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Factors Influencing Outbound Logistics Cost and Service Quality in Steel Industries in India: A Survey in Indian Steel Sector

N Jena and Nitin Seth

Indian institute of Foreign Trade, New Delhi

Abstract

Purpose- *The main purpose of this study is to explore the relationship of outbound logistics cost and service quality on Indian steel sector using descriptive analysis. Steel industry is the primary industry for any developed and developing country which plays very important role in the growth of its GDP and its economic sustainability. To address the research questions, a survey based empirical study was carried out in a representative sample of 390 from different levels like managers, Senior managers, Presidents and Vice Presidents and General Managers at the operational levels at reputed steel industries having annual turnover of US$150,000 dollars. All 390 responses received and analyzed descriptively and the results presented.*

The result showed that 88 percent of the respondents perceived the relationship of outbound logistics cost and service quality with reference to the impact on total overall logistics cost on the context of Indian steel industry. At the same time, poor infrastructure and port inefficiency were the main barriers for increasing the logistics cost as perceived by the respondents. The sample is restricted to the outbound logistics cost and its service quality in steel industries in India only. So caution needs to be exercised in generalizing the results.

In order to achieve the cost level at other developed and developing nations, the government of India should give focus on infrastructure development, improvising the exiting road condition and sea port development so that bigger size vessels can call to Indian ports for taking direct delivery of goods without any transshipment. Further, government of Indian needs to promote the multimodal logistics providers for timely evacuation of material as per the demand of industry requirements. To the best knowledge of the authors this study is the first attempt to survey the importance of outbound logistics cost and its service quality on steel manufacturing companies in India.

Keywords*: Logistics process, Indian Steel industry, outbound movements, Logistics cost, route mapping, transit time, Performance measurement.*

1. INTRODUCTION

This paper develops a clear nexus of outbound logistics service quality and the logistics cost for the steel manufacturing companies in India.

The foremost goal of outbound logistics are to satisfy customers' demands with effective cost. This idea is supported by Michael Porter, who mentioned that a successful company needs to provide the various products at a competitive price and to meet the requirement of customer all the time. Previously, companies have tried to reduce costs by looking for cheaper supply while customer service level might be reduced. Therefore, a new trend of logistics activity is traded-off on cost and customer service level, known "customer value". Waters *et al* describes that customer value is a ratio between perceived benefits and total cost of ownership of each customer. Rushton *et al*. Gave an equation to express that "***Outbound Logistics = Supply + Materials management + Distribution"***

The definition of cost is confined within their business entity. However, it has been argued that today's competition takes place not only between companies but between supply chains (Christopher, 1992). Hence, the proper view of costs has to be "end-to-end", since all costs will ultimately be reflected in the price of the finished product in the marketplace. However, outbound logistics cost within and across-firms are further underscored in most out-sourcing cases. For most companies, the costs are beyond their legal boundaries. The logistics cost in steel industry is considered as one of the top performance measurement of the entrepreneur in this research.

This paper develops a clear nexus of outbound logistics service quality and the logistics cost for the steel manufacturing companies in India.

1.1 Service Quality

The subject of service quality is explored by numerous researchers, as a result a large number of researchers have attempted to define service quality. For example, Parasuraman

et al., (1998) defined service quality as "the consumer's judgment about a firm's overall excellence or superiority", Gronroos, (2000) defines as the quality of a service subjectively perceived by customers during the interactions with an organization. The quality of service is an efficient means like the secure service which protect the information of customer's transaction by using latest technology. Service quality has five major dimensions: reliability, responsiveness, tangibles, empathy and assurance (Parasuraman *et al.*, 1988). Service quality further defined as "it is a form of behavior that relates to satisfaction but not equivalent to it which results as a balance of prospect with performance" (Bolton and Drew, 1991; Cronin Jr. and Taylor, 1992; Parasuraman, Zeithaml and Berry, 1988; Shepherd, 1999)

1.2 Service Quality Perspectives

Five perspectives of service quality have been identified by Parasuraman et al. (1988). These are empathy, reliability, responsiveness, assurance and tangibles which connect particular service character with hopes of customers.

(a) **Tangibles** – corporal impression of human resources, conveniences and equipments.

(b**) Empathy** – more attention towards things individually and concern about them.

(c) **Assurance** - employee's awareness and politeness and their potential to deliver faith and self-belief.

(d) **Reliability** – potential of institute, organization and employees to carry out service in promised and correct way.

(e) **Responsiveness** – Willingness of employees to help customers when they needed and deliver quick service to them. Asubonteng, McCleary and Swan (1996) discussed in their research that service quality scope is changed from one industry to another industry. As an example**,** Kettinger and Lee (1994) found four perspectives in their study about quality of information system that have not material perspective. Cronin and Taylor (1992) identified one-factor depth as a combination of five factor s 'measure introduced by Parasuarma et al., (1988)

1.3 Service quality and outbound logistics cost

The relationship between the service quality and outbound logistics cost have been investigated in a number of researches (Zeithaml, et al, 1988). They found that, there is very strong relationship between quality of service and logistics cost (Parasuraman et al, 1985). Increase in service quality of the product will definitely increase on logistics cost which ultimately retains valued customers at the global scenario (Nadiri, et al 2009). The higher level of perceived service quality results in increased customer satisfaction. When perceived service quality is less than expected service quality customer will be dissatisfied (Jain and Gupta, 2004). According to Cronin and Taylor (1992) satisfaction super ordinate to quality-that quality is one of the service dimensions factored in to overseas customer satisfaction judgment.

2.1 Logistics cost on Indian steel sector

Globally, the elements of Logistics are very critical factor in deciding the competitiveness of steel sector. The profitability of Indian steel sector depends entirely on how outbound logistics are managed. Moreover, it is observed that for the Indian steel manufacturing companies, the logistics cost are very high as compared to other developed countries. The total cost on logistics is around 16-18% of the business turn-over whereas; the world average is around 7-8%. (Source: CSMP report, 2016), hence there seems a tremendous opportunity to explore the subject and find the drivers for its control. Also it is noticed that outbound costs is about 55-60% of the total logistics cost and thus accounting as a major section of the total cost.

Outbound logistics is an important key to become a successful of a company, there are several parameters affecting the capability of logistics; new product development and order fulfillment, for instance. Logistics system can be depicted in figure -1, as follows;

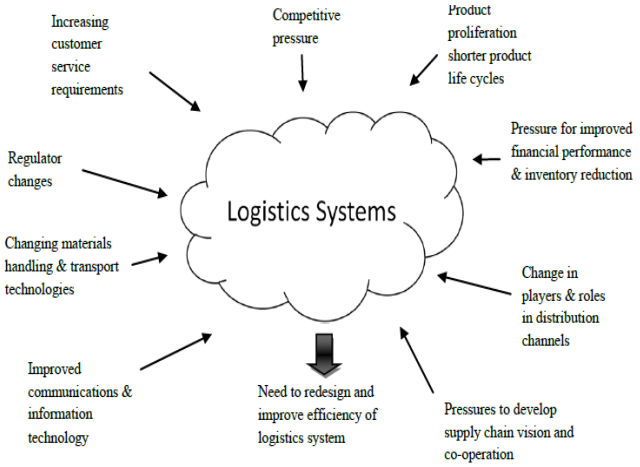


Figure: 1 Pressure influencing logistics system

Outbound logistics is one of the main functions within a company. The main targets of logistics can be divided into **performance** related and **cost** related. They are high due date reliability, short delivery times, low inventory level and high capacity utilization. But when decisions need to be made, there is always a tradeoff between these targets. This is what makes being a logistician challenging and interesting.

In today's highly competitive and global marketplace the pressure on organizations to find new ways to create and deliver value to customers grows ever stronger. The increasing need of industry to compete with its products in a global market, across cost, quality and service dimensions, has driven the need to develop logistic systems more efficient than those traditionally employed. Therefore, in the last two decades, logistics has moved from an operational function to the corporate function level. There has been a growing recognition that it is through an effective logistics management that the goal of cost reduction and performance enhancement can be achieved.

2. KEY CONCEPTS

3.1 Outbound logistics in Steel Industry in India

India is facing a bigger challenge in terms of logistics cost and its sustainability. The logistics industries in India are evolving rapidly and it is the interplay of infrastructure, technology and new types of service providers that will define whether the industry is able to help its customers to reduce their logistics costs. Logistics has been treated as one of the most potential area for the companies to provide a base for cost reduction.

India is the world's Fourth-largest producer of crude steel and is expected to become the second-largest producer by 2020. The growth in the Indian steel sector has been driven by domestic availability of raw materials such as iron ore and cost-effective labor. Consequently, the steel sector has been a major contributor to India's manufacturing output.

Steel sector is one of such sector, where the competition is very high and the potentials of growth are also very low, thus focus on logistics cost can help them in gaining competitiveness. Indian steel industries are in an advantageous condition on account of low cost manufacturing and easy access to technology.

Looking to this high logistics cost, various organizations are striving to understand various

elements of logistics processes and the factors influencing for such high logistics cost. An attempt is made to study the logistics process in steel sector. Figure -2 presents an attempt highlighting various processes involved on outbound logistics management.

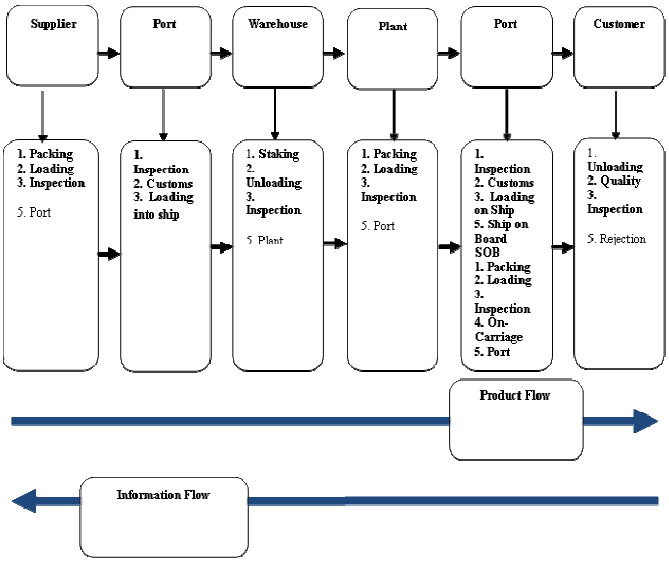


Figure 2: Typical logistics management process in Indian steel sector.

An attempt is made to identify the out bound logistics cost and its service quality in Indian steel industry; these are depicted in Table 1.

Outbound Logistics cost	Outbound Logistics Service Quality
a) Inventory carrying costs b) On-time delivery performance cost c) Obsolete inventory cost. d) Delivery of inventory on hand cost e) Warehousing cost f) Forecast accuracy cost g) Supply chain planning cost.	a) Intact Packing and palletizing b) Quality inspection Techniques c) Usage of reliable carriers d) 100% quality assurances e) Usage if good quality packing materials f) On time information to customers

(Adopted from State of Logistics report from CSCMP, 2016 and Council of Logistics Management, 2016)

In today's hyper competitive world and complex global environment, developing and maintaining competitive advantage is becoming increasingly challenging for different organizations. Organizations have realized one of the essential ways to succeed is to have a control on the cost of operations through effective and efficient management of their supply chains. Further, competitive priorities have forced Indian manufacturing organizations to change dramatically due to escalating customer expectations, continually increasing competition on a world-wide scale, cost, time and quality based constraints and mass customization (Mohanty and Deshmukh, 2012).

Logistics management can be formally defined as that part of the supply chain process that plans, implements, and controls the effective, efficient flow and storage of goods, services and related information from the point of origin to the point of

consummation in order to meet customer requirements (Chopra and Meindi, 2001).

Also, during the last 20 years, Indian steel sector has transformed itself from the conventional low cost steel manufacturing from iron ore to specialized and multipurpose steels manufacturing from scrap steels. This shift of manufacturing has led the heavy imports of scrap steel and thus a very high cost of inbound logistics and also high cost for out bound logistics. An attempt is made to study the inbound and outbound cost in Indian steel manufacturing highlighting select ways of logistics cost control;

On analyzing these elements of outbound logistics cost, it is visualized that the service quality are dependable on following logistics costs which can be categorized in to three broad categories, they are:

a) Inventory carrying cost.

b) Warehousing cost.

c) Supply Chain cost.

a) Inventory carrying cost:

Outbound delivery plays a very important role in steel industry's profitability. Any changes in the inventory policies would definitely affect the supply chain's efficiency and responsiveness. Inventory, being one of the drivers of supply chain performance, need to coordinate with other drivers to be able to determine the responsiveness and efficiency of the supply chain's performance.

Without inventory management, there would be no supply chain process. Each process should be managed according to the fulfillment of the ultimate priority which is the consumer satisfaction. Good management of the supply chain is achieved by integrating the logistics business processes of the partners in a supply chain to ensure the coordinated flow and storage as this would be carried out in the functional area of inventory management as well.

b) Warehousing Cost:

Warehousing and transportation are two primary components of the outbound logistics process. From a cost perspective, we thought it is important to capture both of these cost variables. Warehousing and transportation can provide different insights, including a perspective on how significant a commitment a firm chooses to make to the distribution process and how quickly the material can reach at buyer's place (i.e., the importance of the outbound logistics distribution process to a firm), or alternatively, the efficiency of a firm's outbound logistics process.

There are many surveys of supply chain practitioners are carried out which invariably show that practitioners rate on-time delivery as the most important measure of a supplier's service to a customer. Therefore, we selected warehouse charges are the key service indicator in our analysis.

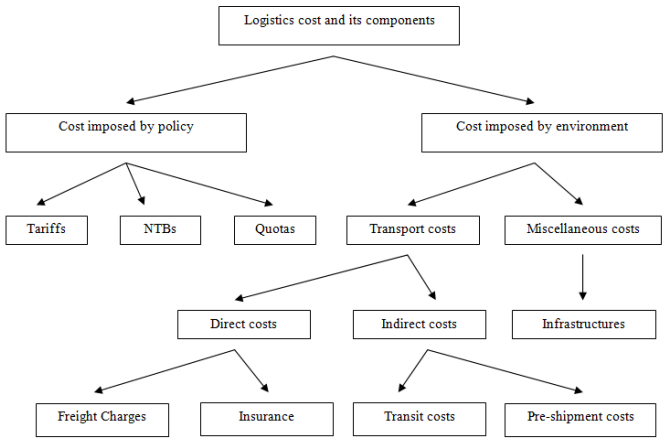
c) Supply Chain cost.

However, despite the importance of the role of outbound logistics in supply chain management , minimal rigorous performance data based research has been done on the direct, stand-alone impact of outbound logistics on such questions as its influence on a firm's profitability and how firms' approaches to outbound logistics differ. Rather, the literature to date tends to group outbound logistics activities into broader studies of supply chain operations where outbound logistics represents just one sub-component. In this research, outbound logistics represents our sole focus. Further, research on ***supply chain management*** including outbound logistics also tends to be survey based (i.e., based on surveys of practitioners' perceptions) rather than performance data based. In this study, we attempt to address this gap by utilizing actual firm performance data.

There are two types of cost inbuilt with outbound logistics components. A detailed logistics cost and its components are shown in Figure 3..

a) Cost imposed by Policy.

b) Cost imposed by environment.



Source: Council of Logistics Management, 2016

Figure 3: Typical logistics cost and its components in Indian steel industry.

4. MATERIALS AND METHODS

4.1 Research objectives

The primary objective of this paper is to investigate the importance of the dependent variables, outbound logistics service quality via Logistics Cost as an independent variable in steel sector in India. Therefore the following hypothesis is framed:

H_1. There is positive relationship between Logistics cost and outbound logistics service quality at Steel manufacturing sector in India.

Further in order to accomplish the aim of research the following sub objectives are also considered

1) Understanding the elements of outbound logistics cost in different activities such as inventory carrying cost, Warehousing cost and Supply chain cost.

2) Developing the relations of various costs with fuel price, labor cost and exchange rates with the outbound logistics service qualities.

4.2 Materials and methods

This study was conducted in two phases. The first phase focused on qualitative research, and the second phase focused on a quantitative research approach. The focus group assisted the researchers in developing the questionnaire and provided the desired information on the importance of Logistics cost and the outbound logistics performance from the viewpoint of steel manufacturing industries in India. The questionnaire was used during the quantitative phase of research. The reason for quantitative data is that it is easy to interpret the results in simple conclusion (Zinkmund and Babin, 2007). Taking into consideration, the nature of the research, the study was descriptive. A structured questionnaire survey was used to collect data for this research, and this process was administered by conducting personal interviews. The questionnaire included self-developed items, as well as items from questionnaires used in previous researches.

The populations of the research consist of the senior logistics professional of major steel industries in India whose annual turnover is more than US$ 150,000 million. For the purpose of this study, a probability sampling method was used followed by simple random sampling in this study and analysis. The reason for selecting this sampling technique was that the sampling frame of the study was divided into subgroup, strata, and the sampling process was performed separately on each stratum. Stratified samples are the most statistically efficient and they allow the investigation of the characteristics of the interest for particular subgroups within the population (Churchilll and lacobucci, 2005). The sample size of this study was twofold. Firstly, the sample was based on the senior logistics professionals like president and Vice –Presidents who have daily interaction with the people down below for logistics management for the timely delivery of goods with proper mode of transportation and inspection of goods while leaving from their factory premises.

Secondly, the percentage was applied to 390 senior logistics professionals at the different steel manufacturing companies in India to understand how the proper logistics management can help the performance of outbound logistics in a better way in order to meet the need and desire of customers. The research instrument, a questionnaire was pre-tested in a pilot study involving twenty one senior managers those are engaged in shipping and logistics for arranging the timely transportation and onward movement through reputed shipping lines with lesser transit time. The reliability measurement for this study was the internal consistency reliability test. Reliability tests whether the questionnaire will measure the same thing more than once and result in the same outcome every time, the extent to which a particular measure is free both systematic and random error indicates the validity of the measure. Data analysis refers to the transformation of raw data into a form that makes it easy to understand and intercept. Describing responses or observations is typically the first form of analysis (Ndubisi *et al.*, 2008) SPSS 16 was used to analyze the data so that the data could be interrupted into meaningful information or findings that were explored further to propose recommendations to the research.

5. STATISTICAL ANALYSIS

The findings of the empirical investigation are subsequently presented. Firstly the statistical analysis is presented to show the relations of inventory carrying cost, Warehousing cost and supply chain costs with respective related variables. Further, the multiple regression analysis is carried out to understand the relations between the outbound logistics cost and outbound logistics performance.

a) Reliability testing

The internal consistency reliability test compares different samples of the items being used to measure a phenomenon during the same time period. This can be done by means of a split -half reliability test also known as the coefficient alpha or Cronbach's alpha and results below 0.60 will reflect the lower level of acceptability (Ndubisi *et al.* 2008). The reliability Cronbach's alpha for the questionnaire was 0.85. This confirms that the measurement set used in the study is reliable.

b) Data Analysis and Results

A study of relationship between the various elements of logistics cost of Indian steel industry and various economics factors are analysed through multi-regression model presented in this section. SPSS 16 statistical software is used as a tool to determine and analyze for parameters selection into the logistics cost model. There are several parameters related to each of the cost function are analysed, the results are presented as follows:

1) Inventory carrying cost depends on the warehouse charges, fuel price, and the labour cost. The result from regression analysis of inventory carrying cost is shown in Table 2.

Table 2: Inventory carrying cost function and Statistical results.

Inventory carrying Cost = f (warehouse charges, fuel price, and labour cost)	
R- squared =0.947326	F-statistics -78.76543
Adjusted R-squared =0.926786	Durbin-Watson= 2.38765

2) Warehousing cost depended on the cost of labour and interest rate. The result from regression analysis of warehousing cost is shown in Table 3.

Table 3 Warehousing cost function and Statistical results.

Warehouse Cost = f (interest rate , labour cost)	
R- squared =0.934565	F-statistics = 45.08765
Adjusted R-squared =0.924343	Durbin-Watson= 1.665432

3) Supply Chain cost depended on the labour cost and exchange rate. The result from regression analysis of supply chain cost is shown in Table 4.

Table 4: Supply chain cost function and Statistical results.

Administrative Cost = f (exchange rate ,number of labor)	
R- squared =0.898765	F-statistics = 38.07876
Adjusted R-squared =0.843543	Durbin-Watson= 1.87654

The influencing and important factors like fuel price, exchange rate and **interest** rate are the data taken from various government agencies and presented as under:

5.2 Fuel Price:

Fuel price plays an important role on the entire logistics outbound delivery cost as water freight is one of the important component for deciding the price competitiveness. Crude oil prices are always volatile and while deciding the water freight there is always a provision kept in mind that the component is bifurcated into two segments as (***Basis water freight + Bunker adjustment factor)*** . BAF is only paid at the time of actual fuel price incurred while transporting the goods on a particular voyage.

Price for outbound logistics cost = Inventory carrying cost + Warehousing charges + supply chain cost.

5.3 Exchange rate:

In international business, an exchange rate is the rate at which one currency will be exchanged for another. It is also regarded as the value of one country's currency in relation to another currency. The impact of fluctuation is very much volatile and it is measured through various financial agencies all the time. The international freight for outbound logistics is always negotiated and decided through foreign currencies at a particular exchange rate. The shipping transit time from Indian port to all European countries are in the range of 25-30days voyage time. By the time cargo reaches at the foreign destination and outbound freight paid to shipping company, it is always found and observed that there is a significant difference on exchange rate fluctuations.

Therefore, the outbound supply chain component is also bifurcated into two segments as (***Basis water charges + Currency adjustment factor)***. CAF is always taken into consideration since the impact on international transaction is quite substantial.

5.4 Interest rate.

An interest rate is the amount of interest due for a particular period from where the funding arranged. In terms of international business, the borrowing parten is totally different in comparison to the domestic business. Export related transactions are being taken place through the borrowing from Export Import Bank, Asian development Banks, External Commercial borrowings and other financial institutions at a concessional interest rate which is called as "LIBOR "rate.

Therefore any interest levied on outbound inventory delivery has also been considered on this research.

6. Multiple regression analysis results for outbound Logistics cost and logistics performance

Multiple regression analysis was performed to assess the relationship between the independent variable, i.e. outbound logistics cost and the dependent variable, logistics performance. The results are reflected in Table 5. It clearly indicates that the independent variable positively influenced the dependent variable. The relationship between outbound logistics cost elements and logistics performance is significant at p = 0.000. This relationship implied that if the outbound logistics cost successfully maintains relationships with its customers by way of providing on time information, data and documents, service performance at customers end will definitely increase. Table 5 indicates that the independent variable in the multiple regression analysis explained 81 percent of the variance (R) in the dependent variable.

Table 5: Influence of the independent variable outbound logistics cost on logistics performance

Frame work	Sum of square	DF	Service Mean Square	Quality F	Sig	R^2	Standardized Coefficients Beta	T	Sig
Regression	262.776	I	69.956	0.654	0.000	0.887			
Residual	5673.17	46	114.641						
Total	5876.986	49							

Constant								2.134	0.074
LM							0.912	28.198	0.000

In other words, it can be said that 91 percent of a possible change in the level of customer outbound logistics performance is intact with proper logistics cost. Table 5 further indicates that one unit in logistics cost will increase outbound logistics performance by 88.7 percent when considering Beta. Therefore, the hypothesis which states that there is a positive relationship between the outbound logistics cost and outbound logistics performance with all manufacturing of steel products in India is accepted.

6.1 Validity

Criterion – related validity, sometimes called predictive validity or external validity, is concerned with extent to which a measuring instrument is related to an independent measure to the relevant criterion (Kaplan, 1987). Thus it is expected that as a result of successful implementation of logistics management in the steel sector in India, outbound logistics performance will improve.

6.2 Relevance of the findings for training and development

The empirical results imply that outbound Logistics cost can improve outbound logistics performance and maintain its relationship between the steel industry and the need of customer on more efficiently and accurately. Furthermore it is clear that the elements of outbound logistics process further to be strengthened on step–wise and there should be close monitoring mechanism in order to further improve the logistics performance.

The findings of this study provides very significant insights for training and development, some of the significant insights are:

a) The steel manufacturing companies should develop training sessions to inform the employees and to make them understand the whole logistics process and its management in such a way that the outbound material movement should be faster, hassle free and avoidance of other hidden costs for which the ultimate customer should not suffer while taking the delivery of goods.

b) The employees also should get adequate training and knowledge about the changes on shipping paten, packaging changes as per international standards along with the interest rate on their borrowings in order to make their organization into profitability.

c) The ground staff must have adequate training towards the knowledge on INCO (international commercial terms) while arranging the outbound shipment, route mapping and on time delivery of goods at buyer go down. As this study suggests, only one unit increase then the importance of other factors also increases for high performance and on time delivery of goods at buyers place. . The steel manufacturing companies should ensure that outbound Logistics cost and outbound logistics performance will increase by delivering high quality and high value services.

d) A strong need is visualized towards training the managers for identifying the market fluctuation in crude pricing, exchange rates and interest rates as have a direct impact on outbound logistics cost.

7. CONCLUSIONS

This study analyzed the competitive outbound logistics performance for the steel industries in India. This study attempted the important area of outbound logistics management in Indian steel sector. Outbound logistics management for the steel sector in India gains high importance as key steel manufacturing organizations are situated far away from ports and majority of the finished products like steel coils, slabs and steel sheets are exported on container mode. Many times it is observed that materials are getting dispatched from plant and it is again stored at warehouses nearer to port area for further loading into available vessels. *The inventory carrying cost* increases when the finished goods kept at warehouses for a longer period of time because of non-availability of adequate size of vessel because of port inefficiency which further leading additional warehousing charges.

Indian sea ports are incapable to handle bigger size of vessels like Cape size, Panamax, Supermax because of lower drafts. Outbound delivery for steel industries are quite dense cargo which requires heavy lift containers and again immediate loading into vessel in order to avoid further damages to cargo as well as to containers. But , in Indian scenario because of all such uncertainties ,*the inventory carrying cost , warehousing cost and supply chain cost* are quite high all the time which leads to the organizations profitability low.

The findings of this research are very useful for both academia and professionals. Based on the results obtained from the test of hypothesis it could be concluded that Indian steel industries should implement strategies aimed at improving the outbound logistics performances and thus the overall outbound logistics process will improve and cost will be reduced. The strategies when implemented will increase outbound logistics performance which in turn will lead to increased profitability of the organization and sustainability of the Indian steel sector in future.

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