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Optimisation of Multimodal Transport System for Enhancing Port Operations

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Abstract
Multimodal Transportation is the cornerstone of the entire transportation sector. Multimodal Transportation is the process of transporting goods from one place to another place by using multiple modes of transportation such as Road, Rail, Air and Sea. Multimodal Transportation connects all modes of transportation by facilitating the goods to be transported back and forth the places. When the goods are available in the premises of the exporter then the goods will be transported through the road ways to the port of loading and then the goodsto be delivered will be loaded into the ship so as to reach the destination place on the right time. There are innumerable number of professionals and companies involved in the transportation of goods through the multimodal transportation. All these professionals are having a common goal of delivering the goods on time to the destination place. When the cargoes are to be delivered to a location which is located inside the land area then road and rail modes of transportation will be frequently used but when the cargoes have to be transported in huge quantities then the sea transportation is the only mode of transportation available. The research study aims to identify the ways of optimising the multimodal transportation system in order to enhance the port operations in Chennai Sector.

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I. INTRODUCTION

Multimodal transport is the process of moving goods from one location to another location using different modes of transportation such as road transportation, rail transportation, sea transportation and air transportation by a single multimodal transport operator. In the country like India, it really complicated to take the goods from one location to another location in the seamless manner and this requires enormous efforts to be put-in by the set of operators who are in the transportation chain. It would be really difficult deliver goods from one location to another location without the assistance of multimodal transport operators. The multimodal transport operation is used by many companies which are involved in the logistics operation because the dire necessity of transporting the cargoes from one end to another end without much hassles. Moreover the multimodal transport operation effectively uses the different storage options such as warehousing facility, container freight station, and inland container depots.

The seaports are considered to be the gateway for the goods to be transported from place to another place through ships. There are a number of destinations available in this world wherein the ships are not directly operated from Chennai port. In such cases, the goods have to be taken to the nearest hub port; also called as Transhipment port and then transported to the destination port. This process requires the goods to loaded and unloaded in the intermediate ports and the repeated unloading and loading of goods may end up in time delays. To avoid this problem, the multimodal transport operator jumps into the situation to have continuous link about the whereabouts of the containers loaded with goods. Moreover the multimodal transport operation enhances the port operations in the seamless manner in the port of origin of goods and also in the transhipment ports. The multimodal transport operation transports the goods through various modes in the fastest manner possible and this will

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reduce the unnecessary delays in the delivering of goods from end to end.

The multimodal transport operation minimizes the number of documents to be handled and processed since the multimodal transport operator issues few documents so as to reduce the difficulty in handling the formalities related to documentation when the goods are being transported in multiple modes. The cost of transporting of goods from one port to another port through transhipment ports would involve less cost of handling of goods stowed in the containers. The rates charged by the multimodal transport operator would be cheaper than the normal freight rate since the cost of transportation through the multiple modes will be reduced and the freight rate savings will be passed on to the clients. Moreover the insurance cost for the goods would also rapidly reduce since the goods are handled by the multimodal transport operator.

The consignors would normally deal with only one agent who is none other than the multimodal transport operator in the case of transhipment operations. The multimodal transport operator handles all the aspects related to transhipment operation fulfilling the needs of the consignor. The basic advantage of the multimodal transport system is the cost of transporting goods under competitive pricing strategies. The consignors would be willing to take the assistance of multimodal transport operators for reducing the cost of transportation and also for the value added services offered by the multimodal transport operators. In order to stay competitive in the global freight market, it would be really essential to quote a competitive pricing so as to attract the consignors who are willing to involve themselves in the export of goods.

The multimodal transport operator plays an important role in the transport of goods under one transport regime. The multimodal transportation is governed by the multimodal transport act in India which was established in 1992. The multimodal transport operators can register themselves under this act with the director general of shipping. The multimodal transport act brought in a real boost to the multimodal transportation within India and also outside India. The act paved way for the smooth flow of goods from one place to another place without any hitches. The multimodal transport operation paved an appropriate way for the flow of goods from and to the ports of India. Especially when the goods are to be exported through Chennai Port, the multimodal transportation improved the port operation without much tussle and hustle.

II. REVIEW OF LITERATURE

Adam Smith (2018) specifies that the technological advancement in the field of telecommunication and information technology can be effectively used in multimodal transportation. The multimodal transportation effectively involves road, rail and sea transportation of cargoes or road, rail and air transportation of cargoes. The heterogeneity of operation prevailing in the South Asian countries is considered to be really predominant. The laws relating to multimodal transportation that are currently being followed have to be standardised for the efficient operation of loading and discharging of cargoes from one end to another end. In order to fulfil the needs of the customers, it is essential to deliver the goods in the hurdle free manner and in order to have this in place, it becomes essential to have appropriate regulations governing the multimodal transport of cargoes. The multimodal transport laws followed in one place must be made simple so as to take the cargoes to another place through transhipment. The legal framework should facilitate the transportation of cargoes in the seamless manner rather than hampering the process.

Sharma R.K (2018) specifies that the multimodal transportation is well supported by the rail transport since the rail transportation is considered to carry huge volume of cargo from one inland location to another inland location, next to sea transportation. The rail mode of transporting the cargoes will have a direct impact on the volume of cargoes that are transported as compared to road transportation. Rail transportation to the inland location will result in a lot of savings in terms of money and time. The documentation process will also be simplified. Since the rail carrier's huge amount of cargoes, there won't be any pollution problem as compared to road transportation. The

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problems that every seaport is facing would be based on the railway siding facility inside the port area. The railway siding in the port will actually smoothen the process of interlinking the port operation and the rail operation. The cargoes can be directly taken to the side of the ship for loading of the cargoes and also the cargoes that are imported can also be taken through the rail wagons. The railway siding inside the port premises will increase the competition between the ports.

Jonathan Clerk (2018) has studied the process of easing the port operations from the multimodal perspective. The containers can comfortably be brought in and out of the seaport with the help of road and rail mode of transportation. The road transportation is the next best option to carry the export containers and also the import containers from and to the port. The door to door delivery of cargoes are possible mainly because of multimodal transpot systems. The cargoes can be brought in to the port in the seamless manner. Expecially in the case of containers, the . This study proposes a measurement instrument for port performance in the context of container transport logisticsby taking perspectives from different port stakeholders. An importance-performance analysis is used to develop an analytical tool for investigating the importance and performance of major container ports in South Korea against individual transport logistics criterion. The main originality of this study is the development of a measurement instrument to provide managerial and operational insights to both port managers (i.e. terminal operating companies) and policy makers (i.e. port authorities and government) for stakeholder management in transport logistics. The analysis helps port managers and policy makers to converge the different objectives and concerns for better management.

Ravila George (2017). Supply chain complexity and disintegration lead to increased uncertainty from a stakeholders' perspective, which is emerging as one of the major challenges of risk management. The ability to identify risks has weakened, as the responsibility of supply chain risk management is handed over to outside service providers. Regardless, the risks, their visibility and their impact depend on the position of the companies in the supply chain. The actors in the chain must therefore collaborate to create effective risk management conditions. This paper contributes to current risk management literature by providing a holistic and systemic view of risk visibility and control in maritime supply chains.

III. RESEARCH OBJECTIVES

The objectives of the study are as follows

- To identify the different mode of transport used for cargo movement and opportunities for multimodal transportation system
- To understand how multimodal transportation facilities containerization cargo effectively

IV. HYPOTHESIS OF THE STUDY

H_0: There is no significant difference in the mean scores of the factors of Multimodal Transport Optimization for Port Operations

V. METHODOLOGY

The study aims to identify the techniques of optimising the multimodal transport systems so as to optimise the port operations. The methodology followed in this study is descriptive research study. The opinion of the respondents were obtained about the efficiency and effectiveness of multimodal transport system and also the port operations. The sampling method used in this study is the stratified random sampling method with a sample size of 150. A structured questionnaire was used to collect data from the respondents by using the Likert Scale from 1 (Strongly Disagree) to 5 (Strongly Agree). A pilot study was conducted so as to test the questionnaire for its internal consistency and reliability by calculating Cronbach's Alpha Value.

VI. DATA ANALYSIS AND INTERPRETATION

The demographic data analysis has been done for the primary data collected from the respondents and are specified from Table-1 through Table-5. 80.7% of the respondents were of male gender. 36% of the respondents were port users and they belong to the age category of 20-30. This is closely followed by the age category 30-40 with 28%. The respondents had different occupations

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in the organisation in which they were working and 34% of them were freight forwarders. 34.7% of the respondents possessed an under-graduate degree. 34.7% of the respondents possessed an experience of 5-10 years in the multimodal transportation operation.

Table-1: Gender of Port User

Gender	Frequency	Percentage
Male	121	80.7
Female	29	19.3

Table-2: Age of Port User

Age of Port User	Frequency	Percentage
20 – 30	54	36.0
30 – 40	42	28.0
40 – 50	29	19.3
50 – 60	18	12.0
> 60	7	4.7

Table-3: Occupation

Occupation	Frequency	Percentage
MTO	31	20.7
NVOCC	14	9.3
Freight Forwarder	51	34.0
Agent	21	14.0
LSP	22	14.7
Others	11	7.3

Table-4: Education of Port User

Education	Frequency	Percentage
10^{th}Std	12	8.0
12^{th} Std	31	20.7
Diploma	42	28.0
UG degree	58	38.7
PG degree	7	4.7

Table-5: Experience in Port Operation

Experience	Frequency	Percentage
Below 2 yrs	17	11.3
2 – 5 yrs	38	25.3
5 – 10 yrs	52	34.7
10 – 15 yrs	32	21.3
Above 15 yrs	11	7.3

The collected data from the questionnaire with respect to the level of agreement of the Optimization of Multimodal Transportation for enhancing the Port Operations in Chennai, has been analysed by using Analysis of Variance (ANOVA). It is found that the p-values of the cost involved in the multimodal transportation is less than 0.05 and hence the hypothesis is rejected. This means that the factors considered for studying the multimodal transport optimisation are significant in enhancing the port operations such as Cost Reduction, Reduction of Indirect Costs, Only one contract is made, Reduction of costs per vehicle, Centralization of responsibility, Experience of Transport Operator, Transportation is the key for Trade Facilitation, Cargo Movement, Movement of Containers, Reduction of cargo handling times, Decrease in customs controls, Tracking cargo through satellite systems, Low rates of theft or damage to the cargo, Faster Transit Operations, Economies of scale in transport negotiations, Better use of available infrastructure, More efficient means of transportation.

Table-6: Multimodal Transport Optimization for Port Operations

Factors of Multimodal Transportation	F-value	P-value
Cost Reduction	2.521	0.008
Reduction of Indirect Costs	2.851	0.011
Only one contract is made	2.856	0.008
Reduction of costs per vehicle	2.589	0.012
Centralization of responsibility	3.121	0.018
Experience of Transport Operator	2.451	0.007
Transportation is the key for Trade Facilitation	2.132	0.012
Cargo Movement	3.021	0.028
Movement of Containers	3.127	0.031
Reduction of cargo handling times	2.004	0.003
Decrease in customs controls	2.035	0.017
Tracking cargo through satellite systems	2.958	0.005
Low rates of theft or damage to the cargo	2.458	0.014
Faster Transit Operations	2.698	0.015
Economies of scale in transport negotiations	3.214	0.018
Better use of available infrastructure	3.121	0.007
More efficient means of transportation	2.534	0.009

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VII. CONCLUSION

The cargoes are transported in and out of the sea ports in the effective and efficient manner with the help of the multimodal transport system. The cargoes which are sourced from various locations in and around Chennai are transported through trucks and rail wagons to the Chennai Port in the seamless manner. The only complication with regard to the trucks carrying the container cargoes, over dimensional cargoes, project cargoes and general cargoes are the long wait outside the zero gate of Chennai Port. The waiting time can drastically be reduced when a dedicated freight corridor is built to carry the cargoes inside the port premises. Moreover the Chennai Port has got a good rail siding which can be expanded to carry the cargoes alongside the ships berthed. The dwell time of cargoes and the ships can be reduced through enhancing the multimodal transport operation, customs operations, faster transit operations, reducing the direct and indirect costs.

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