



## A STUDY ON EFFECTIVENESS OF LOGISTICS SERVICES IN DELIVERING PRODUCTS TO CUSTOMER IN SUGAR INDUSTRY IN TAMIL NADU

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### Abstract

Logistics is the process of planning, implementing, and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods and related information from point of origin to point of consumption for the purpose of conforming to customer requirements. The main purpose of this research paper is to examine the effectiveness of logistics operations in delivering product to the customer and also focus on logistics practices in sugar Industry in Tamilnadu. Today customers are demanding an increasingly higher level of logistics service. The fully integrated control of all aspects of the good flow integrated logistics services. For the effective logistics services of the goods flow, logistics functions and operations must be coordinated in such a way that supplier, customers and carriers are explicitly involved in the process of making sure that end products are available on time. More recently Sugar Industry are putting more attention on building a long term contractual relationship with their customers by providing multiple services.

**Key Words:** Transportation, Material Handling, Order Processing, Protective Packaging, Delivery System.

### Introduction

The word logistics has been derived from the Greek word 'logistikos' and the Latin word 'logisticus', meaning the science of computing and calculating. Logistics is considered to have originated in the military's need to supply themselves with arms, ammunition and rations as they moved from their base to a forward position. Logistics management is that part of the supply chain which plans, implements and controls the efficient, effective forward and reverse flow and storage of goods, services and information between the point of origin and the point of consumption in order to meet customers' requirements. Logistics is a process of movement of goods across the supply chain of the company. However this process consists of various functions, which have to be properly managed to bring effectiveness and efficiency in the supply chain of the organization. The major logistics functions are shown as Order Processing, Inventory Management, Warehousing, Transportation, Material Handling and Logistical Packaging. India has been known as the original home of sugar and sugarcane. Indian mythology supports the above fact as it contains legends showing the origin of sugarcane. The Indian sugar industry banks on the sweet tooth of the country's citizens as sweets and savories favor every occasion. Almost 75% of the sugar available in the open market is consumed by bulk consumers like bakeries, candy makers, sweet makers and soft drink manufacturers. Greater urbanization and rising standard of living have sparked of a rising trend in usage of sugar. Some of the pertinent facts relating to the Indian sugar industry can be encapsulated in the following manner: Tamil Nadu is recognized as one of the leading sugar producing states in

- The quantum of sugar produced by a mill is determined by the factors like daily crushing capacity, duration of crushing season and percentage of sugar recovery from the cane crushed.
- Sugar prices in the country can be classified into two broad categories at the user end as free market prices and prices of sugar through public distribution system.
- The substantial increase in the volume of free international trade in sugar presents an excellent opportunity to the Indian sugar industry to embark on a regular plan for sugar exports.
- The only cloud on the horizon is the restrictive sugar policy along with unstable sugar production pattern makes it an erratic trader on the world market.

### Literature of Review

Chang-Ing and I-Jin (1999) show the relation between average logistics cost per item, consumer demand and the interrelationship between them analyzed. Commodities are distributed through a depot directly or through single intermediate terminal to many retail establishments. Minimizing average logistics cost, or maximizing total supply subject to the demand.

Supply equality determines the optimal density of retail establishments and local terminals. The envelope curves for the optimal configuration strategies corresponding to different values of total market area and terminal cost are derived.

Vijayaraghavan (2001) focuses on the importance of transportation in logistics. He states that transportation is the backbone of the entire supply chain. Transportation makes it possible for a company to achieve the well-known seven 'R's—the Right product in the Right quantity and the Right condition, at the Right place, at the Right time for the Right customer at the Right cost.



Yung-Yu Tseng (2005) accentuates the role of logistics and transportation. The overall performance of a logistics system can be changed by improving transport efficiencies because transport accounts for the highest cost among the related elements in the logistics systems. He also opines that there is an interdependent relationship between transport and logistics system. A successful logistics system can improve traffic environment and transportation development.

Martin Christopher (2007) states that effective logistics management can be a major source of competitive advantage. Superiority over competitors in terms of customer performance may be achieved only through effective management of logistics. He also states that the ingredients of success in the market place are numerous but it is based on the three 'C's— the triangular linkage of the companies, its customers and its competitors.

Campos & Nobrega, (2009) said that Logistics service quality is the result received comparing customers' expectations with customers' perception of service quality. Clients, prior to ordering the service, already have expectations of what the service provider should offer them. Therefore the quality of logistical service perceived by the client is the difference between the perceived service and expectation.

### **Statement of the Problem**

Logistics involve the integration of transportation, inventory, warehousing, information, material handling and packaging of an organization. The operating responsibility of logistics is the geographical positioning of raw materials, work-in-process, and finished inventories where required at the lowest cost possible. The study is aimed at assessing and analyzing the cost in Transportation, order processing and Inventory of sugar manufacturer in delivering product to the customer.

### **Objective of the Study**

- To identify and analyze the effectiveness of logistics services of the sugar industry in delivering products to the customer.
- To analyze, whether the present logistics practices meet the needs of the customer in sugar manufacturer in Tamilnadu.
- To identify the satisfaction level of the customer regarding the logistics practices at sugar industry in Tamilnadu.
- To examine the various values added services such as product packaging, inventory, and documentation processing and delivery system of sugar manufacturer.

### **Scope of the Study**

Logistic management is the management process which integrates the flow of supplies in to, through and out of organization to achieve a level of service which ensures that the right materials are available at the right place, at the right time, of the right quality at the right cost.

- The scope of the study is to know the customer requirement and expectation towards logistics operation in the sugar manufacturer in Tamilnadu.
- It helps to study the customer grievance handling towards the Logistics Service of the sugar manufacturer in Tamilnadu.
- It helps to know the efficient use of transportation resources while meeting the needs of the customer.
- To study the trends and challenges faced by service provided in the sugar industry.
- To have a clear idea about the operations related to order processing, inventory management, warehousing, transportation, material handling, material packaging and delivery system.

### **Research Methodology**

#### **Research Design**

The research design used for the study is descriptive. The major purpose of using such a design is description of the state of affairs as it exists at present.

#### **Sampling Design**

##### **Population**

The population of the study consists of the different target respondents like wholesalers, Traders, retailers, hotels, food manufacturer and Pharmaceuticals Company. The sample size of the actual study consisted of 75 clients.

##### **Sampling Technique**

The sampling technique used was random sampling method is adopted in this study. It refers to the technique or the procedure in selecting the items for the sample.

### Data Collection Method

Data was collected only through primary source. Primary data was collected through questionnaires, which were administered through face-to-face interview.

### Data Analysis

#### Reliability Test

Reliability Statistics	
Cronbach's Alpha	N of Items
0.563	30

### Inference

The alpha coefficient for 30 items is 0.563 suggesting that the items have relatively internal consistency.

### Factor Analysis

#### Descriptive Statistics

Descriptive Statistics			
	Mean	Std. Deviation	Analysis N
Year of experience	2.69	1.102	75
Years dealing with sugar manufacturer	2.69	1.102	75
Type of customer are you	2.48	1.119	75
Type of sugar bag is being purchased by you	2.73	1.256	75
Frequently do you place orders	2.48	1.119	75
Any delay in your order being processed and confirmed	3.37	1.373	75
Quantity of sugar purchased by you per month	2.43	1.029	75
Products available to you whenever you ask for it	3.57	1.296	75
Infrastructure and facilities in the sugar warehouse	3.36	1.291	75
Opinion about service of the transport arrangement by Sugar Manufacturer	3.37	1.373	75
Approximate distance between you and Sugar Manufacturer	2.25	1.015	75
Status of placed order and delivery is being intimated to you	3.60	1.252	75
Satisfaction level based delivery of products to you	3.36	1.291	75
Value added services offered during product delivery	3.53	1.189	75
Products are delivered on the time	3.45	1.222	75
Satisfaction level about the stocking of sugar bags in lot at the sugar godown	3.32	1.264	75
Opinion about storage of sugar bags in hygienic condition at the warehouse	3.64	1.270	75
Satisfaction level abt the use material handling equipments used for loading the sugar bags to the customer	3.32	1.264	75
The material handling effectiveness of the workers in loading sugar bags to the vehicle	3.64	1.270	75
Opinion about the quality of packaging material used for the sugar bags	3.45	1.222	75
Feel about the precautionary measures taken for delivering products on time	3.35	1.257	75
Opinion about packaging process of the sugar bags	3.48	1.277	75
Documentation process for delivery of products	3.48	1.277	75
Flow of communication and information with Sugar Manufacturer	3.48	1.277	75
Complaint arise regarding Sugar Manufacturer	3.59	1.231	75
Factors had made you to select Sugar Manufacturer	2.27	1.095	75

### Inference

From the above table looking at the mean, it is concluded that storage of sugar bags in hygiene condition at the warehouse and material handling effectiveness of the worker in the loading the sugar bags to the vehicle is the most important variable that influence logistics services in delivering the products to the customers.

### Kmo and Bartlett's Test

Kmo and Bartlett' Test		
Kaiser-Meyer-Olkin Measures of Sampling Adequacy	0.723	
Bartlett's Test of Sphericity	Approx. Chi-Square	3422.295
	Df	1225
	Sig.	0.000

### Inference

The KMO value close to 1 indicates that pattern of correlation are relatively compact and so factor analysis yielded is reliable. Kaiser (1974) recommend accepting values greater than 0.5 as acceptable. Values between 0.7 and 0.8 are good. For the present study the KMO value is 0.723 which falls in to the range of being good. So factor analysis is appropriate for the study. The Bartlett's test is highly significant ( $p < 0.0001$ ) therefore the factor analysis is appropriate.

### Communalities

Communalities		
	Initial	Extraction
Year of experience	1.000	.924
Years dealing with sugar manufacturer	1.000	.788
Type of customer are you	1.000	.595
Type of sugar bag is being purchased by you	1.000	.845
Frequently do you place orders	1.000	.510
Any delay in your order being processed and confirmed	1.000	.937
Quantity of sugar purchased by you per month	1.000	.604
Products available to you whenever you ask for it	1.000	.880
Infrastructure and facilities in the sugar warehouse	1.000	.911
Opinion about service of the transport arrangement by Sugar Manufacturer	1.000	.937
Approximate distance between you and Sugar Manufacturer	1.000	.393
Status of placed order and delivery is being intimated to you	1.000	.795
Satisfaction level based delivery of products to you	1.000	.911
Value added services offered during product delivery	1.000	.861
Products are delivered on the time	1.000	.906
Satisfaction level about the stocking of sugar bags in lot at the sugar godown	1.000	.828
Opinion about storage of sugar bags in hygienic condition at the warehouse	1.000	.847
Satisfaction level abt the use material handling equipments used for loading the sugar bags to the customer	1.000	.847
The material handling effectiveness of the workers in loading sugar bags to the vehicle	1.000	.799
Opinion about the quality of packaging material used for the sugar bags	1.000	.814
Feel about the precautionary measures taken for delivering products on time	1.000	.889
Opinion about packaging process of the sugar bags	1.000	.838
Documentation process for delivery of products	1.000	.840
Flow of communication and information with Sugar Manufacturer	1.000	.775
Complaint arise regarding Sugar Manufacturer	1.000	.814
Factors had made you to select Sugar Manufacturer	1.000	.851
Extraction Method: Principal Component Analysis.		

### Inference

The above table shows how much of the variance (i.e. the communality value should be more than 0.5 to be considered for further analysis. Else these variables are to be removed from further steps of factor analysis). Since all the variable has communality value more than 0.5 the next step of factor analysis can be done.

### Total Variance Explained

Component	Total Variance Explained								
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.808	18.491	18.491	4.808	18.491	18.491	3.971	15.274	15.274
2	4.087	15.718	34.209	4.087	15.718	34.209	3.544	13.630	28.904
3	3.027	11.643	45.852	3.027	11.643	45.852	2.445	9.402	38.306
4	2.639	10.150	56.002	2.639	10.150	56.002	2.422	9.316	47.622
5	2.195	8.441	64.443	2.195	8.441	64.443	2.413	9.280	56.901
6	1.496	5.754	70.196	1.496	5.754	70.196	2.073	7.973	64.874
7	1.339	5.151	75.347	1.339	5.151	75.347	2.027	7.798	72.672
8	1.149	4.419	79.766	1.149	4.419	79.766	1.844	7.094	79.766
9	.969	3.726	83.492						
10	.910	3.501	86.993						
11	.801	3.080	90.073						
12	.545	2.097	92.170						
13	.494	1.902	94.072						
14	.419	1.613	95.685						
15	.271	1.041	96.725						
16	.186	.714	97.440						
17	.170	.653	98.093						
18	.127	.490	98.582						
19	.119	.459	99.041						
20	.082	.316	99.357						
21	.069	.265	99.622						
22	.050	.191	99.813						
23	.026	.102	99.915						
24	.022	.085	100.000						
25	7.318E-017	2.815E-016	100.000						
26	-5.236E-018	-2.014E-017	100.000						

Extraction Method: Principal Component Analysis.

### Inference

From the above table for analysis and interpretation purpose extracted sum of squared loading is only considered. In that the first factor accounts for 18.49% of the variance, the second 15.718% and the third 11.643% and continues till the eight factor. All the remaining factors are not significant.

### Component Matrix

	Component Matrix <sup>a</sup>							
	Component							
	1	2	3	4	5	6	7	8
Year of experience	-.518	.655						
Years dealing with sugar manufacturer	-.675		.387					
Type of customer are you							-.345	.306
Type of sugar bag is being purchased by you	.412	.507						-.511
Frequently do you place orders			.373		-.307			.453
Any delay in your order being processed and confirmed	-.331	.756	-.363					
Quantity of sugar purchased by you per month					-.336	.443		
Products available to you whenever you ask for it	.631			-.575				
Infrastructure and facilities in the sugar warehouse	.826	.302						
Opinion about service of the transport arrangement By Sugar Manufacturer	-.331	.756	-.363					
Approximate distance between you and Sugar Manufacturer								.412

Status of placed order and delivery is being intimated to you			.377		.347	.476		
Satisfaction level based delivery of products to you	.826	.302						
Value added services offered during product delivery	-.360			.710			.330	
Products are delivered on the time			.636		.591			
Satisfaction level about the stocking of sugar bags in lot at the sugar godown		.447		.653			-.339	
Opinion about storage of sugar bags in hygienic condition at the warehouse	.349	-.669		.454				
Satisfaction level abt the use material handling equipments used for loading the sugar bags to the customer		.307	.390	.548		.348		
The material handling effectiveness of the workers in loading sugar bags to the vehicle	.622	-.303	-.336		.356			
Opinion about the quality of packaging material used for the sugar bags			.797			-.391		
Feel about the precautionary measures taken for delivering products on time			.791				.333	
Opinion about packaging process of the sugar bags	.465	.481			.446			
Documentation process for delivery of products	.521	-.393		.337		.399		
Flow of communication and information with Sugar Manufacturer	.610				.517			
Complaint arise regarding Sugar Manufacturer			.437		-.444	-.580		
Factors had made you to select Sugar Manufacturer	.312	.575					.547	
Extraction Method: Principal Component Analysis.								
a. 8 components extracted.								

### Inference

The above table shows the loading (extracted value of each item under 8 variable) of the thirty variable on the eight factor extracted. The higher the absolute value of the loading, the more the factor contributes to the variable (extracted 8 variable according to the most important item which similarly responses in component 1 and simultaneously in component 2, 3, 4, 5 and so on. The empty space on the table represent loading that are less than 0.3.

### Rotated Component Matrix

	Rotated Component Matrix <sup>a</sup>							
	Component							
	1	2	3	4	5	6	7	8
Year of experience	-.792		.315	.338				
Years dealing with sugar manufacturer	-.722							.319
Type of customer are you					.551			
Type of sugar bag is being purchased by you							.846	
Frequently do you place orders								.670
Any delay in your order being processed and confirmed	-.441		.668				.347	
Quantity of sugar purchased by you per month		.426				-.403		.403
Products available to you whenever you ask for it		.805		.330				
Infrastructure and facilities in the sugar warehouse		.810					.360	
Opinion about service of the transport arrangement by Sugar Manufacturer	-.441		.668				.347	
Approximate distance between you and Sugar Manufacturer							-.436	
Status of placed order and delivery is being intimated to you			-.750	.311				
Satisfaction level based delivery of products to you		.810					.360	
Value added services offered during product delivery		-.856						
Products are delivered on the time				.889				
Satisfaction level about the stocking of sugar bags in lot at the sugar godown					.796			
Opinion about storage of sugar bags in hygienic condition at the warehouse	.841							

Satisfaction level about the use material handling equipments					.472		.409	.604
The material handling effectiveness of the workers in loading sugar bags to the vehicle	.748							-.351
Opinion about the quality of packaging material used for the sugar bags				.440		.736		
Feel about the precautionary measures taken for delivering products on time				.706			.317	.440
Opinion about packaging process of the sugar bags					.835			
Documentation process for delivery of products	.774							.316
Flow of communication and information with Sugar Manufacturer		.370		.410	.384			-.476
Complaint arise regarding Sugar Manufacturer						.872		
Factors had made you to select Sugar Manufacturer			.809	.316				
Extraction Method: Principal Component Analysis.								
a. Rotation converged in 12 iterations.								

### Inference

Rotated component matrix makes the interpretation of the analysis easier. From the table, year of experience dealing with sugar manufacturer, delay in order being processed, opinion about the service of transport arrangement loaded on factor (component) 1 while quantity of sugar purchased, product availability, infrastructure and facility in sugar warehouse are substantially loaded on factor 2. All the remaining variable are substantially loaded on factor. These further can be used as variable for further analysis.

### Chi Square Analysis

**Null Hypothesis (H0):** There is no significant association between rating of transportation service by manufacturer and dealing with the customers.

**Alternate Hypothesis (H1):** There is significant association between rating of transportation service by manufacturer and dealing with the customers.

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	29.517 <sup>a</sup>	12	.003
Likelihood Ratio	32.864	12	.001
Linear-by-Linear Association	4.487	1	.034
N of Valid Cases	75		

a. 0 cells (0.0%) have expected count less than 5.  
The minimum expected count is 1.60.

### Inference

The pearson chi square significant value is 0.000 which is less than 0.05. Hence null hypothesis is accepted. Therefore there is no difference between rating of transportation service by manufacturer and dealing with the customers.

### Correlation Analysis

**To the Study the Relationship Between Products Delivered on Time and the Quality of Packaging Material Used for Sugar Bags.**

Correlations			
		Products are Delivered on the Time	Opinion about Packaging Process of the Sugar Bags
Products are delivered on the time	Pearson Correlation	1	.378**
	Sig. (2-tailed)		.001
	N	75	75
Opinion about packaging process of the sugar bags	Pearson Correlation	.378**	1
	Sig. (2-tailed)	.001	
	N	75	75

\*\* . Correlation is significant at the 0.01 level (2-tailed).



### **Inference**

The table represent the Pearson correlation coefficient  $r$  is 0.378 and that this is statistically significant. Hence the relationship between products delivered on time and the quality of packaging material used for sugar bags. Is positively correlated.

### **Findings of the Study**

- It is found that 28% of the customers are wholesale traders, 15% of the customers are retailers, 13% of the customers are pharmaceuticals and 44% of the customers are dealing with food products.
- The alpha coefficient for 30 items is 0.563 suggesting that the items have relatively internal consistency.
- The Pearson chi square significant value is 0.000 which is less than 0.05. Hence null hypothesis is accepted. Therefore there is no difference between rating of transportation service by manufacturer and dealing with the customers.
- The Pearson correlation coefficient  $r$  is 0.378 and that this is statistically significant. Hence the relationship between products delivered on time and the quality of packaging material used for sugar bags. Is positively correlated.

### **Suggestions**

The suggestions and recommendations in order to make the logistics operations more effective are as follows

- The response to the customer for the order placed should be given immediately for achieving customer satisfaction.
- The order placed by the customers should be processed and confirmed within short time.
- Transportation should be arranged in such a way to deliver the products to the customer without delay.
- There should be free flow of information between the sugar manufacturer and the customer.
- The use of advanced material handling equipment's should be done in order to deliver the products fast to the customers.

### **Conclusion**

In today's competitive environment logistics play a vital role in manufacturing industries. This research paper work to help the sugar manufacturer to know the customer opinion about the various logistics operations carried out by them to deliver the products to the customer. In this study the primary data was collected through distributing questionnaires to the sampled 75 customers of the organization. The customers include traders, retailers, pharmaceuticals, food product manufacturers, hotels and sweet makers, etc. Their opinion about the logistics practices for delivering the products to them in known. This findings of the study reflects that the organization out stands in the quality of sugar, inventory management, material storage and packaging. Moreover the areas of order processing, material handling, transportation, and warehousing and information flow should be improved and it should create a competitive advantage in order to over come the competitors and achieve customer satisfaction by providing them effective and efficient service.

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