Cross Docking as a factor of Distribution Efficiencies Improving in conditions of Governance Digitalization

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Abstract. This paper is an attempt to investigate the impact of cross docking on transportation and distribution efficiencies, while focusing on role of cross docking to reduce warehousing cost. 1073 Respondents from the logistic industry were selected through restricted probability sampling, for crawling the perceptions/responses on the proposition of this research while the 1000 responses were filtered and recorded for evaluating the hypotheses and extracting the empirical findings on the impact of cross docking on improving distribution efficiencies and reducing warehousing cost. The responses to gauge the propositions/hypotheses of the study were collected from the respondents belong to logistic industry from four major Asian countries including China, Pakistan, India and Sri Lanka, while, the respondents were contacted through their LinkedIn and Facebook profiles. The findings confirmed that 1% improvement in cross docking reduces 32.4% warehousing cost and improves 35.6% distributions efficiencies significantly.

1. Introduction

Cross Docking is an out of the ordinary subject, equally from a research point of view in addition with realistic perspective. Numerous businesses are increasingly shifting towards the concept of Cross Docking that gives us the competent ways to standardize the overall flow. In this conduit, companies also believe that the vital part is to improve distribution efficiencies towards the success of cross docking process. Success in a distribution network can only be attained if supply and demand is managed with no stock in hand in between. Secondly, advance planning of vehicles can only be set if arrival, departure and destination times have to be available in time. Thirdly, delivery to customers should be through consistent transport that avoids delays.

The reason that companies and professionals are showing their interest towards cross docking is reduction of inventory and related cost, less pilot period, progression in consumer services, building good relations with providers and likewise taking decisions on right time.

Apte & Viswanathan [1] have also discuss that companies after achieving their improved manufacturing operations are step forward their efforts to improve their distribution and logistics processes because the inconsistency in individual demand cost more and increase overall logistics cost for more than 30 percent of sales dollar. In these circumstances, one of the most contemporary
warehousing approaches that are probable to calculate the uninterrupted flow of process cost and delivery cost meanwhile keeping the buyer check in point is cross docking. It’s correct that Supply Chain managers from around the world are agreed on the statement that it is necessary for the organization to have efficient and effective logistics and distribution management. Many authors [2,3] have also explained the importance of cross docking. In this paper we have endeavor to further examine and authenticate the hypotheses that there is the impact of cross docking on improving distribution efficiencies.

**Problem Statement**

To empirically examine the controlling impact of cross docking on improving distribution efficiencies and reducing warehousing cost in conditions of government digitalization.

2. **Literature Review**

Rohrer defines the term cross docking as it is a material managing and distribution model which include moving of supplies through an uninterrupted flow from an incoming to outgoing shipment [4]. From one of the perspective of this method, main purpose as reduce cargo space with redundant management. He also added new knowledge when businesses go on in the direction of rationalize delivery process, now gradually become broadly conventional delivery technique. Belle & Valckenaers describes that distribution network with less or little storage space system where goods are take down to receiving dock along with (almost) in a straight line weighed down to the shipping dock [5].

The management of the warehouse which involve the delivery of goods to the warehouse from incoming trucks and then categorized by specific items which is based on demand of customer with no items being placed in inventory in the warehouse [6].

Vis & Roodbergen found that this is mainly a way where goods must be take down outside the truck also consequently weighed down to further vehicles. Goods then separated on weighting vehicles according to the destinations [7]. Component weights (e.g. bundle of goods) are placed on flooring among receiving and shipping to stay the vehicle to get there in for little dwell time in between. On the other hand, goods are not stored for a longer time. A distribution system to eradicate cargo space plus categorize selection purpose of a depot whereas permits this system to provide it’s shipped as well as distribution flows. This is the contemporary approach where we move consignment in a sequence flow from inbound to outbound trailers without involving any storage. A shipment on average takes underneath a day in a receiving port, off and on it takes more or less than half an hour. They also define that in grocery business, cross docking has permitted firms to decrease inventories and shipping costs in the middle of severe price rivalry. Cross docking is also a foundation practice of less-than-truckload (LTL) trucking firms, which seek out combine shipments to attain transportation economies. Superior information systems and better supply chain management have significantly reduced transaction costs which in turn, have led to smaller batch sizes and have to merge to get back transportation economies [8].

Apte & Viswanathan explain in their thesis that it is a storekeeping path [1]. This approach engage flow of goods straightly on or after the incoming doors on the way to the delivery doors by means of a least stay period involved. They also explains the efficiency of the distribution chain by efficiently get considerable decrease of shipping price with no rise in stock whereas retaining the point of consumer check. It decrease goods sequence period, so doing enhancing flexibility in addition create the delivery chain awareness. Effective cross docking for potential improvement can lead to cut off the delivery price, the substantial place required like cross dock place which named as stopover place to deliver supplies, obsolete supplies which no longer place in the market.

Cross docking is a new approach towards supply chain and replaces traditional warehousing. It enables uninterrupted flow of goods with no storage space. Cross docking is a distribution system where things received at the warehouse are not acknowledged into stock, but are arranged for shipment to another location or for retail supplies. It is the uninterrupted movement, where the
continuous freight chain is moving from inbound to outbound (dispatch), hence eradicating cargo space. It describe as movement throughout division [9].

[10] suggest that it is the contemporary approach where freight are discharge from receiving dock, rearrange and assemble into categorize according to specific items further weighed down onto dispatching dock for shipment according to its order sample in a supply system. They also influence the significance and implementation of cross docking system has developed quickly in recent years. Mainly in distribution networks, it plays a key role that defines the beginning of multipurpose loom which can take place to resolve the true world dilemmas in addition many unusual and still inconsistent objectives are measured. The cross docking scheduling dilemma is solved through three well-known multipurpose algorithms consist of non-dominated sorting genetic algorithm-II (NSGA-II), strength Pareto evolutionary algorithm-II (SPEA-II), and sub-population genetic algorithm-II (SPGA-II) in which there is the unloading of product items from incoming port afterward according to the specific product item category weigh down onto outgoing port for delivering. Finally, whole operational period and the whole delay of all outbound trailers can be evaluated efficiently through the act of these multipurpose algorithms but when we take about point facet, these activities are critical and decisive.

This paper discuss about merger end in a cross docking system. When several tiny consignments are able to combine to complete vehicle weigh in arrangement to understand cost-cutting measure in shipping. It also ensures quick turn over and in time deliveries which decide the progression of vehicle dispensation on distribution ports. They defines that the incoming deliveries at dock doors of incoming vehicles are unpack, reorganized and stimulated transversely to shipping area and at the end weigh the outgoing vehicles, where goods are depart to the end point for there final target area in the cross docking system [8].

[11] found that the main issue in cross dock operation is how to minimize the incurring cost and time while transporting shipment from inbound trailer to outbound trailer because any stoppage in its freight handling can affect the entire system. Due to their performance measures they use right point in time instruction to program vehicle off-load to reduce overall goods shipment period. We should also consider spending duration of a truck that it spend during loading of dispatches in spite of only taking in to account the measuring of voyage period to consign waiting vehicles.

Because for a travel time it might take less than five minutes from receiving to shipping but it might exceed an hour for per item of goods when an inbound vehicle is weigh down to set again for an outbound shipment and ready to leave. These potential measures must be taken into consideration because it would increase the efficiency of cross docking operations. In the new era where technologies take their place, right point in time instructions on stuff material, places, and final point of delivery in a cross dock can eagerly accessible. For instance, the pre planned list of information about the arrival of inbound trailers with proceeds delivery notices; with radio-frequency identification (RFID) labels marked on shipment and RFID readers set up which matched the shipment both at receiving and shipping places.

It point out two different cross docking processes: pre-distribution (Pre-C) and post-distribution (Post-C) where shipments between market place is apply. Several set measures are examined and evaluate. The investigative summary evaluate the stock economies, shipment and functional price in cross docking system, the appropriateness of Pre-C and Post-C are extremely susceptible to functional surroundings aspects which include ambiguity of insist, the per head functional price at dock doors, and the per head stock hold and scarcity rate [12].

Wen, Larsen & Laporte suggest that many manufacturing and retailing companies extensively adopted cross docking in practice. Its successful application is start at Wal Mart the highest as well as largest revenue generating sellers in the world. It uses uninterrupted delivery of products to Wal Mart centre, from their they are selected, rearranged and ship to market place with no stock storage [13]. With adopting cross docking, Wal Mart has enabled to get every day low price strategy and also improves its market share and profitability by evading expending precious instance and administrative stock rate. They referred cross dock as distribution center and considered it to be a new warehousing
strategy because it eliminates traditional warehousing strategy of inventory holding while allowing new approach of consolidation. The overall process of cross docking from inbound to outbound usually takes 24 hours, more or less than an hour. It also provide excellent consumer check however in addition give in considerable benefit above conventional warehousing: reduced stock ventures, cargo space, reduced handling rate, and order cycle time in addition more rapidly stock turnover and quick cash flows. The major user of cross docking is CompUSA because 70 percent of its product’s dollar quantity goes through cross docking.

Wooyeon & Egbelu defines another concept that gives the warehousing technique where orders being dispatched to the depot from incoming vehicles then directly rearranged according to the consumer demand with no goods essentially been detained in stock at the depot, moved then weighed down into outgoing trailers for dispatching to consumers [14]. The goods that are stored at dock are usually for short period of less than 24 hours. Due to this short period of storage, the order cycle period of consumers, stock managing unit, and warehousing storage needs are decreased. To measure the system performance, the optimization of some objectives should be considered. The objective of this consolidation technique is to check the scheduling of vehicles and the appropriation of goods from incoming to outgoing shipment vehicles. This research objective is also have to find most excellent trucking or forecasting order for uninterrupted flow of goods between both the dock doors to reduce entire process period while impermanent stock safeguard for embracing goods for the time being allocated to distribution doors.

Study reports a information break issue in approach to just in time for the movement of vehicles from incoming to outgoing. In this warehousing technique, freight are off-load from incoming docks, arrange and classify according to stipulation and weighed down onto outgoing docks for release to demand end in a warehousing process. Basic problems in these networks is to create synchronization among network of incoming and outgoing docks so it becomes organized, and the goods can be allocate to vehicles successfully. As we scrutinize the JIT perception, the regularity and accuracy of goods deliverance are important for the system’s performance. To assure this objective, this thesis believe a multi-criteria development in which most important point is to reduce earliness and lateness concurrently by means of a combined purpose process. [15].

Hypothesis 01: There is a controlling effect of cross docking on reducing warehousing costs.
Hypothesis 02: There is a controlling effect of cross docking on improving distributions efficiencies.

3. Research Methodology
Method of Data Collection
The personal survey method was chosen for collecting the data from the respondents those were the logistics mangers and logistic professionals working in the various regions of Pakistan. Since the data was collected from the first hand source/ respondents therefore the collected data was known as a primary data. Further, the closed ended questionnaires were designed to collect the primary data or the responses of logistic professionals.

Sampling Technique & Sample Size
A restricted non probability sampling was deployed in this research for collecting the set of information from the respondents from the logistic/ supply chain industry pertaining to the role of cross docking in cutting warehousing costs and improving distributions efficiencies. A total of 1073 respondents were reached and out of 1073 respondents 1000 responses were found valid to process the collected data for extracting the results/ findings.

Profile of respondents
As mentioned already that the responses to gauge the propositions / hypotheses of the study were collected from the respondents belong to logistic industry present in the four major Asian countries including China, Pakistan, India and Sri Lanka. Survey markedly confined the statements pertaining to cross dockings, were taking the responses through google survey from the respondents.

Research Model & Statistical Test Deployed
OLS model was deployed while taking one independent variable i.e. cross docking and two dependent variable i.e. warehousing cost and distribution efficiency respectively which are explained in following OLS equations.

\[
WC = \alpha_1 + \beta_1 CD + ET_1 \\
DE = \alpha_2 + \beta_2 CD + ET_2
\]

For running above mentioned both two OLS equation Simple linear regressions were deployed to examine the possible controlling impact of cross dockings on warehousing costs and distribution efficiencies.

4. Findings and Interpretation of Results

**Table 1 Model Summary**

| Independent Variable | Dependent Variables       | R Square | F       | Sig.  |
|----------------------|---------------------------|----------|---------|-------|
| Cross Docking (CD)   | Warehousing Cost (WC)     | .64      | 12.381  | .000  |
| Cross Docking (CD)   | Distribution Efficiency (DE) | .73      | 24.775  | .000  |

**Table 2 Coefficients**

| Independent Variable | Dependent Variables            | Standardized Coefficients / Beta | F         | Sig.  |
|----------------------|--------------------------------|---------------------------------|-----------|-------|
| Cross Docking (CD)   | Warehousing Cost (WC)          | -.324                           | 32.904    | .000  |
| Cross Docking (CD)   | Distribution Efficiency (DE)    | .356                            | 46.492    | .000  |

Findings as reported in table 1 and table 2 confirmed that the crossdocking has its controlling effect on cutting warehousing cost as for explaining the relations ship between cross docking the warehousing cost, the beta coefficient is -0.324 at F = 32.904 > 3.84. This implies that 1% improvement in cross docking reduces 32.4% warehousing cost significantly as F> 3.84 (3.84 is a cut off value of significance of F value). These findings of crossdocking controlling effect on cutting warehousing are explained empirically as under.

\[
WC = \alpha_1 + \beta_1 CD \quad \text{OLS Model 01} \\
\text{-.324} \\
\text{(32.904)}
\]

Further, the empirical value of R-Square (0.64 at F= 24.775) confirmed that the above mentioned model /OLS Model 02 (i.e. \(\alpha_2 + \beta_2 CD\)) is significant and explained the dependent variable (Warehousing cost) 64%. Precisely, the above model 01 is significant and 64% good fit. Thus, we are failed to reject hypothesis 01, i.e. there is a controlling effect of cross docking on reducing warehousing costs as reported in Hypotheses Assessment Summary (Table 3).

Findings as reported in table 2 also confirmed that the crossdocking has its controlling effect on improving distributions efficiencies as for explaining the relations ship between cross docking the distribution efficiencies, the beta coefficient is 0.356 at F = 46.492 > 3.84. This implies that 1% improvement in cross docking improves 35.6% distributions efficiencies significantly as F> 3.84 (3.84
is a cut off value of significance of F value). These findings of crossdocking controlling effect on improving distribution efficiencies are explained empirically as under.

$$\text{DE} = \alpha_1 + \beta_1 \text{CD} \quad \text{OLS Model 02}$$

Further, as mentioned in table 1, the empirical value of R-Square (0.73 at F= 12.831) confirmed that the above mentioned model /OLS Model 02 (i.e. \(\alpha_2 + \beta_2 \text{CD}\)) is significant and explained the dependent variable (Distribution efficiencies) 73%. Precisely, the above model 02 is 73% good fit significantly. Thus, we are failed to reject hypothesis 02, i.e. there is a controlling effect of cross docking on improving distributions efficiencies as reported in Hypotheses Assessment Summary (Table 3).

5. Hypotheses Assessment Summary

| Hypotheses                                                                 | Beat Coefficient | Interpretations of Beat & F Value | Empirical Conclusion |
|---------------------------------------------------------------------------|------------------|----------------------------------|----------------------|
| Hypothesis 01: There is a controlling effect of cross docking on reducing warehousing costs. | -0.324 at F = 32.904 > 3.84 | 1% improvement in cross docking reduces 32.4% warehousing cost significantly. | Hypothesis is failed to be rejected |
| Hypothesis 02: There is a controlling effect of cross docking on improving distributions efficiencies. | 0.356 at F = 46.492 > 3.84 | 1% improvement in cross docking improves 35.6% distributions efficiencies significantly. | Hypothesis is failed to be rejected |

6. Discussions & Conclusion

This research was an empirical attempt to investigate the impact of cross docking on warehousing cost transportation and distribution efficiencies, The findings confirmed that 1% improvement in cross docking reduces 32.4% warehousing cost and improves 35.6% distributions efficiencies significantly. These findings were supported by [15, 16], [4] also confirmed that cross docking increases the distributions and transportations efficiencies. Whereas, Wang & Amelia [11] believed that cross docking reduces costs associated with logistics etc.

7. References

[1] Apte U M, Viswanathan S 2000 International Journal of Logistics 3(3) pp 291-302
[2] Samarina V et al. 2019 Espacios 40 (16)
[3] Zakharchenko O et al. 2019 Journal of Reviews on Global Economics 8 pp 859-872
[4] Rohrer M 1995 Proceeding of 27th WSC conference on winter simulation pp 846-849
[5] Belle J V, Valkenaers P 2012 Journal Omega 40(6) pp 827–846
[6] Yu W, Egbelu P 2008 European Journal of Operational Research 184(1) pp 377–396
[7] Vis F A, Roodbergen K 2004 Journal of Economics &Business Administration 1-11
[8] Boysen N, Fliedner M 2009 School of Economics and Business Administration, 1-10
[9] Gumus M, Bookbinder J H 2004 Journal of Business Logistics 25(2) pp 199–228
[10] Arabani B, Ghomi F, Zandieh M 2011 Expert systems with applications 38(3) pp 1964-1979
[11] Wang J, Amelia R 2008. Transportation journal 47(2) pp 5-20
[12] Tang S, Yan H 2010 Journal Omega 38(4) pp 192–202
[13] Wen M, Larsan J, Laporte G 2007 *Journal of Operational Research Society* **60**(12) pp 1708-1718
[14] Wooyeon Y, Egbelu P J 2008 *European Journal of Operational Research* **184** (1) pp 377-396
[15] Arabani B, Ghomi F, Zandieh M 2010 *The International Journal of Advanced Manufacturing Technology* **49**(5) pp 741-756
[16] Bartholdi J, Kevin R G 2004 *Transportation Science* **38**(2) pp 235-244