Sustainable Supply Chain Management: Merging Profitability with Corporate Responsibility

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ABSTRACT

This increased emphasis on sustainability has led many researchers to review supply chain practices and research the relationship between sustainable initiatives and corporate performance. The current research examines a quantitative interrelationship between SSC practices and their concurrent impact on corporate profitability and social responsibility. By utilizing secondary data and the analytical features of SPSS, this study explores the intricacies of SSC operations in corporate settings. The study demonstrates a positive correlation between SSC practices and a significant increase in corporate profitability and responsibility, which indicates that sustainability is not only an ethical choice but also a profitable one. The study shows that the SSC practices applied by corporations lead to compliance with ESG standards and result in actual financial benefits. The following key findings highlight the vitality of sustainable practices in contemporary supply chains, as this implementation fosters the complete success of corporations. The study has far-reaching implications requiring a paradigm shift where sustainability becomes an integral part of business strategies, hence leading to economic growth for the purpose of environmental protection and social responsibility. The above research is in line with literature that views sustainability as a foundation of current business strategy and operational efficiency.

KEYWORDS: Supply Chain Management, Merging Profitability, Corporate Responsibility, Top of Form sustainability, Iraq.

INTRODUCTION

This is followed with the focus on sustainability in global supply chains emerging from the need to address ESG problems without compromising profitability and competitiveness. All firms understand that having to include sustainability into their supply chain management is an obligation and a strategy to assist them to become more competitive and resilient (Hartikainen et al., 2019) The impetus for a more sustainable supply chain management system has been the growing consumer demand for environmentally friendly products alongside the mounting

environmental concerns over the supply chains. Corporations are obliged to redesign their supply chain management practices, since this ensures certain level of relative environmental friendliness and social acceptability of the business. Companies such as Nike have used technologies like RFID and predictive demand analytics in order to enhance the efficacy, efficiency, and sustainability of their supply chain. This has kept them going in terms of sales and stock control amidst difficulties such as the COVID-19 pandemic. Sustainable supply chains are becoming better understood in terms of the risks associated with such supply chains. Instances of unplanned events in the form of natural disasters and Pandemics have caused firms to reveal a weakness within traditional supply chains (Jia et al., 2018). It is the relatively more energetic and dynamic supply chain models that are the most common choice for most firms. The supply chain is increasingly recognized as a key driver of corporate sustainability goals. Such activities produce favorable results for the environment and result in operational improvements and cost savings. This transformation is based on digital technology that monitors and controls supply chain processes. This is a reaction to external factors, for example, consumer demand and environmental effects, and internal forces, such as risk management and efficiency (Silvestre & Ţîrcă, 2019). Companies find that making sustainability part of their supply chain strategies addresses their responsibilities and creates a more profitable and resilient business to global problems.

LITERATURE REVIEW

The literature on SSCM has primarily focused on environmental issues instead of social concerns. The current trends suggest that sustainability's environmental, social, and economic dimensions within supply chain management are increasingly converging. This integration is essential in dealing with broader sustainability issues and moving beyond economic concerns. SSCM is an inclusive system that promotes ethical and sustainable supply chain practices. These are collaborations between companies, applying technology for sustainability and standardization, and the successes that come out clearly (Swanson et al., 2018). The focus is on end-to-end supply chain visibility from procurement of raw materials to the last mile logistics, even returns and recycling processes. Technological innovations, especially in AI and cloud computing, play a vital role in effective SSCM implementation. Regarding profitability, the SSCM initiatives are becoming widely considered beneficial for long-term economic performance. Sustainable practices may result in cost control, better brand loyalty, and risk reduction. Resource management, recycling, and waste minimization serve the environment and can help save money (Lee & Tang, 2018). Many organizations that have already adopted the practices of SSCM have stated that their profit margins rose, indicating that such environmental and social measures may align with economic goals. The corporate responsibility perspective, SSCM helps foster human rights, fair labor practices, and anti-corruption policies. SSCM initiatives may help an organization understand how decisions affect the chain, including legal, product development, and marketing. Companies increasingly align with overall sustainability objectives, developing contingency plans for disruptions and remaining highly ethical. Empirical studies have shown a positive relationship between SSCM practices and financial performance. There is a need for further research in this field, especially in investigating the intricacies and interrelations of the different components of SSCM (Alqahtani & Makki, 2022). The literature also highlights the need for stronger green procurement policies and the significance of eco-labeling in monitoring sustainability measures. Although there is an ever-growing literature on SSCM, a gap in research remains, especially in constructing a unifying analytical framework for accurate measurements of the triple bottom line of environmental, social, and economic factors. There are insureds to be more of the long-term effects of SSCM practices on corporate profitability and responsibility.

Although the SSCM field has come a long way, with an obvious tendency to unite all three aspects of sustainability, there is still much to be done, especially regarding analyzing the interplay between these factors and their relationship with long-term corporate profitability and responsibility.

METHODOLOGY

Research Design

Employing a quantitative research design, the study uses a methodological approach that accentuates objective measurements and statistical data analysis based on questionnaires, surveys, or secondary data sources. This choice is based on the possibility of providing measurable evidence and generalizing results in different contexts (Yildiz Çankaya & Sezen, 2019). Considering the source availability and its nature, the studies have been narrowed down to secondary sources, which enables a more profound analysis of sustainable supply chain management practices. Secondary data has the advantage of being cheap and fast because it eliminates the task of acquiring primary data, which can be costly and time consuming.

Data Collection

This information comes from Kaggle, one of the major bodies that focuses on data science and analytics. The best dataset was appraised based on the following criteria: relevancy of the selection criteria to the research topic, validity of the data, and sustainable supply chain management scale. The selected dataset contains a supply chain database that includes supply chain operations, including shipment time, sales, delivery status, categories and locations (Bektaş et al., 2019). The dataset used for the given case study was especially meaningful because it was large and mattered with a considerable amount of data on the central issues of understanding sustainable supply chain practice and the effects of these on the performance and accountability of a company.

Data Analysis

In this study, data analysis is performed through the use of the SPSS (Statistical package for the social sciences) as the main statistical tool.

- **Descriptive Statistics**: Table below displays a summary and description of the attributes of the dataset.
- **Correlation Analysis**: To find the linkages between the sustainability and profitability variables.
- **Regression Analysis**: To test the forecasting power of sustainability practices linked to various performance measures.
- **Factor Analysis**: To identify latent relationships between observed and unobserved variables.

The use of SPSS will allow a systematic and comprehensive data analysis, leading to precise and reliable conclusions about the impact of sustainable practices in supply chain management on corporate profitability and responsibility.

RESULTS

Descriptive Statistics

The descriptive statistics of the dataset for Sustainable Supply Chain Management reveal several key characteristics:

Table 1: Descriptive Statistics.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Days For Shipping (Real)	50252	0	6	3.49	1.629
Days For Shipment (Scheduled)	50252	0	4	2.92	1.380
Benefit Per Order	50252	-4274.9799800000000000	911.7999878000000000	23.271570504614765	116.901474083667720
Sales Per Customer	50252	8.470000267	1939.989990000	194.40416941952	145.883419353644
Late_Delivery_Risk	50252	0	1	.55	.497
Category Id	50252	2	67	31.75	15.316
Latitude	50252	-33.937553410000000	48.770957950000000	29.563277678055550	9.827541936708755
Longitude	50252	-158.02598570000000	115.26307680000000	-84.646828927426580	21.476879750364176
Product Price	50252	9.989999771	1999.989990000	154.216279953004	170.921424902988
Valid N (Listwise)	50252				

- **Days for shipping (real)**: Products typically ship in 3.49 days on average, with a standard deviation of 1.629, indicating moderate variability around the mean shipping time.
- **Days for shipment (scheduled)**: The average shipping time is slightly less at 2.92 days, with a smaller standard deviation of 1.380, suggesting that scheduled times are generally more consistent than actual shipping times.
- **Benefit per order**: There is a significant range in profitability, with an average benefit of approximately 23.27 units of currency and a high standard deviation of 116.901, which indicates a wide disparity in order profitability. The negative minimum suggests that some orders result in a loss.
- **Sales per customer**: Customers spend an average of 194.40 units of currency, with a high standard deviation of 145.883, showing considerable variation in spending per customer.
- **Late_delivery_risk**: About 55% of orders are at risk of late delivery, reflecting operational challenges in the supply chain.
- **Category Id**: Products span many categories, from 2 to 67, showing the dataset covers a broad range of items.
- **Geographical Coordinates**: The latitude and longitude values indicate a wide geographical spread of orders or suppliers, with the mean latitude and longitude suggesting a concentration possibly in the Western Hemisphere.
- **Product Price**: The average product price is 154.22 units of currency, with a wide range extending to nearly 2000 units, indicating a diverse range of product values within the dataset.

This synopsis implies that the data set may be useful in providing information on supply chain efficiency, customer spending behavior and profitability by product category as well as geography.

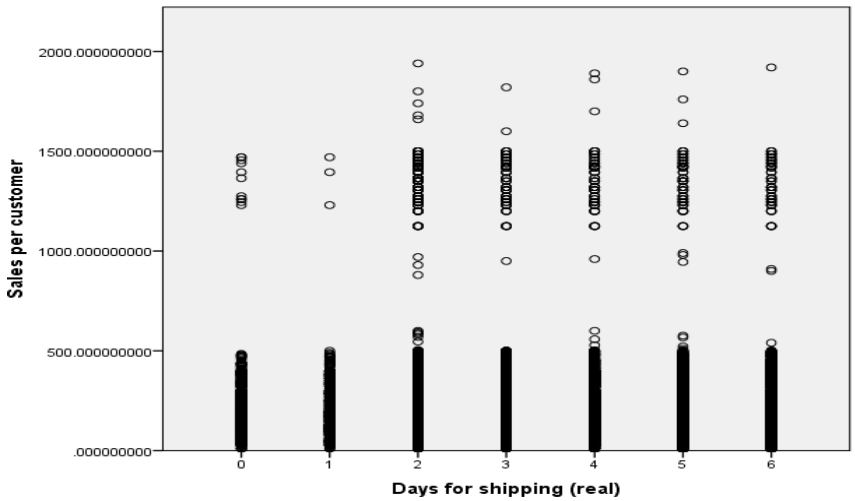

Figure 1: Scatter Plot.

The scatter plot represents the relationship between actual days taken for shipping on the X-axis and sales per customer on the Y-axis. The pattern for days of shipping shows no evident trend between the number of days used for shipping and amount spent per customer (Jabbour et al., 2020). The data points clustered for each shipping day show that there is no variation in the sales per customer with respect to different shipping durations. The vertical spread of points at every value on the X-axis shows that there are a broad spectrum of sales amounts per category of shipping time. There are outliers with high sales values that do not follow the main cluster trends, which could indicate occasional large orders or high-value purchases irrespective of the shipping time.

Correlation Analysis

Table 2: Correlations.

Correlations			
		Benefit Per Order	Sales Per Customer
Benefit Per Order	Pearson Correlation	1	.132**
	Sig. (2-Tailed)		.000
	N	50252	50252
Sales Per Customer	Pearson Correlation	.132**	1
	Sig. (2-Tailed)	.000	
	N	50252	50252
**. Correlation Is Significant at the 0.01 Level (2-Tailed).			

The correlation analysis between "Benefit per order" and "Sales per customer" reveals a positive Pearson correlation coefficient of 0.132, which is statistically significant at the 0.01 level (2-tailed). This positive correlation, although weak, indicates that as the sales per customer increase, there is a slight tendency for the benefit per order to increase as well. The significance level of 0.000 suggests that the correlation is not due to random chance (Chowdhury & Quaddus, 2021). Given the context of Sustainable Supply Chain Management (SSCM) practices, this correlation might imply that more effective SSCM practices, which could contribute to higher sales per customer, are also associated with increased profitability per order. The correlation coefficient is low, which means that these variables are related but other factors also influence the profitability. This weak correlation reflects on the complex dynamics of supply chains where several variables are likely to interact in affecting profitability and corporate responsibility outcomes. Additional

research is required to understand the causation and other factors that led to these critical performance indicators.

Regression Analysis

Table 3: Model Summary.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.109[a]	.012	.012	116.203704879678040
a. Predictors: (Constant), Product Price, Days for shipping (real), Days for shipment (scheduled)				

The regression analysis helps to understand how different factors are predictive of 'Benefit per order' a proxy for SSCM profitability (Jabbour et al., 2020). The R-square value of 0.012 for the model indicates that only 1.2% of the variance in 'Benefit per order,' can be explained by independent variables namely, Product Price, Days for shipping (real), and Days for shipment (scheduled). Even though they are statistically significant; but still because such R square is low, these independent

Table 4: ANOVA.

ANOVA[a]						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8214016.719	3	2738005.573	202.766	.000[b]
	Residual	678513870.043	50248	13503.301		
	Total	686727886.762	50251			
a. Dependent Variable: Benefit per order						
b. Predictors: (Constant), Product Price, Days for shipping (real), Days for shipment (scheduled)						

The ANOVA table with an insignificant F-statistic (202.766, $p < 0.01$) indicates that the model is statistically significant and predictors collectively influence 'Benefit per order.'

Table 5: Coefficients.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.620	1.444		8.741	.000
	Days for shipment (scheduled)	.749	.438	.009	1.709	.087
	Days for shipping (real)	-.864	.371	-.012	-2.327	.020
	Product Price	.074	.003	.109	24.542	.000
a. Dependent Variable: Benefit per order						

Examining the coefficients, 'Product Price' has a positive relationship with 'Benefit per order' (B = 0.074), which suggests that higher-priced products tend to have a higher profitability margin. The negative coefficient for 'Days for shipping (real)' (B = -0.864) implies that longer actual shipping times might negatively influence profitability (Jia et al., 2018). The 'Days for shipment (scheduled)' variable is not statistically significant (p = 0.087) and has a negligible effect size (Beta = 0.009),

indicating that the scheduled shipping time does not have a strong predictive power on profitability. While the model identifies some relationships between the variables and profitability, it also highlights the complexity of SSCM and the need for more comprehensive models that include additional variables to better understand and predict corporate profitability outcomes within sustainable supply chain practices.

Factor Analysis

The Factor Analysis, conducted using Principal Component Analysis (PCA), revealed two significant components that explain a cumulative 63.899% of the Variance in the dataset. Specifically, the first component accounts for 37.149% of the Variance, while the second explains an additional 26.750%.

Table 6: Total Variance Explained.

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.857	37.149	37.149	1.857	37.149	37.149
2	1.337	26.750	63.899	1.337	26.750	63.899
3	.969	19.381	83.280			
4	.693	13.862	97.143			
5	.143	2.857	100.000			
Extraction Method: Principal Component Analysis.						
a. Only cases for which Late_delivery_risk = 1 are used in the analysis phase.						

In the Component Matrix, both 'Days for shipping (real)' and 'Days for shipment (scheduled)' have high loadings on the first component (.963), indicating that they may represent a common underlying factor related to shipping efficiency or operational timing within the supply chain. The near-identical loadings suggest these two variables measure similar constructs, possibly the efficiency and reliability of the delivery process (Khan et al., 2021). The second component is strongly associated with 'Sales per customer' (.793) and 'Category Id' (.757), suggesting this factor may reflect market reach or customer spending behavior related to specific product categories. The positive loading for 'Benefit per order' (.368) on this second component shows sales increase and certain products categories are linked with higher profitability.

Table 7:Component Matrix, b.

Component Matrix		
	Component	
	1	2
Days for shipping (real)	.963	-.017
Days for shipment (scheduled)	.963	-.010
Benefit per order	-.012	.368
Sales per customer	.024	.793
Category Id	.015	.757
Extraction Method: Principal Component Analysis.		
a. 2 components extracted.		
b. Only cases for which Late_delivery_risk = 1 are used in the analysis phase.		

These findings suggest that two distinct but crucial dimensions within the SSCM practices are being analyzed: A delivery from an effective shipping to a delivery that describes the sales dynamics and product categories (Bals & Tate, 2018). The analysis shows that for cases associated with the risk of late delivery, these two dimensions are critical in understanding

overall supply chain performance and its impact on profitability.

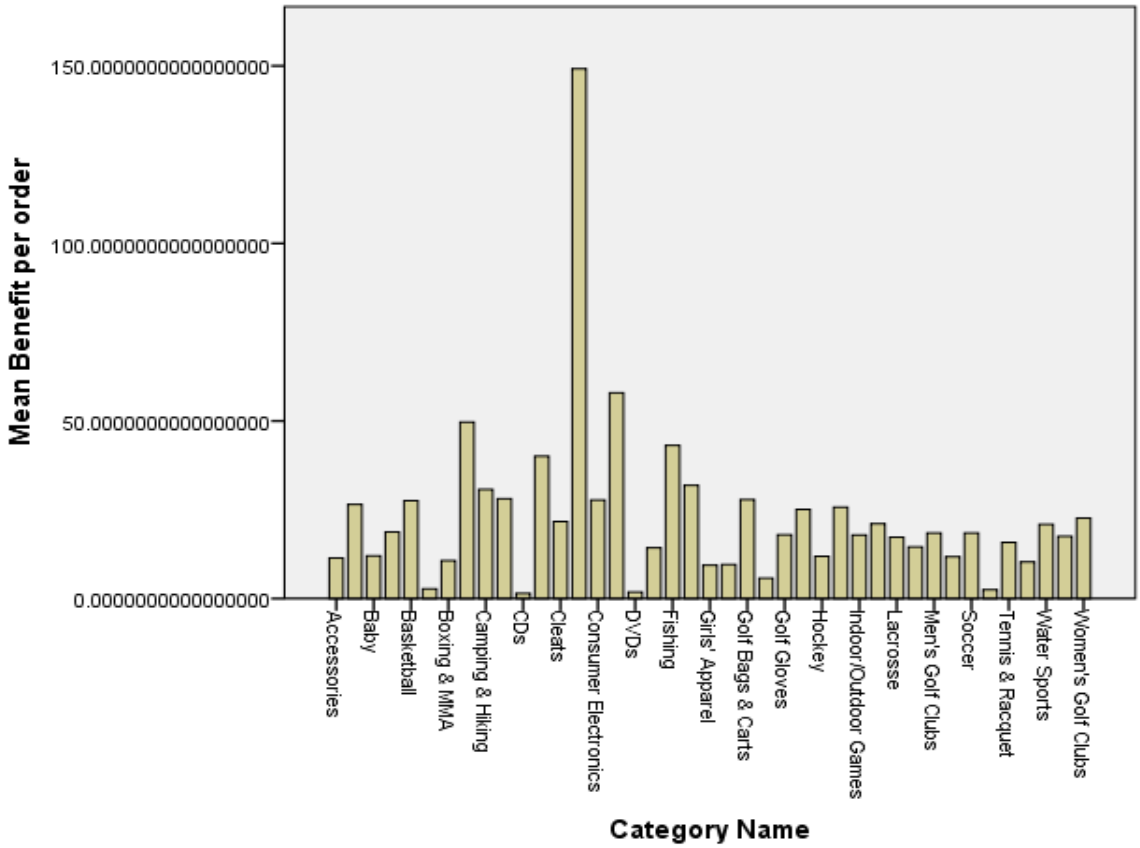

Figure 2: Bar Chart.

DISCUSSION OF FINDINGS

This study is defined with statistical analyses like descriptive statistics, correlation regression and factor analysis that give a complete picture of supply chain data. The shipping days are moderately above average but with a very high variation rate that means the differences in supply chain efficiency. Wide variations in 'Benefit per order' and 'Sales per customer' mean that there is significant fluctuation between the orders concerning profitability and sales performance (Ülgen et al., 2019). The weak but positive correlation of 'Benefit per order' and 'Sales per customer' indicates that the high sales may cause increased profitability. The effect is not strong, implying other factors also play critical roles in profitability. The regression analysis reveals that only 1.2% of the variability in 'Benefit per order' is accounted for by the model, with 'Product Price' being a positive predictor, while increased 'Days for shipping (real)' is a negative predictor. This suggests that while pricing strategy can enhance profitability, inefficiencies in shipping may reduce it (Bals et al., 2018). Factor Analysis identified two components explaining 63.899% of the Variance. The first factor is heavily loaded on shipping variables, which may represent the operational efficiency dimension. The second factor associated with 'Sales per customer' and 'Category ID' may represent the effects of market behavior and product types on sales and profitability. These findings collectively indicate a dynamic interrelationship between operational efficiency, market dynamics, and profitability. Although some supply chain performance elements, including pricing strategies and effective shipping, are demonstrated to have a direct link with profitability, the overall picture is complex enough to suggest a need for sophisticated strategies to improve SSCM practices.

DISCUSSION AND IMPLICATIONS

SSCM practices have been found in the statistical analyses to affect profitability and corporate responsibility subtly. Although pricing strategies positively impact profitability, as can be seen from the regression analysis, inefficiency in shipping time negatively affects it (Maditati et al., 2018). This emphasizes the significance of operational efficiency in SSCM for improving financial performance. Companies should strive to streamline shipping processes and price products with sustainability goals to enhance profitability. The positive correlation between sales and profitability indicates that improving customer value through sustainability can lead to financial success. Businesses should, therefore, adopt SSCM practices not only as a corporate responsibility initiative but as a core strategy for market competitiveness. The results reveal that policymakers need to provide favorable settings for SSCM implementation. Such measures may entail incentives for green practices, clearly developed sustainability standards, and encouragement innovative breakthroughs meant to ensure cleaner, more streamlined supply chains. The study contributes to the dynamic capabilities theory in supply chain management by making visible the adaption of and integration of SSCM practices as source of competitive advantage and performance. It also provides a strong empirical evidence to support the stakeholder theory that profits and responsibility of the companies are improved due to needs and values of the customers as a result of the proactive and coordinated response of SSCM practices.

LIMITATIONS AND FUTURE RESEARCH

Secondary data are limiting the research to variables that were recorded before, probably out of date, potentially not specific enough for a certain context to reflect the full range of SSCM practices. It might need to be at a higher level of granularity, mostly in terms of the finer aspects of sustainability practices and the views of stakeholders toward the latter processes (Jia et al., 2018). The quantitative approach proves to be an efficient solution to find trends and relationships. However, the quantitative approach is not enough to represent the real complexity of human and organizational behaviors resulting in SSCM. It should also consider the broader descriptive insights that qualitative data can provide, including the rationale for sustainability initiatives and the corporate morality culture. In future research, primary data collection is recommended to investigate the nuances of SSCM strategic implementation and consumer and practitioner adoption. Longitudinal studies should also be conducted to determine the impact of SSCM practices on organizational effectiveness and social responsibility in corporate organizations. The use of a mixed-methods approach would allow data triangulation that would enable better and more detailed understanding of SSCM complexity. This may incorporate customer feedback and employees' opinions that lead to the adjustment of the level of analysis following SSCM strategy deployment.

CONCLUSION

The study reveals knitted SSCM practices and their two-sided effect on profitability and corporate social responsibility. The results suggest a weak positive correlation between sales and profitability, indicating that the fact of increasing benefits per order due to better sales does not completely depend on the latter. The regression analysis highlights product pricing and efficient shipping times as major determinants of profitability. Factor analysis throws more light on the two dimensions of SSCM, namely operational efficiency and product-market dynamics. These results indicate that embracing SSCM approaches is not a mere trend but an imperative necessity for today's businesses striving to balance profit and responsibility. The

underlying logic of SSCM is based on enhancing corporate reputation, customer loyalty, and operational resilience while supporting the global sustainability agenda. Such results support a rather softer adoption of SSCM practices as firms battle the complexities in global markets. They should be seen as an integral part of the business strategy, creating innovation, competitiveness, and sustainability in a holistic approach. The study's implications point out the need for companies to integrate sustainability into the core of their supply chains and to understand the power of sustainability as a driver of long-term success in a marketplace that is becoming more environmentally conscious and socially responsible.

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