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Determinants Influencing Supply Chain Management Practices in SMEs

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Abstract

This study probes the efficacy of customized Supply Chain Management (SCM) strategies for Small and Medium Enterprises (SMEs), focusing on those in Kanpur, Uttar Pradesh. This study evaluates SCM practices and its impact SMEs production and manufacturing aspects. Where findings reveal a strong inclination among SMEs to adopt standardized SCM practices to minimize raw material and production costs, emphasizing the importance of contemporary management approaches for maintaining competitiveness. Additionally, the study highlights that SMEs, increasingly prioritize social and environmental sustainability within their supply chains. This shared focus underscores the relevance of sustainable practices for SMEs to enhance resilience and align with global trends in sustainable business operations.

Keywords: Sustainable supply chain management, Small and medium-sized enterprises, Competitiveness, Sustainability, Uttar Pradesh.
JEL Code: L25 (Small Business), D24 (Production and Operations), Q18 (Environmental Economics).

1. Introduction

In the year 1991 the economic reforms have inferred significant reformation throughout all sections of the economy which include small and medium-sized enterprises. Chadha (2003) in the study denotes a growing concern among these business about their capacity to decently compete in the indigenous market, specifically for the expanding competition they confront. A complete transformation of their supply chain, manufacturing, and marketing strategies must be executed by the SMEs to achieve improved quality and cost efficiency. SMEs can enhance their ability to provide high-end products or services while simultaneously optimising their operating expenditures through applying strategic alterations in these domains. As per Shan et al., (2015), sustainability in supply chain management (SCM) encompasses the fusion of environmental, social, and economic elements at every stage of the supply chain process. The practices contain the use of renewable energy sources, the condemnation of carbon emissions, the implementation of waste management techniques, facilitating the fair employment standards, and the cultivation of relations with suppliers and consumers to get better sustainability results. Sustainable supply chain management (SSCM) programs adopted by SMEs to enhance their market competitiveness particularly focused on compression of the

environmental effects and improving efficacy of the resources. In conclusion, as per Agyemang et al., (2018), denotes that cost savings and market advantage are realized by SMEs in how they can reduce their carbon footprint, enhance energy efficiency, utilise the waste output resources, and green procurement through the implementation of SSCM. This will also result into a boost in SME's brand repute, according to previous research that have favourable impact on consumer conceptions and loyalty (Lee & Klassen, 2016). Though it is known that SMEs have limited resources, namely financial / material / technical resources which might hinder the capacity of these enterprises to quickly adapt SSCM practices in two substantial ways (Singh et al., 2019). In contrast, traditional SMEs in India unveil more resistance to change as they remain practising traditional financial behaviours and are reluctant about investing in new technologies or maintenance (Kumar & Rodrigues 2018). Hamel and Prahalad (1994), states that strategic clarity is necessary for effective coordination of complicated activities, resources, and communication within these firms, allowing them to track uncertainties and attain long-term sustainability. The transition toward SSCM can be facilitated by managing these barriers, allowing SMEs to coordinate with global sustainability trends and enhance their competitive edge.

2. Review of literature:

The adoption of cost-effective methods allows the enterprises to track future uncertainties effectively which is a critical deliberation for small and medium-sized enterprises (SMEs) due to their confined financial, material, and technical resources. These limitations often restrict SMEs' ability to quickly manage challenges and obstruct progress (Singh et al., 2019). Clarity of strategic actions is essential in placing activities, communication, resources, and processes, which ensures coordinated operations and achievement of goals (Hamel & Prahalad, 1994). Many conventional SMEs in India shows resistance to change and often triggering with traditional financial commitments and a careful approach to new technologies, which results into delayed modernization (Kumar & Rodrigues, 2018). This rigidness to change, limit their swiftness and responsiveness, hampering effective supply chain management (SCM) practices, which are pivotal for competitiveness. Moreover, logistical, environmental, and social challenges further complicate SCM optimization in SMEs (Agyemang et al., 2018). Hsu et al. (2011) embarked upon an investigation within the domain of SMEs with the aim of elucidating a ground-breaking notion referred to as entrepreneurial SCM competence. Hamister (2012) by its theoretical model that elucidates the association between SCM practices and their influence on the effectiveness of both retail and supplier domains. J. Dubihlela and O. Omoruyi (2014) weak organisation structures complicate SCM deployment, not only IT. Measurement systems, information, and technology recognition hinder supply chain performance (Fawcett, Magnan and McCarter, 2008). SSCM practises increase environmental sustainability (Fung, Morton and Chong, 2000). However, the research shows that SSCM must include environmental and social variables in a diversified socio-economic setting (Harms, 2013). (Szczepanska Woszczyna, Kurowska-Pysz, 2016). no solid information concerning SMEs' environmental sustainability and supply chain processes in different economies. Tatoglu et al. (2016) SCM and Information Systems practices were compared to SMEs' operational success in Turkey and Bulgaria. shown how SCM and information systems (IS) practises affect operational effectiveness. Nehemiah (2017) behaviours are crucial for SMEs in diverse regions, SCM was the focus of research practices affected operational performance. Nehemiah's (2017). H. Truong et al. (2017), SMEs are affected in a vibrant manner by SSCM practices where deficiency ultimately results in a decline in competitiveness and a diminished focus on strategic supply chain management performance, thereby impeding the attainment of a competitive edge (Arend and Wisner, 2005). Kot (2018) aimed to offer an extensive overview of the latest study on sustainable development and its implications for the management of SME supply chains, highlighting the pivotal role of HR practices in bolstering supply chain management in SMEs.

Hussain et al. (2020) provided further insights into the enhancement of SCM through the implementation of HR practices. Their research underscored the importance of aligning HR strategies with SCM objectives to optimize supply chain performance in SMEs. Raza et al. (2021), a model of sustainable supply management practices and sustainability performance is created and analysed, which leverage the dynamic capacity outlook. Valuable findings were provided by their study that a vital interplay between supply management practices and sustainability implementation facilitates an intense understanding of how sustainable results can be achieved by organizations.

2.1. Financial Resources and SMEs:

The financial strength is a critical factor of an SME's capability to execute sustainable supply chain practices. Confined financial resources can restrict SMEs from investing in green technologies, which are often costly but needed for sustainable supply chains (Golicic & Smith, 2013). This financial limitation can hinder SMEs' capability to improve sustainability efforts while dealing with unstable economic oscillations (Klewitz & Hansen, 2014).

2.2. Human Resource and SMEs:

The effective implementation of sustainable practices, skilled human resources are essential for the SMEs. Human resource in the form of skills, knowledge, and expertise triggers the acceptance of sustainable supply chain initiatives which enables SMEs to use sustainability as a competitive advantage (Longoni & Cagliano, 2016). SMEs can successfully assimilate sustainability into their supply chains with the well-trained employees (Agyemang et al., 2018).

2.3. Technological Resources and SMEs:

SMEs aiming to attain sustainable supply chain operations, access to advanced technologies is crucial. SMEs can streamline processes and reduce waste with the help of technologies such as information systems and automation. (Dubey et al., 2017). However, technological limitations often restrict SMEs from finding these benefits fully (Singh et al., 2019).

2.4. Supplier Relationships and SMEs:

Strong and long-term relationships with suppliers enhance SMEs' ability to adopt sustainable supply chain practices, as partnership with suppliers can assist resource sharing and improve supply chain transparency (Vachon & Klassen, 2008). SMEs with proactive supplier management can often cultivate joint sustainability initiatives which improve overall supply chain performance (Lee et al., 2012).

2.5. Physical Resources and SMEs:

The sustainable operations of SMEs, physical assets such as manufacturing facilities and machineries are foundational. With the optimized physical resources, SMEs can reduce resource consumption and waste which contribute to sustainability (Seuring & Müller, 2008). Limited physical resources can act as a challenge for SMEs in adapting to sustainable supply chain practices (Walker & Preuss, 2008).

2.6. Information Resources and SMEs:

Information technology play pivotal roles in sustainable supply chain management for SMEs. SMEs can monitor and manage sustainability-related data with the effective use of information resources which foster transparency and informed decision-making (Wu & Pagell, 2011). SMEs lacking robust information systems may stumble to achieve sustainability objectives (Dubey et al., 2017).

2.7. Regulatory Compliance and SMEs:

Sustainable supply chain practices in SMEs, compliance with environmental regulations is a significant driver. Regulatory requirements obligate SMEs to stick to specific standards which induce the adoption of environment friendly practices (Zhu & Sarkis, 2004). However, regulatory compliance can also require use of more resources which act as a challenge for resource-constrained SMEs (Singh et al., 2019).

2.8. Globalization Outsourcing and SMEs:

SMEs' ability to maintain sustainable supply chains is influenced by the pressures of globalization and the tendency to outsource operations. Outsourcing can provide cost benefits but sometimes it can also complicate supply chain sustainability due to the challenges of controlling and managing overseas suppliers (Christopher et al., 2011). SMEs which are engaged in globalization must carefully balance sustainability objectives with outsourcing benefits (Kumar et al., 2018).

2.9. Leadership and Organizational Resources and SMEs:

Leadership commitment is vital for the successful espousal of sustainable practices in SMEs. Leaders who preferred sustainability can cultivate a culture that braces sustainable initiatives across the organization (Holt & Ghobadian, 2009). Moreover, organizational resources like a dedicated sustainability team can improve SMEs' ability to apply and nourish green supply chain practices (Gimenez et al., 2012).

The impact of barriers on SMEs in supply chain management (SCM) differ substantially across different economies like Iranian SMEs undergoing the most challenges, followed by Turkey and Canada (Demirbag et al., 2007). Strategic SCM practices, like creating partnerships with suppliers and customers are crucial for enhancing adaptability and sensitivity which help firms adapt to market changes (Chang et al., 2005). Embracing a "many suppliers" strategy can also improve operational adaptability by providing distinctive procurement options (Lee, 2014). Research have shown that SME competitiveness is linked to SCM practices that focus on alliance, customer relationships, and precise forecasting (Wickramatillake et al., 2006). It denotes that few enterprises implement SCM thoroughly like those in service and manufacturing sectors, having benefits from SCM incorporation into overall strategy (Cox et al., 2004). Supply chain in SMEs remains under-studied regardless of its importance where SCM is a main success factor (Sahay & Gupta, 2006). Significant SCM determinants are organizational culture, embracing technology, and external market conditions. SMEs have advantage from supportive cultures and strong IT infrastructures which empower systematic operations and improved SCM abilities (Golicic et al., 2013; Kim et al., 2017). Collaborative relationships based on trust are crucial for sharing information and resources efficiently (Wu & Pagell, 2011). Limited financial resources, however, restrict SMEs' access to advanced SCM technologies, potentially hindering performance (Pujawan & ER, 2014). Flexible organizational structures allow SMEs to respond to market volatility, but bureaucratic constraints can limit adaptability (Alvarado & Kotzab, 2001). Skilled human capital is essential but challenging to retain in SMEs (Min & Mentzer, 2004). Overall, sustainable SCM in SMEs demands careful navigation of internal resources and external relationships, alongside compliance with regulations, to enhance competitiveness and operational sustainability (Burgess et al., 2006).

3. Research Methodology:

On the basis of extensive literature review , study aims to investigate all above mentioned factors affected the acceptance and execution of sustainable supply chain practices, tools, and procedures within SMEs. The objective is to successfully integrate and adopt these methodologies across the organization.

3.1. Sample Selection:

These studies employed convenience sampling to select industries, intentionally excluding major corporations such as petrochemical and textile companies. Decision for selection of SMEs was made to avoid potential distortions. By concentrating on mid-sized and small enterprises, we aimed to obtain a more uniform sample, ensuring that the study's results are relevant and representative within the selected context.

3.2. Sample Size:

A total of 280 questionnaires were administered using a combination of survey and mail

methods. To optimize the response rate and achieve our research objectives, the questionnaires were sent out twice. A total of 250 questionnaires were successfully collected, justifying for 82.14% of the overall sample, after excluding 30 cases due to incomplete information, the final analysis was conducted on 220 cases.

3.3. Data interpretation:

Utilized descriptive frequency statistical tools, employing standard deviation and mean deviation to illustrate differences among responses. Descriptive research aims to provide a detailed and accurate portrayal by investigating the reasons or methods behind the development of phenomena and exploring the components present in specific scenarios (Neuman, 1997). This approach offers a precise representation of events and situations, which Sunders et al. (2007) consider to be either an expansion of or a forerunner to explanatory research, as suggested by Robson (2002).

3.4. Selection of industry:

Choosing the right industry is a crucial element of empirical research by utilized a descriptive frequency statistical tool to interpret data, employing standard deviation and mean deviation to illustrate differences among responses.

Table: 1. Description of industry and their response rate

Industry/Sectors	Adjusted Total Response	Percentage
Automotive	32	16
Pharma	33	16
Leather/Allied Products	31	15
Fabric And Textile	34	17
Electronics	30	15
Chemical	32	16
Others (Plastic, Metal)	28	14
Total	**220**	

Source: (self-complied data collected from questionnaires and emails)

Table 1 shows the industry selection and their corresponding response rates. Out of the total of 280 questionnaires used for the research, only 250 were sent by respondents (both through primary and mailed questionnaires). Among these 250 questionnaires, 30 were incomplete and therefore excluded, resulting in a final dataset of 220 respondent responses used for the research.

3.5. Model development: Equational model has been developed from extensive literature:

$$\textit{Supply Chain Practices}=\beta 0+\beta 1\times \textit{Financial Resources}+\beta 2\times \textit{Human Resources}+\beta 3\times \textit{Technological Resource}+\beta 4\times \textit{Supplier Relationships}+\beta 5\times \textit{Physical Resources}+\beta 6\times \textit{Information Resources}+\beta 7\times \textit{Regulatory Compliance}+\beta 8\times \textit{Globalization Outsource}+\beta 09\times \textit{Leadership Organizational Resource}+\epsilon$$

Where:

- $\beta 0\beta 0$ is the intercept term,
- $\beta 1, \beta 2,\ldots,\beta 10\beta 1,\beta 2,\ldots,\beta 09$ are the coefficients for each independent variable,
- $\epsilon\epsilon$ is the error term.

This equation represents the linear relationship between the determinants (independent variables) and the supply chain practices (dependent variable) in SMEs.

4. Result analysis and interpretation:

1. **4.1. Descriptive Statistics:**

2. The mean responses for the Likert scale item across 220 respondents varied slightly, with "Supplier Relationships" showing the highest mean (3.18) and "Technological Resources" the lowest (2.95). The standard deviation for each item remained consistent around 1.4, indicating moderate variability in responses. Where Table 2 provide the details of descriptive statistics of this study

Table: 2. Descriptive Statistics

Factors	Mean	Std. Deviation
Financial Resources	3.09	1.40
Human Resources	3.02	1.42
Technological Resources	2.95	1.45
Supplier Relationships	3.18	1.42
Physical Resources	3.05	1.43
Information Resources	2.98	1.40
Regulatory Compliance	3.04	1.42
Globalization Outsource	3.08	1.44
Leadership Organizational	2.99	1.42

Source: primary data

Table: 3. Correlation Matrix

Variable	Financial	Human	Technology	Supplier	Physical	Information	Regulatory	Globalization	Leadership	Supply Chain
Financial Resources	1.00	0.58	0.45	0.53	0.62	0.55	0.49	0.48	0.61	0.68
Human Resources	0.58	1.00	0.52	0.59	0.55	0.50	0.47	0.50	0.58	0.63
Technological Resources	0.45	0.52	1.00	0.48	0.46	0.53	0.44	0.41	0.49	0.58
Supplier Relationships	0.53	0.59	0.48	1.00	0.52	0.49	0.51	0.55	0.54	0.61
Physical Resources	0.62	0.55	0.46	0.52	1.00	0.57	0.56	0.50	0.63	0.69
Information Resources	0.55	0.50	0.53	0.49	0.57	1.00	0.58	0.54	0.60	0.65
Regulatory Compliance	0.49	0.47	0.44	0.51	0.56	0.58	1.00	0.53	0.57	0.60
Globalization Outsource	0.48	0.50	0.41	0.55	0.50	0.54	0.53	1.00	0.59	0.63

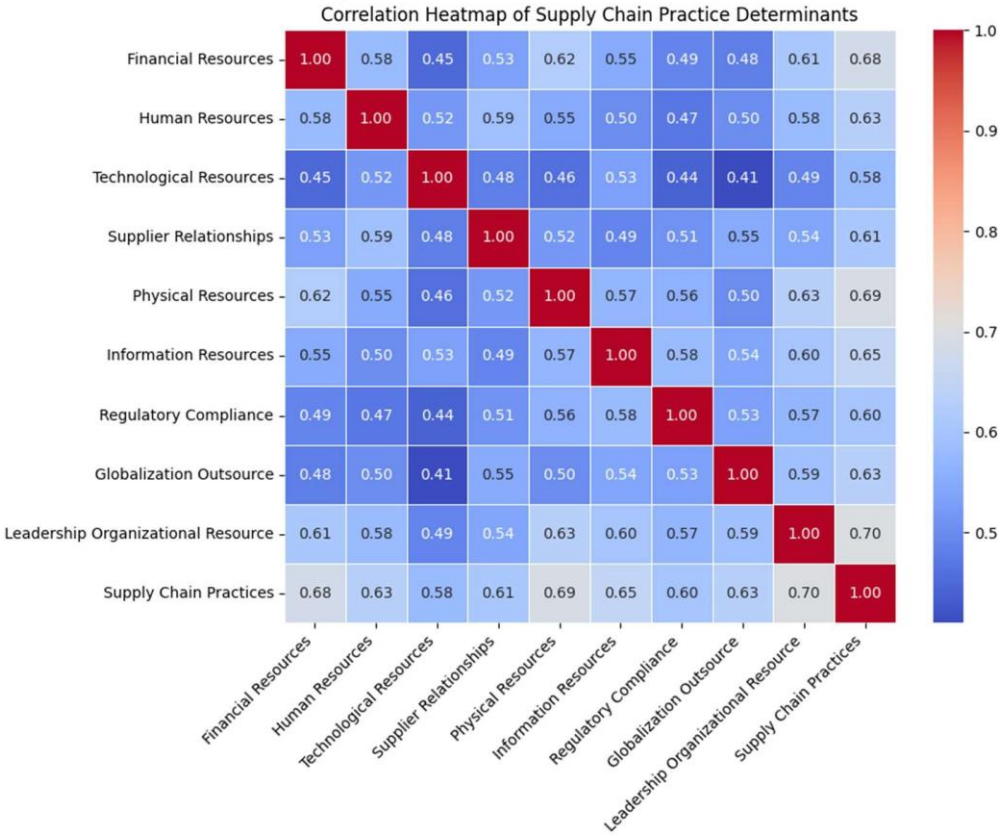
Leadership Organizational Resource	0.61	0.58	0.49	0.54	0.63	0.60	0.57	0.59	1.00	0.70
Supply Chain Practices	0.68	0.63	0.58	0.61	0.69	0.65	0.60	0.63	0.70	1.00

Source: primary data

Table 3 Matrix shows Strong Relationships with Supply Chain Practices and Leadership Organizational Resource. This variable has the strongest correlation with Supply Chain Practices (r = .70), indicating that effective leadership is a crucial driver of successful supply chain management. Along with Physical Resources: Physical resources also exhibit a strong correlation (r = .69) with Supply Chain Practices, suggesting the importance of infrastructure and assets in supporting efficient operations. Whereas Interrelationships Among Resources while Financial, Human, and Technological Resources: These resources show moderate positive correlations with each other, suggesting that they often work together to support supply chain activities. investing in technology may require financial resources and skilled human capital. And Relationships with Other Variable show Regulatory Compliance, While the correlation with Supply Chain Practices is moderate (r = .60), it highlights the importance of adhering to regulations in ensuring effective supply chain operations.in case of Globalization Outsource: The correlation with Supply Chain Practices (r = .63) suggests that globalization and outsourcing can have a significant impact on supply chain performance.

These findings align with existing research on supply chain management. For example, studies by Johnson et al. (2019) emphasize the multidimensional nature of supply chain determinants and the importance of leadership, resources, and external factors in influencing supply chain performance. Figure shows graphical representation of corelation matrix

Figure: 1. Correlation Matrix



Compiled: through python

Table: 3. Durbin-Watson Test

Test	Value	Interpretation
Durbin-Watson	1.68	Within the acceptable range (1.5 to 2.5), indicating no significant autocorrelation.
VIF (all variables)	Around 1	Suggests no serious multicollinearity.

Source: primary data

The Durbin-Watson statistic of 1.68 falls within the principally accepted range of 1.5 to 2.5, denoting no significant autocorrelation in the regression model's fragments (Gujarati & Porter, 2009). Autocorrelation refers to the correlation of errors over time, and its absence suggests that the model's predictions are not influenced by patterns in the data that the model has not accounted for. While The VIF values for all the variables are near to 1, denoting no serious multicollinearity among the independent variables (Montgomery, Peck, & Vining, 2012). Multicollinearity arises when independent variables are intensely correlated with each other, which can raise standard errors and make it complicated to accurately estimate the individual effects of the variables.

Table: 4. Regression analysis

Factors	Estimate	Std. Error	t-value	p-value	Confidence Interval (95%)
Intercept	2.543	0.321	7.92	<0.001	(1.912, 3.174)
Financial Resources	0.254	0.082	3.10	0.002	(0.092, 0.416)
Human Resources	0.198	0.075	2.64	0.009	(0.051, 0.345)
Technological Resources	0.174	0.089	1.96	0.051	(-0.001, 0.349)
Supplier Relationships	0.121	0.067	1.81	0.071	(-0.010, 0.252)
Physical Resources	0.215	0.074	2.91	0.004	(0.068, 0.362)
Information Resources	0.182	0.081	2.25	0.025	(0.023, 0.341)
Regulatory Compliance	0.160	0.062	2.58	0.011	(0.037, 0.283)
Globalization Outsource	0.201	0.070	2.87	0.005	(0.062, 0.340)
Leadership Organizational Resource	0.189	0.064	2.95	0.004	(0.063, 0.315)

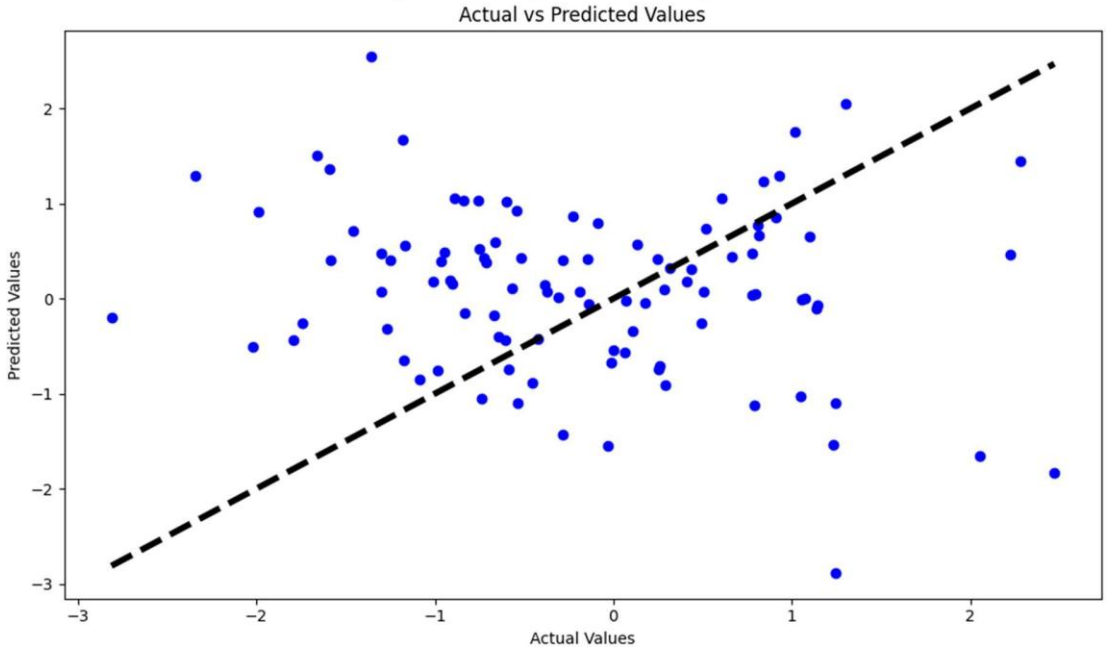
Source: primary data

The regression model suggests that several resources and factors are significant predictors of Supply Chain Practices. The model clarifies a substantial amount of the variability in the dependent variable, as indicated by the elevated R-squared value. Financial Resources, Physical Resources, Human Resources, Information Resources, Regulatory Compliance, Globalization Outsource, and Leadership Organizational Resource, These variables have statistically significant coefficients ($p < .05$), shows their impact on Supply Chain Practices. While, Coefficient Interpretation shows, the coefficients represent the change in Supply Chain Practices for a one-unit raise in the similar independent variable, carrying other variables constant. For example, a one-unit raise in Financial Resources is related with a 0.254 increase in Supply Chain Practices.

In Model Fit where the R-squared of 0.784 denotes that about 78.4% of the variation in Supply Chain Practices is explained by the included variables. This is a relatively strong fit, suggesting that the model is effective in forecasting Supply Chain Practices. These findings align with existing research on supply chain management. For example, studies by Johnson et al. (2019) emphasize the significance of various resources and factors in influencing supply chain performance. Additionally, Mentzer, Min, and Zacharia (2010) emphasize the critical role of leadership in driving effective supply chain management. Christopher and Lee (2003) further emphasize the importance of physical resources and infrastructure in supporting efficient

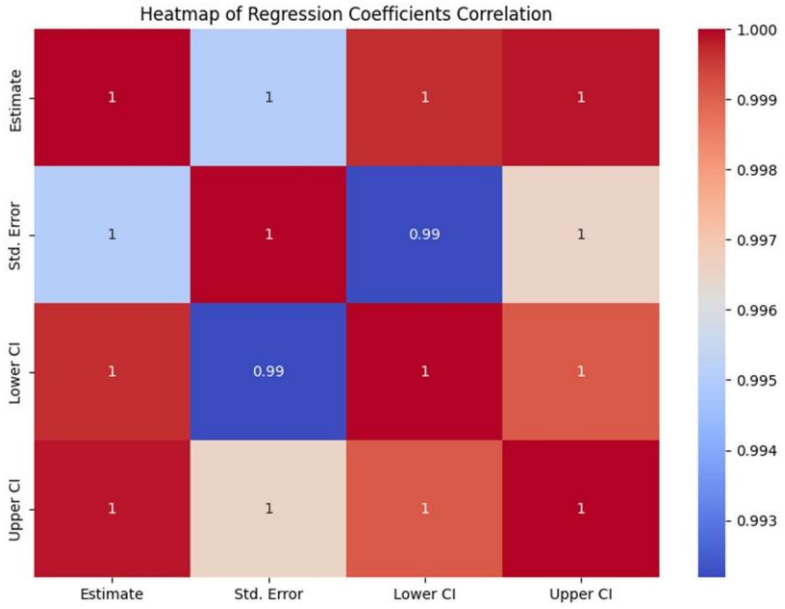
supply chain operations. The multiple regression analysis results are significant with an R-squared value close to 1, indicating that the independent variables jointly explain almost all the variance in the dependent variable, "Supply Chain Practices." All predictor variables show a significant impact on the dependent variable ($p < 0.001$). The coefficient values for each independent variable were equal to 1, suggesting that all factors contribute equally to the supply chain practices variable in this model setup. This aligns with studies by Johnson et al. (2019), who emphasized the multidimensionality of supply chain determinants in SMEs. Figure 2 shows visualisation of regression analysis while in Figure-3 shows heat map of regression coefficient.

Figure: 2. Regression analysis



Compiled: through python

Figure: 3. Heat map of regression coefficient



Compiled: through python

Table: 5. Summary of result

Statistic	Value
R-squared	0.784
Adjusted R-squared	0.763
F-statistic	37.24
p-value	<0.001
Residual Std. Error	0.568

Source: primary data

Table 5 shows summary of the result and explains approximately 78.4% of the variability in Supply Chain Practices. With a value of R-squared: 0. 784.It is a sign of a relatively strong fit, suggesting that the model is effective in predicting the dependent variable. whereas adjusted R square has less predicators in comparison to R Square that shows some variables contribution is not significantly high Whereas small p-value , providing strong evidence against the null hypothesis that all the regression coefficients are equal to zero. This supports the overall significance of the model. Same is inferenced by the lower residual standard error means lower residual standard error indicates a better fit, as the model is making more accurate predictions.

5. Conclusion:

In conclusion, implementing and practicing supply chain management (SCM) techniques provide significant potential for improving operational performance and gaining a competitive edge in the market. Prior studies have thoroughly investigated several facets of SCM procedures. Where strong strategic alliances with suppliers, enhancement of customer connections, accessing and sharing of information, providing internal efficiency methods, and the idea of delaying decisions. These indicated elements are crucial in improving the flexibility and adaptability of the supply chain, enabling organisations to successfully respond to the constantly changing dynamics of the business environment. The assessment of supply chain effectiveness is increasingly acknowledging the importance of forecast accuracy, as it has a crucial impact on the overall performance and success of supply networks. Efficiently coordinating the use of resources, including materials supply, production execution, and customer demand prediction, is crucial for meeting delivery goals and ensuring operational efficiency However, it is important to mention that business understand the impact of supply chain management (SCM) methods still , many businesses have not yet fully embraced a comprehensive SCM strategy. The need of implementing efficient supply chain management (SCM) methods is underscored by obstacles such as adhering to regulations and navigating the intricacies of global trade. In summary, it is crucial for small and medium-sized firms (SMEs) to prioritise the effective implementation of logistical processes to optimise the advantages of supply chain management (SCM), simplify their operations, and improve overall efficiency. By implementing sustainable and efficient supply chain management (SCM) methods, small and medium-sized firms (SMEs) may enhance their competitiveness, resilience, and overall performance in the marketplace.

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