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Inland Transportation and Lead Time of Apparel Exports

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**Anupama Gupta, Pinaki Dasgupta and
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Inland Transportation and Lead Time of Apparel Exports



Inland Transportation and Lead Time of Apparel Exports

Anupama Gupta, Pinaki Dasgupta and Mridula S. Mishra

The purpose of this research was to study the relationship of severity levels of road and rail transportation activities and related issues and challenges in terms of their effect on delivery lead time of Indian apparel exports. The research was conducted in India and 157 managers handling ocean freight operations of apparel export shipments participated. It was found that lack of professionalism/skill levels of truck drivers and bad quality/condition of roads are the two most significant logistics challenges in road transportation that affect delivery lead of Indian apparel exports. The next significant issues and challenges explaining the severity level of road transportation were found as delay involved in interstate regulatory check points and inefficient /older technology inbuilt in trucks /trailers. Lack of planning and coordination in cargo rail services and lack of frequency of container rail services due to evacuation constraints were identified as two most significant logistics challenges in rail transportation that affect delivery lead of Indian apparel exports. The next significant issues and challenges explaining the severity level of rail transportation were found to as non availability of rakes/wagons and less number of dedicated tracks for container rail.

Keywords: Apparel Exports, Delivery Lead Time, Road Transportation, Rail Transportation

1 Introduction

The apparel industry is a classic example of global sourcing and is one of the oldest and largest export industries. It is also one of the most global industries because most nations produce for the international textile and apparel market (Stengg, 2001; Gereffi and Frederick, 2010). International sourcing involves longer lead time than domestic sourcing and is affected by international logistics activities resulting in delayed delivery (Cho and Kang, 2001; Yu, 2011; Yu and Lindsay, 2011). In the context of international purchasing, the key variable underlying logistics factors are lead-time (Lucero, 2008). Lead time is one of the most critical factors in sourcing fashion apparel products (Froza and Vinelli, 2000; Christopher and Towill, 2002; Kam et al, 2011; Candace et al, 2011). The delivery date of apparel export shipments are often not met due to issues and challenges involved in logistics activities (Ahsan and Azeem, 2010). Therefore, the focus of the present research was to study logistics issues and challenges and their severity levels in terms of affecting delivery lead time of apparel exports.

2.1. Apparel supply chain and sourcing complexities

Apparel supply chain is complex and characterised by short product life cycles, tremendous product variety, volatile and unpredictable demand, long and inflexible supply processes (Lam and Postle, 2006; Sen, 2008). The supply network includes different kinds of retailers, agents, garment manufacturers, yarn/fabric producers, trims/embellishment producers, freight forwarding and warehousing companies, etc. Every stakeholder in the apparel supply chain has separate set of challenges which are interlinked. Maintaining delivery lead time is primarily the responsibility of apparel export manufacturing units which face intense competition (Lim and Lam, 2007;

Watchravesringkan et al, 2009) and are always under pressure of low cost production (Lim and Lam, 2007) in less time (Gereffi and Frederick, 2010, Ahsan and Azeem, 2010). Apparel export supply chain has various kind of logistics related complexities like underdeveloped domestic infrastructure, inter modal transportation related issues and challenges (Kalegama, 2009; Watchravesringkan et al, 2009, etc).

2 Apparel Supply Chain and Sourcing Complexities

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2.1 Role of Freight Forwarders in Apparel Export Supply Chain

Apparel exporters normally outsource their logistics activities to third party who are freight forwarders. The selection of freight forwarders and carriers is generally based on the buyer's choice or requirement (Yu and Lindsay, 2011). Freight forwarders are international trade specialist who can manage variety of logistics related function to facilitate the movements of cross border shipments. Some of the logistics functions are booking vessel space, preparing relevant documentation, paying freight charges on behalf of shipper/buyer, arranging inland transportation services, many value added services, etc. (Murphy and Daley, 2000; Costes et al, 2009).

2.2 Indian Apparel Exports

The textiles and clothing industry is one of the mainstays of the Indian national economy. The textiles industry accounts for 14% of industrial production, which is 4% of GDP and employs approximately 45 million. Readymade garments account for almost 39% of the total textiles exports (Annual Report, Ministry of Textiles 2012-13). Buyers work with Indian suppliers because of category expertise, a high level of convenience, functional capabilities, effective pricing structures, and good service (Singh, 2008).

2.3 Challenges of Indian Apparel Industry

It was estimated that India's share in world trade could quadruple from about 4 % to 15 % after the removal of Multi Fibre Agreement (Nordås, 2004) but India could not ever cross even 4 % share of world apparel exports (ITS

statistics, WTO, 2003-2013). China was the clear winner along with Bangladesh, Vietnam and Cambodia performing very well but India's performance was disappointing (Thoburn, 2010).

The reasons for India not reaching to its predicted potential performance are many. Indian apparel industry suffers from technological obsolescence, fragmented capacities, low scales of operation, rigid labour laws, less competitive pricing, product quality, business culture issues, poor logistic support, etc. (Tewari, 2005; Singh, 2008). Few research studies have mentioned about logistics challenges affecting Indian apparel exports industry like port infrastructure, customs regulation, cumbersome inspection, poor rail and road infrastructure, poor quality of inland roads, large number of octroi posts, lack of available space, slow clearance time, no link facility at ports and airports (Ramachandran, 2001; Shetty, 2001 ; Verma, 2002).

2.4 Business Process of Apparel Exports and Outbound Logistics Activities

The business process analysis of outbound logistics process of apparel exports can be explained in nine steps: arrange transport, arrange for inspection, obtain cargo insurance, collect empty container from yard, stuff the container, transportation to port of departure, customs inspection and clearance, container handling and prepare documents for importer (Ramassamy, 2011). The steps of arranging transport and transportation to port of departure can be categorised under inland transportation. The focus of the present study is to cover inland transportation activities under road and rail transportation.

2.5 Road Transportation Activity

India's road network is second largest in the world. Roads carry about 65% of the freight and 80% of the passenger traffic. National highways constitute 1.7% of all roads and carry 40% of the road traffic. It is evident from these data that road transit is most important mode of freight transportation in India. Irrespective of continuous efforts through projects and regular work by the authorities, still there are many issues and challenges.

2.6 Issues and Challenges in Road Transportation

1) Delay at regulatory check points: During road transit of cargo from factory premises to gateway seaport; it has to cross many state borders. All of these state borders have several regulatory check points to inspect export and transport documents and physical check of cargo, if required (Mitra, 2011; Gupta et al, 2010). 2) Time bound vehicle entry restrictions in cities: Many highways pass through the small and big cities. These cities put entry restrictions for the cargo trucks to enter and cross the city during day time to avoid inconvenience (Subramanian and Arnold, 2001; Planning Commission Report, Government of India, 2007; Gupta et al, 2010). 3) Unavailability of trucks/trailers: Availability issue of trucks and trailers may not be there in all areas. But in few areas, shippers face this challenge (Horst and Langen, 2008). 4) Technology level of existing vehicles: Most of the cargo trucks do not have inbuilt tracking technology through GPS which makes it difficult to have real time and correct information. The trucks are also ill maintained which leads to breakdown of vehicles. (Hsu et al, 2009; Gupta et al, 2010; Shi et al, 2011; Kemp et al, 2013). 5) Professionalism/skill level of drivers: This is big area of concern as drivers become the sole caretakers

of the cargo during transit. The maintenance of vehicle during transit, safeguarding of vehicle from any breakdown/damage/accident and safeguarding of cargo from damage/theft/pilferage is very crucial issue for road transportation (Fugate et al, 2009; Kemp et al, 2013). 6) Inadequate road networks: Although India has second largest road network in the world but still inadequacy of road network is felt in case of freight transportation (Peters, 1990; Mitra, 2011). 7) Poor quality/condition of roads: It has been observed that roads are narrow and made of substandard quality materials. Moreover, the maintenance and repair work of roads are not as per standard. Many road accidents and traffic congestions are also due to poor quality and conditions of roads (Sahay and Mohan, 2006; Planning Commission Report, Government of India, 2007).

3 Indian Apparel Clusters under the Study

Indian apparel clusters (AEPC, 2010) were considered for the study. The seven clusters, Tirupur, Ludhiana, Gurgaon, Bangalore, Noida, Okhla and Jaipur were selected for the study. All selected clusters are located in landlocked regions and require inland transportation to reach gateway seaport.

3.1 Hypotheses Statements

Within the purview of the present research objective about measurement of severity level of key issues and challenges and outbound logistics activities that affect delivery lead time of apparel exports in consideration, following hypotheses statements were made basis the literature review.

Literature review for the present study explained that road transportation activity has many issues and challenges. Bad quality/condition of roads, time bound vehicle entry restriction in cities, unavailability of trucks/trailers, delay at regulatory check points, older technology level of existing vehicles, lack of professionalism/skill levels of drivers, inadequate road networks, traffic congestion, and unfavourable weather conditions are problem areas.

Therefore the hypothesis statements related to road transportation activity are:

H₀₁: There is no significant relation between severity levels of road transportation activity and its issues and challenges that affect delivery lead time of apparel exports.

H_{a1}: There is a significant relation between severity levels of road transportation activity and its issues and challenges that affect delivery lead time of apparel exports.

Literature review highlighted that rail transportation faces various issues and challenges like coordination/planning issues, absence of dedicated and good quality tracks, availability of rakes/wagons, low priority to cargo trains over passenger trains and unfavourable weather conditions.

Therefore the hypothesis statements related to rail transportation activity are:

H₀₂: There is no significant relation between severity levels of rail transportation activity and its issues and challenges that affect delivery lead time of apparel exports.

H_{a2}: There is a significant relation between severity levels of rail transportation activity and its issues and challenges that affect delivery lead time of apparel exports.

4 Research Approach and Design

The study was divided in two stages. Descriptive cross-sectional research design was adopted for the study. In the first stage pilot study was conducted with the help of Delphi technique and at the second stage survey was undertaken through structured questionnaire.

4.1 First Stage: Pilot Study

Pilot study was conducted to with the purpose of validation of issues and challenges involved in road and rail transportation activities of apparel exports and identification of any other issues and challenges beyond available literature.

16 experts holding post in senior management and having experience of more than 20 years in handling logistics of apparel export shipments participated in pilot study (Stakeholders covered: Manufacturer exporters, Freight Forwarders).

In the first stage questionnaire 12 logistics issues and challenges under road and rail transportation activities were mentioned for validation. All experts were not in agreement for availability of trucks/trailers being a challenge in present Indian scenario. In second round all experts agreed that the same issue may not be considered in present context. Experts validated rest all issues and challenges for Indian apparel exports.

The detail of identified issues and challenges under road and rail transportation activities in context of Indian apparel exports are listed below,

Road Transportation:

1. Bad quality /condition of roads
2. Inefficiency /older technology (GPS, etc.) inbuilt in trucks /trailers
3. Lack of expansion of road network
4. Lack of professionalism/skills of truck driver
5. Delay involved in interstate regulatory check points
6. Waiting time due to vehicle entry restrictions in cities

Rail Transportation:

1. Lack of availability of rakes/wagons for rail transportation
2. Lack of number of dedicated tracks for container rail transportation
3. Lack of regular frequency of container rail services due to evacuation constraints
4. Lack of planning and coordination in cargo rail services
5. Lack of priority to passenger trains over container trains

4.2 Second Stage: Survey

The objective of survey was to measure severity levels and analyse relationship between severity levels of existing challenges and road/rail activities through quantitative research. The research studies having similar kind of focus were identified to decide on the measurement scale selection for the study. Razzaque (1996) employed 5 point Likert scale to rate the variables which were viewed as challenges in the development of logistics in Bangladesh. Carter et al (1997) used 5 point Likert scale to measure the severity of

the logistics barriers in China. Ta et al (2000) employed 7 point Likert Scale to rate the degree of seriousness for various transportation problems. Ozdemir (2010) used 5 point Likert to measure variables indicating weaknesses of Istanbul as a regional logistics centre.

Considering above, Likert scale was chosen for this part of study. One participant each from all five target apparel clusters were chosen for scale evaluation and personal interview was conducted. Content validity was done to check the coverage of construct to be measured. Participants agreed on the applicability of the scale for the study and also commented positively on the scale's relevance for the landlocked apparel clusters sending export shipments through sea mode.

Three questions on five point Likert were prepared keeping the objective in consideration. The first question was designed to rate road and rail transportation activities of Indian apparel exports in terms of their severity level of affecting delivery lead time. Rest two questions were designed to rate respective issues and challenges of road and rail transportation activities in terms of their severity level of affecting delivery lead time. All questions were deigned on 5 point rating scale in which 1 was indicated as "least severe" and 5 being "most severe". Pretesting of questionnaire was done through electronic mode and personal telephonic interviews. 15 respondents (3 each from 5 apparel clusters) participated for pretesting and debriefing method was adopted. Two participants gave feedback in terms of language modification which was incorporated.

4.2.1 Sampling Design for the Survey

Freight forwarders handling apparel export shipments in the selected area of study (all 5 apparel clusters) were targeted for this stage of study. Managers handling ocean freight operations of apparel export shipments were requested to participate in this survey. Since there was no database available of the freight forwarding organisations that handle apparel export shipments hence, snowball sampling technique was chosen for the study. In total 36 freight forwarders were approached. All branch offices of freight forwarders located in selected apparel clusters were contacted. In response, 157 managers handling ocean freight operations of apparel export shipments participated in the survey. Data was collected through online method. Four rounds of reminder e-mails and follow up calls were made in the time span of 65 days. It took 70 days to get the response from 157 managers.

4.2.2 Data Analysis

Considering the objective of study and developed scale, principle component factor analysis and multiple regression analysis were chosen as data analysis tools. Component analysis was used to check the grouping of considered items in the scale. Version 16.0 of SPSS software package was used for statistical analysis.

The KMO measure of sampling adequacy value was 0.867 which is interpreted as meritorious (Hair et al, 2006). The result of Bartlett's test of sphericity was also significant. The two factors accounted for 72.23% of total variance.

Table 1 Rotated Component Matrix

	Factor 1	Factor 2
Lack of number of dedicated tracks for container rail transportation		0.8207
Lack of frequency of cargo rail services due to evacuation constraints		0.8677
Lack of planning and coordination in cargo rail services		0.8976
Lack of availability of rakes/wagons for rail transportation		0.8794
Lack of priority to passenger trains over container trains		0.7433
Bad quality /condition of roads	0.8700	
Inefficiency /older technology inbuilt in trucks /trailers for road transit	0.7830	
Lack of expansion of road network	0.8076	
Lack of professionalism/skills of truck driver	0.8329	
Waiting time due to vehicle entry restrictions in cities	0.7808	
Delay involved in interstate regulatory check points	0.8144	

As per table 1, factor 1 comprises of all items considered in scale under road transportation activity and factor 2 comprises of all items under rail transportation activity. Reliability test was done for both these factors. The Cronbach's alpha value for both road transportation and rail transportation activity factors was 0.913.

The purpose of employing multiple regression analysis was to study the relationship of severity levels of road and rail transportation activities and their related issues and challenges in term of their effect on delivery lead time of Indian apparel exports.

Road Transportation Activity: For the factor representing road transportation activity the following issues and challenges were loaded: Lack of professionalism/skills of truck driver (X_1), Bad quality /condition of roads (X_2), Delay involved in interstate regulatory check points (X_3), Level of inefficiency /older technology inbuilt in trucks /trailers (X_4), Lack of expansion of road network (X_5), Waiting time due to vehicle entry restrictions in cities (X_6).

All six issues and challenges were considered as independent variables and road transportation activity was considered as dependent variable (Y_1). Following represents the model summary of stepwise multiple regression done.

Table 2 Model Summary of Stepwise Multiple Regression (Road Transportation)

Overall Model Fit					
Model	R	R ²	Adjusted R ²	Std. Error of the Estimate	
Step 4	0.878	0.771	0.765	0.490	
R ² Change Statistics					
Model	R ² Change	F Change	df1	df2	Sig. F Change
Step 4	0.017	11.428	1.000	152.000	0.001
Model 4- Predictors: (Constant), X ₁ , X ₂ , X ₃ , X ₄ , Dependent Variable: Y ₁					

Model 4 is the final multiple regression model and the value of multiple R and R² was 0.878 and 0.771 respectively. The value of adjusted R² was 0.765 which indicated the final model was able to explain 76.5% of the variance. The standard error of the model which measures the variation around the regression line decreased to 0.49 showed good overall model fit. The F value in final model was 128.77 which is more than the corresponding critical F value of 4.39. The significance value showed that the regression model is significant.

Following table shows the coefficient value of final model. The four regression coefficients plus the constant, were significant both at .05 and .01 level. The t values for all were more than corresponding critical t value of

1.976. The collinearity statistics was studied it was found that the tolerance values for the variables in the equation ranged from 0.552 to 0.357. All values were well above the cut off value of 0.1 (Hair et al, 2006). The VIF value ranged from 1.812 to 2.8 which is less than cut off value of 10 (Hair et al, 2006).

Table 3 Table of Coefficients for final model of Regression (Road Transportation)

Coefficients of Final Model						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
4	Const.	0.609	0.140		4.348	0.000
	X ₁	0.239	0.046	0.314	5.192	0.000
	X ₂	0.220	0.051	0.282	4.347	0.000
	X ₃	0.173	0.042	0.216	4.138	0.000
	X ₄	0.167	0.049	0.213	3.381	0.001

The predictive equation based on four independent variables is:

$$Y_1 = 0.609 + 0.239 X_1 + 0.220 X_2 + 0.173 X_3 + 0.167 X_4 \quad (1)$$

Therefore the severity level of road transportation can be explained through severity levels of following four issues and challenges:

Severity levels of road transportation = 0.609 + 0.239 (Severity Level of lack of professionalism/skills of truck driver) + 0.220 (Severity Level of bad quality/condition of roads) + 0.173 (Severity level of delay involved in interstate regulatory check points) + 0.167 (Severity level of inefficiency/older technology inbuilt in trucks/trailers)

With the help of regression beta coefficients the relative importance of issues and challenges in the regression variate was analysed. Lack of professionalism/skills of truck driver and bad quality /condition of roads were most crucial followed by delay involved in interstate regulatory check points and inefficiency/older technology inbuilt in trucks /trailers.

Thus the alternate hypothesis, H_{a1} that there is a significant relation between severity levels of road transportation activity and its issues and challenges that affect delivery lead time of apparel exports was accepted.

Rail Transportation Activity: For the factor representing rail transportation activity the following issues and challenges were loaded:

Lack of frequency of container rail services due to evacuation constraints (X_7), Lack of planning and coordination in cargo rail services (X_8), Non availability of rakes/wagons for rail transportation (X_9), less number of dedicated tracks for container rail transportation (X_{10}), Lack of priority to passenger trains over container trains (X_{11}).

All five issues and challenges were considered as independent variables and rail transportation activity was considered as dependent variable (Y_2).

Following table represents the model summary of stepwise multiple regression done.

Table 4 Model Summary of Stepwise Multiple Regression (Rail Transportation)

Overall Model Fit					
Model	R	R ²	Adjusted R ²	Std. Error of the Estimate	
Step 4	0.928	0.861	0.858	0.412	
R ² Change Statistics					
Model	R ² Change	F Change	df1	df2	Sig. F Change
Step 4	0.016	17.267	1.000	152.000	0.000
Model 4- Predictors: (Constant), X ₇ , X ₈ , X ₉ , X ₁₀ , Dependent Variable: Y ₂					

Model 4 is the final multiple regression model and the value of multiple R and R^2 was 0.928 and 0.861 respectively. The value of adjusted R^2 was 0.858 which indicated the final model was able to explain 85.8% of the variance. The standard error of the model which measures the variation around the regression line decreased to 0.412 showed good overall model fit. The F value in the final model was 236.05 which is more than the corresponding critical F value of 4.39. The significance value showed that the regression model was significant.

Table 5 shows the coefficient value of final model. The four regression coefficients plus the constant, were significant both at .05 and .01 level. The t values for all are more than corresponding critical t value of 1.976.

The collinearity statistics shown that the tolerance values for the variables in the equation ranged from 0.275 to 0.388 which are not below the cut off value of 0.1 (Hair et al, 2006). The VIF value ranged from 2.574 to 3.631 which is less than cut off value of 10 (Hair et al, 2006).

Therefore the severity level of rail transportation can be explained through severity levels of following four issues and challenges,

Severity levels of rail transportation = 0.467 + 0.215 (Severity Level of lack of frequency of container rail services due to evacuation constraints) + 0.230 (Severity Level of lack of planning and coordination in cargo rail services) + 0.207 (Severity level of non availability of rakes/wagons for rail transportation) + 0.173 (Severity level of less number of dedicated tracks for container rail transportation).

Table 5 Table of Coefficients for final model of Regression (Rail Transportation)

Coefficients of Final Model						
Model		Unstandardized Coefficients		Standardized Co-efficients	t	Sig.
		B	Std. Error	Beta		
4	Const.	0.467	0.091		5.152	0.000
	X ₇	0.215	0.046	0.270	4.693	0.000
	X ₈	0.230	0.044	0.290	5.288	0.000
	X ₉	0.207	0.039	0.259	5.336	0.000
	X ₁₀	0.173	0.042	0.217	4.155	0.000

The predictive equation based on four independent variables is:

$$Y_2 = 0.467 + 0.215 X_7 + 0.230 X_8 + 0.207 X_9 + 0.173 X_{10} \quad (2)$$

With the help of regression beta coefficients the relative importance of issues and challenges in the regression variate was analysed. Lack of planning and coordination in cargo rail services, lack of frequency of container rail services due to evacuation constraints and non-availability of rakes/wagons for rail transportation most crucial followed by less number of dedicated tracks for container rail transportation. Thus the alternate hypothesis H_{a2} that there is a significant relation between severity levels of rail transportation activity and its issues and challenges that affect delivery lead time of apparel exports was accepted.

5 Findings of the Study

The major findings of the study are analysis of relationship between the road and rail logistics activities and their issues and challenges in the current Indian scenario. Out of six key issues and challenges related to road transportation activity, severity level of four issues and challenges were able to explain the 76.5 % of variance of severity level of road transportation in terms of affecting delivery lead time of Indian apparel exports. Lack of professionalism/skill levels of truck driver and bad quality/condition of roads emerged as two most significant logistics hindrances in road transportation that affect delivery lead of Indian apparel exports. The next significant issues and challenges explaining the severity level of road transportation were found to as delay involved in interstate regulatory check points and inefficient /older technology inbuilt in trucks /trailers.

Out of five key issues and challenges related to rail transportation activity, severity level of four issues and challenges were able to explain the 85.8 %

of variance of severity level of rail transportation in terms of affecting delivery lead time of Indian apparel exports. Lack of planning and coordination in cargo rail services and lack of frequency of container rail services due to evacuation constraints were identified as two most significant logistics hindrances in rail transportation that affect delivery lead of Indian apparel exports. The next significant issues and challenges explaining the severity level of rail transportation were found to as non availability of rakes/wagons for rail transportation and less number of dedicated tracks for container rail transportation.

6 Significance of the Study

In post MFA phase, the study holds significance because of changing pattern of the business of shorter fashion seasons/business cycles. This is in addition to the ever demanding buyers who look for shorter procurement lead time. In the post MFA scenario, combating sourcing challenges has become very crucial for apparel exporting countries to remain and grow in the global trade. In this regard, challenge of managing delivery lead time has become an important aspect for apparel trade. As a part of this, identifying and managing outbound logistics challenges have become critical in the process. The research has been able to adequately cover the perspectives of freight forwarders who analyzed micro level logistics issues and challenges in inland transportation activities with specific focus to apparel exports business from landlocked areas till gateway seaports. The study has been able to clearly identify the micro level issues and challenges that affect delivery lead time of apparel trade. Most of the studies, so far, aimed

at identification of micro level issues, were either not sector driven or lacked export focus. From that context the study has been clearly been able to identify the micro level issues specific to apparel trade for inland transportation logistics activities.

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