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Analysis of Supply Chain Performance Under the Influence of Social Sustainability Initiative of Organizations

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ABSTRACT

This study investigates the impact of organization's social sustainability initiatives on supply chain performance, with organization's size as a moderating factor. Data was collected via a survey of supply chain management professionals and analyzed using Partial Least Squares-Structural Equation Modelling (PLS-SEM), with performance measured through the On-Time-In-Full (OTIF) metric. The findings reveal that social sustainability initiatives, particularly those focused on employee welfare, significantly enhance supply chain performance. This supports the theory that social sustainability directly influences supply chain costs and performance, independent of organizational size. The study offers practical insights for supply chain professionals, emphasizing the role of employee welfare in improving operational outcomes and contributing to sustainable development goals. This research fills a critical gap in the literature by quantitatively linking social sustainability with supply chain performance, providing new insights into how these initiatives can drive organizational success.

Keywords: *multivariate analysis, SEM, social factors, supply chain performance measurement*

1. INTRODUCTION

Traditionally fixated on profit margins, contemporary scrutiny has broadened to encompass organizations' environmental and social sustainability practices, marking a significant paradigm shift in business ethos. Business leaders grapple with evolving stakeholder expectations in the present realm of dynamic commercial landscapes. This transition underscores the intricate relationships between organizations and their suppliers. Within the extensive network of global supply chains, interwoven across economies, the actions of suppliers resonate beyond the production floor and constitute a key determinant of organizations' long-term viability (Carter, 2005). However, the expansion of supplier networks into emerging economies introduced heightened risks (Gurtu & Johny, 2021; Gurtu *et al.*, 2016; Johny & Gurtu, 2022; Klassen & Vereecke, 2012; Srivastava & Vyas, 2023). Suppliers' decisions on social sustainability policies reverberate through societal strata (Wood, 1991; Tate *et al.*, 2010; Mani *et al.*, 2016a).

This intricate interplay unfolds against the backdrop of supply chain issues, which have operational risks triggered by social issues (Klassen & Vereecke, 2012). Ageron *et al.* (2012). This emphasizes the interconnectedness of upstream suppliers, emphasizing the cascading effect of their actions throughout the supply chain, which impacts the company's performance.

Social sustainability in supply chains emerges as a prerequisite for manufacturing economics, cost reductions in health and safety, enhanced product quality, shortened lead times, and strong corporate reputations (Carter & Rogers, 2008). Meticulous supplier selection, with a dedicated focus on social sustainability, elevates social performance and helps firms leverage competitive advantages, cost reduction, and market share expansion (Klassen & Vereecke, 2012; Rao & Holt, 2005). To maintain growth and competitive sustainability, companies must continually showcase their capacity to offer distinct advantages that are preferred over those of their competitors, and social sustainability in supply chains can be one of them (Bendoly *et al.*, 2007).

Envision a workplace where accidents are negligible, disruptions are rare, and delivery timelines are shortened—a clear reassurance of the profound impact of a positive work environment (Freire & Alarcon, 2002; Yuan & Woodman, 2010). Such an environment ensures a seamless operational flow, materializing into enhanced product quality driven by higher employee motivation (Pagell *et al.*, 2010).

Social issues are progressively garnering scholarly attention in supply chain management (Yawar & Seuring, 2017; Gopalakrishnan *et al.*, 2012), including British Aerospace's social sustainability initiatives. These initiatives present critical considerations such as ethical codes of conduct, diversity and inclusion, safety, and environmental performance in emerging economies. Conversely, Hall *et al.* (2012) studied a Brazilian oil and gas supply chain, identifying social issues ranging from poverty reduction to health and educational efficacy.

Most studies adopted qualitative and case-based reasoning approaches for linking social sustainability efforts with supply chain performance. Zailani *et al.* (2012) correlate sustainable purchasing to supply chain performance through survey-based research in Malaysia.

As we progress in the sustainability aspects, it becomes evident that the societal development of a country intertwines with the dynamic nature of its social problems. Yawar and Seuring (2017) advocate for a detailed analysis of supply chain performance—one that is contextual, time-dependent, and connected to the emerging social issues of a country. Social concerns vary significantly among diverse stakeholder groups according to the contextual environment (Clarkson, 1995; Hoejmose *et al.*, 2013). Therefore, efficient internal governance is essential for the successful execution of social sustainability initiatives by firms (Ruesch *et al.*, 2022).

This study explores the influence of organizations' social sustainability policies on supply chain performance. This exploration led to the development of a theory highlighting how social sustainability significantly impacts supply costs and performance metrics. The array of policies concerning social sustainability includes monetary considerations, health and safety, social sustainability awareness, gender diversity, work-life balance, social welfare schemes, and training. The supply chain performance has been measured via the On-Time In-Full (OTIF), which has been explained in Section 2.2. Apart from measuring the impact of social sustainability measures on supply chain performance, we also tried to understand if the size of firms plays any role as a moderating factor on supply chain performance. The study draws primary data from automotive ancillary firms in India as a case of an emerging economy.

This research contributes to (i) quantitatively establishing the relation between a firm's social sustainability policies and its supply chain performance and (ii) examining the moderating impact of firm size on supply chain performance. The paper deployed Smart PLS to develop the relationship between social factors and analyze its impact on supply chain performance, which is a one-of-a-kind attempt. Subsequent sections of this paper traverse a comprehensive review of existing literature, the methodology and research design, a detailed analysis, insightful discussions, and implications. The article concludes with reflections on the limitations of this research and potential avenues for future exploration.

2. LITERATURE REVIEW

This section provides an overview of pertinent literature concerning sustainability within supply chains, delving into social sustainability and supply chain performance. By scrutinizing existing research, this section aims to identify gaps in current knowledge and subsequently formulate hypotheses for empirical exploration.

2.1 Social Sustainability in Supply Chain Management

The foundational framework articulated by Carroll (1979) delineates four primary responsibilities of a company: economic, legal, ethical, and voluntary, encapsulating the essence of modern corporate sustainability. Organizations are pivotal in championing sustainability and assuming accountability for the economic, environmental, and social impacts of their activities (Elkington, 1998). The repercussions of corporate conduct extend beyond individual businesses to entire supply chains spanning multiple countries (Rao & Holt, 2005). Consequently, scientific attention has inevitably shifted toward supply chain sustainability (Seuring & Müller, 2008; Carter & Rogers, 2008; Carter & Easton, 2011; Sharma & Singla, 2021), considering objectives across all three dimensions (economic, social, and environmental) of sustainable development and deriving from customer and stakeholder needs (Seuring & Mueller, 2008).

Stakeholders drive sustainable organizational performance (Freeman, 1994; Maignan *et al.*, 2002; Morali & Searcy, 2013; Park-Poaps & Rees, 2010). Organizations can achieve social and economic performance by addressing social concerns and meeting the expectations of their internal and external stakeholders (Waddock *et al.*, 2002). Branco and Rodrigues (2008) profess social concerns in the supply chain as a strategic approach, suggesting that it enhances credibility and bolsters the reputation of organizations with stakeholders. While the environmental aspects of sustainability have received more attention due to their quantifiable nature, social issues have often been overlooked (Yawar & Seuring, 2017; Ashby *et al.*, 2012; Gurgler & Shi, 2009; Srivastava *et al.*, 2022).

Social sustainability, as defined by Lafferty and Langhelle (1999), is an ethical standard of behavior that is essential for human survival, encompassing the management of talents, abilities, relationships, and social values. In supply chain literature, social sustainability is often an extension of corporate social responsibility (Hutchins & Sutherland, 2008). Scholars recognize societal issues and their link to supply chain performance through concepts like logistic social responsibility (LSR) and purchasing social responsibility (PSR) (Murphy & Poist, 2002; Carter & Jennings, 2004). However, consensus on what constitutes social viability in the supply chain remains elusive (Van Marrewijk, 2003; Awaysheh & Klassen, 2010; Gimenez & Tachizawa, 2012). Social sustainability is contingent on decision-makers' responsibility for specific issues and making responsible business choices (New, 2004).

Socially responsible business practices prioritize factors affecting people's safety, welfare, and well-being (Wood, 1991). Supply Chain Social Sustainability (SCSS) encompasses six dimensions: equity, philanthropy, safety and health, human rights, child and forced labor, and product stewardship. Scholars argue that addressing social sustainability in the supply chain can positively impact product and process issues extending to people working upstream and downstream (Mani *et al.*, 2016b). While

organizations influence inter-firm sustainability challenges, supplier issues pose a potential risk (Klassen & Vereecke, 2012; Gurtu & Johny, 2021; Johny & Gurtu, 2022).

The performance of a supply chain is contingent on its ability to meet the end user's needs. Supply chain performance is defined as the extensive array of actions undertaken by the supply chain to meet the needs and demands of the end consumer (Grimm, 2004). Understanding economic, environmental, and social sustainability is contingent on the research focus (Gallego-Alvarez *et al.*, 2015; Pagell & Wasserman, 2010; Duong, 2022).

The factors influencing social sustainability practices and their measurement have been discussed by many scholars (Castka & Corbett, 2016; Giannakis & Papadopoulos, 2016; Mani *et al.*, 2015; Tate *et al.*, 2010). Key components of social sustainability practices include "employees' safety, health, and welfare." Additional criteria for evaluating the social sustainability of supply chains encompass "diversity, philanthropy, health and safety, and human rights" (Hutchins & Sutherland, 2008). In emerging economies, the three primary pillars of social sustainability are identified as “safety, equity, and poverty” (Vachon & Klassen, 2008).

The social behaviors encompassing safety, diversity, human rights, philanthropy, and labor practices within the supply chain, particularly in logistics and purchasing, exert a noteworthy influence on supply chain performance (Carter, 2005). These social sustainability factors play a crucial role in shaping the overall effectiveness of the supply chain (Maloni & Brown, 2006). The importance of employee diversity in Malaysia's manufacturing industry further underscores the multifaceted nature of social sustainability within the supply chain (Chin *et al.*, 2015). The authors identified five interrelated parameters, namely, (i) social welfare, (ii) safety and health measures, (iii) monetary schemes, (iv) policies promoting awareness of social sustainability, including ethics, and (v) training, as pivotal contributors influencing both social sustainability and supply chain performance which aligns with the newly developed theory that organizations social sustainability policies impact supply performance.

2.2 Supply Chain Performance

The approach to measuring the effectiveness of a supply chain is known as a supply chain performance system. Supply chain performance measures can be divided into two broad categories, i.e., qualitative and quantitative. The qualitative measures are feeling-based, such as customer satisfaction, quality of product, etc., whereas quantitative measures measure parameters, such as lead time between placing an order and delivery, the supply chain’s response time, and delivery efficiency. The supply chain performance from the perspective of a customer (buyer) can be gauged through OTIF. OTIF is the abbreviation for “On Time (deliveries) In Full,” which is sometimes also written as **Delivery in Full, On Time (DIFOT)**. However, we will use OTIF in the rest of the paper. OTIF is a composite measure of the effectiveness of a supplier’s processes, from receiving raw materials to delivering the finished products. OTIF calculates the percentage of on-time, full deliveries of good-quality products. It is the ratio of deliveries of the exact quantity of acceptable quality items ordered to all deliveries made in a period (Eq. 1).

$$\text{OTIF Rate} = \left(\frac{\text{Deliveries made on time and in full}}{\text{Total deliveries made}}\right) \text{x}100$$

Walmart introduced the OTIF initiative in 2017 (Davis, 2023). OTIF encourages suppliers to adhere to the due dates for order fulfillment. Suppliers incur penalties for not adhering to a buyer’s on-time, complete delivery schedule. For example, Walmart charges a penalty of up to 3% of the cost of the consignment value for each incident of delay in delivery on time in full (Souza, 2020). A 100% OTIF rate is an aspirational goal. Different organizations may have their own OTIF goals/expectations, and different product lines may have different OTIF rates. However, Walmart has kept an OTIF target of 98% for its suppliers (Bower, 2021; Walmart, 2023).

OTIF (On-Time, In-Full) is a comprehensive and critical KPI for assessing and enhancing supply chain performance. Shang *et al.* (2024) proposed a five-level scheduling strategy integrating OTIF to optimize supply chain efficiency. Sehgal *et al.* (2006) demonstrated that adopting OTIF led to significant improvements, including over 20% enhancement in service levels and an 18% reduction in inventory. Raaymann and Spinler (2024) identified OTIF as a crucial metric for measuring supply chain resilience, while Geary and Cosgrove (2023) linked OTIF to Industry 4.0, highlighting it as a key indicator for evaluating advancements in supply chain performance. Narayanan and Ishfaq (2022) explored OTIF within retail distribution centers, emphasizing its behavioral dimensions. Our study concentrates on supply chain performance under the influence of the social sustainability initiatives of an organization. As indicated earlier, we could not find any study in this area.

3. RESEARCH GAP AND HYPOTHESES DEVELOPMENT

The existing literature strongly indicates a gap in research regarding the relationship between social sustainability measures and their impact on supply chain performance. The influence of social sustainability practices on supply chain performance is a less explored area of sustainable supply chain management (Gurtu, Searcy & Jaber, 2015). To the best of our research, not much empirical research has been done in this area, making it one of the pioneer studies. One key metric considered to evaluate the performance of socially sustainable supply chains across different organizations is OTIF, which measures the efficiency and reliability of supply chain operations.

A widespread practice categorizing organizations as Large, Medium, Small, and Micro is based on annual turnover. Large organizations have more social sustainability initiatives compared to medium, small, and micro-organizations, which is a general perception. This perception is due to voluntary corporate social responsibility (CSR) disclosure and information sharing on organizations’ websites but does not necessarily reflect the true sustainability of an organization (Calderon *et al.*, 2024; Bansal, 2021). Against the backdrop of this perception, this

study explores the role of the organization's category as a moderating factor in understanding the dynamics of social sustainability initiatives across various sizes of organizations. Liao and Widowati (2021) highlight the limited research in supply chain management, emphasizing the need for a comprehensive review of theoretical models that explore the roles and interactions of independent and dependent variables, moderators, mediators, moderated mediators, and mediated moderators.

This study emphasizes the need to consider industry-specific dynamics when exploring the link between social sustainability and supply chain performance. We have formulated seven hypotheses outlined in **Figure 1** to address the research gap. These hypotheses aim to provide insights into the influence of social sustainability issues on supply chain performance.

H1: *Social welfare measures do not impact social sustainability.*
H2: *Health and safety policies are not related to social sustainability.*
H3: *Monetary policies of an organization are not positively associated with social sustainability.*
H4: *Awareness of policies has no relationship with social sustainability.*
H5: *Training does not impact the social sustainability of an organization.*
H6: *Industry Category impacts the social sustainability of an organization.*
H7: *Social sustainability does not have a positive impact on OTIF, regardless of the industry category.*

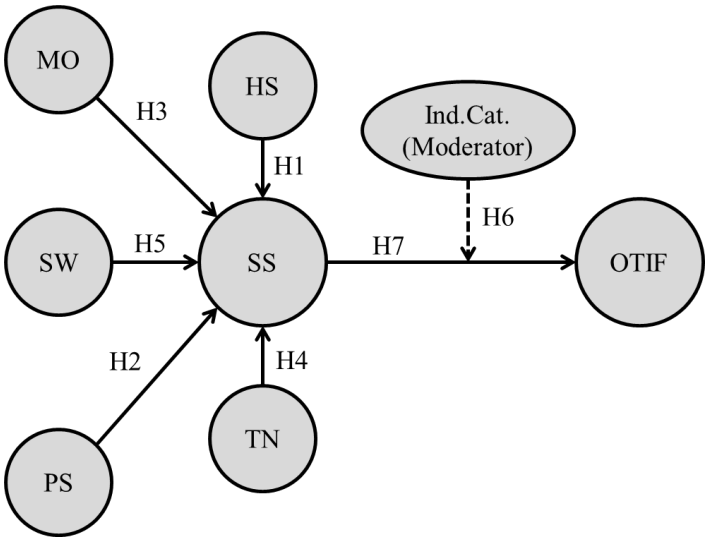

Figure 1 Hypothesized model

Where MO=Monetary Policies, SW=Social Welfare practices, PS=Policies on awareness of social sustainability and ethics, HS=Health and safety, SS=Social Sustainability, TN=Training Policies, Ind.Cat.=Industry Category, OTIF=On Time in Full

4. RESEARCH METHODOLOGY AND DATA ANALYSIS

The study employed Partial Least Squares-Structural Equation Modelling (PLS-SEM) for analysis, emphasizing its versatility in handling the interplay between theory and data, particularly for smaller sample sizes. PLS-SEM is recommended by Nitzl (2016), Rigdon (2016), and Hair *et al.* (2018) as a preferred tool for smaller sample sizes that align with the characteristics of the studied population. In contrast, Covariance-Based Structural Equation Modeling (CB-SEM) is suited for large data and intricate models. We used SMART PLS 4.0 to test our hypotheses.

The development of a consistent PLS approach emerged from debates about the reliability of the PLS algorithm (Dash & Paul, 2021). Specific methods within Structural Equation Modelling (SEM) have been contentious in recent years. Some researchers have dismissed PLS altogether (Ronkko *et al.,* 2016), while others have provided substantial evidence supporting its use (Sarstedt *et al.*, 2016; Rigdon, 2016). Despite the extreme call for its discontinuation by some critics (Antonakis *et al.*, 2010), PLS has garnered significant support from many scholars (Dash & Paul, 2021; Rigdon, 2016; Sarstedt *et al.*, 2016; Astrachen *et al.*, 2014; Liao & Widowati, 2021; Robb *et al.*, 2022). Although CB-SEM remains more prevalent, recent empirical studies and literature suggest that PLS-SEM offers greater flexibility for exploring various configurations (Dash & Paul, 2021). Dash and Paul (2021) argue that SEM software is particularly advantageous for research in social sciences, making it a fitting choice for our assessment using regular PLS.

4.1 Data Collection

The first step was creating a structured questionnaire for data collection and validation. We shared the questionnaire with three academic scholars specializing in sustainable supply management research, as well as seven SCM managers. This step was taken to assess the clarity and validity of the questions, aligning with the guidelines provided by Heeler and Ray (1972). Subsequently, question wordings were refined to ensure clarity and precision. The final questionnaire contained sixteen social sustainability parameters subdivided into five sections – Monetary (3 items), Health and Safety (4 items), Social welfare (3 items), Training Policies (4 items), and Policies on awareness of

social sustainability and ethics (2 items) – refer Appendix A for details. A five-point Likert scale was utilized, where 1 signifies strongly disagree and 5 strongly agree. This was used for data collection from SCM professionals and business leaders.

4.2 Measurement Model

A measurement model was created to check the factor loading. After running factor analysis in its initial stage, all items with factor loadings less than 0.7 were eliminated (Hair *et al.*, 2011). Refer to Appendix B for the initial model. We observed that five-factor loadings in the measurement construct were less than 0.70. Therefore, we removed those factors (HS2, HS3, SW1, TN3, and TN4) from further analyses and created the final measurement model (**Figure 2**), where all latent variables have a factor loading of more than 0.70.

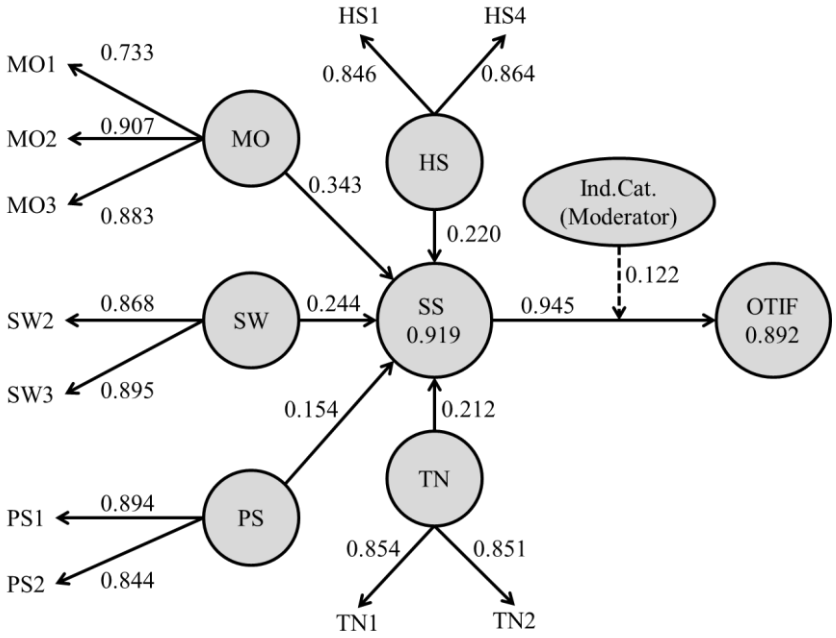

Figure 2 Final measurement model

4.3 Data Validity and Reliability

The questionnaire was distributed to sixty automotive parts manufacturing organizations (17 large, 18 medium, 21 small, and 4 micro) and received 657 responses. The survey metrics were derived from published literature. The constructs of social sustainability initiatives were formulated based on research by Marshall (2015) and Bhagwat and Sharma (2007). To investigate the consistency of the variables, we used factor analysis and reliability tests in Smart PLS 4.0 (**Table 1**). The results suggest a robust and consistent relationship between the items and essential factors. Factor Loading exceeds 0.70, Average Variance Explained (AVE) exceeds 0.50, and Composite Reliability (rho_c) surpasses 0.70. These findings affirm the strong internal consistency and convergence of the latent construct under investigation (Ringle *et al.*, 2015).

Table 1 Results of descriptive statistics and factor analysis

Construct	Item	Mean	Standard deviation	Factor Loading (>0.70)	Average Variance Explained (AVE)>0.50	Composite reliability (rho_c)>0.70
Monetary	MO1	3.459	1.322	0.733	0.713	0.881
	MO2	4.118	0.881	0.907		
	MO3	4.209	0.9	0.883		
Training	TN1	4.382	0.556	0.854	0.727	0.842
	TN2	4.336	0.607	0.851		
Health and Safety	HS1	4.468	0.598	0.846	0.731	0.845
	HS4	4.259	0.727	0.864		
Policies on Awareness of Social Sustainability & Ethics	PS1	4.286	0.599	0.894	0.756	0.861
	PS2	4.291	0.601	0.844		
Social Welfare	SW2	4.086	0.877	0.868	0.777	0.874
	SW3	4.277	0.726	0.895		

4.4 Common Method Bias and Non-Response Bias

The dependent and independent variables were measured using one questionnaire. Studies, where data for both independent and dependent variables are gathered from the same person in the same measurement utilizing the same item context and similar item attributes, are more likely to exhibit common method bias. Ehrgott *et al.* (2011) recommend that researchers mitigate common method bias in questionnaires by employing various strategies, including using multiple data sources, enabling anonymous responses, incorporating reverse-coded questions, administering sections separately, including control questions, and providing clear instructions. The items about the hypothesized antecedents were included first in the questionnaire, followed by the ones belonging to the focus construct, "Impact of social sustainability on OTIF," and the last items belonged to the anticipated results. Our survey questionnaire used the Likert scale for the Independent Variable (IV) and the semantic differential for the Dependent Variable (DV) questions. The IV is altered to observe its impact on another variable, while the DV is the variable being assessed or measured. The structural model was extended by a further moderating construct, to which all model components were attached as indicators. No previously significant pathways become less or more significant because of the addition of this component. Consequently, the test does not reveal a bias brought on by common method variance.

4.5 Model Validity

4.5.1 Convergent Validity and Discriminant Validity

The test for convergent validity assesses the strength of the relationship between two scores on the same construct, while the test for divergent validity examines the minimal or non-existent relationship between scores from different constructs.

In evaluating convergent validity, several variables, such as the component loading, the average variance extracted (AVE), and composite reliability (CR), must be considered (Hair *et al.*, 2018). The analysis presented in **Table 1** indicates a robust association between the items and essential factors. Both AVE and CR values surpass the established threshold limits (AVE>0.5 and CR>0.70), signifying strong internal consistency and convergence of the latent construct under study.

To assess discriminant validity, the Fornell-Larcker criterion and Heterotrait-Monotrait ratio (HTMT) were employed (Henseler *et al.*, 2015). **Table 2** illustrates that the square root of the AVE (diagonal elements) for each construct exceeds other inter-construct correlations, supporting solid discriminant validity. HTMT results indicate no concerns for discriminant validity, as all Heterotrait-Monotrait ratios of the correlations between constructs (ranging from 0.639 to 0.875) are below the threshold of 0.90 for conceptually similar constructs (Hair *et al.*, 2018).

Table 2 Correlations between research constructs

	HS	MO	PS	SW	TN
HS	0.695				
MO	0.688	0.844			
PS	0.670	0.477	0.869		
SW	0.527	0.500	0.468	0.754	
TN	0.708	0.620	0.745	0.555	0.677

(Note: Diagonal elements show the square root of the extracted average variance)

4.5.2 Assessment of Multi-Collinearity in the Measurement Model

The variance inflation factor (VIF) is often used to evaluate the collinearity of the formative indicators. The VIF value should be close to 3 or lower (Hair *et al.*, 2018). We found no multi-collinearity in our measurement model as the VIF values (**Table 3**) were <3, indicating that our model is stable.

Table 3 Multi-collinearity statistics of outer model

Construct	Indicator	Multi collinearity outer Model (VIF) <3
Monetary	MO1	1.344
	MO2	2.583
	MO3	2.381
Training	TN1	1.261
	TN2	1.261
Health and Safety	HS1	1.273
	HS4	1.273
Policies on awareness of social sustainability and ethics	PS1	1.359
	PS2	1.359
Social Welfare	SW2	1.444
	SW3	1.444

5. RESULTS AND ANALYSIS

5.1 Structural Model-Testing of Hypothesized Model

A structural model represents the relationships and interactions among latent constructs, illustrating the underlying theoretical framework. Its importance lies in elucidating the causal pathways and interdependencies between variables, providing a comprehensive understanding of the studied phenomena, and facilitating hypothesis testing in empirical studies.

Following the recommendation of Hair *et al.* (2011), the model was tested using 5,000 bootstrap samples to ensure the accuracy of the projected path coefficients. **Figure 3** and **Table 4** present information about the statistics of the structural model. This encompasses details on path significance, bootstrapping, and other pertinent statistical measures. Path significance assesses whether the relationships between variables are statistically significant, while bootstrapping, a resampling technique, estimates the distribution of statistics like path coefficients, offering insights into their reliability and associated confidence intervals in structural equation modeling or similar analyses. These elements collectively aid in evaluating the model's validity and the reliability of relationships between variables.

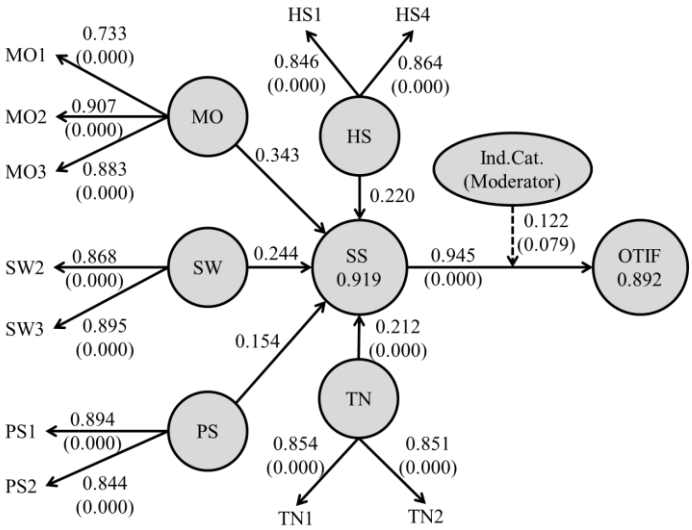

Figure 3 The conceptual model derived from PLS-SEM 4

Table 4 The PLS-SEM results

Hypothesis	Description	Main Path	β Values	T statistics (> 1.96)	P values (< 0.05)	Path	Result
H1	Social welfare measures do not impact social sustainability	MO → SS	0.343	13.487	0.00	Significant	Reject
H2	Health and safety policies are not related to social sustainability	TN → SS	0.212	7.792	0.00	Significant	Reject
H3	Monetary benefits of an organization are not positively associated with social sustainability	HS →SS	0.22	8.13	0.00	Significant	Reject
H4	Awareness of policies has no relationship with social sustainability	PS → SS	0.154	5.951	0.00	Significant	Reject
H5	Training does not impact the Social Sustainability of an organization	SW → SS	0.244	12.078	0.00	Significant	Reject
H6	Industry Category does not impact the social sustainability of an organization	Ind.Cat→ SS.	0.122	1.757	0.079	Insignificant as the P value is > 0.05	Do not Reject
H7	Social sustainability does not have a positive impact on OTIF, regardless of the industry category	(MO, HS, PS, TN, HS)→SS→Ind.Cat→OTIF	0.945	129.771	0.00	Significant	Reject

The final model (**Figure 3**) is robust, with a coefficient of determination (R2) exceeding 0.75. R2 values of 0.75, 0.50, and 0.25 are deemed highly significant, moderate, and weak, respectively (Hair *et al.*, 2018). **Table 5** shows R2 values.

Table 5 Coefficient of determination

Coefficient of determination	R^2
SS	0.919
Ind.Cat. (Moderating Construct)	0.015
OTIF	0.892

5.2 Model Fit Analysis

5.2.1 Assessing Composite Outer Model

In evaluating composite constructs, it is crucial to consider nomological validity, reliability, and indicators (Henseler, 2017). Nomological validity assesses how well a measurement aligns with other measures or theories within a broader conceptual framework. Confirmatory Composite Analysis (CCA) is indispensable for assessing nomological validity. Henseler *et al.* (2016) emphasize that the model fit statistics of CCA should fall below the upper bound of the 95% confidence interval. The Standard Root Mean Squared Residual (SRMR) is a goodness-of-fit metric for PLS–SEM (Henseler *et al.*, 2014). In a more conservative context, a value of 0.08 indicates

5.2.2 Assessing Composite Inner Model

Usakli and Rasoolimanesh (2023) propose that the assessment of the inner model in PLS-SEM follows the completion of the outer model evaluation. The VIF criterion, as indicated in the formative outer model assessment, is employed to examine multicollinearity. Through analysis, no multicollinearity problem (< 3) has been observed, and the coefficient of determination surpasses the threshold limits (> 0.75), affirming the inner model as a good fit.

The recommendations of Shmueli *et al.* (2016) and Usakli and Rasoolimanesh (2023) were followed, and PLS Predict was used to check the performance of our endogenous constructs. Very encouraging results were obtained, listed in **Table 6**. According to Shmueli *et al.* (2019), assessing the Q^2predict after selecting the constructs is recommended to ensure that the predictions surpass the naive benchmark. This benchmark is represented by the indicator means from the analysis sample. The PLS prediction method suggests that a naive benchmark creates predictions for the manifest variables using a linear regression model (LM). This involves running each dependent construct's indicator through the model against the indicators of the exogenous latent variables (Shmueli *et al.*, 2019). To validate the PLS Predict output, the Root Mean Square Error (RMSE) and Mean Absolute Error (MAE) should be compared with the linear regression model (LM). As proposed by Shmueli *et al.* (2019), the PLS-RMSE values and PLS-MAE values should be lower than the Naïve LM Values.

Table 6 PLS results

Prediction Summary	Q^2predict	PLS-SEM_RMSE	LM_RMSE	PLS-SEM_MAE	LM_MAE
Ind.Cat.	0.002	0.999	1.003	0.901	0.902
OTIF	0.004	0.563	0.564	0.501	0.502
SS	0.916	0.133	0.135	0.108	0.110
Guidelines	Q^2predict > 0 and PLS-RMSE, PLS-MAE values <LM_RMSE and LM_ MAE				

The above results show that our model is a good fit and that social sustainability is an exogenous construct that plays a significant role in achieving OTIF.

6. DISCUSSION

This research investigated the influence of social sustainability initiatives on their supply chain performance in auto ancillary firms. It explored the impact or potential of social initiatives of an organization in improving supply chain performance measured through OTIF (On-Time In-Full). Social welfare initiatives, health and safety schemes, monetary incentives, and employee well-being through employee training programs positively correlate with an organization's internal social sustainability and influence supply chain performance. The research indicates that factors like promoting employee welfare, ensuring safe working conditions, and providing healthcare support have consistently demonstrated positive impacts on employee integration within organizations. Key indicators for evaluating company policies and human resource practices encompass the well-being of employees and health and safety programs (Kaur & Sharma, 2018; Yawar & Securing, 2017). Wang *et al.* (2024) explores how development aid affects the health workforce. Our results corroborate the findings of previous research. Survey responses emphasize adopting ethical and transparent business practices that are integral to achieving social sustainability. These practices include fostering awareness of social sustainability, upholding strong ethical standards in the workplace, and providing employee training, which are instrumental in realizing social sustainability goals and agree with the insights offered by Marshall *et al.* (2015).

One of the findings from the structural model is that monetary initiatives play a significant role in achieving social sustainability in an organization. It indicates that the internal stakeholders are looking for financial stability. The welfare schemes, health and safety, along with relevant training on safe production techniques, reducing rejections, and clearly defined policies on social sustainability, gender biases, work-life balances, and ethical values also contribute to achieving socially responsible supply chains.

There seems to be a notable connection between socially sustainable supply chain indicators and OTIF (On-Time In-Full) performance. When employees feel the needs for their children's education, housing, transportation, healthcare, etc., have been taken care of, they put their best efforts at work. Contented employees produce less rejection, improving the first-time-right (FTR) rate. FTR not only increases the output but also reduces the wastage of raw materials. Training is a tool that equips people with the desired skills. Process training helps people to reduce rejections and increase FTR products. This is possible through awareness of the subject. Company policies on gender biases and work ethics motivate people to work cohesively. Training is pivotal in an organization's

performance and in achieving OTIF targets. Social welfare schemes such as family get-togethers, employee recognition (long service awards), and scholarships to meritorious children of employees create a good working environment in organizations and positively affect OTIF, which indicates improvements in supply chain performance. (Wang *et al.*, 2024)

A moderating factor was applied to comprehend the industry category's function in promoting social sustainability, and the analysis showed a negligible influence on OTIF. The structural model demonstrated that social sustainability favorably affects OTIF with and without the moderation of the industry category.

One significant finding from the structural model underscores the substantial role of monetary initiatives in fostering social sustainability within organizations, signifying (p=0.000) the importance of financial stability for internal stakeholders. Additionally, the study reveals that welfare programs, health and safety measures, targeted training in safe production techniques, reduction in rejections, and defined policies concerning social sustainability, gender equality, work-life balance, and ethical values contribute to establishing socially sustainable supply chains. Focal enterprises often influence suppliers to adopt social sustainability practices, as effective collaboration is linked to long-term organizational performance. Improved working conditions at the supplier's end contribute to a positive transformation in the supply chain (Lee *et al.*, 2012).

7. CONCLUSIONS AND IMPLICATIONS

This investigation offers insights into social sustainability practices that act as catalysts for supply chain management professionals to adopt responsible actions. The findings suggest intensifying efforts to enhance employee welfare and benefits and reinforcing the importance of community engagement. The study provides directions for supply chain managers to enable social sustainability measures within organizations to progress towards a 100% OTIF rate, which is also supplemented by our proposed insights.

Encouraging collaborative efforts among stakeholders, such as supply chain managers, suppliers, clients, and staff, to promote responsible behaviors and community contributions is crucial. Such endeavors are anticipated not only to enhance OTIF performance but also to contribute to successful and efficient supply chain management. The study accentuates the potential for organizations to integrate customer expectations into sustainability practices, fostering customer integration through OTIF and aligning with broader sustainable development goals (SDGs).

It is urged that organizations focus on their suppliers' social sustainability, recognizing its impact on brand value and internal integration concerning workplace safety and employee well-being. The research highlights that the seamless integration of social indicators is crucial for creating sustainable supply chains, positively influencing supply chain performance, and elevating the OTIF percentage, subsequently enhancing customer satisfaction.

Furthermore, the study reveals the necessity for proper internal and external collaboration to achieve high-performance levels in the supply chain. Despite the meaningful implications of our findings for theoretical understanding and practical application, certain limitations should be acknowledged. The study's participant pool comprised middle to senior management in auto-ancillary units in the National Capital Region of India, potentially introducing biases based on roles and perspectives. Future research endeavors should prioritize a more diverse sample to enhance the generalizability of findings.

Moreover, the focus on OTIF in terms of quantities from tier-one auto ancillary units may limit the broader applicability of results. Recognizing this, alternative metrics should be explored, and research should be expanded to encompass industries beyond auto ancillaries. The temporal dimension of our data collection underscores the importance of longitudinal studies to gauge the evolution of social sustainability practices over time.

In conclusion, our research underscores the transformative potential of social sustainability practices on supply chain performance. It not only highlights the need for increased attention among supply chain managers in developing countries but also encourages a holistic approach, considering community development, employee well-being, and safety. Through these concerted efforts, firms stand to gain enhanced credibility and expedited task completion, reinforcing the integral role of social sustainability in achieving sustainable and effective supply chain management.

CONTRIBUTION

In the literature, we could not find any study on how the OTIF in the automotive ancillary sector is affected by social sustainability initiatives. This work may influence academics' perspectives on social sustainability, and further research needs to be done in this area. All contributors played a role in the study's conception and design, material preparation, data collection, analysis, discussion, and conclusion. The initial manuscript draft underwent collective authorship, with all contributors providing feedback on previous versions, and the entire team reviewed and approved the final manuscript.

CONFLICT OF INTEREST

There is no conflict of interest, and this research has not received any financial assistance from any agency.

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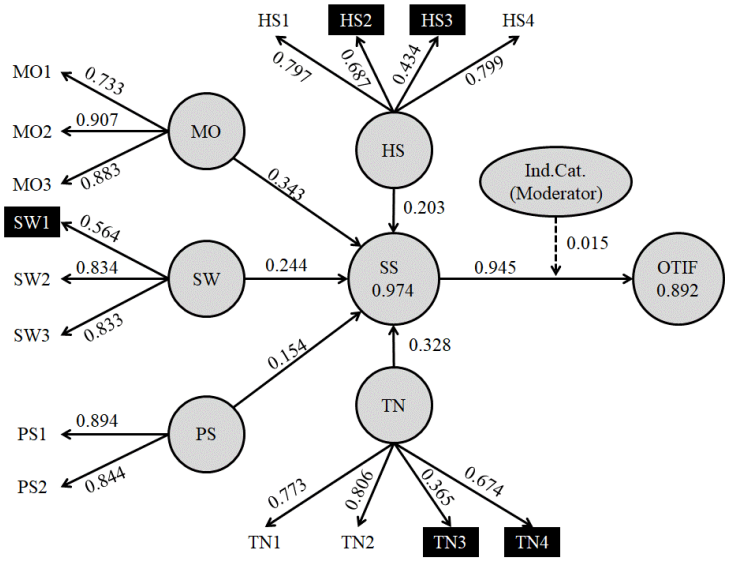
APPENDIX 1

S. No.	Category	Factor	Parameter Description
1	MO	MO1	Supply chain performance is positively influenced by monetary assistance programs, such as housing, education, crop, and vehicle loans to employees (at low or zero interest).
2		MO2	Employee health insurance schemes influence employees' performance, leading to better supply chain performance.
3		MO3	Leave encashment schemes directly impact supply chain performance.
4	TN	TN1	Training programs on productivity improvement, such as Kaizen, TPM, or TQM, lead to fewer rejections and have a positive effect on a company's supply chain efficiency.
5		TN2	Educating employees about adopting sustainable measures at the workplace and training them for the same is essential.
6		TN3	Supply chain performance is linked with the gender of employees.
7		TN4	Your company provides training and awareness about women's safety and behavior toward them.
8	HS	HS1	Maintaining government guidelines on safety and security ensures better performance of the supply chain.
9		HS2	Uniform tariff codes (HS Codes) reduce the usage of hazardous materials, such as lead, mercury, and chromium, thus focusing on the health of the employees. At the same time, employers encourage employees to have a healthy lifestyle through regular health checkups, which leads to better work conditions and positively impacts the performance of the employees and the organization as a whole.
10		HS3	Regular monitoring of accidents and prevention leads to a reduction in the loss of working hours and reduces lead time.
11		HS4	Maintaining a record of accidents leads to better supply chain performance.
12	PS	PS1	Awareness of sustainable development goals among employees impacts the performance of the supply chain by reducing rejections, wastages, and lead time.
13		PS2	Inclusiveness and diversity are important to the company.
14	SW	SW1	Supply chain performance and work-life balance are related to each other.
15		SW2	Facilities such as a canteen, pick-up and drop-off vehicles, and childcare improve employees' dedication to work and their performance.
16		Sw3	Celebrations such as the annual day/Diwali Mela or long service awards boost the working environment among employees and are perceived as healthy practices that enhance output, efficiency, and productivity.

Note: Cells highlighted have been removed from the final analysis

APPENDIX 2: INITIAL MEASUREMENT MODEL



Note: the parameters in Black boxes have been removed from the final analysis

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