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"A STUDY ON SUPPLY CHAIN MANAGEMENT ON COSTING OF MANUFACTURING INDUSTRIES IN BANGALORE"

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Abstract

The purpose of this research was to investigate the impact that SCM has on the costing of the manufacturing industry in order to fill a research void that has been identified in the existing body of work. This study will provide significant insights into effective SCM and cost management practices for manufacturing organizations by providing a comprehensive understanding of how SCM practices are being utilized in a real-world manufacturing scenario. These insights will be useful for manufacturing company executives. This research also gives the highlight of hypothesis conducted based on SCM based on survey collected data through questionnaire and reviewed few literature which relates to SCM.

Keywords

SCM, Automative industry, Human metrics, Activity based costing

I. Introduction

India is one of the fast-growing economies. Manufacturing sector in India has a growthrate of 7.1 per cent for the fiscal year 2015 and a heady 8.4% in the last quarter. In the year 2013 it is 5.3 per cent and in 2014 it is 4.4 per cent. With this it is evident that the manufacturing sector in India is growing steadily. The requirements of the industry are equally growing and so is the case with supply chain management. Since the 1990's after the Reforms done in the economic policy (LPG) by the then Prime Minister Mr. P. V. Narasimha Rao in the year 1991, Indian economy has undergone tremendous changes and the industrial sector has grown rapidly. This intern has increased the competition and challenges for getting the products and services at the right place and at the right time for the lowest cost possible. So, the organizations started to concentrate in streamlining the whole process of manufacturing. In the same process they even found it beneficial to concentrate on the supply chain process along with the manufacturing process, as they found it the most essential one for staying competitive in the market.

Supply chain has gained a prominent role in increasing the firm's performance over few years. Today's competitive environment demands the attention of researchers to identify the ways to meet the needs of the customers. Compared to the past, today business environment is more global and more competitive,

as it prefers to have short product life cycles, frequent new product developments and improvements. Not just that, these days because of the upsurge in the information technology customers are well informed, have high knowledge and with sophisticated technology.

A supply chain includes all the parties involved, directly or indirectly, in addressing a customer request. It includes manufacturer, suppliers, transporters, warehouses, retailers and even customers themselves. Every organization's supply chain includes all functions involved in receiving and filling a customer request like new product development, marketing, operation, distribution, finance, customer service and other function that related to serving customer request. Effective supply chain management is required to build the competitive advantage in the product and the services of the firm. "The performance of supply chain was influenced by managing and integrating key element of information into their supply chain".

To achieve a competitive advantage and better performance, supply chain management strategy needs support of the business strategy.

- Customer Relationship Management - Provides the structure for developing and maintaining relationships with customers.
- **Customer Service Management** – introduces the firm to the customer, acts as a single source of customer information, and the key point of contact for administering the product service agreements.
- **Demand Management** –It balances the customers' requirements with supply chain capabilities. Concentrates in increasing supply chain flexibility by reducing the demand variability.
- **Order Fulfilment** – includes defining the customer requirements, design a network, and enabling the firm to meet customer request by minimizing the total delivered cost.
- **Manufacturing Flow Management** – includes all activities necessary to obtain, implement and manage manufacturing flexibility and move products through the plants in the supply chain.
- **Supplier Relationship Management** – gives the structure regarding how relationships with suppliers are developed and maintained, and Cross-functional teams will modify the products and services agreements with key suppliers.
- **Product Development and Commercialization** – provides the structure for developing and bringing to market products jointly with customers and suppliers.
- **Returns Management** – includes the activities like returns, reverse logistics, gate keeping, and avoidance.

Evolution of SCM

Evolution of Supply chain management dates to 1980's when an American Industry consultancy has first coined the term Supply Chain Management. By the creation if Assembly line SCM has gained great importance in the early 20th century. Supply chain is the mixer of all the activities, facilities and the functions of production, delivering and services forecasting from the suppliers to the end user.
The evolution of supply chain management studies observed six major movements. Jeff Beech explained Creation, Integration, Globalization, Specialization Phases One and Two, and SCM as the six phases in the SCM Evolution. All these six stages depict about the suitability of a particular strategy to each era. For e.g., in the sixth era information Technology and IT enabled supply chain was given priority and they are the burning issues.

- Creation Era - In early 1980's the term Supply Chain Management was first coined by an American industry consultant. The concept of supply chain in management, has great importance long before in the early 20th century, because of the creation of the assembly line.
- Integration Era - This era of supply chain management studies was highlighted with the development of Electronic Data Interchange (EDI) systems in the 1960sand developed through the 1990s by the introduction of Enterprise Resource Planning (ERP) systems.

- Globalization Era - This era is characterized by the globalization of supply chain management in organizations with the goal of increasing competitive advantage, creating more value-added, and reducing costs through global sourcing.
- Specialization Era Phase One - In 1990's industries concentrated in developing the core competencies and specialized models through Distribution and Outsourced Manufacturing. Companies have withdrawn vertical integration, sold many non-core operations, and outsourced all those functions to other companies.
- Specialization Era Phase Two - Supply Chain Management as A Service Specialization within the supply chain began in the 1980s with the inception of transportation brokerages, warehouse management, and non-asset-based carriers and has matured beyond transportation and logistics into aspects of supply planning, collaboration, execution, and performance management.
- Supply Chain Management - Increases creativity and information sharing and enhances collaboration among users.

Objectives of SCPM

- Facilitates the enhancement of the efficiency and effectiveness of SCM.
- SCPM models and frameworks will support the management in measuring business performance, analyze and improve operational efficiency through better decision-making processes.
- Engages the organization's performance measurement system for bringing change in the organization.
- It facilitates a better understanding among the SC members.
- It contributes to decision making in SCM, particularly in re-designing business goals and strategies, and re-engineering processes.

Net led Business Revolution

Another major development, that is bringing the revolution in the business scenario, is the emergence of the net. Aggressive supply chain managers can convert Internet into major opportunity for not only achieving substantial cost reduction, but also to develop excellent transparency with their customers. Shopping on net provides the supply chain manager an access to sources anywhere in the world, and generates the opportunities to find low-cost, high-quality suppliers. Further, if the supply chain manager decides to avail net-based auctioning to source his items, he may have to deal with a different supplier at each time for the same item.

Statement of Problem

Management of the supply chain, often known as SCM, is an essential component of manufacturing that has the potential to have a substantial effect on the profitability of an organization. However, due to the complexity of the manufacturing process and the large number of stakeholders involved, many manufacturers struggle to effectively manage their supply chains. The process of manufacturing consists of a number of stages, such as procurement, production, and delivery; each of these steps presents its own set of distinct obstacles. For this reason, it is necessary for manufacturers to perfect their SCM practices to cut costs, boost efficiency and production, and, eventually, increase their profit margins.

OBJECTIVE OF THE STUDY

1. Investigate the present SCM practices and strategies employed by a medium-sized automotive manufacturing company to control production costs.
2. Examine the effect of SCM on the costing of the manufacturing industry, particularly the automotive industry.

SCOPE OF THE STUDY

1. The effects of supply chain management (also known as SCM) on the pricing in the manufacturing sector will be the primary focus of this study.

2. The research will take the form of a case study, focusing on a manufacturing company of medium size operating in the automobile industry.

II. LITERATURE REVIEW

1. **R.L. Daugherty and T.J. 2011:** Supply chain management practices can help to reduce manufacturing costs by improving efficiency and reducing waste. Daugherty and Stank (2011) found that effective inventory management, transportation management, and collaboration among supply chain partners can help to reduce manufacturing costs. Effective inventory management practices can reduce the costs associated with inventory holding, such as storage and obsolescence.

2. **M. Duran and J. Puigjaner 2011:** The manufacturing industry is facing intense pressure to improve supply chain management practices due to increased competition and globalization. To remain competitive, manufacturers need to understand how supply chain management practices can impact their costs. The purpose of this literature review is to examine the relationship between supply chain management and manufacturing costs. Duran and Puigjaner (2011) found that the use of information technology such as enterprise resource planning (ERP) systems, radio frequency identification (RFID) technology, and web-based systems can help to improve supply chain visibility and reduce costs associated with manual processes.

3. **M.T.H. Khan and M.S. Rahman's (2014):** Literature review explores the impact of supply chain management practices on cost reduction in the manufacturing industry. The authors argue that the importance of effective supply chain management practices cannot be overstated, particularly in today's global economy where the competition is fierce, and the margins are tight. They suggest that supply chain management practices can help manufacturers reduce costs associated with transportation, inventory holding, and production, which can ultimately lead to higher profits and improved competitiveness. The authors highlight the importance of information technology in improving supply chain management practices and reducing costs.

4. **T. Chen and Y. Chen's (2015)**: Literature review explores the relationship between supply chain management (SCM) and environmental performance in the manufacturing industry. The authors argue that the integration of environmental concerns into supply chain management practices can help manufacturers reduce their environmental impact and achieve sustainable growth. They examine various SCM practices, such as green purchasing, green design, green logistics, and green manufacturing, and their impact on environmental performance. The authors highlight that green purchasing practices can help manufacturers to select suppliers that are committed to environmental sustainability and minimize the environmental impact of raw materials and components. Green design practices, such as design for the environment (DfE), can help manufacturers to reduce the environmental impact of products throughout their lifecycle.

5. **S. F. Kutanoglu and E. Ozgen's (2008):** Literature review focuses on the impact of supply chain management (SCM) on customer satisfaction and firm performance in the manufacturing industry. The authors argue that effective SCM practices are critical for manufacturers to improve customer satisfaction and achieve sustainable growth in today's competitive business environment. They examine various SCM practices, such as supplier selection, inventory management, information technology, and customer relationship management, and their impact on customer satisfaction and firm performance. Kutanoglu and Ozgen's literature review

highlights the critical role of supply chain management in improving customer satisfaction and achieving sustainable growth in the manufacturing industry.

6. **M. Kumar, A. Vashishtha, and M. Kumar's (2016):** Literature review focuses on the relationship between supply chain management (SCM) practices and firm performance in the Indian manufacturing industry. The authors examine the impact of various SCM practices, such as supplier relationship management, inventory management, information technology, and sustainability practices, on different dimensions of firm performance, such as financial performance, operational performance, and customer satisfaction. The authors conclude that effective SCM practices are critical for improving firm performance in the Indian manufacturing industry.

7. **S. H. Park, M. M. Tseng, and H. S. Lee (2012)**: They conducted a literature review on supply chain management (SCM) practices in the context of small and medium-sized enterprises (SMEs). The authors focused on the challenges faced by SMEs in implementing effective SCM practices, as well as the strategies and solutions that can help SMEs overcome these challenges and improve their supply chain performance. The authors identified several challenges that SMEs face in implementing effective SCM practices, including limited resources, lack of internal expertise and knowledge, and difficulties in developing long-term relationships with suppliers and customers. These challenges can lead to inefficiencies in supply chain operations, including increased costs, longer lead times, and reduced quality. The authors also highlight the role of government policies and initiatives in supporting SMEs in implementing effective SCM practices. They suggest that government support can take various forms, such as providing funding for SCM-related training and education, promoting collaboration and knowledge-sharing among SMEs, and establishing supportive regulatory frameworks and incentives.

III. RESEARCH METHODOLOGY

a. Data Collection Method: The primary data for this study will be collected through a questionnaire designed to gather information on the challenges faced by manufacturing companies in Bangalore due to GST implementation.

b. Secondary data: The secondary data for this study will be collected through a literature review of relevant academic articles, reports, and government publications.

c. Sample design: The sample design for this study involves selecting individual representatives of 108 employees from companies.

d. Sample unit: The study collected 120 responses from individual employee and interns from manufacturing companies.

e. Tools for Data Collection: The primary data will be collected using a questionnaire that will be administered through Google Forms.

Draft of Questionnaire

Demographic details- Age, Gender, Experience

1. What metrics does your organization use to evaluate the performance of its supply chain management?
2. How important do you think supply chain management is in the costing of your organization?

3. What factors do you consider while estimating the cost of your products?
4. What are the cost implications of supply chain disruptions in your organization?
5. What strategies does your organization use to optimize the supply chain?
6. How frequently does your organization review and revise its supply chain management strategies?

HYPOTHESIS

01.

H1 (Alternative Hypothesis) The present SCM practices employed by the medium-sized automotive manufacturing company significantly impact the control of production costs.
H0 (Null Hypothesis) There is no significant relationship between the present SCM practices and the control of production costs in the medium-sized automotive manufacturing company.

TEST---1	Tested on Column-- 6 & 9	
F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	3.1067961	2.495145631
Variance	1.3512279	0.860270322
Observations	103	103
df	102	102
F	1.5707015	
P(F<=f) one-tail	0.0117574	
F Critical one-tail	1.3871522	

TEST-----2	Tested on Column-- 4, 5, 6, 7, 8 & 9					
Covariance						
	Column 1	*Column 2*	*Column 3*	*Column 4*	*Column 5*	*Column 6*
Column 1	0.9					
Column 2	0.25	1.25				
Column 3	0.4	2.22045E-17	1.59			
Column 4	-0.15	-0.2	0.54	1.34		
Column 5	0.3	-0.05	0.97	0.22	1.56	
Column 6	0.4	-0.025	0.545	0.02	0.66	0.9475

Test----3	Tested on Column-- 6 & 8.	
Corelation		
	Column 1	*Column 2*
Column 1	1	
Column 2	0.1553607	1

HYPOTHESIS –02.

H1 (Alternative Hypothesis) SCM has a significant effect on reducing production costs in the automotive manufacturing industry.
H0 (Null Hypothesis) There is no significant effect of SCM on reducing production costs in the automotive manufacturing industry.

Test----1	Tested on Column-- 9 & 10.	
Correlation		
	Column 1	*Column 2*
Column 1	1	
Column 2	0.079620098	1

Anova: Single Factor	Tested on Column-- 6 & 10.					
SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Column 1	103	320	3.106796	1.35122787		
Column 2	103	205	1.990291	0.990100895		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	64.19902913	1	64.19903	54.83982438	3.3818E-12	3.88744666
Within Groups	238.815534	204	1.170664			
Total	303.0145631	205				

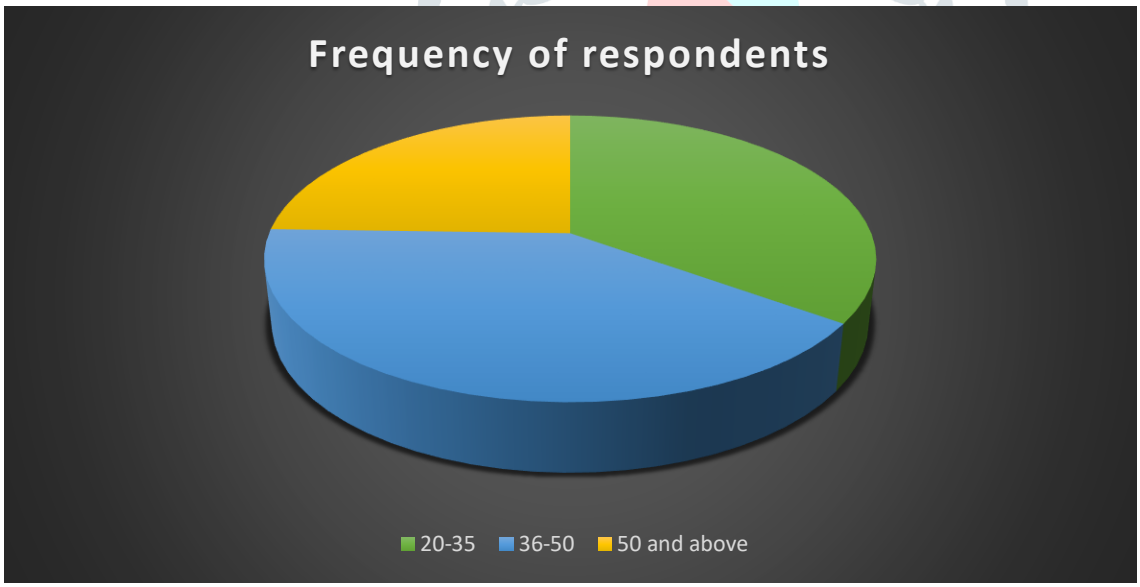
IV. DATA ANALYSIS AND INTERPRETATION

DEMOGRAPHIC ANALYSIS

TABLE 4.1 A – AGE of Respondents

Category	Frequency of respondents	Percentage (in %)
20-35	37	35%
36-50	43	41%
50 and above	26	24%
Total	104	100%

TABLE 4.1 A – PIE Chart representation



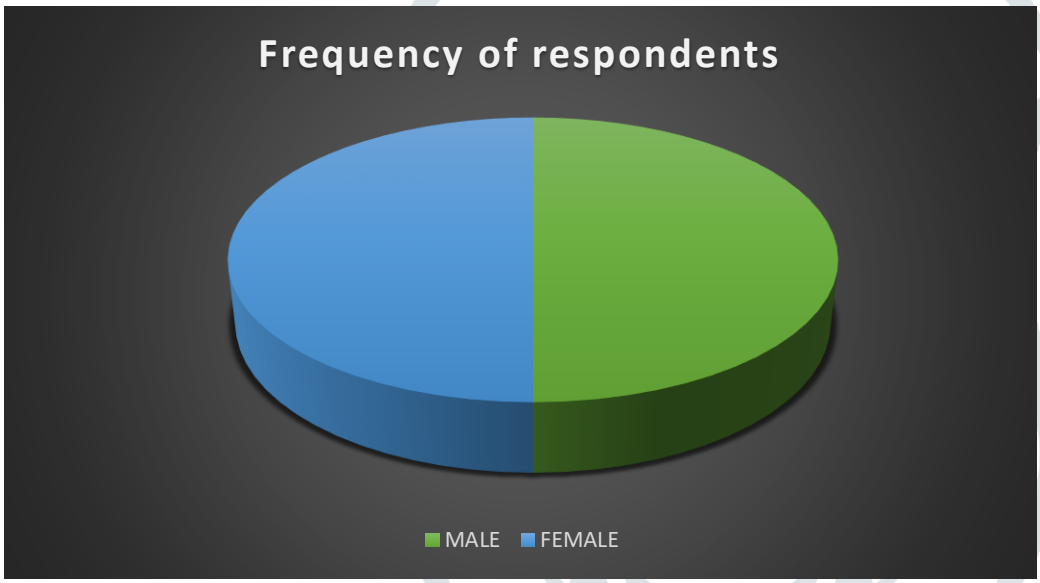
Interpretation

From the above pie chart analysis out of 104 respondents, 37 were age of 20-35, 26 were age of 50 and above and i.e., 43 respondents are of 36-50 are little experienced and matured people.

TABLE 4.1 B – Gender of Respondents

Category	Frequency of respondents	Percentage (in %)
MALE	52	50%
FEMALE	52	50%
Total	104	100%

TABLE 4.1 B – PIE Chart representation



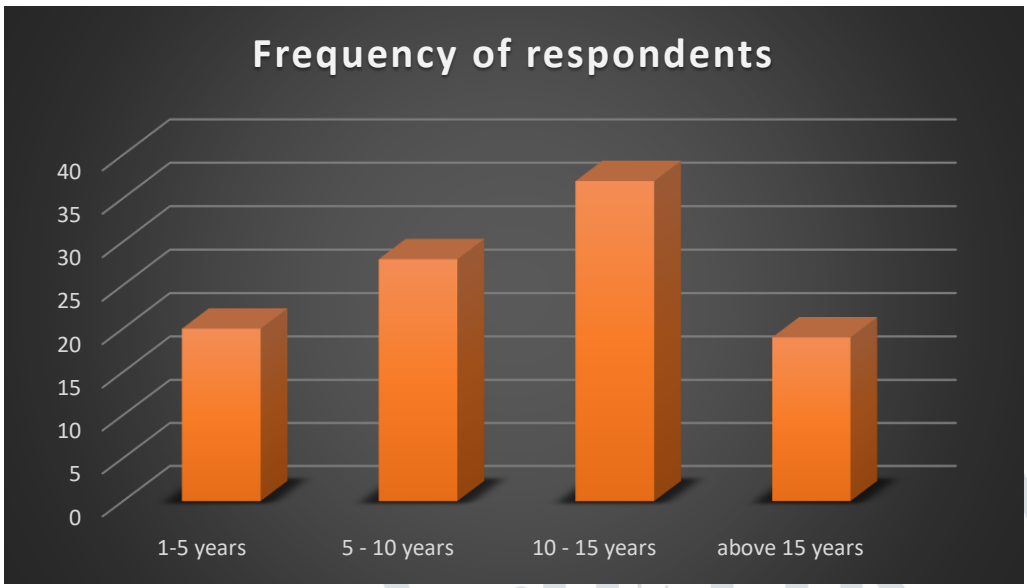
Interpretation

From the above pie chart, the respondents of gender are equal of 50% each of 52 are male and 52 are female.

TABLE 4.1 C – Experience of Respondents in Manufacturing Industry

Category	Frequency of respondents	Percentage (in %)
1-5 years	20	19.23
5 - 10 years	28	26.92
10 - 15 years	37	35.58
above 15 years	19	18.27
Total	104	100

TABLE 4.1 C – Chart Representation



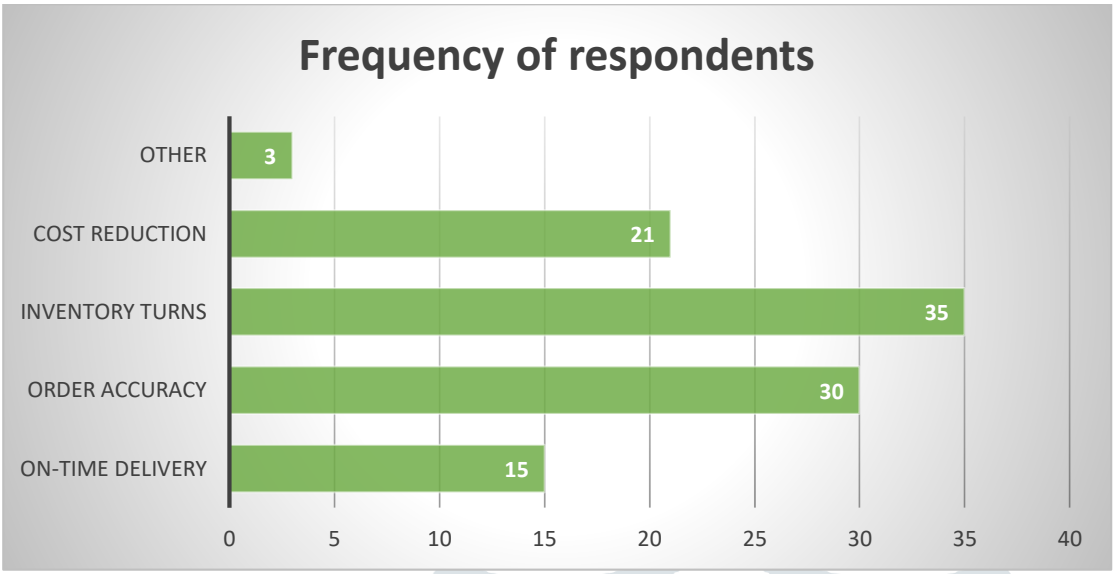
Interpretation

From above graphical data more experienced respondents are 19, 1-5yr experience respondents are 20 and 37 respondents are of 10–15-year experience which is highest from above survey and 5-10years are of only 28 respondents.

TABLE 4.1 C – Metrics of respondent's organization use to evaluate the performance of its supply chain management

Category	Frequency of respondents	Percentage (in %)
On-time delivery	15	14.42
Order accuracy	30	28.85
Inventory turns	35	33.65
Cost reduction	21	20.19
Other	3	2.88
Total	104	100%

TABLE 4.1 C Graphical Representation



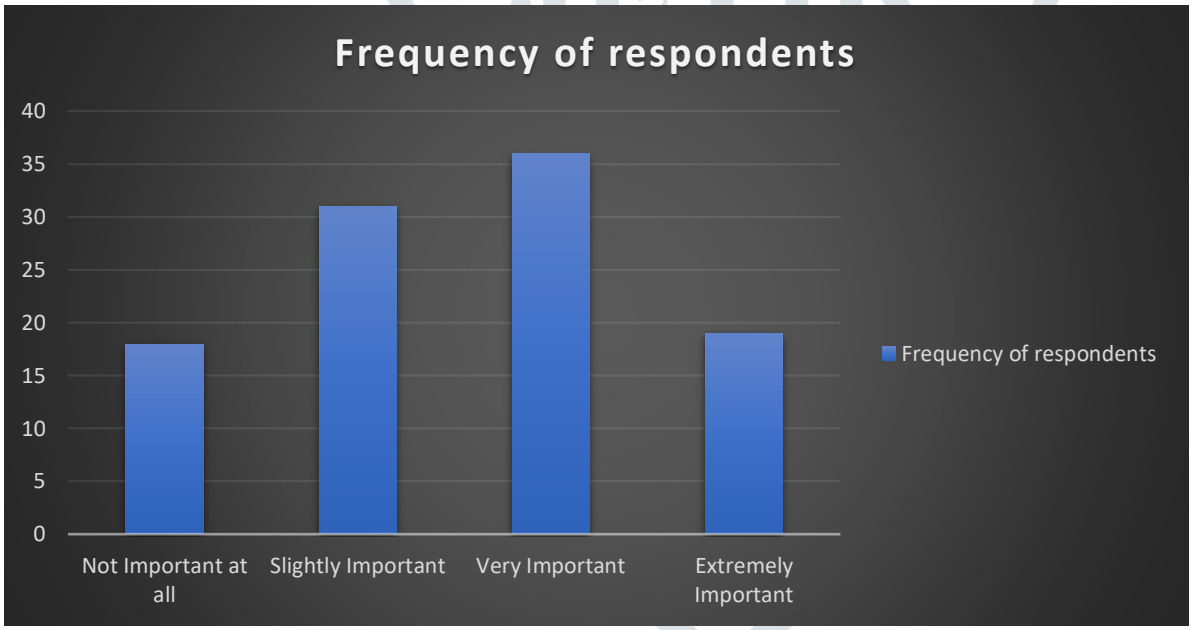
Interpretation

On referring to above data the respondents have choose inventory return metrics is most used in evaluating the organizations performance and order accuracy is 30 respondent and 21 choose cost reduction metric where as on time delivery and other is 15 and 3.

TABLE 4.1 D – The importance of supply chain management is in the costing of your organization.

Category	Frequency of respondents	Percentage (in %)
Not Important at all	18	17.31
Slightly Important	31	29.81
Very Important	36	34.62
Extremely Important	19	18.27
Total	104	100%

TABLE 4.1 D Graphical Representation



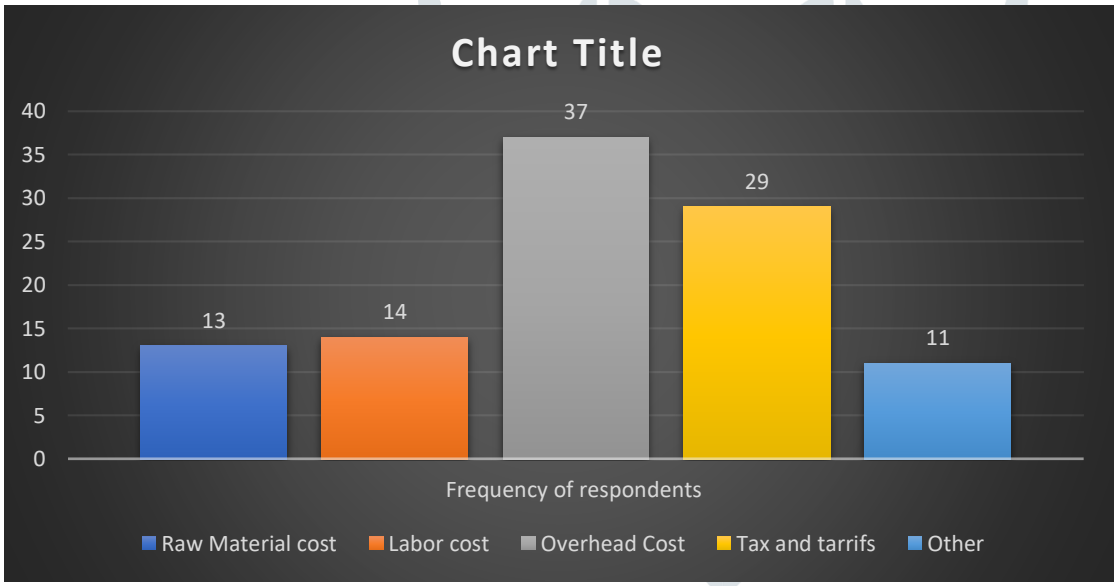
Interpretation

From the above graphical data, it gives and clear interpretation that SCM is very much important as 36 respondents have agreed out of 140 and other like not at all important, slightly important, extremely important are 17%, 29% and 18%.

TABLE 4.1 E- Factors which are considered while estimating the cost of products.

Category	Frequency of respondents	Percentage (in %)
Raw Material cost	13	12.50
Labor cost	14	13.46
Overhead Cost	37	35.58
Tax and tarrifs	29	27.88
Other	11	10.58
Total	104	100%

TABLE 4.1 F- Graphical Representation



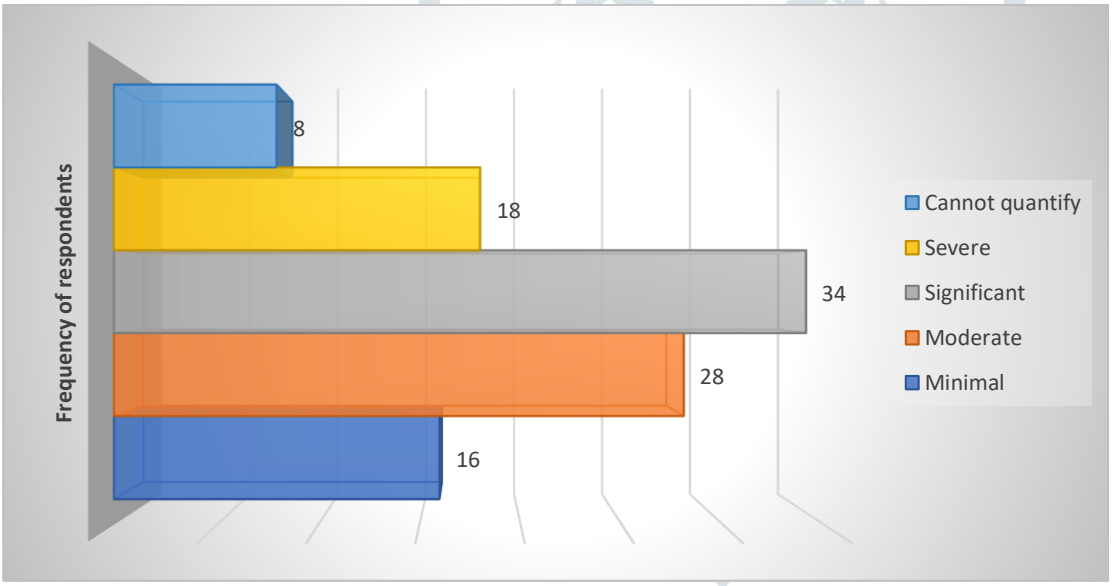
Interpretation

From the above data the factors considered while estimating the cost of products which are Raw material, Labor cost, overhead cost, tax and tariffs and other. Here the Overhead cost has considered more by respondents of 37 where it is also an important factor to be considered and other are comparatively less considered and tax and tariff is also and other important factor considered by 29 and 13 for Raw material, 14 for labor cost and other is by 11.

TABLE 4.1 F- the cost implications of supply chain disruptions in organization

Category	Frequency of respondents	Percentage (in %)
Minimal	16	15.38
Moderate	28	26.92
Significant	34	32.69
Severe	18	17.31
Cannot quantify	8	7.69
Total	104	100%

TABLE 4.1 F – Graphical Representation



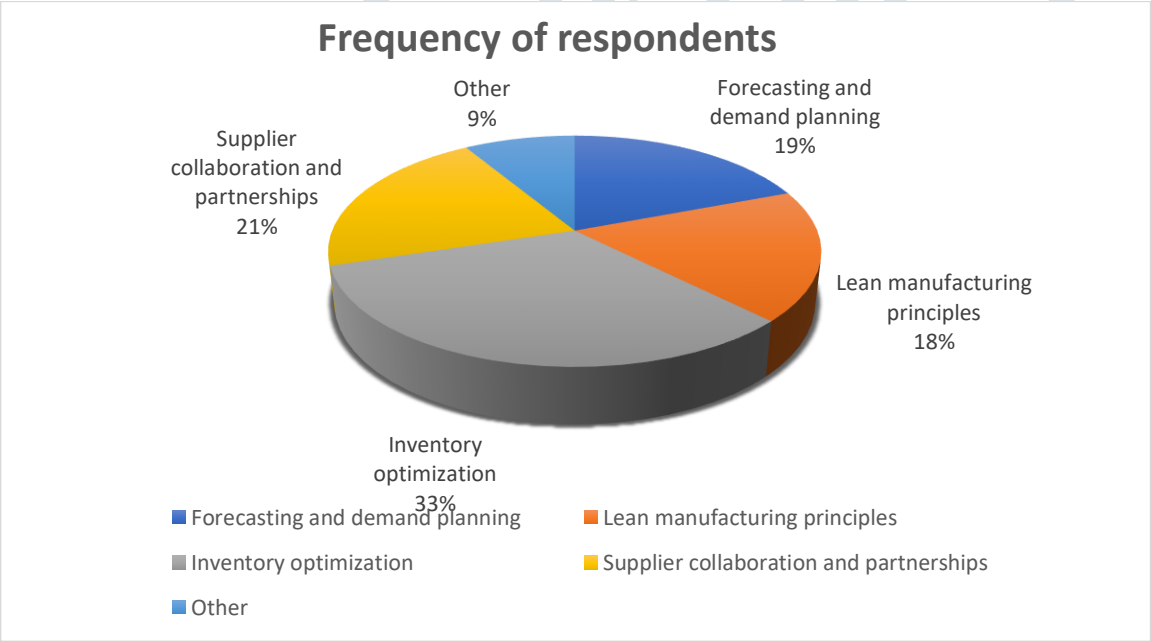
Interpretation

From the above table and data the cost implications of supply chain disruptions in organization is more likely to be significant by 34 responses, cannot quantify by 8, severe by 18, moderate by 28 and minimal by 16. Therefore, its more significant in organization that cost implications disrupts the supply chain.

TABLE 4.1 G - Strategies does organization use to optimize the supply chain

Category	Frequency of respondents	Percentage (in %)
Forecasting and demand planning	20	19.23
Lean manufacturing principles	19	18.27
Inventory optimization	34	32.69
Supplier collaboration and partnerships	22	21.15
Other	9	8.65
Total	104	100%

TABLE 4.1 G- Graphical Representation



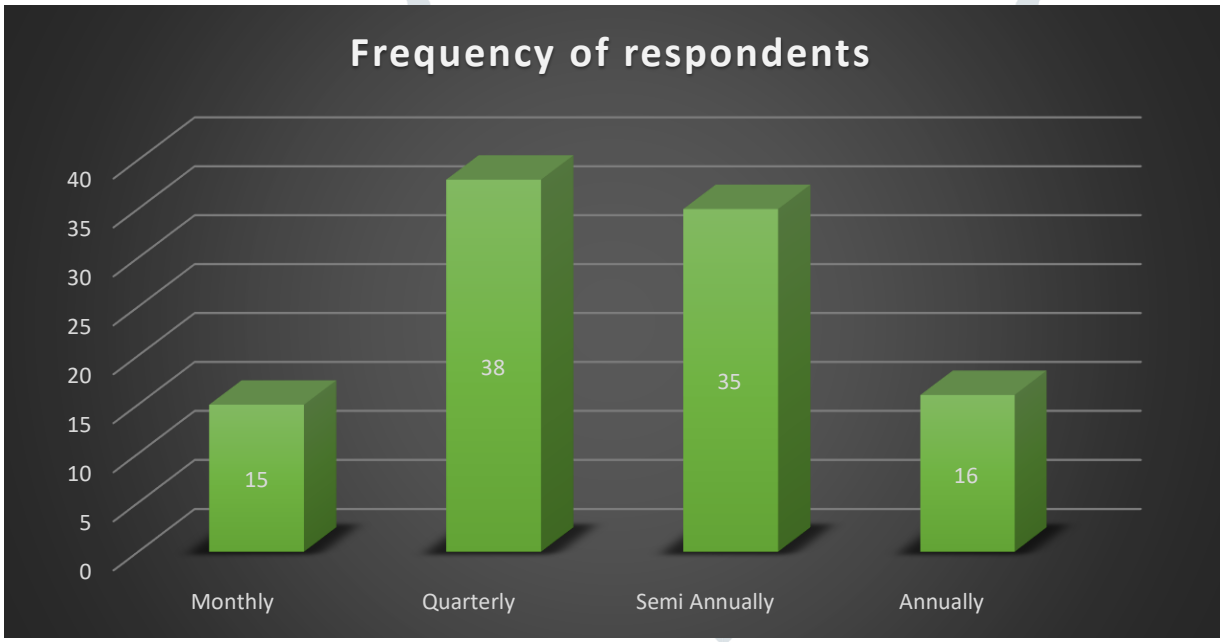
Interpretation

From the above data and representation that shows which strategy is suitable to optimize the supply chain in organization. Inventory Optimization is very suitable according to 33% of respondents, Supplier collaboration and partnerships is optimizable for 21% respondents also other, lean manufacturing principles and forecasting demand planning are little less than other as 9%,18% and 19%.

TABLE 4.1 H- How frequently does organization review and revise its supply chain management strategies.

Category	Frequency of respondents	Percentage (in %)
Monthly	15	14.42
Quarterly	38	36.54
Semi Annually	35	33.65
Annually	16	15.38
Total	104	100%

TABLE 4.1 H- Graphical representation



Interpretation

From the above representation the how frequently does organization review and revise its supply chain management strategies. The respondents review and revise quarterly are 38, Semi annually are chosen by 35, annually and monthly are 16 and 15.

FINDINGS AND SUGGESITION

1.In study it suggests that 43 respondents out of 104 are of the age 35-50 in the survey questionnaire. This suggests most of the respondents are known about topic well.

2. In this study it suggests that out of 104 respondents both male and female are equal respondents of 52 each.

3. In study it suggests that out of 104 respondents 37 are of people experienced of 10-15years. This could indicate a transitional phase in the workforce, where professionals either gain more experience or potentially move to more senior roles after 5 years.

4. With 35 respondents choosing inventory return metrics as the most used for evaluating organizational performance. It suggests that organizations prioritize understanding how well their inventory turnover contributes to profitability and operational efficiency.

5. Since 36 out of 140 respondents (about 26%) agreed that SCM is very important, emphasize the significance of SCM in enhancing operational efficiency, reducing costs, and ensuring timely delivery of goods and services. For the 17% who think SCM is not at all important and the 29% and 18% who find it slightly or extremely important respectively, it's crucial to understand their perspectives. Consider conducting follow-up surveys or interviews to delve deeper into their reasons for their opinions.

6. It seems that overhead costs are perceived as the most significant factor affecting product cost estimation by the respondents, followed by tax and tariffs. Raw material costs, labor costs, and other factors are also considered but to a lesser extent according to the respondents. Since overhead costs are considered significant, it would be beneficial to conduct a detailed analysis of all overhead expenses. Identify areas where overhead costs can be optimized or reduced without compromising product quality or operational efficiency.

7. Based on the responses highlighting significant cost implications from supply chain disruptions, it's crucial for organizations to prioritize resilience. Implementing robust risk management strategies, diversifying suppliers, and investing in technology for real-time monitoring can mitigate impacts. Collaborative contingency planning with key stakeholders is essential to safeguard operations.

8. Based on the survey data, prioritizing Inventory Optimization is key, as indicated by 33% of respondents. Additionally, focus on Supplier Collaboration (21%) is crucial. To enhance effectiveness, consider leveraging Lean Manufacturing (9%), Forecasting/Demand Planning (18%), and other optimization strategies (19%) in tandem for a comprehensive supply chain improvement plan.

9. Based on the survey results, most organizations review and revise their supply chain management strategies either quarterly (38 respondents) or semi-annually (35 respondents). Only a smaller portion opt for annual or monthly. To optimize supply chain effectiveness, consider more frequent reviews aligned with evolving market demands.

RECOMMENDATIONS

The report underscores the cost implications of supply chain disruptions and the necessity for organizations to have a well-defined strategy to manage risks. One recommendation from the study is to have a comprehensive strategy for managing risks in the supply chain. To reduce the negative effects of disruptions in the supply chain, companies had to carefully assess the feasibility of creating mitigation plans, transfer strategies, and contingency plans.

- Adopt technological solutions: The findings of the study indicate that technology plays a key role in the management of supply chains, and as a result, businesses ought to adopt technological solutions such as customer relationship management systems, transportation management systems, and warehouse management systems.
- Create collaboration with suppliers: The study emphasizes how important it is to collaborate with

suppliers in order to optimize the supply chain. In order to create collaboration, organizations should think about collaborative planning and forecasting, exchanging data and information, and continuous improvement activities.

- Maintain a healthy equilibrium between cost cutting and environmental responsibility: the findings of this study indicate that businesses must maintain a healthy equilibrium between cost cutting and environmental responsibility because both aspects are equally significant. Both of these factors are important for organizations to consider as they work to manage their supply chains, and they should make every effort to strike a balance between them.

In summary, the study emphasizes the significance of supply chain management in manufacturing businesses, and it offers insightful information regarding both the difficulties and the most effective solutions to these problems. The aforementioned recommendations should be seriously considered for implementation by companies in order to maximize the effectiveness of their supply chain management, save costs, promote sustainability, and enhance efficiencies

CONCLUSION

In conclusion, the research on the effects of supply chain management on the costing of manufacturing sectors has shown how essential efficient supply chain management is to the success of a company. According to the findings of the study, the management of supply chains, the reduction of costs, and the pursuit of sustainability are critical areas that organizations should focus on in order to achieve success

The results of the poll were analyzed, and the findings revealed that organizations confront several issues when it comes to the management of their supply chain. These challenges include managing the logistics and transportation, assuring the quality of raw materials, and preventing supply chain interruptions. According to the findings of the survey, technology also plays a key part in supply chain management, with customer relationship management systems and transportation management systems being the two types of systems that are utilized the most frequently

In general, the findings of the study have helped to advance our understanding of supply chain management and the role that it plays in determining pricing in the industrial sector. It is essential for any company to have efficient supply chain management to be successful, and companies need to continue investing in their supply chains if they want to maintain their competitive edge in the modern global economy.

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