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Leveraging Edible Oil Producers with Cross-Docking Innovation in Pakistan: A Way Forward

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Abstract

This study's objective is to examine the benefits of cross-docking innovation for oil producers in Pakistan. Thus, data has been collected from the SCM departments of leading oil producers in order to reflect the opinion towards inferential analysis of benefits that are produced by cross-docking. Although due to time constraints the response rate for the study is around 73% but as this is one of the premier and initial study in this area hence the benefits of the study are not limited with researchers and academicians only. SEM-Based analysis has been conducted through using SMART-PLS and results affirm the impact of cross-docking for the oil producers in Pakistan.

Keywords: *Cross-Docking, Edible Oil Producing Companies. Supply Chain Management, Time Cost, Inventory Cost & Transportation Cost*

Introduction

Background

Cross docking is characterized as an operational methodology that moves things through union focuses or cross docks without placing them into capacity. (Li, Sim,He, & Chen 2010). Having accomplished significant enhancements in their assembling activities, numerous organizations are currently concentrating their endeavors on improving the proficiency of their coordination's and appropriation tasks. With expanded item multiplication, the normal interest for the individual item is decreasing but then the fluctuation in individual interest is expanding (Apte & Viswanathan 2000).

The straightforward advancement of material from the receiving dock to the transportation dock with an essential stay period in the middle is referred to as cross docking. Despite the fact that it's anything but another idea, it is picking up support as a wide scope of works on, incorporating without a moment to spare assembling, electronic information trade and propelled outsource strategies, apply effect on the coordination procedure (Ross,1997, McEvoy,1997;, Schwind, 1996, White, 1998). Cross-docking is calculated office between the maker and shopper with the capacity of item coordination instead of item stockpiling. At the stage inbound entryway, the approaching items, which vary as per their sending goals, are emptied, separated, prepared and combined to be reshipped at outbound entryway. The combined goods are either lawfully transported to a semi-trailer stack (one pickup) or put into brief stockpiling (two pickups) for future reshipment (Maknoon & Baptiste 2009). Cross-docking is characterized as a transshipment stage that gets items from a provider for a few goals and merges them with other providers' items for a typical last conveyance goal (Kinnear 1997). Planning a productive system of cross docks is

significant achievement of cross docking additionally relies upon how well every single cross dock is structured and oversaw (Yang, Balakrishnan & cheng 2010).

Most examinations regarding cross-docking talk about the concept of cross docking, its physical plan, or area assurance. In 2000, Apte and Viswanathan proposed a framework for the development of a cross-docking system and showed that, with the exception of growing stock, cross-docking may successfully achieve a considerable reduction in transportation costs. Sung et al (2003). Organizations in newly changing globalized condition, quest imaginative approaches to insert their store network so as to limit their expenses and oversee adequately their stock dimensions. Cross-docking activities increment throughput at basic appropriation focuses by emptying shipments straightforwardly on departing transport, which dispenses with the essential to store cargo (Papadopoulou & Manthou, 2012). The principle preferred position of cross docking is abatement in expense of store a network (Gümüş and Bookbinder, 2004). This is accomplished through the shipment of various requests at the same span of time. Notwithstanding that, it has been evaluated that by this technique the items remain away for under twelve hours (Waller et al., 2006).

Boysen et al (2010) express that "economies in transportation cost could be acknowledged via merging dissimilar deliveries to full truckloads without relying upon (augmented) inventories at the cross dock", reasoning that the coordination among incoming and outgoing streams is a significant factor on which the adequacy of cross docking technique is based Vasiljevic, Stepanovic, and Manojlovic (2013) demonstrates the advantages that can be increased through cross docking by utilizing a true contextual analysis of a driving grocery store chain in Serbia. Separation travel, fuel utilization, time spend for visiting, number of visits, number of beds transported, vehicle upkeep cost, rent cost have been taken as markers for the contextual investigation.

Statement of Problem

How Cross-Docking might decrease the cost associated with supply chain operations? Especially under uncertain countries like Pakistan

Problem Discussion

In order for conventional distribution centers and cross-docking centers to coordinate with the manufacturing process, a few references in the literature have emphasized the effectiveness of production/distribution planning (Vector & amp; Fand-Tzu, 2008). However, research has also shown that the industrial sector in particular, where demand might occasionally grow quickly, requires cross-docking to be adopted in any case to address demand side deviations (Khan, Hussainy, Khan, Khan, Sahrif & Tariq, 2017). On the other hand, several studies associated with cross-docking indicated advantages of cross docking as advantages such as cost reduction in developed countries and there is also a need of cross docking in underdeveloped countries or developing countries (www.worldbank.org). On the other hand, there are number of studies which highlighted importance of cross docking but there is hardly an evidence of this concept in the food industry (Dragan, Miroslav & Oliver, 2013). Similarly posited by Sultan Khan and Shere (2019) done on perceived impacts of cross docking highlighted the requirement of research on cross-docking for FMCG industry.

Furthermore, Pakistan is playing major role in edible oil industry of world although country is on lower side with respect to technology (Edible Oil Industry Sector Update, 2018) and cross-docking is one of the best strategies to deal with uncertainties (Shuib & Fatthi, 2012). Therefore, this study specifically focuses upon the impact of cross-docking strategy with respect to edible oil industry of Pakistan in order to indicate various advantages.

Literature Review

Cross-docking is regarded as the most inventive supply chain method (Guignard Hahn and Zhang, 2013). However, cross-docking is impractical, particularly in unstable nations (Khan et al., 2017). Although 3PL and LTL companies are constantly following cross-docking & quantitative analysis is required on benefits of cross-docking especially for the logistic companies (Sultan,

Khan & Shere, 2019). Generally, the concept of cross-docking means there is no inventory kept but it may lead to the stock-out situation due to fluctuation in demand. Although most of the studies done in this regard are qualitative in nature (Khan et al, 2017) and therefore there is a need of quantitative studies which can optimize the work especially with respect to the uncertain countries like Pakistan.

Transportation Cost

Apte & Viswanathan (2000) recommended a structure for planning a crossdocking framework and demonstrated that cross-docking can viably acquire generous decrease transportation costs without enhancing stock. For a coordinated administration system, Sung and Melody (2003) proposed a tabu search computation to identify the locations of one and more cross-docks and vehicles. They drew attention to the fact that cross-docking has been shown to be an effective way to reduce transportation costs and delivery times without increasing inventory.
Gumus and Bookbinder (2004) utilized business delicate product including LINDO and CPLEX to decide transportation strategies in calculated system and ideal areas of cross docks. Recently, Kreng and Chen (2008) created two models, a cross-docking model and a conventional warehousing model, to facilitate both generation and circulation so as to decrease significant expenses in a store network. Then again, the exemplary vehicle directing issue (VRP) includes the administration of a lot of clients with known requests by an armada of vehicles from a solitary circulation focus. The item of the VRP is to limit the absolute separation and the quantity of vehicles which begin and end their visits at the focal depot. Mosheiov (1998). Crafted by Lee et al (2006) is most likely the main that takes both VRP and cross-docking into thought. They proposed a tabu pursuit (TS) to decide the quantity of vehicles and the ideal vehicle steering plan at a cross-dock to limit the total of transportation cost and fixed expense of vehicles. The pickup vehicles begin from the cross-dock and touch base at cross-dock all the while.

At that point the conveyance vehicles move to the retailers and come back to the cross-dock in the wake of finishing their visits. The target of the issue is to decide the quantity of carriage and best course just as the landing time of every vehicle in order to limit the entirety of the operational expense of vehicles and the transportation cost. Walmart and Harp's Food Stores, revealed huge reserve funds in transportation, stock, and stock-out expenses subsequent to actualizing cross docking in their frameworks (Snyder 1995). Gumus and Bookbinder (2004) likewise proposed a methodology to decide the areas of cross docks and portion of vehicles. Their goal is to structure an effective system of cross docks to limit the complete expense of transportation, stock and offices, permitting both immediate and roundabout shipments between the causes and goals.

H_1O: Cross-docking has no impact on the price of transportation.
H_1A: Cross-docking has a positive effect on transportation costs.

Inventory Cost

Thought as another outcome of the nonattendance of warehousing, low stock expense improves the corporate income and the by and large corporate budgetary execution configurating the fundamental upper hand for the organization that presents cross-docking strategy. (Vrisagotis, Siassiakos. Panta., Kaimakamis and Kaimakamis. 2009) Due to quick transshipments stock expense is essentially unimportant in cross docking though in conventional frameworks is high, no prompt transshipments. Now an exchange off between insignificant stock expense and of lost deals cost is fitting to be done for the design of the best coordination system affirming or not the use of cross docking. (Vrisagotis et al., 2009) Reduce inventory at the point when the volume and timing of supply can be figured out how to decisively match request, the requirement for huge wellbeing stocks is dispensed with.

H_2o: Cross-docking has no impact on inventory costs.
H_2A: There is a positive effect of cross-docking on inventory cost.

Labor Cost

Work cost is diminished with the utilization of cross-docking yet one of the respondents has shown that it does not get diminished in light of the fact that the works are employed and they are given compensations on month to month premise. It implies whether they would work or not, they will get their compensations every month. It tends to be diminished on account of re-appropriating of the works at whatever point required as referenced (Khan et al. 2017). In an equivalent way, another analyst has brought up that work cost is possibly diminished in the event that they are redistributed as opposed to contracting them for all time as, if your works are in changeless premise and you have employed; not re-appropriated then certainly it won't be influenced like it is going on in our organization our expense gets decreased in feeling of cross-docking. Correct? Be that as it may, in the event that you enlist changeless work, at that point certainly it won't have any critical effect on cost" ((Khan et al. 2017).

H_3o: Cross-docking has no impact on labor costs.
H_3A: Cross-docking has a positive effect on labor costs.

Research Methodology

The purpose of this is descriptive in nature and the study setting was non contrived in order to collect data from respondents at their own work setting. (Sekaran & Bougie, 2016). In addition to this the philosophy of research indulged with the study is epistemology and research stance is realism (Saunders, Lewis, & Thornhill, 2009). Furthermore, the study is limited to giants of oil sector therefore the sampling technique is non-probability and in order to collect data the method used in snowball sampling. This became prevalent due to advantages of snow ball sampling cited by Voicu and Babonea (2011) e.g. **a)** Identification of respondents and initiation of referral chains and **b)** Monitoring of the referral chains and of quality of data collected

Method of Data Collection

Data collection has been done through supply chain department of various FMCG companies like Dalda Foods, Habib Oil Mills and Evil Oil Mills. Although in order to develop

effective instrument for data collection references like Panousopoulou, Papadopoulou, Eleni-Maria and Manthou, (2012) and Ramaa, Subramanya and Rangaswamy (2012).

Sampling Technique

Sampling Technique used in this regard is coherent with Sultan Sheikh and John (2019) Sultan Khan and Shere (2019) and Khan et al (2019) which has been done through non probability sampling. The study also signifies the criterion used by Sultan Sheikh and John (2019) and Sultan Khan and Shere (2019) in order to incorporate snowball sampling to the study

Sample Size

As the research is linked with the Supply Chain Management and the use of strategy of cross-docking is non generalizing able and thus data might only be collected from those who are working in the department of supply chain therefore the data has only been collected from 108 respondents by specifically focusing upon manager, additional manager and assistant mangers of the supply chain department through the indication of prior respondent.

Data Collection- Instrument

Closed ended questionnaire adapted from Panousopoulou, Papadopoulou, Eleni-Maria and Manthou, (2012) and Ramaa, Subramanya and Rangaswami (2012). Research work on the tropic is used to collect data in effective and efficient manner.

Validity and Reliability Test

The data has not only been checked with SPSS I order to check the level of initial reliability and after getting the values of initial testing around 70% for entire range of constructs in our study researcher march towards discriminate validity and implemented the strategy for cross-docking.

Statistical technique

The statistical technique was used Structure Equation Modeling as recommended by the study of Shah and Goldstein (2006) that the tool is recommended especially for the studies under operations management.

Theoretical Framework

Figure 1: Research Model and its Relationship

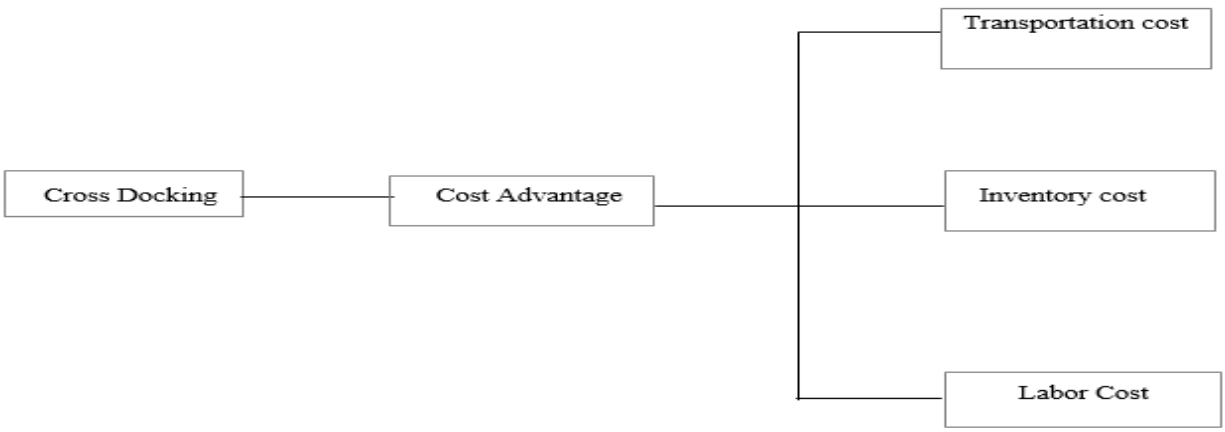

Figure 2: Highlights the coefficient and effect of statistical analysis made through SMART PLS

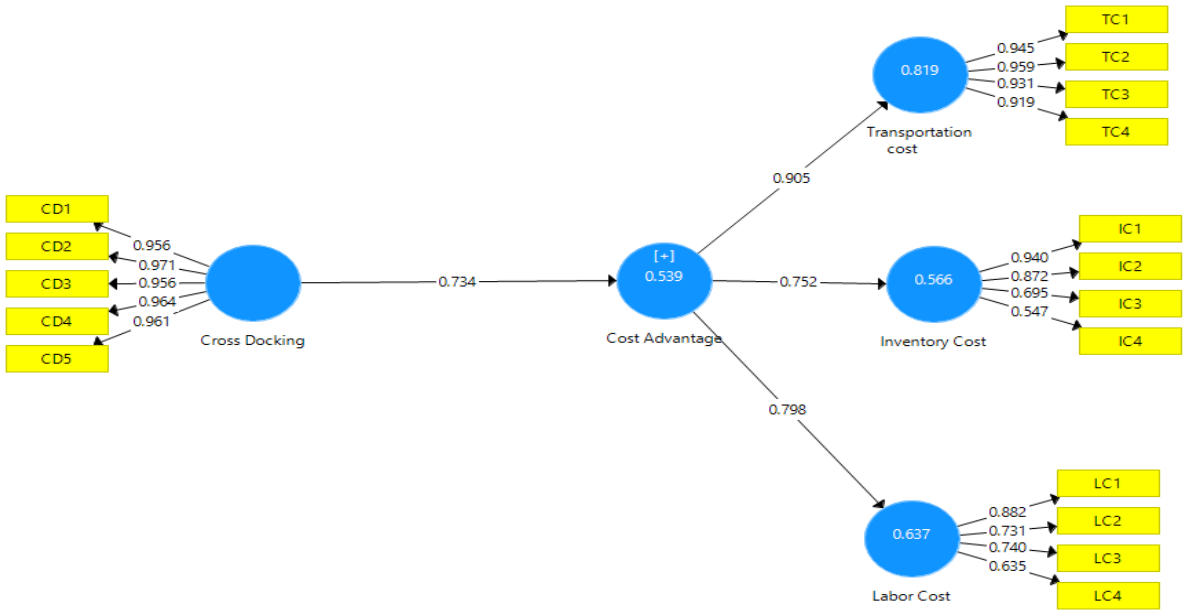

Table 1 indicted that research construct is the hybrid of four variables i.e. Cross-Docking which is independent in nature and Inventory Cost, Labor Cost and Transportation Cost as dependent variable. Moreover, table also indicated that independent variable is based upon five elements having reliability values above than ninety for each element. Similarly, all the dependent

Table 1. Descriptive Statistics:

	Cost Advantage	Cross Docking	Inventory Cost	Labor Cost	Transportation cost
CD1		0.956			
CD2		0.971			
CD3		0.956			
CD4		0.964			
CD5		0.961			
IC1			0.840		
IC1	0.744				
IC2			0.872		
IC2	0.734				
IC3			0.795		
IC3	0.720				
IC4			0.747		
IC4	0.815				
LC1				0.882	
LC1	0.724				
LC2				0.731	
LC2	0.799				
LC3				0.840	

LC3	0.766			
LC4			0.735	
LC4	0.811			
TC1				0.945
TC1	0.883			
TC2				0.959
TC2	0.861			
TC3				0.931
TC3	0.811			
TC4				0.919
TC4	0.840			

Variables are based upon four elements and each one is not only reliable but last fostering positive impact upon cost advantage.

Table 2: Quality Criteria

	R-Square	R-Square Adjusted
Cost Advantage	0.839	0.774
Inventory Cost	0.807	0.783
Labor Cost	0.821	0.798
Transportation Cost	0.801	0.789

Table 2 indicated that value of R-Square is more than 80% of dependent variable has been predicted by the independent variable i.e. cross-docking. Moreover table also indicated that the value of R-Square for each case is less than 10% that means the variables also do not have multi-co linearity. Therefore the data is said to be reliable for inferential testing (Rehman et al., 2021).

Table 3: Heterotrait - Monotrait Ratio (HTMT)

	Cost Advantage	Cross Docking	Inventory Cost	Labor Cost	Transportation cost
Cost Advantage					
Cross Docking	0.768				
Inventory Cost	0.788	0.472			
Labor Cost	0.672	0.709	0.486		
Transportation cost	0.628	0.690	0.488	0.642	

Table 3 indicated that value of discriminate validity is less than 0.8 in each case that makes discriminate validity appropriate. Therefore, data seems to be reliable for further inferential testing.

Inferential Statistics

Table 4: Path Coefficient

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Cost Advantage -> Inventory Cost	0.829	0.835	0.048	17.326	**0.000**
Cost Advantage -> Labor Cost	0.928	0.930	0.060	15.369	**0.000**
Cost Advantage -> Transportation cost	0.966	0.966	0.017	56.390	**0.000**
Cross Docking -> Cost Advantage	0.774	0.777	0.048	16.216	**0.000**

As per the table sample mean for all the variables are more than 0.70 that means the mean value is predicting positive preference of the respondents as the value of mean for all variables is near to 1. Moreover, the t value for all the variables is more than 3 therefore it is said to valid that all the variables are creating positive impact on the dependent variable is cost advantage and its other sub variables. At last but not the least the p-value for all variables is 0.000 therefore it is legitimate to believe that the values are significant and independent variables are fostering clear impact on the dependent variables.

Table 5: Total Effect

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Cost Advantage -> Inventory Cost	0.829	0.835	0.048	17.326	**0.000**
Cost Advantage -> Labor Cost	0.928	0.930	0.060	15.369	**0.000**
Cost Advantage -> Transportation cost	0.966	0.966	0.017	56.390	**0.000**
Cross Docking -> Cost Advantage	0.774	0.777	0.048	16.216	**0.000**
Cross Docking -> Inventory Cost	0.642	0.649	0.058	10.998	**0.000**
Cross Docking -> Labor Cost	0.718	0.723	0.068	10.622	**0.000**
Cross Docking -> Transportation cost	0.748	0.750	0.049	15.150	**0.000**

Table indicated that Cost Advantage creating positive impact on its sub-variables i.e. inventory cost, labor cost and transportation cost. That means the variables which has been predicted on the bases of literature review are valid. Moreover, the independent variables cross-docking is also producing desired impact on all the subdivisions of cross-docking i.e. inventory cost, labor cost and transportation cost.

Hypotheses Assessment Summary:

On the bases of above mentioned statistical testing researcher became able to reject the null hypotheses therefore it is legitimate to state that:

H_1A: Cross-docking has a positive effect on transportation costs.
H_2A: There is a positive effect of cross-docking on inventory cost.
H_3A: Cross-docking has a positive effect on labor costs.

Conclusion

Khan et al (2017) indicated cross-docking is the requirement of recent times and organizations must implement the strategy of cross-docking with small warehouses in order to prevent the risk of stock-out, damages, pilferages and misrouting. Thus this study has been done with the perception of SCM specialist is intensely focused upon reduction of cost of operations associated with cross-docking. Hence researcher has adopted the questionnaire through blend of qualitative as well as quantitative studies and after pilot testing through SPSS the data has been indulged with SMART PLS software in order to induce results associated with research objectives. The analyses based on SMART PLS has two folds one is descriptive statistics includes Reliability, Quality Criteria and Discriminate Validity. The other side of analyses is inferential statistics which is based upon Structural Equational Modeling (SEM) and the analyses of data indicated that cross-docking has been perceived as the strategy which is efficient for the decrease of cost associated with operations. Moreover, the results of the study also highlighted that cross-docking is perceived as the strategy which can yield competitive advantage for the companies having fixed demand as well as low risk of inventory holding.

Discussion

Study of Khan et al (2017) indicated that inventory management is one of the most important challenge in the recent times and one must not ignore risks and challenges associated with the strategy. Moreover, through using the reference of Kreng and Chen (2008) study indicated that cross-docking might have resulted in optimization of efficiency as well as aids in decrease of cost and lead time. One of the latest studies of Benrqya (2019) indicated that cross-docking resulted in mixed results as cross-docking at supplier level increases the cost of supply chain by 5.3% although cross-docking at retailer reduces the cost of supply chain by 1% and combination of cross-docking and traditional warehouse reduces the cost by 6.4%. Thus, our study also consistent with the second implication of Benrqya (2019) that cross-docking implementation reduces the cost for oil sector. Adding further the findings of the study is coherent with the findings of Kahn et al (2017) that cross-docking leads to decrease in the inventory cost although it does not match with the results of Sultan et al (2019) as study could not leads to decrease in inventory cost until or unless supported by effective coordination between supply chain members.

In association with labor cost study of Khan et al (2017) posited mix results that if labor were hired on permanent bases then strategy of cross-docking does not have any effect on labor cost although if the labor is hired on the bases of work and number of pieces then cross-docking must reduce the labor cost. Similar sort of findings are resulted from this study which highlighted the perception of supply chain specialists and pd posited that the strategy is effective for the reduction of labor cost. At last this study also highlighted that cross-docking is also effective in reducing the cost of transportation cost which is again against of conclusion made by Sultan Sheikh and John (2019) as study of Sultan et al (2019) predicted that there will be no impact of cross-docking on time cost until or unless supported by effective coordination between supply chain members Therefore, it is legitimate to believe in the implications of Kahn et al (2017) that use of cross-docking in uncertain countries is a form of risk and the strategy of cross-docking must be implement with high care and concern.

Policy Implications

As mentioned earlier the study is associated with one of the sector of FMCG industry having fixed or less fluctuated demand and having lesser inventory stock out cost. Therefore the findings of the study might also be associate with the sectors of FMCG industry and intraprenuers working in any sector of FMCG industry might consider the findings of this study worthy. Therefore, it is legitimate to write that in FMCG sector the strategy of cross-docking might also be linked without using ware housing although this might create less competitive results for the sector as compared to the use of strategy with cross-docking.

Future Research

As mentioned earlier the study is limited to manufacturer cross-docking and not related supplier as well as retailer cross-docking therefore it is feasible to state that the further studies might be done on supplier and retailer cross docking. Moreover, comparison of perception of SCM experts working in supplier related areas, manufacturer related areas and retailer related areas might also optimize level of understanding. Furthermore, studies associated with the moderation of variables as mentioned by Sultan et al (2019) i.e. proper communication, as well as variables like IT and implementation of ERP might produce different results for retailer, manufacturer and supplier associated supply chain.

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