

Strategic Supplier Relationship Management in EMS Companies: Evidence from Telangana's Twin Cities

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Abstract

This study examines strategic supplier relationship management in Electronics Manufacturing Services (EMS) companies in the Twin Cities of Telangana. The study analyzes supplier relationship management practices, supplier collaboration, supplier performance, logistics and supply chain efficiency, and operational performance. Three hundred and forty-four people, including electronic component suppliers, EMS providers, logistics service providers, and electronic maker, participated in the study. Both supplier performance and logistical efficiency are favorably affected by supplier relationship management strategies, according to the data. Supplier collaboration also improves logistics and supply chain efficiency, while supplier performance and logistics efficiency enhance operational performance. The study concludes that strong supplier relationships improve EMS competitiveness.

Keywords: Supplier Relationship Management, Supplier Collaboration, Supplier Performance, Logistics Efficiency, Operational Performance

1. Introduction

Suppliers Relationship Management (SRM) is a systematic, organization-wide methodology for strategizing, regulating, and enhancing engagements with external suppliers, ensuring that each relationship significantly impacts strategic objectives in terms of cost, quality, service, risks, innovation, and sustainability [1]. An effective implementation of the SRM involves moving from mere transactional procurement to comprehensive joint business planning, performance management, and value creation in the supply chain. SRM links the daily operations of procurement to corporate strategy by converting category objectives into supplier-based roadmaps, incentives alignment with the total cost of ownership, and quality, regulatory compliance, timely delivery, and environmental and social performance [2] [3].

The significance of SRM has grown owing to market uncertainty, evolving consumer demands, political instability, technical advancements, disruptions caused by climatic conditions, and potential risks involved in global supply chains [4]. There is an immediate need for enhanced cooperation between businesses and their suppliers, since the COVID-19 situation has further shown the supply chains weaknesses. 'Several firms encountered delays in material supplies, shortages of essential components, transport interruptions, and higher procurement costs during the pandemic crisis. These disruptions underscored the necessity of

sustaining transparent, dependable, and cooperative supplier relationships to guarantee operational continuity [5].

SRM is crucial in EMS firms, due to their reliance on the prompt and dependable provision of electronic components, printed circuit boards, cables, connectors, packaging materials, and technical services. Due to the stringent quality requirements, customized specifications, brief production cycles, and rigid delivery timelines that EMS organizations adhere to, delays from suppliers or quality deficiencies can interrupt production, elevate prices, and diminish customer satisfaction.

Selecting and evaluating suppliers, keeping in close contact, sharing relevant information, and working together to plan and solve problems are all parts of strategic supplier relationship management. By collaborating on demand forecasting, inventory planning, quality enhancement, product development, and risk management, EMS organizations may minimize lead times, avoid shortages of components, enhance quality, and react to changes in customer demands [6]. The use of digital technologies like procurement software, supplier portals, enterprise resource planning software, and data analytics, enhance SRM by facilitating supplier performance assessment, monitoring orders, and inventory tracking, and informed decision-making.

Robust supplier relationships enhance supply chain resilience, adherence to quality and environmental requirements and ethical sourcing practices. Consequently, this research investigates strategic SRM in EMS firms located in the Twin Cities of Telangana and their impact on performance, quality, cost, efficiency, delivery accuracy, supply chain resilience, and development.

2. Review of Literature

SRM is an essential component of contemporary supply chain management [7]. It is related to the establishment of dynamic partnerships between organizations and their suppliers [8]. The main concern of SRM is building long-lasting and mutually-beneficial relationships that go beyond transactions [9]. In the current business environment, robust supplier connections are essential for success [10]. SRM mere transactions, incorporating strategic collaboration, innovation, and value creation [11]. SRM has shifted from transactional relationship to strategic partnership relationship. This analysis examines the impact of SRM on the efficiency of the supply chain, which includes cost, quality of product, delivery, and customer satisfaction [12].

The recognition of the importance of suppliers as partners resulted in increased importance given to co-operation and partnerships. Improvements in technology have resulted in making SRM more effective since digital tools help in communicating [13]. Robust ties with suppliers foster innovation and value generation [14]. SRM currently includes collaborative relationships, risk management, supplier development, and sustainability [15]. Empirical research indicates that effective Supplier Relationship Management (SRM) enhances supplier performance, cost efficiency, product quality, and delivery timeliness [16]. Successful Supplier Relationship Management rests on three pillars: collaboration, information sharing, and trust development. Supplier development initiatives improve supplier performance.

[17] examined how trust, commitment, and Relationship Specific Investment (RSI) affect cooperation, innovation, and financial performance from both the buyers and suppliers side in mainland China. Through a questionnaire survey conducted among 209 participants in textiles, food, and consumer electronics sectors, results have been obtained that indicate the varying levels of effectiveness of each factor. Trust and RSI increase cooperation among buyers, whereas commitment improves the cooperation of the suppliers. Further, trust and commitment encourage innovation among buyers while RSI affects the innovation and

financial performance of suppliers. This research provides relationship management approaches for businesses, where trust and commitment become essential to buyers, while RSI holds equal importance for suppliers.

[18] analyzed the impact of SRM on manufacturing firms in Makassar. Researchers used regression techniques to examine the connection between SRM practices—including early supplier involvement, supplier development, and joint investment—and organizational performance through the use of a descriptive design and structured questionnaires. These results show a high positive correlation, which implies that efficient SRM processes ensure efficiency, cost-effectiveness, and supply chain integration. Additionally, the study emphasizes the role of government support in fostering effective SRM strategies for sustainable industrial growth.

[19] emphasized the importance of the SRM in increasing resiliency in e-commerce supply chains through a qualitative study. The results of this study, which are based on semi-structured interviews with industry professionals, show that open and honest communication and teamwork are crucial to SRM. It is also very important to have strategic risk management for dealing with uncertainties. Although there are many advantages of SRM like better efficiencies and quality of products, there are some challenges in this process due to its complexities in terms of technology and culture. The use of digital technologies, such as AI and blockchain, further improves SRM because of data sharing and decision making.

[20] explored the link between SRM and the performance of Fast-Moving Consumer Goods (FMCG) manufacturing firms in Nairobi City County, Kenya, analyzing 95 manufacturing companies across various sectors, including textiles, foods, chemicals, wood and paper, building materials, water and drinks, breweries, metals, and toiletries.

As a response to rising market competition and sustainability pressures, firms need to develop sustainable relationships with their supply chain partners, especially between suppliers and manufacturers. [21] has explored the KPIs for a home appliances firm in India, focusing on the importance of continual monitoring and development of suppliers. By applying the grey-based decision-making trial and evaluation laboratory approach to the data collected, seven influencing and eight influenced KPIs have been identified, with Information disclosure being the most important KPI for the evaluation of suppliers. The results provide managers insights for enhancing supplier-manufacturer relationships and improving organizational performance.

2.1 Research Gap

Although the corresponding study on supplier relationship management, many significant gaps still persist. Most prior research have been carried out in the general manufacturing industry, across fast-moving consumer goods (FMCG), e-commerce, textiles, and consumer goods; nevertheless, SRMs function in the emergency medical services (EMS) sector has received comparatively limited research focus, particularly in the Telangana state of Indias Twin Cities. Prior research has mostly focused on how SRM affects supply chain or organizational performance. However, the interrelationship among supplier collaboration, supplier performance, logistics and supply chain efficiency, and their performance driver role has not yet been adequately researched in a unified framework. Furthermore, empirical evidence within the Indian EMS environment is limited. Research on the effects of strategic supplier relationship management on EMS businesses operational performance, logistics and supply chain efficiency, and supplier performance is lacking. This study intends to rectify that.

3. Research Methodology

3.1 Research Design

The current study examines strategic supplier relationship management in EMS companies using a quantitative research design. A statistically valid and reliable sample of 384 respondents was used to gather and evaluate data using a structured technique. A structured questionnaire based on five-point Likert-scale was used to capture primary data via the survey. The questionnaire was distributed to employees and professionals working in electronic manufacturing firms, electronic component suppliers, EMS companies, and logistics or supply chain service providers. Our data was analyzed using AMOS software, specifically for Structural Equation Modelling (SEM). We tested our assumptions and looked at the relationships between the main variables using methods like descriptive statistics, reliability analysis, composite reliability (CR), and average variance extracted (AVE), and discriminant validity.

3.2 Objectives

1. To examine the influence of supplier relationship management practices on supplier performance in EMS companies in the Twin Cities of Telangana.
2. To analyze the effect of supplier collaboration on logistics and supply chain efficiency in EMS companies.
3. To study the impact of supplier performance and logistics efficiency on the operational performance of EMS companies.

3.3 Hypothesis

H1: Supplier relationship management practices have a significant positive effect on supplier performance in EMS companies.

H2: Supplier relationship management practices have a significant positive effect on logistics and supply chain efficiency in EMS companies.

H3: Supplier collaboration has a significant positive effect on logistics and supply chain efficiency in EMS companies.

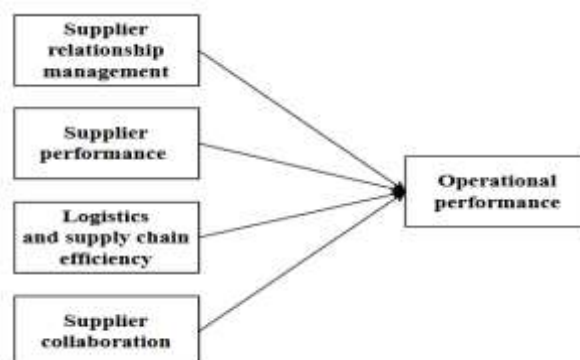
H4: Supplier performance has a significant positive effect on the operational performance of EMS companies.

H5: Logistics and supply chain efficiency has a significant positive effect on the operational performance of EMS companies.

H6: Supplier relationship management practices and supplier collaboration jointly have a significant effect on the operational performance of EMS companies in the Twin Cities of Telangana.

3.4 Conceptual Framework

Figure 1 Conceptual Frame Work



3.5 Sample Selection

In order to get reliable statistical results, the study used a sample size of 384 participants. In order to choose professionals and workers from logistics and supply chain service providers, electronic component suppliers, electronic manufacturing businesses, and EMS companies, a stratified random selection approach was used. Age, gender, level of education, years of experience, and business category were some of the criteria used for stratification in order to guarantee accurate population representation.

3.6 Data Collection

In this quantitative study, we used a five-point Likert scale, from "strongly disagree" to "strongly agree," to organise our findings in a questionnaire. The surveys organizers hoped to glean useful information on operational performance, supplier performance, logistics, supply chain efficiency, supplier cooperation, and offering relationship management. Methods such as Google Forms and field surveys were used to carry out the survey. As part of this investigation, the secondary data was also considered.

3.7 Measures

The data collection process is carried out through the preparation of a well-structured questionnaire. The questionnaire has been designed taking into consideration the questions prepared on a 5-point Likert scale ranging from "strongly disagree to strongly agree". This will make it convenient for the respondents to state their views on the various research questions. Open and closed questions have been included in the questionnaire. The following are the variables with the corresponding measurement items.

Table 1 Measures

S.no	Variables	Number of items
1	Supply Relationship Management	6
2	Supplier Performance	6
3	Logistics and Supply chain efficiency	5
4	Supplier Collaboration	5
5	Operational Performance	5

4. Results

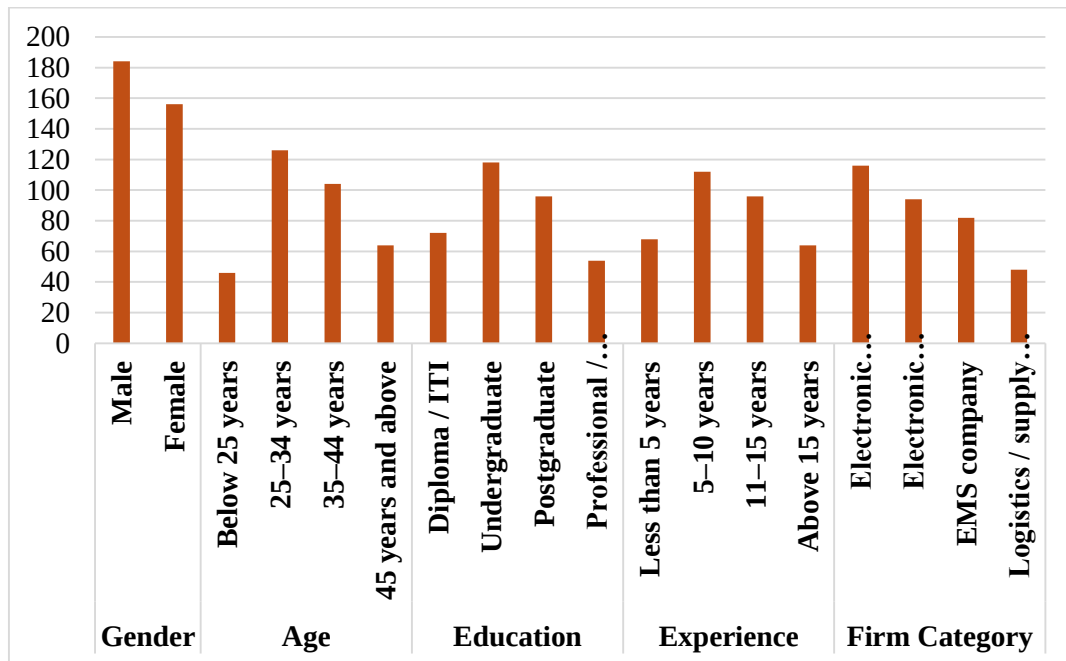
4.1 Introduction

One such example of the results of the analysis conducted through survey studies is presented below. This analysis has been conducted based on the study of the impact of the supplier relationship management, collaboration, supplier performance, logistics efficiency, and operational efficiency in EMS firms. These results comprise demographic analysis, reliability and validity, discriminant validity, model fit, and hypothesis testing. Through statistical results, information can be obtained regarding the impact of the supplier practices on the logistics efficiency and operational efficiency in EMS firms in Hyderabad and Secunderabad.

Table 2 Demographic Variable

Demographic Variable	Category	Frequency	Percent
Gender	Male	184	54.1
	Female	156	45.9
	Total	340	100
Age	Below 25 years	46	13.5
	25–34 years	126	37.1

	35–44 years	104	30.6
	45 years and above	64	18.8
	Total	340	100
Education	Diploma / ITI	72	21.2
	Undergraduate	118	34.7
	Postgraduate	96	28.2
	Professional / Technical qualification	54	15.9
	Total	340	100
Experience	Less than 5 years	68	20
	5–10 years	112	32.9
	11–15 years	96	28.2
	Above 15 years	64	18.8
	Total	340	100
Firm Category	Electronic manufacturer	116	34.1
	Electronic component supplier	94	27.6
	EMS company	82	24.1
	Logistics / supply chain service provider	48	14.1
	Total	340	100



From the demographics table, it is evident that the total number of respondents from EMS industry from the twin cities of Telangana is 340 for this study. In terms of gender, 54.1% respondents are male while the rest 45.9% respondents are female. In terms of age, the major part of respondents falls within 25–34 years (37.1%), 35–44 years (30.6%), 45 years and above (18.8%) and less than 25 years (13.5%). In terms of educational qualification of respondents, the major part of respondents has undergone under graduate education (34.7%), postgraduate education (28.2%), diploma/ITI (21.2%) and professional/technical (15.9%). As for the work experience, the majority of the population surveyed, accounting for 32.9% of

the total sample, are individuals with a work experience ranging from 5 to 10 years, then 28.2% with 11 to 15 years, 20.0% with less than 5 years and 18.8% with more than 15 years. In terms of companies' types, the majority of companies are comprised of electronic manufacturers accounting for 34.1% of all companies, followed by electronic components suppliers that comprise 27.6%, EMS companies, which accounts for 24.1%, and logistics/supply chain service providers that account for 14.1%.

Table 3 Reliability and validity test

Variables	CR	AVE	Cronbach Alpha
Logistics and Supply Chain Efficiency	0.95	0.792	0.95
Supplier Relationship Management Practices	0.948	0.783	0.947
Supplier Collaboration	0.933	0.736	0.933
Supplier Performance	0.945	0.774	0.945
Operational Performance	0.952	0.797	0.951

Strong internal consistency and good convergent validity were observed in all research variables according to the reliability and validity findings. With Composite Reliability scores ranging from 0.933 to 0.952, which are all over the threshold of 0.70, we can say that the construct is reliable. Another piece of evidence that all the constructs are very reliable is the Cronbach Alpha value, which ranges from 0.933 to 0.951. Finally, looking at the Average Variance Extracted, we can see that all the constructions have substantial variances, with values ranging from 0.736 to 0.797. This is more than the minimal value of 0.50. Following Logistics and Supply Chain Efficiency with CR and Alpha values of 0.950, Operational Performance recorded the highest reliability and validity among the variables with a CR of 0.952, an AVE of 0.797, and Cronbachs Alpha of 0.951. In sum, the findings validate the reliability and validity of the following constructs for use in future statistical analyses: operational performance, supplier collaboration, performance, relationship management practices, logistics and supply chain efficiency, and supplier performance.

Table 4 Mean and Discriminant validity test

Variables	Mean	Std	Logistics and Supply Chain Efficiency	Supplier Relationship Management Practices	Supplier Collaboration	Supplier Performance	Operational Performance
Logistics and Supply Chain Efficiency	4.12	0.97	0.890				
Supplier Relationship Management Practices	3.63	1.09	0.600	0.885			
Supplier Collaboration	3.97	0.95	0.656	0.544	0.858		

Supplier Performance	3.97	0.99	0.628	0.584	0.623	0.880	
Operational Performance	4.28	0.94	0.664	0.543	0.596	0.635	0.893

The mean and discriminant validity results show that the respondents had a generally positive perception toward the major constructs of the study. Operational Performance recorded the highest mean value of 4.28, followed by Logistics and Supply Chain Efficiency with 4.12, Supplier Collaboration and Supplier Performance with 3.97 each, and Supplier Relationship Management Practices with 3.63. Standard deviation values fall within the interval of 0.94-1.09; hence, the levels of dispersion of the responses are relatively moderate. The discriminant validity values can be viewed as satisfactory because the values in the diagonal (the square root of AVE) are substantially higher than those off-diagonal (correlation between constructs). The diagonal value of the Logistics and Supply Chain Efficiency construct is 0.890; for the Supplier Relationship Management Practices construct – 0.885; for the Supplier Collaboration construct – 0.858; for the Supplier Performance construct – 0.880; for the Operational Performance construct – 0.893. It is evident that all the values are substantially higher than the correlations between constructs and, therefore, distinctive.

Table 5 Model fit indices

CMIN	CMIN/DF	NFI	RFI	CFI	RMR
308.947	1.166	.965	.961	.995	.028

The suggested model fits the data quite well, according to the model fit indices. CMIN is 308.947 while the CMIN/DF is 1.166, which is less than the minimum requirement of 3.00, which means that the model fits very well. NFI, RFI, and CFI are 0.965, 0.961, and 0.995 respectively, which is above the minimum requirement of 0.90, and thus it means that the model fits very well and there exists a high degree of similarity between the proposed model and the data. RMR is 0.028, which is below the maximum requirement of 0.08, and it means that there exists little difference between observed and expected covariance values.

Proposed Hypothesis

H1: Supplier relationship management practices have a significant positive effect on supplier performance in EMS companies.

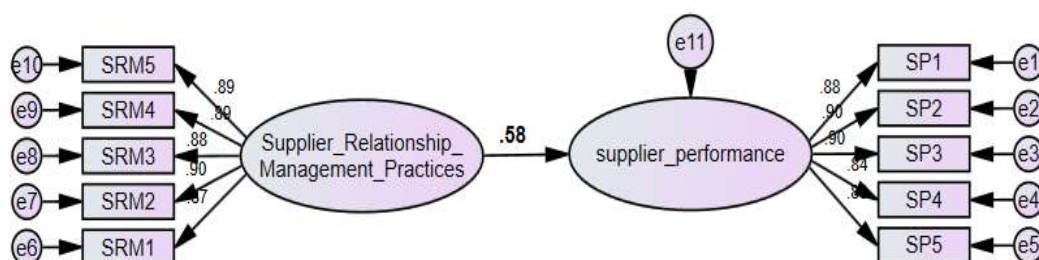


Table 6 Regression Weights

Path			Estimate	S.E.	C.R.	P
Supplier performance	<--	Supplier Relationship Management Practices	0.584	0.048	10.982	***

According to the results of the regression analysis test conducted on hypothesis H1, a positive relationship exists between supplier relationship management and the performance of suppliers in EMS companies. This because the estimated value is 0.584 which means that when there is good supplier relationship management, then the performance of the suppliers is good. The value of the standard error is 0.048 which shows consistency of the estimates. The value of critical ratio is 10.982 which is higher than the recommended value of ± 1.96 .

H2: Supplier relationship management practices have a significant positive effect on logistics and supply chain efficiency in EMS companies.

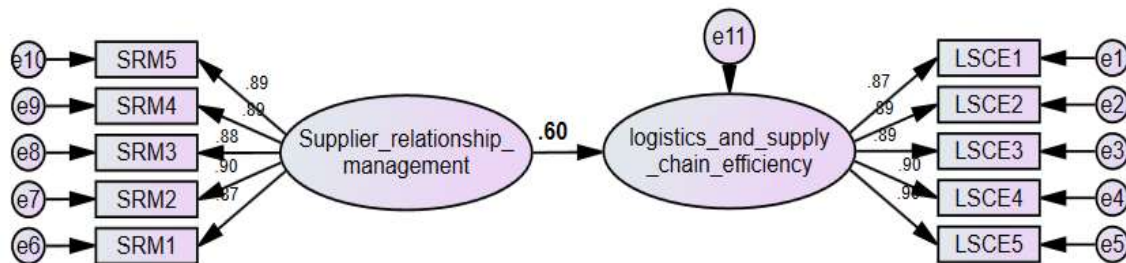


Table 7 Regression Weights

Path			Estimate	S.E.	C.R.	P
Logistics and supply chain efficiency	<---	Supplier relationship management	0.6	0.046	11.251	***

The result of H2 hypothesis indicates that the supplier relationship management techniques influence logistic and supply chain efficiency of EMS enterprises. From the results of regression, it is clear that the figure of 0.600 indicates the fact that effective supplier relationship management techniques enhance logistic and supply chain efficiency. The figure of the standard error of 0.046 indicates the fact that there is reliable estimation. The figure of the critical ratio of 11.251 is higher than the figure of ± 1.96 . Therefore, the P-value is significant at $p < 0.001$. Hence, we may conclude that the hypothesis H2 is supported.

H3: Supplier collaboration has a significant positive effect on logistics and supply chain efficiency in EMS companies.

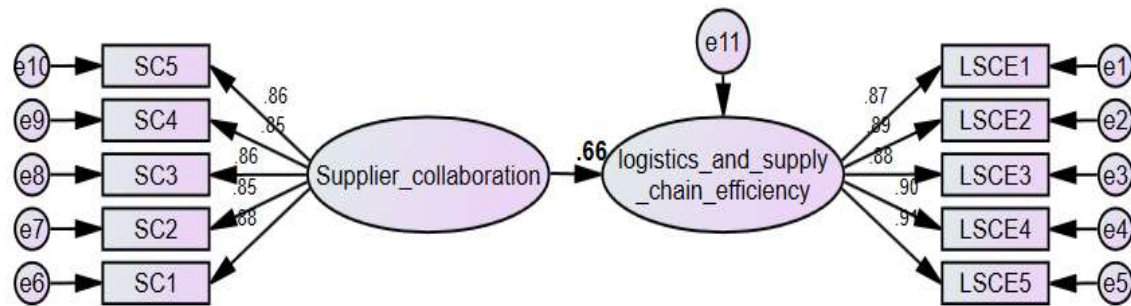


Table 8 Regression Weights

Path			Estimate	S.E.	C.R.	P
Logistics and supply chain efficiency	<---	Supplier collaboration	0.656	0.05	12.439	***

Findings from the third hypothesis have shown that there is a positive correlation between supplier collaboration and logistics and supply chain efficiency in EMS firms. This shows that supplier collaboration makes logistics and supply chain in EMS firms more efficient. The value of the estimate is 0.656, showing that supplier collaboration improves the efficiency of logistics and supply chain in EMS firms. The value of standard error is 0.050, indicating that the estimate is credible. The value of the critical ratio is 12.439, which is higher than the required value of ± 1.96 .

H4: Supplier performance has a significant positive effect on the operational performance of EMS companies.

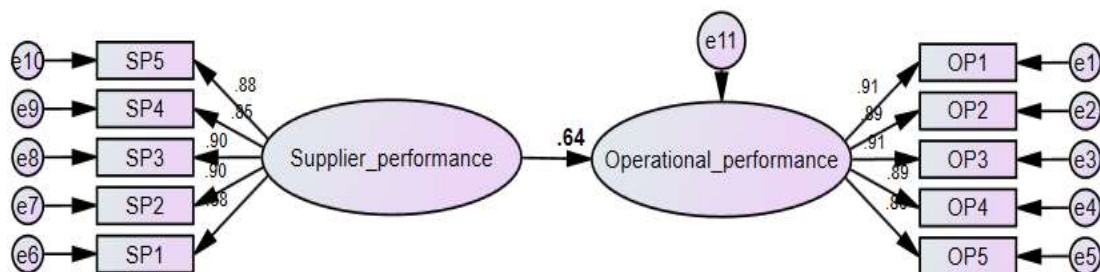


Table 9 Regression Weights

Path			Estimate	S.E.	C.R.	P
Operational performance	<---	Supplier performance	0.635	0.051	12.449	***

Results generated from H4 indicate a positive and significant influence of supplier performance on operational performance of EMS companies. This is because of the significance of the value of the estimate which is 0.635, meaning that the improvement in the supplier performance will positively influence the operational performance. The standard error is 0.051, implying that the estimate value is highly precise. The critical ratio is 12.449, which is higher than the required value of ± 1.96 . Additionally, the p-value is significant with a value of less than 0.001.

H5: Logistics and supply chain efficiency has a significant positive effect on the operational performance of EMS companies.

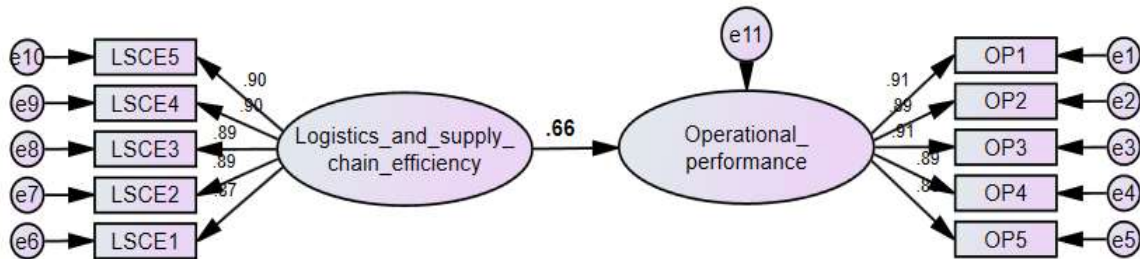


Table 10 Regression Weights

Path			Estimate	S.E.	C.R.	P
Operational Performance	<-	Logistics and supply chain efficiency	0.664	0.052	13.085	***

Given the outcome of the regression test conducted for H5, it needs to be noted that the logistics and supply chain efficiency positively affect the performance of EMS companies. In other words, the estimated value equals 0.664 and means that the higher the logistics and supply chain efficiency, the higher the performance of EMS companies. In addition, the value of the standard error is 0.052 and indicates that the estimated value is reliable. Finally, the critical ratio equals 13.085 and is higher than the critical value of ± 1.96 .

H6: Supplier relationship management practices and supplier collaboration jointly have a significant effect on the operational performance of EMS companies in the Twin Cities of Telangana.

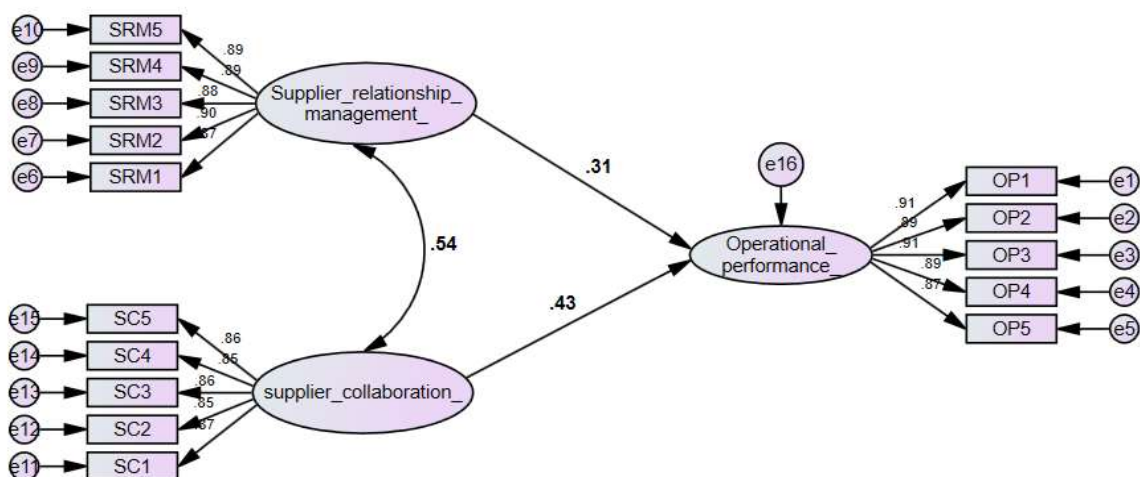


Table 11 Regression Weights

Path			Estimate	S.E.	C.R.	P
Operational performance	<---	Supplier relationship management	0.31	0.05	5.549	***
Operational performance	<---	Supplier collaboration	0.428	0.057	7.465	***

Conclusion from the regression analysis of hypothesis H6 is that supplier relationship management and supplier collaboration affect operational performance together. The estimate value is 0.310, the standard error is 0.050, and the critical ratio is 5.549, all of which point to a favorable influence of supplier relationship management. The estimate value, standard error, and critical ratio for supplier cooperation are 0.428, 0.057, and 7.465 respectively, indicating a higher favorable impact. Both p-values are significant at $p < 0.001$, confirming statistically significant relationships. Therefore, H6 is supported. The result indicates that better supplier relationship practices and stronger supplier collaboration improve coordination, delivery reliability, production flow, and overall operational performance of EMS companies in the Twin Cities of Telangana.

4.2 Discussion

The study results demonstrate that EMS companies in the Telangana Twin Cities can considerably enhance their operational performance, logistics and supply chain efficiency, and supplier performance through the implementation of supplier collaboration and supplier relationship management practices. H1 and H2 confirmed that supplier relationship management practices positively affect supplier performance and logistics efficiency, which is supported by [22], who found that supplier relationship management practices such as supplier collaboration, supplier development, supplier evaluation, and long-term relationships improve supply chain performance and cost efficiency. H3 showed that supplier collaboration significantly improves logistics and supply chain efficiency, which is consistent with [23], who reported that supply chain collaboration leads to better firm performance and transaction cost advantage. H4 confirmed that supplier performance positively affects operational performance, which is supported by [24], who stated that vendor evaluation and supplier performance factors such as quality, delivery, cost, and relationship management contribute to supply chain performance'. H5 showed that logistics and supply chain efficiency improves operational performance, which is similar to [25], who emphasized the relationship between logistics efficiency, cost optimization, and enterprise performance. Finally, H6 confirmed that supplier relationship management and supplier collaboration jointly affect operational performance, supporting [26], who found that supply chain integration and technology management significantly improve operational performance. Overall, the study confirms that EMS companies can improve operational performance by strengthening supplier relationships, collaboration, supplier reliability, logistics coordination, and supply chain efficiency.

5. Conclusion

Accordingly, it is found through this research that supplier relationship management and supplier collaboration are two such variables which have great impact on improving operational performance of EMS firms located in the cities of the state of Telangana. In fact, it is found through this research that supplier relationship management is an effective approach for achieving improvement in supplier performance as well as logistics efficiency. On the other hand, supplier collaboration is another variable which ensures coordination and deliveries of supplies in the supply chain process. Therefore, supplier performance and logistics efficiency become two very significant variables for operational performance improvement.

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