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Parameters And Costs Influencing Transportation Decisions In Small Manufacturing Firms

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ABSTRACT

The changing role of the corporate transportation functions in the modern business environment requires a broad view of managers responsibilities in an integrated supply chain. Product manufactured at one place is globally required, so role of transportation becomes indispensable. The present study highlights the transportation modes and strategies used in 44 small scale units operating in district Udhampur of J&K State. The research framework was examined by empirical analysis of primary data collected. Validity and reliability of the scales in the construct were assessed through BTS and Cronbach-alpha. The results of ranking tables revealed that vehicle type is the main parameter influencing optimal transportation system, the main cost affecting transportation decision is the vehicle cost and firms own transportation helps in reducing the overall cost of transportation.

Keywords : Transportation, Supply Chain, effectiveness, Small Scale Industries (SSIs).

INTRODUCTION

A key decision in logistics management is the selection of the transportation mode and carrier to move the firm's inbound and outbound freight. Managers typically consider multiple attributes when making this decision, often focusing on cost and transit time as the primary criteria. This is not a trivial decision, however, as the process often involves multiple criteria, some of which are not readily quantified. Mode choice and carrier selection are part of the decision-making process in transportation that includes identifying relevant transportation performance variables, selecting mode of transport and carrier, negotiating rates and service levels, and evaluating carrier performance (Monczka et al., 2005). Transportation costs average 20 percent of total production costs (Russell and Taylor, 2003). For the Norwegian companies surveyed in Pedersen and Gray (1998), more than 50 percent of the total logistics cost of a product is attributed to transportation. But transportation and distribution can be instrumental in achieving competitive advantage (Reimann, 1989). The performance of the transport carrier may influence the effectiveness of the entire logistics function of a company.

REVIEW OF LITERATURE

As technologies and economies became more sophisticated and globalised, transport geographers began to embrace on new ways of understanding the role of transport at local, national and global scales (Tolley & Turton, 1995). As a consequence, there has been a considerable increase in the number of means & number of transport modes to cater the needs of high performance product at lower maintenance costs. Then transport manufacturers have focused their attention on the minimisation of the life-cycle-cost and on its main determining factors, in particular reliability, maintainability and availability of products (Black, 2001). Transport system makes products movable through timely and regional efficacy for promoting value-added under the least cost principle. Transport affects the results of logistics activities and influences production & sale. Value of transportation varies with different industries. The present study examines the parameters and costs influencing transportation decisions and systems in small manufacturing industries of district Udhampur of J&K State.

RESEARCH DESIGN AND METHODOLOGY

The primary data for the study were collected from 44 functional manufacturing SSIs registered under District Industries Centre (DIC), Udhampur of J&K State sub-divided into ten lines of operation comprising cement (8), pesticide (3), steel (3), battery/lead/alloy (5), menthol (2), guns (2), conduit pipes (2), gates/grills/varnish (5), maize/atta/dal mills (3) and miscellaneous (11). Census method was used to elicit response from owners/managers of the SSIs. Information was collected by administering self developed questionnaire prepared after consulting experts and review of literature which comprised of general information and various statements of transportation management. Items in the questionnaire were in descriptive form, ranking, dichotomous, open ended and five-point Likert scale. The data collected was further analysed with the help of SPSS (Version 16.00) for purification, checking validity and reliability. Ranking tables were used to elicit meaningful responses from the data.

DATA ANALYSIS ANS INTERPRETATION

The suitability of raw data for factor analysis obtained from SSI managers was examined through Anti-image, KMO value, Bartlett's Test of Sphercity (p-value = 0.000), Principal Component Analysis and Varimax Rotation (Stewart, 1981) indicating sufficient common variance and correlation matrix (Dess et al., 1997 and Field, 2000). On seventh round, the KMO value (0.599) and Bartlett Test of Sphercity (624.049) indicated acceptable and significant values. The process of R-Mode Principal Component Analysis (PSA) with Varimax Rotation brought the construct to the level of 22 statements out of 30 statements originally kept in the domain of transportation management. Therefore, factor loadings in the final factorial design, were consistent with conservative criteria, thereby resulting into five-factor solution using Kaiser Criteria (i.e. eigen value ≥1) with 71.21% of the total variance explained, i.e. 22 items got grouped in five factors. The communality for 22 items ranged from 0.59 to 0.88, indicating moderate to high degree of linear association among the variables. The factor loading ranges from 0.585 to 0.905 and the cumulative variance extracted ranges from 18.98 to 71.21 percent (Table 1.1).

Reliability: The alpha reliability coefficients for F1 (0.852), F2 (0.809), is higher than the criteria of 0.77 obtained by Gordon and Narayanan (1984) indicating high internal consistency. F3 (0.769), F4 (0.652) and F5 (0.704) are also at a minimum acceptable level of 0.50 as recommended by Brown et al. (2001) and Kakati and Dhar (2002) thereby obtaining satisfactory internal consistency.

Validity: The five factors obtained alpha reliability higher & equal to 0.50 and KMO value at 0.599, indicating significant construct validity of the construct (Hair et al., 1995).

Table 1.2 portrays the parameters influencing the optimal transportation system. Six parameters taken into account are: “Vehicle type”, “Type of operation”, “Travel time”, Time & distance”, “Objectives of the firm” and “Road network”. “Vehicle type” is accorded rank one with mean score (1.81) by all the firms except for menthol and guns. Travel time is given second rank with mean score (2.99). Type of operation ranked third (mean score = 3.26), time & distance acquires fourth rank, objectives of the company shows fifth rank and road network is accorded sixth rank by all the operating firms.

Table 1.3 depicts impact of vehicle costs, overhead costs, road tax and processing costs on transportation decisions. Vehicle costs is accorded rank one by all the manufacturing firms. Road tax is given rank II by almost all the firms except for cements, pesticides/insecticides, guns and steel. Overhead costs are ranked third and processing costs is ranked IV by almost all the operating firms. In the nutshell, vehicle costs affect the most while making transportation decisions.

Table 1.4 depicts the benefits of having firm’s own transportation. The variables identified are “Helps in reducing overall costs”, “Helps in satisfying customers”, “Leads to increased safety & social regulations” and “Provides efficient services”. The most important benefits of own transportation is that it helps in reducing overall costs as connoted by its mean score and rank [1.84, (I)]. Secondly, it helps in satisfying customers [2.34, (II)]. Thirdly, it leads to increased safety and social regulations [2.77, (III)] and lastly, it provides efficient services than the hired ones [3.00, (IV)]. Overall, small manufacturing firms enjoys numerous benefits of their own transportation which assists in reducing costs, enhancing profits, meeting frequent customer requirements and provides stability periods of uncertainty.

CONCLUSION

The supply chain processes emerging from transportation regulation, advances in information technology, time-based competition, and globalization encounter significant challenges as their firms proceed down the road toward supply chain integration. Managers must encourage their firms to view the total cost and total value provided by carriers, and refrain from buying transportation solely based upon lowest transactional cost. The findings of the study is limited to small scale industries of district Udhampur of J&K State, so results drawn cannot be generalized for medium or large scale industries functioning in other parts of country having dissimilar business environment.

Table 1.1: Results Showing Factor Loadings and Variance Explained After Scale Purification for Transportation Management

Factor-wise Dimensions	Mean	S.D	F.L	Eigen Value	Variance Explained %	Cumulative Variance %	Communality	α
F1 Cost reduction	4.18	.411		6.458	18.982	18.982		.8526
Lowers the overall cost	4.20	.408	.775				.667	
Improved safety & social regulations	4.11	.321	.751				.765	
Results in lowering inventory	4.11	.386	.746				.776	
Improves plant efficiencies	4.13	.347	.726				.831	
Maximises customer service	4.27	.450	.661				.641	
Timely movement of goods	4.25	.575	.630				.606	
F2 Improvement in business performance	4.11	.438		3.025	15.904	34.886		.8097
Creates time & place utilities	4.15	.428	.905				.853	
Improved production technology	4.13	.408	.815				.869	
Simplifies customer search process	4.13	.347	.775				.670	
Inbound & outbound transportation	4.04	.568	.585				.637	
F3 Effective transportation design	4.19	.477		2.046	13.902	48.789		.7696
Huge profit margins	4.13	.462	.729				.759	
Reduces warehousing costing	4.20	.509	.716				.772	
Prices of products	4.29	.509	.701				.592	
Influences product costs	4.15	.428	.669				.667	
F4 Proper routenization	4.30	.460		1.499	13.070	61.858		.6528
Freight rates & inter state tax	4.09	.421	.783				.697	
Supplier scheduling	4.04	.370	.680				.779	
Places right product at the right time	4.50	.505	.612				.685	
Proper routenization of goods	4.56	.545	.599				.599	
F5 Customer service	4.15	.357		1.214	9.394	71.212		.7047
Customer responsive	4.09	.290	.848				.882	
Speed is critical	4.22	.423	.764				.814	

Footnotes: KMO Value = .599; Bartlett’s Test of Sphercity = 624.049, df = 190, Sig. =.000; Extraction Method Principal Component Analysis; Varimax with Kaiser Normalisation; Rotation converged in 7 iterations; ‘FL’ stands for Factor Loadings, ‘S.D’ for Standard Deviation and ‘α’ for Alpha

Table 1.2: Parameters Influencing the Optimal Transportation System

Units/Parameters	Vehicle type	Type of operation	Travel time	Time & distance	Objectives	Road network
Cement	1.5 (I)	2.6 (II)	3.5 (III)	3.8 (IV)	4.1 (V)	5.3 (VI)
Battery/Lead/Alloy	1.4 (I)	4.4 (IV)	3 (III)	2.2 (II)	4.6 (V)	5.4 (VI)
Pesticides/Insecticides	2 (I)	2.3 (II)	4 (V)	3.3 (IV)	3 (III)	6 (VI)
Conduit pipes	1 (I)	3.5 (III)	3.5 (IV)	5.5 (V)	2 (II)	5.5 (VI)
Menthol	3 (III)	2 (II)	1 (I)	4.5 (IV)	4.5 (V)	6 (VI)
Guns	2.5 (II)	3.5 (IV)	2.5 (III)	1.5 (I)	5 (V)	--
Steel	2 (I)	3.6 (V)	3.6 (IV)	3.3 (III)	3 (II)	5.3 (VI)
Gates/Grills/Varnish/Paint	1 (I)	3.4 (III)	2.8 (II)	4.2 (IV)	4.4 (V)	5.2 (VI)

Atta/Maize/Dal mills	1 (I)	3.6 (III)	2.6 (II)	3.6 (IV)	4 (V)	6 (VI)
Others (Miscellaneous)	2.7 (I)	3.7 (V)	3.4 (III)	3.5 (IV)	3.2 (II)	4.1 (VI)
Mean & Rank	**1.81 (I)**	**3.26 (III)**	**2.99 (II)**	**3.54 (IV)**	**3.78 (V)**	**5.42 (VI)**

Note: Where 1 denotes "highest rank" and 6 denotes "lowest rank"

Table 1.3: Costs Affecting Transportation Decisions in Small Manufacturing Firms

Units/Costs	Vehicle costs	Overhead costs	Road tax	Processing costs
Cement	1.25 (I)	2.62 (II)	2.62 (III)	3.42 (IV)
Battery/Lead/Alloy	1 (I)	3 (III)	2.2 (II)	3.8 (IV)
Pesticides/Insecticides	1 (I)	2.6 (II)	3 (III)	3 (IV)
Conduit pipes	1 (I)	4 (IV)	2 (II)	3 (III)
Menthol	1 (I)	3 (III)	2 (II)	4 (IV)
Guns	1 (I)	2.5 (II)	2.5 (III)	4 (IV)
Steel	1.3 (I)	3.3 (III)	3.3 (IV)	2 (II)
Gates/Grills/Varnish/Paint	1.4 (I)	4 (IV)	1.8 (II)	2.8 (III)
Atta/Maize/Dal mills	1.3 (I)	3 (III)	2 (II)	3.5 (IV)
Others (Miscellaneous)	1 (I)	3 (III)	2.27 (II)	3.72 (IV)
Mean & Rank	**1.12 (I)**	**3.17 (III)**	**2.36 (II)**	**3.32 (IV)**

Note: Where 1 denotes "highest rank" and 4 denotes "lowest rank"

Table 1.4: Benefits Derived From Own Transportation

Units/Benefits	Helps in reducing overall costs	Helps in satisfying customers	Leads to increased safety & social regulations	Provides efficient service
Cement	1.7 (I)	2.5 (II)	2.6 (III)	3 (IV)
Battery/Lead/Alloy	1.8 (I)	2.7 (III)	2.8 (IV)	2.6 (II)
Pesticides/Insecticides	2 (II)	1.6 (I)	4 (IV)	2.3 (III)
Conduit pipes	1 (I)	2.5 (II)	3 (III)	3.5 (IV)
Menthol	1 (I)	3 (III)	2 (II)	4 (IV)
Guns	2 (I)	2 (II)	2.5 (III)	3.5 (IV)
Steel	1.3 (I)	2.6 (II)	3 (III)	3 (IV)
Gates/Grills/Varnish/Paint	3 (III)	1.8 (I)	3.2 (IV)	2 (II)
Atta/Maize/Dal mills	2 (I)	2.6 (III)	2 (II)	3.3 (IV)
Others (Miscellaneous)	2.4 (II)	2.0 (II)	2.6 (III)	2.8 (IV)
Mean & Rank	1.84 (I)	2.34 (II)	2.77 (III)	3.00 (IV)

Note: Where 1 denotes "highest rank" and 4 denotes "lowest rank"

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