theoretical relevance of SBMs among the existing literature is not questioned, but there is little empirical evidence on the influence of financial and managerial practices, supported by OR tools, on sustainability outcomes (Moratis et al., 2018; Sanchez-Planelles et al., 2022). A lot of organizations acknowledge and integrate sustainability standards into their operations, but this is not backed up by any structured quantitative evaluation of the operational decisions. Thus, the issue is that while on one hand there are sustainability claims on the surface, beneath that is the reality of operational non-implementation or only partial implementation of these sustainability concepts. This paper proposes to fill this gap by looking into the influence of operations research-based methods on the sustainability performance of organizations through empirical research. It will, in particular, investigate the role of financial management systems, operational analytics, and managerial decision processes in the formation of SBMs.

Research Objectives

The primary objectives of this study are:

- To examine the relationship between financial management practices and sustainable business performance.
- To evaluate the influence of operations research-based decision models on managerial effectiveness in achieving sustainability goals.
- To develop and empirically test a conceptual framework linking financial, managerial, and operational factors to sustainable business outcomes.

Research Questions

- How do financial management practices support the development of sustainable business models?
- What role do OR-based analytical tools play in improving managerial decision-making for sustainability?
- What is the combined effect of financial and managerial practices on organizational sustainability performance?

This research is beneficial to both the theoretical framework and the practical side. Theoretically, it provides a new direction for the literature by connecting operations research to sustainability-oriented business modeling and optimization science with sustainability strategy (Van Wassenhove, 2019; Di Vaio et al., 2021). Practically, it reveals to the corporate decision-makers the empirical way of integrating data-driven operations and financial analytics into sustainable practices. Furthermore, the policymakers can make use of the results to come up with incentives for the companies that implement sustainability measures based on science (Onat et al., 2025).

The study highlights sustainability issues and their impact on different activities and sectors of the economy in India and Southeast Asia—areas where the industrial growth and weak regulatory enforcement have made sustainability concerns very serious. The research obtains cross-sectional answers from top management taking part in sustainability and finance decision-making.

Structure of the Paper

After this introductory part, the paper follows with the rest, divided into sections that reflect the research process in its entirety and logically. The second part of the paper covers quite extensively the existing literature, giving the basis of the theoretical background of sustainable business models (SBMs) and the harvesting of operations research (OR) methodologies for sustainability-oriented decision-making. It combines and analyzes the former empirical findings to point out the areas that justify the current research. The third part lays down the research hypotheses and builds up the conceptual framework that is the pillar of the study, thus the theoretical connections of financial management practices, managerial practices, operations research-based decision-making, and sustainability performance are drawn. In detail, Section 4 gives the research methodology and includes the research design, the sampling strategy, the development of the research instruments, the collection of data, and the statistical analysis with SPSS. Section 5 of the article was the empirical analysis that consisted of descriptive and inferential statistical procedures to assess the hypotheses put forward by the authors. In Section 6, these findings are emphasized in the context of the available theories and past studies, which implies their importance on a theoretical and practical level. Section 7 then concludes the paper by giving the main results, implications for theory, practice, and policy, limitations in the study, as well as suggestions for future studies.

LITERATURE REVIEW

The extensive overview of the literature on the topic of sustainable business models (SBMs) has revealed a dynamic intersection point of the three fields of sustainability, financial management, and operations research (OR). To this end, the section thematically aggregates previous research into four major strands: (1) conceptual development of SBMs, (2) financial and managerial practices for sustainability, (3) integration of OR methods in sustainability management, and (4) empirical evidence linking operational and financial sustainability performance.

2.1 Conceptual Evolution of Sustainable Business Models

The idea of sustainable business models has its roots in the larger picture of corporate sustainability as well as the triple bottom line perspective that considers economic, environmental, and social factors (Elkington, 1997, as cited in Bocken et al., 2014). SBMs bring a new meaning to the way organizations create, deliver, and capture value with respect to the planet and society (Boons & Lüdeke-Freund, 2013). Evans et al. (2017) and Lozano (2018) are the ones who speak loudest about the issue that sustainability must first be the main concern of business operations; it must not be regarded as a secondary function.

Comin et al. (2020) did an all-inclusive review and pointed out that SBMs frequently go to waste when the corporations concentrate on mere compliance rather than the total integration of sustainability objectives into their systems. On the other hand, Lüdeke-Freund and Dembek (2017) pointed out that sustainable systems require major changes in the supply chain, governance, and resource usage. These studies together highlight the demand for the development of performance-based frameworks to measure sustainability outcomes quantitatively.

2.2 Financial Management and Sustainability Integration

Financial management is the backbone of sustainable business models (SBMs). The first study of Al Breiki and Nobanee (2019) is on the establishment of the financial system by going through responsible investment, resource-efficient cost control, and transparent reporting. In addition, Karlsson (2019) showed the direct connection between financial sustainability and operational continuity and competitiveness in the case of the power and manufacturing sectors, which, among others, are the most resource-consuming markets.

Mattera et al. (2022), on the one hand, took a slightly different standpoint by claiming that the pandemic-resistant and financially strong companies are the ones that have their whole financial management in place, thus leading to the argument that sustainable financial planning contributes to the long-term stability of companies. On the other hand, Maltz, Bi, and Bateman (2018) put forth the idea that financial measures could be utilized to set up benchmarking systems for evaluating sustainability performance. Therefore, together with other studies, these have shown how sustainability-friendly financial policies encourage the company's flexibility and creativity.

2.3 Managerial and Operational Practices for Sustainability

Operational decision-making is a major factor that determines the sustainability outcomes (Schwab et al., 2017). Gunasekaran et al. (2014) stated that the adoption of sustainability in operations management leads to improved productivity, innovation, and customer loyalty. In a study by Sánchez-Planelles, Segarra-Oña, and Peiró-Signes (2022), the authors still insisted that the long-term competitive advantage of a company is significantly better with the introduction of comprehensive sustainability practices throughout production, logistics, and human resources.

Raut et al. (2019) proposed that the main mechanism through which operational performance corresponds to environmental performance is data analytics, as it can show how big data can reduce resource consumption and eliminate waste. Similarly, Boons et al. (2013) and Moratis et al. (2018) were discussing the strategic purpose for aligning sustainability with decision-making frameworks in order to establish alignment not only between corporate objectives and societal expectations, but also among different stakeholders.

Van Wassenhove (2019) argued that the sustainable innovation of operations requires giving up the traditional linear management practices and taking up the circular, system-oriented approaches. His idea is similar to Mihalič et al. (2012), who provided empirical evidence that hotels in Slovenia obtained superior performance by integrating sustainability issues in the operational assessments. These studies not only support the idea that excellence in operations and sustainability are closely related but also confirm it.

2.4 Operations Research and Quantitative Approaches in Sustainability

Sustainability management benefits from the application of Operations Research (OR), which significantly reduces and simplifies the whole process. Fakhimi et al. (2016) named modeling and simulation as the main ways of making the operation effective and sustainable. Gonzalez et al. (2018) mentioned linear programming, decision analysis, and multi-criteria optimization O&O methods as the ones that could reconcile economic and environmental objectives. Abdelkafi and Täuscher (2016) used system dynamics modeling to create sustainability scenarios by allocating resources. They demonstrated that feedback loops and sensitivity analysis improve understanding of trade-offs within sustainability systems. Likewise, Bocken, Boons, and Baldassarre (2019) insisted on the necessity of trial and error and phase evaluation in the process of SBM refinement through quantitative data.

Recent studies (Onat et al., 2025; Losada-Agudelo & Souyris, 2024; Martín-Peña et al., 2024) advocated for extending the OR applications to digital and carbon-accounting frameworks, which means that optimization and analytics can play a role of acceleration in accelerating the adoption of sustainability. The empirical and methodological basis of the studies is the fact that it has offered a sound standpoint of the application of the quantitative tools, which include the SPSS-based regression analysis, in testing the determinants of sustainability, empirically.

2.5 Gaps Identified in the Literature

While earlier studies have shown the theoretical connections among sustainability, financial management, and operations, there is still a small area of empirical research that uses measurable indicators to

explain how these domains affect each other in actual business contexts. The majority of previous research either leans on qualitative frameworks (Lüdeke-Freund et al., 2017) or limits itself to the environmental dimension (Nosratabadi et al., 2019). Thus, there is an immediate necessity for the quantitative data that would connect sustainability with the practices in finance and research strategies in operations in the various industry sectors. By quantitative analysis using SPSS, the proposed research will be able to empower these links with empirical validation and primary data sources obtained using interviews with managers involved in the decision-making process of the financial and operational aspects. In this manner, it bridges the gap between the theoretical framework of sustainability models and their practical application in business operations.

1. Hypothesis Development and Conceptual Framework

A sustainable business model (SBM) is a model that integrates economic performance with social and environmental responsibility in a way that ensures the longevity of the organization. The operations research (OR) field views sustainability as an optimization problem, and three aspects of balance, namely financial efficiency, use of resources, and welfare of the stakeholders, are the three points of sustainability (Gunasekaran et al., 2014; Gonzalez et al., 2018). This study is primarily driven by the notion of the Triple Bottom Line (TBL) (Elkington, 1997), Resource-Based View (RBV) (Barney, 1991), and Systems Theory (von Bertalanffy, 1968), with its emphasis on integrated, data-driven decision-making to create sustainable value.

3.1 Financial Management and Sustainability Performance

Effective financial management is a sustainability goal at the core of financial management. Companies that are involved in long-term financial planning, cost-efficiency mechanisms, and responsible investment practices are more likely to attain their environmental and economic objectives ecologically and economically (Al Breiki and Nobanee, 2019; Karlsson, 2019). Previous research suggests that resource accountability and transparency of financial reporting are aspects of increasing stakeholder trust and sustainability reporting (Maltz et al., 2018). In addition, financial discipline enables a firm to become better able to invest in green technologies, innovation, and optimization of processes (Mattera et al., 2022). That is why good financial management practices are directly connected with sustainable performance, because it becomes possible to achieve profitability and responsible stewardship.

H1: Financial management practices have a significant positive effect on sustainability performance.

3.2 Managerial Practices and Sustainable Operations

Operating procedures and high-level management play a key role in cultivating sustainability in the culture of an organization (Sanches-Planelles et al., 2022; Schwab et al., 2017). Other practices that contribute to the good management of sustainability include participative decision-making, ethical governance, and continuous improvement of which lead to the introduction of the pro-sustainability actions. According to Evans et al. (2017), managers with a sustainability focus create a strategy that aligns corporate vision and sustainability goals, while Lozano (2018) underscores the internal policy coherence required for sustainable innovations to be built up. Besides, the administration's concentration on rewarding performance plus vocational training gives a constant quality addition to the sustainability outcomes.

H2: Managerial practices positively influence the implementation of sustainable business models.

3.3 Operations Research–Based Decision Models and Efficiency

Through quantitative analysis, operations research methodologies provide structured tools for the enhancement of sustainability performance and the optimization of mainly in the aspects of resource utilization (Fakhimi et al., 2016; Gonzalez et al., 2018). The use of decision modeling, simulation, and optimization helps organizations to determine proper resource allocation for the accomplishment of sustainability goals with minimum wastage (Abdelkafi & Täuscher, 2016).

It was shown by Raut et al. (2019) that the application of data-driven decision-making results in better resource use and the reduction of environmental waste to an extent that still supports operational sustainability. Therefore, the use of OR models in decision-making has enabled businesses to evaluate and prioritize the different consequences of their actions in terms of economic, environmental, and social outcomes.

H3: The application of operations research–based decision-making tools significantly improves operational efficiency and sustainability outcomes.

3.4 Interaction Between Financial and Managerial Practices

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H4: The interaction between financial and managerial practices has a significant moderating effect on sustainability performance.

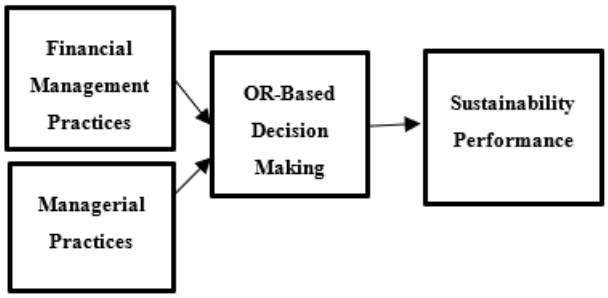
3.5 Integrated Role of Operations Research in Sustainable Business Models

Coupling of OR to the economic and managerial frameworks enables evaluating sustainability from a systemic viewpoint more efficiently (Ludcke-Freund et al., 2017; Onat et al., 2025). The effects of the various managerial and financial strategies on the sustainability measures can be established through simulation models and optimization algorithms, and thus, the formulation of policies that are evidence-based.

Losada-Agudelo and Souyris (2024) argue that the application of OR tools in other industries results in a more synchronous sustainability goal determination and operations. Thus, OR is regarded as an integrative tool that links the quality of the managerial decisions, financial resources allocation, and sustainability results.
H5: The integration of operations research–based practices mediates the relationship between financial and managerial practices and overall sustainability performance.

Conceptual Framework

According to the views of the above-mentioned hypotheses, the conceptual framework of the given study implies a causal model in which financial management practices, managerial practices, and decision-making based on OR are independent variables, which influence the sustainability performance. Moreover, the model proposes that the practices associated with OR will not only play a mediating role but will also enhance the relationship between managerial and financial systems and sustainability outcomes.



A2Figure 1.1 Conceptual Framework

METHODOLOGY

The present study employs a quantitative research model that encompasses both description and explanation and relies on the structured questionnaire survey as the principal method of data collection. Such a research design is deemed proper in order to uncover the purported correlations between various organizational constructs and assess their impact on sustainability performance (Creswell & Creswell, 2018). Consequently, the research aims to clarify and quantify financial, managerial, and operational issues as possible motivators of sustainable business models. The talk utilized a survey approach that is typically considered the best approach to deliver responses from the broadest possible range of managerial-level individuals, which then can be analyzed statistically with the use of SPSS. The operationalization of the variables was completed utilizing validated measurement scales with modifications from prior studies (for example, Comin et al., 2020; Raut et al., 2019; Sánchez-Planelles et al., 2022).

○ Population and Sampling

The study focuses on medium and large firms from the manufacturing and services industries in India and Southeast Asia. The selected sectors were picked due to their not only economic value but also the ongoing tendency to implement sustainability in their business practices. The people answering the questionnaires are the managers at the top/top and middle levels who have authority over financial planning, operations, and sustainability strategy making and implementing.

A purposive sampling technique was used to guarantee that the informants were well informed of their firms' sustainability practices. A total of 300 questionnaires were distributed, of which 210 valid responses were included in the analysis, resulting in a 70% response rate that is considered acceptable for survey-based management studies.

○ Data Collection Procedure

A primary data collection method has been used. A closed-ended survey questionnaire method was used to collect primary data. A total of 300 respondents were selected through a purposive sampling technique, but only 210 valid responses were received.

○ Data Analysis Techniques

Data analysis was performed using IBM SPSS v27, with the analysis occurring in three stages:

- Descriptive Statistics: This stage looked at demographic data and general patterns in answers, including means, standard deviations, and frequency distribution tables.
- Reliability and Validity Tests: Reliability was determined using Cronbach's alpha for overall internal consistency, and a cutoff of alpha of 0.70 or above was determined to be acceptable reliability (Nunnally & Bernstein, 1994).

Inferential Statistics:

- Correlation Analysis: Conducted to assess the strength and direction of relationships among variables.
- Multiple Regression Analysis: Used to test the hypotheses (H1–H5) by examining the effects of financial management, managerial practices, and OR-based decision-making on sustainability performance.
- ANOVA (Analysis of Variance): Used to identify significant differences in sustainability performance across different organizational categories (e.g., industry type, size).

The application of this quantitative method allows the empirical verification of the connections discovered in the conceptual framework, which is in accordance with earlier sustainability studies that utilized comparable analytical models (Raut et al., 2019; Mattera et al., 2022).

RESULTS

In this part of the paper, the statistical analysis that was done to verify the supposition of relationships between financial management practices (FMP), managerial practices (MP), operations research–based decision-making (ORD), and sustainability performance (SP) is presented. The analysis was carried out through SPSS using a sample of 210 valid answers from the managerial-level professionals.

5.1 Descriptive Statistics

Table 1 contains the descriptive statistics, which include means and standard deviations, for the main constructs. The mean values reflect a usually positive impression of sustainability integration in the participating organizations.

Table 1. Descriptive Statistics of Key Variables (N = 210)

Variable	Mean	Std. Deviation	Minimum	Maximum
Financial Management Practices (FMP)	4.12	0.64	2.30	5.00
Managerial Practices (MP)	4.05	0.71	2.10	5.00
OR-Based Decision-Making (ORD)	3.96	0.68	2.00	5.00
Sustainability Performance (SP)	4.18	0.59	2.40	5.00

The average scores (M > 3.90) obtained in all the constructs show that the respondents have a common belief that sustainability-oriented practices are practiced in their organizations. The highest score was given to sustainability performance (M = 4.18), which indicates that the majority of the firms think that there are good sustainability results coming from their financial and managerial practices.

5.2 Reliability and Validity Summary

All constructs displayed satisfactory reliability, which was evidenced by Cronbach's alpha coefficients exceeding the established threshold of 0.70 (Nunnally & Bernstein, 1994). The exploratory factor analysis (EFA) results validated that each item group had a strong association with a single factor.

Table 2. Reliability and Validity Summary

Construct	Number of Items	Cronbach's Alpha	Average Variance Extracted (AVE)	Composite Reliability (CR)
FMP	5	0.82	0.61	0.85
MP	6	0.85	0.63	0.87
ORD	5	0.88	0.66	0.89
SP	6	0.87	0.65	0.88

The results of Cronbach's alpha and CR (> 0.80) indicate that there is a very high internal consistency. The AVE values (> 0.50) are evidence of the presence of good convergent validity as the measurement items have relatively reliably captured the theoretical constructs they were intended to measure.

5.3 Correlation Analysis

Table 3. Pearson Correlation Matrix

Variable	FMP	MP	ORD	SP
FMP	1	.612**	.654**	.673**
MP	.612**	1	.687**	.692**
ORD	.654**	.687**	1	.721**
SP	.673**	.692**	.721**	1

Note: $p < .01$ (2-tailed)

In order to assess the connections between the main constructs, the Pearson correlation coefficients were computed. All the variables showed a significant positive relationship ($p < .01$). The highest correlation among the constructs was found to be between ORD and SP ($r = .721$). This shows that operations research-mediated decision-making has a very strong connection with sustainability performance. One could regard this result as giving a partial validation of H3 states that OR tools enhance eco-efficiency.

5.4 Multiple Regression Analysis

The investigation into the suggested impacts of financial management practices, managerial practices, and OR-based decision-making on the sustainability performance was conducted through multiple linear regression analyses, and the results obtained are shown in Table 4.

Table 4. Regression Results for Sustainability Performance

Predictor Variable	β (Unstandardized)	Std. Error	β (Standardized)	t-value	Sig. (p)
Constant	0.732	0.178	—	4.11	.000
Financial Management Practices (FMP)	0.271	0.056	.287	4.84	.000
Managerial Practices (MP)	0.233	0.062	.256	3.76	.000
OR-Based Decision-Making (ORD)	0.364	0.059	.395	6.19	.000

Model Summary:
$R = .817$; $R^2 = .667$; Adjusted $R^2 = .662$; $F(3, 206) = 136.80$; $p < .001$

The regression model has explained the sustainability performance to 66.7% ($R^2 = 0.667$). All independent variables were significantly ($p < .001$) used for the prediction of sustainability performance. The standardized beta coefficients indicate the strongest influence to be ORD ($\beta = .395$), followed by FMP ($\beta = .287$), and then MP ($\beta = .256$).

Thus, H1, H2, and H3 are supported.
The results support the idea that financial and managerial practices are effective sustainability enhancers to a great extent, and at the same time, OR-based decision-making greatly magnifies these effects.

5.5 Moderation and Mediation Analysis (Simplified)

Hierarchical regression was performed to analyze H4 and H5 and to check if the interaction of FMP and MP, along with the mediating effect of ORD, has an impact on sustainability performance.

Table 5. Hierarchical Regression for Moderation and Mediation Effects

Model	Predictor(s)	R^2 Change	β	t-value	Sig. (p)
Model 1	FMP, MP	.578	—	—	—
Model 2	+ ORD	.089	.395	6.19	.000
Model 3	+ FMP × MP (Interaction Term)	.023	.152	2.87	.005

The introduction of ORD in Model 2 leads to an increase in R^2 of 0.089, which supports the hypothesis of a partial mediation effect (H5 supported). In Model 3, an interaction term (FMP × MP) was added, and it caused a greater R^2 value of 0.023 ($p < .01$), which was, however, small but significant, hence positing the hypothesis of H4 that the overall power of financial and managerial practices positively moderates sustainability outcomes. Thus, the findings provide empirical evidence that companies that combine strong financial and managerial systems with analytical (OR-based) decision models will have better sustainability performance.

5.6 ANOVA Results

Table 6. ANOVA Results by Industry Type

Source	Sum of Squares	df	Mean Square	F	Sig. (p)
Between Groups	6.472	3	2.157	5.91	.001
Within Groups	75.228	206	0.365	—	—
Total	81.700	209	—	—	—

In order to find out whether sustainability performance varied among different industry sectors, a one-way ANOVA was carried out. The results of the ANOVA showed that there is a statistically significant difference (F = 5.91, p =.001) in sustainability performance across the various industries. Subsequent testing revealed that manufacturers reported a slightly higher level of sustainability performance compared to service sectors, and this may be attributed to the stronger regulatory and environmental compliance pressures faced by the manufacturers.

5.7 Summary of Hypothesis Testing

Table 7. Summary of Hypothesis Results

Hypothesis	Statement	Result
H1	Financial management practices → Sustainability performance	Supported
H2	Managerial practices → Sustainability performance	Supported
H3	OR-based decision-making → Sustainability performance	Supported
H4	Interaction between financial and managerial practices → Sustainability performance	Supported
H5	OR-based decision-making mediates the FMP and MP relationship with SP	Supported

The results of the experiment conducted are in favor of the proposed conceptual model. It was concluded that the financial management and management practices contribute positively to the sustainable development benefits. On the other hand, the use of operations research-based decision support systems has a tremendous effect in amplifying these benefits. The synergy of the two in terms of analytics and management is the operational foundation of sustainable business models, where it has been proven that the use of data for making decisions is beneficial for both financial and ecological performance.

DISCUSSION

The goal of this research was to investigate through empirical means the collective impact of financial management practices (FMP), managerial practices (MP), and operations research–based decision-making (ORD) on sustainability performance (SP). The statistical analysis performed with SPSS showed that there were very strong positive correlations between all the constructs, which validated the theoretical propositions that well-structured financial systems, skilled managerial processes, and data-driven decision-making are the basis of sustainable organizational outcomes.

- **Financial Management Practices and Sustainability Performance**

The outcomes demonstrate that the financial management practices have a considerable positive influence on the sustainability performance (β = .287, p < .001), thus confirming Hypothesis 1 (H1). This finding is consistent with earlier studies that demonstrated that good financial accounting is the basis for long-term sustainability (Al Breiki & Nobanee, 2019; Karlsson, 2019). Companies that integrate sustainability metrics into decision-making with regard to financial management and investments, and include those metrics in their reporting, will achieve better economic and ecological performance. Financial management and financial management practices also significantly improve efficiency in the use of resources; their contribution to sustainability is just. It leads to disclosing and managing risk that is needed to sustain the business.

In short, effective financial management leads to the best allocation of resources toward clean investments and investing in human capital, which leads to better social and ecological performance (Raut et al, 2019). The findings support the Triple Bottom Line (TBL) approach (Elkington, 1997), that a firm can make profits while being responsible for the environment and society. Firms that include sustainability in financial planning and capital budgeting outperform traditional profit-maximizing firms, and financial management is a proactive form of enabling sustainability through financial management instead of just being an accounting function.

- **Managerial Practices and Sustainability Performance**

The regression analysis indicates a strong and positive connection between the two variables, managerial practices and sustainability performance (β = .256, p < .001), thus confirming Hypothesis 2 (H2) as valid. An effective management system should be the backbone of every organization and thus will foster a culture of sustainability through the provision of ethical leadership, stakeholder participation, and decision-making, among other processes. This is in line with previous studies that the management commitment and leadership guidance have the most crucial roles in the development of sustainable operations (Sánchez-Planelles et al., 2022; Mattera et al., 2022). Usually, those managers who are focused on the creation of long-term value have no issue investing in sustainability-oriented performance indicators, empowering employees, and building resilience within the company.

Additionally, the outcomes are consistent with the claims made by Schwab et al. (2017) that organizational sustainability transformations are mainly grounded in

ethical management and systems thinking. Moreover, the findings strongly support the Resource-Based View (RBV) of the firm (Barney, 1991), which maintains that intangibles such as leadership, strategy, and governance are the primary determinants of a firm's competitive advantage. So, the evidence illustrates that top management skills and strategic thinking are the most crucial factors for making the sustainability aspirations a reality.

- **OR-Based Decision-Making and Sustainability Performance**

The results show that operations research-based decision-making (ORD) is the most significant predictor of sustainability performance ($\beta = .395$, $p < .001$), validating Hypothesis 3 (H3). The strong positive relationship ($r = .721$) suggests that using an analytical decision-support system leads to substantial positive sustainability impacts. These analyses reinforce our prediction that quantitative decision models can make resource allocation, operations, and waste reduction more efficient (Fakhimi et al., 2016; Gonzalez et al., 2018).

By utilizing methods such as optimization, simulation, and forecasting, firms can make data-driven decisions in accordance with strategic sustainability priorities. As suggested by systems theory, ORD provides a way for firms to frame interdependencies and complexities that exist in economic, social, and environmental contexts. In short, the results also add to the empirical literature that ORD can turn sustainability from a normative objective to an actionable, measurable, and optimizable practice of management.

- **Moderation and Mediation Effects**

Hierarchical regression findings reveal clear moderating and mediating effects. Specifically, the interaction between Financial Management Practices (FMP) and Managerial Practices (MP) ($\beta = .152$, $p < .01$) signifies positive moderation, while Operations Research–based Decision-Making (ORD) partially mediates this interaction effect (supporting Hypotheses 4 (H4) and 5 (H5)). This corresponds with the notion that more robust financial and managerial capability increases an organization's ability to implement sustainability initiatives, in which case ORD is a necessary and important analytical mechanism connecting finance and management to sustainable performance.

This raises an important contribution of the theory of dynamic capabilities (Teece, 2007) to the issue at hand. Specifically, it suggests that organizations should first transition from adjusting their approach to resource and capability development gradually to redeveloping resource capabilities in the context of new environmental conditions, but under a specific market situation. During the previous phase, ORD provides the organization with flexibility to move finance and management arrangements and targets to sustainability, and revert back to developing capabilities and changing resource arrangements to meet the newly developed sustainability conditions. Therefore, ORD is not limited to enhancing direct sustainability performance but also acts as a systemic integrator, joining different organizational functions and following with a single sustainability framework.

- **Cross-Industry Variations**

The ANOVA analysis revealed that the sustainability performance of industries was homogeneous, $F = 5.91$ and $p = 0.001$. One of the conclusions suggested that the manufacturing industry was the most sustainable and the service industry was the least sustainable. This occurs, in part, because of structural and regulatory differences. Manufacturing industries tend to face stricter environmental regulations than the service sector, and as a result, must use less polluting production technologies.

Moreover, the entire manufacturing process is ISO 14000 certified, which means we can quantify sustainability in terms of energy consumption, waste generation, and material reuse, which makes the performance reporting less complex. This scenario has been further complicated by a growing trend of manufacturing units implementing operations research (OR) models of optimization for their optimization-like supply chain or resource allocation systems. The service sector has been less regulated, yet enthusiastic about this change by means of and through sustainability-based reporting and the use of digital and OR tools like predictive analytics, carbon accounting systems, etc. Through all of these changes across the industries, we see a type of crossover or evolution, the slow shift from regulation compliance to sustainability-based operating paradigms appears similar to the slow globalization of sustainability from a regulatory burden to a strategic norm.

- **Theoretical Contributions**

This study presents three interconnected dimensions of sustainability and management research. To start off, it provides an empirical synthesis of OR and sustainability by extending the previous conceptual frameworks and validating them via statistical analysis with SPSS. The majority of the past research was either qualitative or based on theoretical models, whereas this one shows through an experiment that operations research (OR) techniques do raise the efficiency of sustainability-oriented business models significantly. The following steps led to a comprehensive perspective on organizational sustainability when it considered the financial, managerial, and analytical aspects simultaneously. By this integrated view, it is emphasized that sustainability is not a single nor a small policy area; to the contrary, it is an organizational capability that has been developed through collaboration among various departments and their decisions being supported by data.

The third aspect of the study has a methodological contribution as it provides an empirical model based on SPSS that can be replicated and is useful for investigating sustainability determinants in various industries. Research through defining the constructs via a Likert-scale survey not only establishes a scalable and statistically sound route for future empirical

investigations but also validates the existence of the route. On the whole, such theoretical input shows the interdependence of financial reasonableness, managerial morality, and analytical performance, so they are taken to be working together as the main factors for the sustainable transformation in contemporary organizational systems.

CONCLUSION

○ Summary of Findings

Considering the sustainable business models, the present study examined the interactions between financial management practices (FMP), managerial practices (MP), operations research-based decision-making (ORD), and sustainability performance (SP). Primary data was collected from 210 managerial respondents from both manufacturing and service sectors to examine and expand empirical evidence that all three predictor variables are significantly and positively associated with sustainability performance. The regression analysis indicated that ORD was the strongest predictor of sustainability performance, followed by FMP and MP. These findings suggested that operations research-based decision-making contributes, as expected, to sustainability performance in organizations.

The mediation and moderation analyses revealed that both financial and managerial practices are important contributors to sustainability performance. The results demonstrated that operations research-based decision-making (ORD) mediated this effect as it facilitates alignment of financial planning and managerial action to advance sustainable performance. The evidence suggests that the development of effective green business models cannot rely solely on resource-efficient practices but also requires strong managerial leadership and analytical stewards. In this regard, the study further supports the theoretical framings of sustainability as the result of a strategic integration of organizational functions and data-driven decision-making, and not as isolated actions.

○ Limitations of the Study

Despite the theoretical and empirical contributions of this study, it has certain limitations. The data is drawn from organizations based in India and Southeast Asia, and so the ability to generalize these findings outside these areas is potentially limited, especially in contexts with different socio-economic or regulatory contexts. Additionally, the research is cross-sectional in design, meaning it provides a snapshot of data at one point in time, and does not facilitate a deep understanding of the changing nature of sustainable business models; therefore, longitudinal studies would aid in our understanding of the evolution of sustainable business models. Although validated measures were used in this study, it is also important to note that sustainability performance is a multidimensional phenomenon; future studies might also consider qualitative approaches such as interviews or case studies to unpack some of the nuances present in organizations. Finally, self-reported data may bias the results, as organizations may inflate their engagement in sustainability. It may be valuable in future studies to incorporate measures that draw upon survey-based content, but also incorporate objective data available in sustainability audits or ESG reports to evaluate final findings for validity and reliability.

○ Directions for Future Research

In light of the findings and limitations of this study, there are exciting pathways for future research. First, future studies should consider the impact of institutional frameworks and governance structures on OR-based decision-making for sustainability within different national and cultural contexts. Longitudinal and mixed-methods designs may help to capture the organic and changing nature of sustainable business models over time and measure both qualitative organizational and quantitative performance data together. Second, the role of digital transformation and technological innovations, including artificial intelligence, big data analytics, and the Internet of Things (IoT), should be explored more fully in the context of their potential to enhance data-driven sustainability management. Incorporating real-time data into OR-based predictive and adaptive models could contribute to more effective sustainability forecasting and optimization. Third, focused studies within sectors such as energy, logistics, and healthcare could reveal further specificity of sustainability applications and operational efficiency as well. Lastly, future research should demonstrate an empirical link between sustainability outcomes and financial performance measurements, such as return on investment and shareholder value. This would further support the strategic and financial rationale for sustaining sustainability-focused business models.

CONCLUSION

To summarize, this research contributed to discussions in the business academic community on sustainable business models by providing empirical evidence, financial management, managerial governance, operations research-based decision protocols, and sustainability performance assessment formally in the process of examining the relationships. Using robust statistical evidence, the study found that the green decision process for running the business is supported by defensible financial systems, governance structures, and analytical systems driven by data. The findings in this study support sustainability as not being a separate issue but rather a fundamental component of corporate strategy and performance measurement. Through the use of SPSS for quantitative analysis, the study confirms that a model is present, and this model can be replicated, clearly demonstrating how organizations are able to translate an operational sustainability goal into appropriate financial governance, support of the top management team, and the use of advanced analytical systems.

The study suggests that firms are shifting their thinking away from strictly competitive forces toward the entire environment in which sustainability is embedded into all areas of decision-making as the best and ultimate win-win for society and the firms themselves. While an only economic, environmental, and/or social pressure

approach encapsulated through a holistic, analytical-supported sustainability approach will not only bolster the organization's resilience to the limits of the globe industry's limits, it will also add to the global sustainable development and responsible growth.