A Study of the Factors that Affect the Performance of the Supply Chain with Reference to Sme in Chennai City

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Abstract

A small medium enterprise (SME) with a strong supply chain can improve its capacity to address difficulties. In reality, many SMEs continue to struggle with supply chain management due to a variety of reasons impacting their implementation. Adaptability is a critical factor in supply chain success. A growing number of firms have realized the need of improving SCM. It is one of the most important characteristics that influences the outcomes of a supply chain's operation. Many academics point to flexibility as a key source of gaining and sustaining a long-term competitive advantage, one of the most important criteria ensuring the success of supply chain's ,or a major supply chain development megatrend. The main objective of the article was to study the factors affecting supply chain management and to measure the impact of the factors on the supply chain management. 100 Small and medium scale manufacturing companies have been selected as sample using simple random technique in Chennai City. In the present study researcher adopted a Friedman ranking and regression analysis to study the various factors and their influence on the SCM performance. The conclusions and considerations of the study, deals about how the determinants in this study of supply chain performance in an industry cluster have contributed to supply chain performance. According to the findings of the research, the supply chain structure, inventory control management, customer demand, and lead time of the supply chain management all have a substantial impact on the overall enactment of the supply chain.

Keywords: Supply Chain Performance, Determinants and factors affecting SCM in SMEs

Introduction - Preliminary framework of Supply Chain

A Supply Chain (SC) is a network of members connected by the flow of goods, information, and money. Depending on the number of intermediary facilities and their location within the supply chain, the supply structure may change. Suppliers, manufacturers, distributors, wholesalers, and retailers are all establishments in the supply chain. Each facility in the supply chain processes orders based on the information available and sends them to the next site

upstream. The upstream plant fills the downstream facility's demand with available supplies[1]. The flowing facility depicts the way from the final consumer to the final supplier, whereas the upstream facility represents the road from the final consumer to the final supplier. Finally, clients pick up the items at the last facility in the supply chain. Profitability determines the success of a SC. SC performance is now judged in terms of total profitability rather than income from specific stages. The competitive strategy defines the set of consumer expectations that the business wishes to meet through its services and products. To shape a strategic match, a firm should assess the SC's potential and strengths in terms of efficacy and responsiveness. As a result, attaining strategic alignment necessitates striking the optimal mix between efficiency and responsiveness.[2].
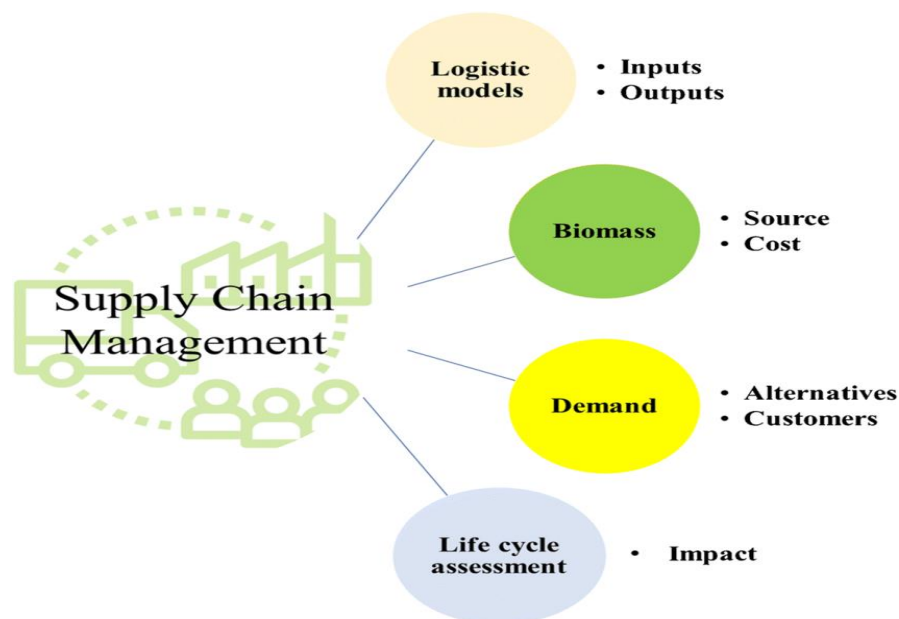
Performance of the supply chain

The costs associated with establishing and maintaining supply chain performance evaluation systems far exceed the benefits.[3] The aim of the literature review is to understand of metrics of supply chain and measurement techniques. They are compared to the supply chain activities/processes of planning, sourcing, manufacturing/assembly, and delivery/customer service.[4] The foundation improved the critical for tools managing integrated supply networks. Performance measurement should be used to determine members' efficacy and efficiency in achieving supply chain goals. The managers should be allowed to focus the sources of process variation, effective measurement systems may encourage continuous process improvement. Businesses can use information gleaned from performance feedback to help them avoid or

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[1]Simchi-Levi (2008), "Designing and managing the supply chain: concepts, strategies and case studies", Third edit. Tata McGraw-Hill , New Delhi, pp.1-3

[2] Christopher (2005), "Logistics and supply chain management", Third edition. Prentice Hall, pp.9-11.

[3] Shepherd, C., Günter, H. (2006),"Measuring supply chain performance: current research and future directions", International Journal of Productivity and Performance Management, Vol. 55, No. 3-4, pp. 242-258

[4] Gunasekaran(2004), "A framework for supply chain performance measurement", Journal of Production Economics, Vol. 87, pp.333-347

quickly resolve difficulties.[5]. Process monitoring is concerned with the monitoring and analysis of processes in real time. Administrators and process managers can use monitoring data to modify the behaviour of running processes and to address issues that arise during process execution. The, process monitoring may be utilised to improve an organization's response time to client concerns. Operational supply chain management evaluates current supply network processes. Managers are more likely to identify departures from previously agreed-upon process routes, as well as changes in material or financial flow patterns, when they study using a formal process description. Due to the need for real-time monitoring, an automated system is required to gather relevant monitoring metrics from throughout the supply chain (inter-organizational monitoring).[6]

SCM emphasizes the relevance of business operations throughout the supply chain network of enterprises. From the end user to the original suppliers, supply chain management (SCM) is the process of integrating critical business processes. Mentzer et al. (2001)[7] defined SC as the systematic, strategic coordination of traditional business functions and tactics within a single company and across businesses in the supply chain, with the goal of enhancing the long-term performance of both the individual companies and the supply chain as a whole. Supply chain management is a collection of strategies for efficiently integrating suppliers, manufacturers, warehouses, and stores, ensuring that merchandise is manufactured and distributed in the appropriate quantities, to the appropriate locations, and at the appropriate times, all while minimizing system-wide costs and meeting service level requirements. The notion encompasses a wide variety of activities necessary to design, develop, and control production and distribution processes from origin to consumption. Shorter time to market, lower inventory, more flexibility and response to changing market demand, and safe access to crucial information are all advantages of supply chain management. Supply chain management has the potential to reduce overall costs while enhancing performance. Furthermore, it typically necessitates the integration, coordination, and collaboration of businesses and supply chain partners, as well as performance monitoring. Finally, the cost effectiveness of developing measurement techniques for monitoring SCP especially for small and medium-sized businesses, must be assessed.[8]

Factors affecting supply chain performance

The battle in today's global market is not between firms, but between supply networks. Comparing supply chain performance metrics enables the identification of a good supply chain. The most efficient supply networks may endure for an extended length of time. Internal and external variables impact the supply chain's performance. Ten years from now, the labour supply will look considerably different. According to scientists, emerging countries would have tremendous growth, while industrialized economies will see more moderate growth. This

[5] Chan and H. K. Chan, (2005) "Simulation modeling for comparative evaluation of supply chain management strategies," Int. J. Adv. Manuf. Technol., vol. 25, no. 9–10, pp. 998–1006.
[6] Holten, R. et al., (2002), "Enabling technologies for supply chain process management", Proceedings of the IRMA 2002 Conference, Seattle.pp.5-7
[7] Mentzer et al. (2001), "Defining Supply Chain Management", Journal of Business Logistics, Vol.22,(2),pp.3-9
[8] Stank, T.P., Emmelhainz, M.A., Daugherty, P.J. (1996), "The impact of information on supplier performance", Journal of Marketing Theory and Practice, Vol. 4, (4), pp. 94-106.
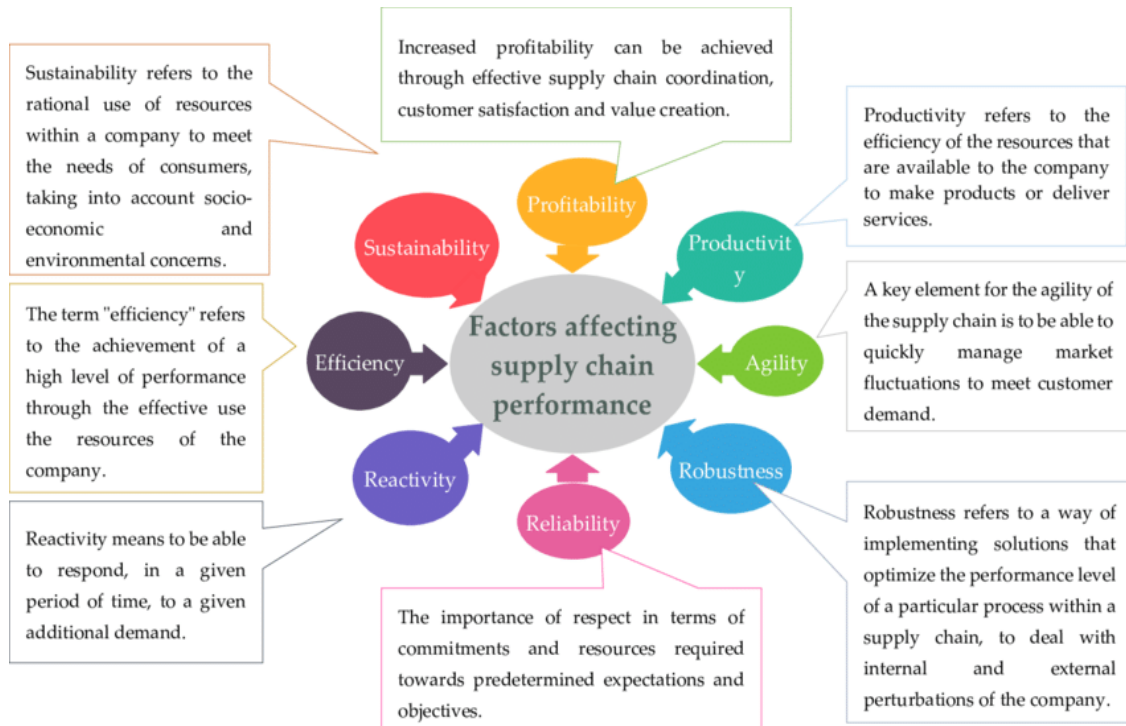
shift in labour supply must be factored into supply chain leaders' global supply networks planning. This tendency will continue and will have a significant influence on talent planning in the supply chain. Talent attraction and retention programmes are a requirement. Digital dexterity will be a critical skill set for the future supply chain worker. The capacity to rapidly adapt to new technologies and the willingness to apply sophisticated analytics and artificial intelligence (AI) in decision-making will be critical in an increasingly automated world. People will coordinate processes, handle errors, and control the machines in the factory of the future.

1.   **Intelligent machines** According to the most current Gartner projection, artificial intelligence will generate $5 trillion in corporate value by 2025. However, AI's full potential has not yet been realized. This will significantly change over the next few of years, particularly in the areas of decision support and automation in the supply chain. "AI's capacity to extract insights and make suggestions from massive volumes of big data will have a profound effect on how supply chains run in ten years," Burkett adds. "While AI has seen times of disillusionment, the status of the technology and early evidence of acceptance indicate that AI will undergo a significant ramp-up in the coming years."

2.   **The circular economy is the norm**.: By 2029, it will be considered unacceptably inefficient for a supply chain to generate trash. The generation of avoidable waste will then be deemed undesirable by society. This requires supply chain executives to embrace a circular economy, in which spent products are returned, recycled, and ultimately repurposed. Numerous businesses have already embarked on this path. Coca Cola's Waste-Free World and Unilever's Sustainable Living Plan are both beginning steps toward a circular economy[9].

3.   **Inventory management policy**: Inventory control refers to the process of ensuring that a firm has the correct inventory on hand in order to maintain appropriate accounting. The cost-benefit analysis of the expenditures invested and the costs saved by stocking the material. Two fundamental judgments must be taken for each item retained in inventory. These choices affect the timing and amount of item orders. Thus, the inventory control mechanism entails judgments about 'when' and 'how much' to order. Inventory policies that take inventory position into account (either for order decision-making) referred to as inventory position-based policies, while those that do not take inventory position into account are referred to as non-inventory position-based policies.

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[9] Sezen and Kitapci, "Spreadsheet simulation for the supply chain inventory problem," Prod. Plan. Control, vol. 18, no. 1, pp. 9–15, Jan. 2007.

Sustainability refers to the rational use of resources within a company to meet the needs of consumers, taking into account socio-economic and environmental concerns.

Increased profitability can be achieved through effective supply chain coordination, customer satisfaction and value creation.

Productivity refers to the efficiency of the resources that are available to the company to make products or deliver services.

The term "efficiency" refers to the achievement of a high level of performance through the effective use the resources of the company.

A key element for the agility of the supply chain is to be able to quickly manage market fluctuations to meet customer demand.

Reactivity means to be able to respond, in a given period of time, to a given additional demand.

The importance of respect in terms of commitments and resources required towards predetermined expectations and objectives.

Robustness refers to a way of implementing solutions that optimize the performance level of a particular process within a supply chain, to deal with internal and external perturbations of the company.

4. **Information sharing:** Information exchange can be considered the primary driver of supply chain performance. Information links and enables diverse SC partners to coordinate their actions. At each level of the SC, information is critical to everyday operations. An information system enables a business to swiftly deliver a diverse range of customized products to clients and to adapt to changing customer tastes and preferences. Continuously sharing fresh information with relevant personnel in a timely and qualitative manner enables managers to make more informed decisions, ultimately improving performance[10]. Information sharing in SCs has a number of advantages, including a decreased effect, improved coordination across multiple tasks, and improved decision-making, and less uncertainty in SCs. In a nutshell, the more individuals learn, the more they desire to learn. The influence of this growth in customer awareness and readily available information on manufacturing (and other B2C businesses as well) may be felt in a variety of ways up and down the value chain.

5. **Adoption of New Technologies Breakneck Pace:** The general public has rapid access to cutting-edge technology, and they've become accustomed to receiving it from their service providers. That implies that if your competitor's technologies notify customers of manufacturing delays, provide shipping choices, and enable direct communication with support, guess where those customers will do business? This pressure is causing a rush to acquire cutting-edge developing technologies in order to stay up with consumer technology usage.

6.   **Flexibility in Supply Chain:** To the untrained eye, demand swings might appear somewhat chaotic. That is where sophisticated analytics come in, levelling the playing field and assisting you in determining what is on the order horizon. The problem is that customers do not see their purchase behaviour as irregular, making it impossible for even the most

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[10] Rogers (2001), "The Supply Chain Management Processes", *The International Journal of Logistics Management*, Vol. 12, No 2, pp. 13-36

sophisticated AI to be 100 percent right all of the time. Consider supply chain adaptability. By applying the Industry 4.0 technologies presented, you can ensure the success of your whole value chain. Intelligent pallets that notify you to changes in atmospheric conditions, RFID tags that track the specific of each order, and intelligent monitoring software all help you become more robust to demand variations and other disturbances. Additionally, your supply chain will be better ready to pivot in response to changing demand in order to preserve customer satisfaction.

7. **Demand Forecasting:** Demand planning encompasses inventory management, but it extends far more. Supply chain managers must consider the responsibilities of each vendor, supplier, transportation provider, and internal supply chain when forecasting demand. Regardless of the chaotic aspects introduced by external variables, forecasting is a critical component of supply chain management. It is the most effective method for rationalizing inventory decisions, establishing safety stock levels, and planning your supply chain for the upcoming quarter or year. A well-prepared demand planner is equipped with a plethora of tools and approaches. While forecasting accuracy is rarely perfect, even under ideal conditions, established demand forecasting approaches enable supply chain managers to estimate future demand with a high degree of accuracy. These forecasts save businesses money and resources, resulting in a more sustainable supply chain.[11].

8. **Environmental Uncertainty**: Government backing and unpredictable factors from abroad also have a significant influence in determining your business's success. In order to manage demand effectively and maintain flexibility, businesses turn to imports, which might have a negative impact owing to their unpredictable nature[12].The degree of government support your business receives for imports is also critical. This comprises government-issued standards, laws, policies, and guidance that support exporters by boosting the industrial sector's competitiveness in the worldwide market through logistical expertise. While we're on the subject of environmental uncertainty, recognizing the existence of an uncertain overseas environment becomes critical for supply chain management systems, as it increases your risks associated with issues such as language barriers, transportation, transportation costs, exchange rates, tariffs, and administrative practices.[13]

9. **Information Technology**: Today's technology enables real-time communication amongst all supply chain players. It decreases lead time, paperwork, and other inefficient procedures, all of which benefit managers in terms of coordination, information access and data exchange, enhanced customer and supplier relationships, and inventory management.[14] Additionally, several IT technologies assist with the execution and administration of warehouse data, vendor-managed inventory, distribution demand planning, and customer relationship management.

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[11] Kelepouris, P. Miliotis, and K. Pramatari, "The impact of replenishment parameters and information sharing on the bullwhip effect: a computational study," Computer Oper. Res., vol. 35, no. 11, pp. 3657–3670, 2008.

[12] Cachon and M. Fisher, "Supply chain inventory management and the value of shared information," Manage. Sci., vol. 46, no. 8, pp. 1032–1048, Aug. 2000.

[13] Bottani and R. Montanari, "Supply chain design and cost analysis through simulation," International Journal of Prod. Res., vol. 48, no. 10, pp. 2859–2886, May 2010.

[14] Lee,Padmanabhan, and Whang, "Information distortion in a supply chain: the bullwhip effect," Manage. Sci., vol. 50, no. 12, pp. 1875–1886, 2004.

10.   **Relationships in the Supply Chain**: Without smart supplier connections and excellent customer interactions, what is an effective supply chain? After all, it is ultimately what enterprises benefit from when they coordinate and integrate operations with suppliers and gain a better grasp of their customers' demands[15]. All businesses are prone to deal indirectly with a variety of suppliers, which is why it is critical that your connection with suppliers meets both your company's and the suppliers' mutual needs.

11.   **Manufacturing**: In today's peer group, smart manufacturing is a critical aspect in determining the success of products. Two primary variables contribute to the value of your products: adaptability and quality[16]. This is because complicated marketplaces, intense rivalry, and rapid changes in demand necessitate your readiness to respond quickly to client requirements. Simultaneously, you must recognize that quality is not a perk for the customer, but a requirement. Costs, productivity, and market share loss have long been inextricably linked to poor quality. Therefore, consider and act prudently. Logistics, supplier markets and performance, and material procurement all help to achieve the operational excellence necessary to provide a world-class customer experience. While logistics must priorities activity coordination and collaboration, social responsibility, strategic distribution planning, and technology and information systems, superior supply chain management necessitates extensive knowledge of supplier markets and performance, which is typically higher when supply managers perceive trust and satisfaction.

Theoretical Underpinning -Review

 Collaboration is a decision-making process that happens amongst mutually dependent individuals. It comprises collaborative decision-making and shared accountability for results. A cross-departmental breadth, a willingness to work, and a shared link or aim are key dimensions. Increased internal and external collaboration is expected to boost logistical performance, and international and domestic collaboration complement one another (Stank et al. 2001). Internal collaboration has a substantial effect on the performance of logistical services, meaning that organizations should develop cooperation and collaboration across internal processes in order to achieve logistical efficiency. The dearth of evidence for a direct association between external cooperation and service performance is startling, suggesting that partnerships with suppliers and customers do not result in increased performance. Additionally, engagement with foreign supply chain companies fosters internal teamwork, which improves logistical service. Collaboration is necessary both within and outside the organization's walls. The benefits are cumulative. Collaboration and information sharing enable firms to devote more resources to operations, both social and financial. As a consequence, better informed choices and risk reduction are possible[17].

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[15] Cannella and Ciancimino, "On the bullwhip avoidance phase: supply chain collaboration and order smoothing," Int. J. Prod. Res., vol. 48, no. 22, pp. 6739–6776, Jan. 2010.

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[17] Stank (2001), "Supply chain collaboration and logistical service performance", Journal of Business Logistics, Vol. 22, No. 1, pp. 29-49

The procurement and supply chain management examine their suppliers' capacity to meet the firm's long-term requirements. A lot of attention should be paid to the supplier's long-term development, future design abilities, and the importance of purchasing and supply chain management in the supplier's strategic planning, as well as the supplier's ability to expand production capacity and its ability to pay for this growth. It's called a supply chain partnership when two people work together. This kind of interaction is all about having a long-term relationship with each other, which makes it easier to plan and solve problems together. It is important to build relationships with suppliers in order to get the best deals and be more effective and successful at sourcing. Maintaining a relationship is just as important. Customer or supplier performance analysis alone is not enough.The features that must be considered while analyzing partnerships are crucial for the promotion and strengthening of those relationships. For example, the degree to which suppliers collaborate to resolve mutual issues is indicative of the efficacy of supplier relationships. By evaluating partnerships against these criteria, win–win connections will emerge, resulting in more efficient and well integrated supply chains[18].

Objectives of the study

1.   To study the factors affecting supply chain management
2.   To measure the impact of the factors on the supply chain management

Research Methodology

In order to gain better understanding about the phenomena of supply chain management, an empirical study was chosen as the research methodology. With 100 samples of small and medium scale manufacturing companies study was carried out in Chennai city

Factors affecting the performance of the SCM

The experts' opinion and theories explain various factors related Supply Chain Management (SCM) influencing its performance. They are structure of the supply chain, inventory control policy of the company, information sharing within the team, customer demand, forecasting method, lead time and review period length. Opinion of the respondents towards these factors is ranked using Friedman technique.

Table 1: Descriptive Statistics

Factors	Mean	Std. Deviation	Mean Rank
Supply chain structure	3.21	1.192	4.57
Inventory control policy	2.98	1.044	4.11
Information sharing	2.81	1.269	3.81
Customer demand	2.64	1.425	3.54
Forecasting method	2.76	1.215	3.71
Lead time	2.91	1.129	3.99
Review period length	3.03	1.283	4.28

[18] Gunasekaran (2004), "A framework for supply chain performance measurement", International Journal of Production Economics, Vol. 87, pp.333-347

The above table indicates that supply chain structure (4.57) is the most considering factors on the performance of the SCM. Review period length (4.28) in the supply chain system has also been considered by the most of the respondents. Inventory control management is also considered by the sample respondents (4.11). Fourthly, lead time taken in the supply chain (3.99) is ranked. Information sharing (3.81), forecasting methods (3.71) and customers demand (3.54) are ranked fifth, sixth and seventh respectively.

Table 2: Friedman Test

N	100
Chi-Square	23.989
df	6
Asymp. Sig.	0.001

The result of the Friedman ranking technique shows that the calculated value of the Chi-Square for the degree of freedom 6 is 23.989 which is significant at 1% level. Hence, it is determined that supply chain structure, the factors reviewed period length and inventory control management as considered most by the sample respondents.

1. Impact of factors on the performance of SCM

The impact of these factors on the supply chain management is measured with the help of a regression model. Here, the above studied 7 factors are considered as predictors and the performance of the SCM is considered as dependents variable. The result of the model is explained below.

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.942	0.888	0.880	1.78192

Predictors: (Constant), Supply chain structure, Inventory control policy, Information sharing, Customer demand, Forecasting method, Lead time and Review period length

Dependent Variable: SCM

The R value (0.942) of the model shows that there is significant influence by the predictors on the dependent variable. The calculated R square value is 0.888 which shows that the predictors are explaining 88.8% on the changes of the dependents variables. It is great influence by the factors. Further, it is tested with the help of ANOVA to find the significance of the model proposed.

Table 4: ANOVA

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2317.667	7	331.095	104.274	0.000
	Residual	292.123	92	3.175		
	Total	2609.790	99			
a. Dependent Variable: SCM						
b. Predictors: (Constant), Supply chain structure, Inventory control policy, Information sharing, Customer demand, Forecasting method, Lead time and Review period length						

The Table 4 shows that calculated F value (104.274) from the ANOVA test proves a valid model. The significance is found at 1% level. Hence, the value of the predictors in the model is explained further from the value of coefficients.

Table 5: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	1.290	0.596		2.163	0.033
Supply chain structure	2.504	0.275	0.581	9.106	0.000
Inventory control policy	1.270	0.363	0.258	3.497	0.001
Information sharing	0.373	0.282	0.092	1.322	0.189
Customer demand	-0.600	0.235	-0.167	-2.553	0.012
Forecasting method	-0.257	0.288	-0.061	-0.890	0.376
Lead time	0.958	0.313	0.211	3.062	0.003
Review period length	0.242	0.246	0.061	0.985	0.327

The Table 5 reveals that supply chain structure, inventory control management, customers demand and lead time in the supply chain management are having significant influence on the performance of the supply chain management. The t values are found out of the range between 1.96 and -1.96 and the significance values are less than 0.05. Hence, it is concluded that supply chain structure, inventory control management, customers demand and lead time of the supply chain management are highly influencing the performance of supply chain management.

Discussion and Conclusion

The prior chapter's findings will be used to provide suggestions, recommendations for more research. The proposals should result in the ability to incorporate performance-related supply chain features. Along with the ideas discussed extensively throughout this text, this section highlights other aspects impacting supply chain effectiveness. The combination of earlier research and current research findings will be beneficial to both the organization and the broader community. To incorporate elements, the following considerations should be made: i) Awareness of the magnitude of change; ii) Consensus on the SCM vision and key procedures; iii) Commitment of resources and empowerment essential to achieve the stated goals. Continuous information exchange enables managers to make more informed decisions, which

enhances the supply chain's performance. Customer demand is very volatile, which raises the bullwhip effect and inventory costs across the supply chain. Forecast accuracy has a significant impact on supply chain performance. Reduced lead times contribute to the supply chain's efficiency. A longer review time should be chosen to minimise the supply chain's total inventory cost. The optimal selection of settings for all aspects leads in improved supply chain performance. The study concluded that supply chain structure, inventory control management, customers demand and lead time of the supply chain management are highly influencing the performance of supply chain management.

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