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Crossdocking Insights from a Third Party Logistics Firm in Turkey

Gürdal Ertek

Sabancı University, Manufacturing Systems Engineering

1. Introduction

In the book "The Silk Road: Two Thousand Years in the Heart of Asia," Wood (2002) remarkably suggests that "the very name of 'Silk Road' is somewhat misleading." Wood explains as follows: "It [the name 'Silk Road'] suggests a continuous journey, whereas goods were in fact transported by a series of routes, a series of agents, passing through many hands before they reached their ultimate destination."

It's striking to realize that the Silk Road was a complete "crossdocking" operation, executed on a geographically dispersed collection of hubs and routes. Products neither traveled on a single route, nor were they stored on the way. Rather, they were staged for short periods at the hubs, and then were passed on towards the next hub on the route, typically by a new caravan or transportation mode.

Today, crossdocking is still very important and popular. Crossdocking has a great potential to bring great financial and time savings in logistics. For example, most of the logistics success of Wal-Mart, the world's leading retailer, is attributed to crossdocking.

In this chapter, different types of crossdocking are reviewed, and the crossdocking applications of a 3rd party logistics firm based in Istanbul, Turkey is presented. Istanbul was one of the two final destinations on the Silk Road, together with Rome. Today, it is home to best practices of crossdocking by a multitude of logistics companies, including the company described in this chapter.

Crossdocking is a supply chain strategy that can accomplish significant reductions in total costs and in lead times in a supply chain. In this strategy, crossdock facilities (CFs) act as transfer points where inbound product flow is synchronized with outbound product flow to essentially eliminate storage of inventory. Two other strategies applied in distribution of products are traditional distribution with warehouses and direct shipment (Simchi-Levi *et al.*, 2003).

In traditional distribution with warehouses, the warehouse typically houses activities of receiving, putaway, storage, replenishment, order picking, and shipping. Storage is well known to contribute greatly to costs due to inventory holding. Order picking is well known to contribute greatly to costs, due to labor requirements or the investments in costly automated equipment (Frazelle, 2001). In pure crossdocking, the activities carried out are receiving, staging, and shipping. Staging of products should last for a very limited time span, such as 24 hours, for the facility to be considered a CF.

Increased competition in almost every industry, especially retail and grocery industries, has been pushing companies to search for ways of reducing costs throughout the supply chain. For example, grocery retailers and distributors operate under profit margins of approximately 1.5% (Modern Materials Handling, 2003). Cooperating with supply chain partners to reduce the system-wide costs throughout the supply chain and sharing the benefits is a strategy followed by many companies. The Internet allows companies to communicate among each other in real time at costs significantly lower than the past, when establishing Electronic Data Interchange (EDI) systems was required for real time communication (Brockmann, 1999). These listed factors have increased the applicability of crossdocking as a supply chain strategy.

Crossdocking in various forms has been in use for a long time, especially by package delivery companies. However, its recent popularity can be attributed to its extensive use by Wal-Mart, which implemented this strategy successfully and eventually became the world's largest retailer with more than 5,000 stores throughout the world (Stalk *et al.*, 1992).

Napolitano (2000) provides practical guidelines to planning, designing, and implementing a crossdock operation. This paper firstly provides a brief tutorial on crossdocking through a review of literature, covering Napolitano (2000) and other sources. Then a case study that describes the crossdocking operations of Ekol Logistics, a leading 3rd party logistics firm in Turkey, is presented. The challenges faced by this firm in implementing crossdocking are listed, and insights are summarized.

2. Types of Crossdocking

Napolitano (2000) classifies crossdocking systems into the following three types:

- Type 1 crossdocking: Pre-allocated supplier consolidation
- Type 2 crossdocking: Pre-allocated crossdocking operator (CDO) consolidation
- Type 3 crossdocking: Post-allocated CDO consolidation

When the product is pre-allocated, its destination is determined at the supplier; when the product is post-allocated, its destination is determined at the CF. When supplier consolidation takes place, the supplier builds the final (possibly multi-SKU) pallets that will be shipped to the final destinations. When CDO consolidation takes place, the final pallets are built by the CDO at the CF.

(Figures 8.1-8.3) illustrate the 3 types of crossdocking, as one would encounter in retail industry: Let us assume a supplier that produces 3 types of product, shown by different colors in the figures. Let us also assume that there are 3 stores served by the CF, which demand 1/3 of a pallet from each product that the supplier produces. In type 1 crossdocking (Figure 8.1), the 3 products are consolidated into 3 pallets, each consisting of 1/3 pallet of each product. The destinations for each of the pallets are pre-allocated at the supplier. In type 2 crossdocking (Figure 8.2), the destination of each product in each of the 3 pallets is determined at the supplier; however, they are shipped as single-SKU pallets to the CF. The consolidation into mixed pallets is carried out at the CF, hence the name CDO consolidation. In type 3 crossdocking (Figure 8.3), the supplier sends correct quantities (1 pallet of each product) without any label/tag on them that tells their destinations. The allocation of contents of each pallet to the destinations is determined at the CF, followed by the CDO consolidation.

Figure 8.1 Type 1 Crossdocking: pre-allocated supplier-consolidation.

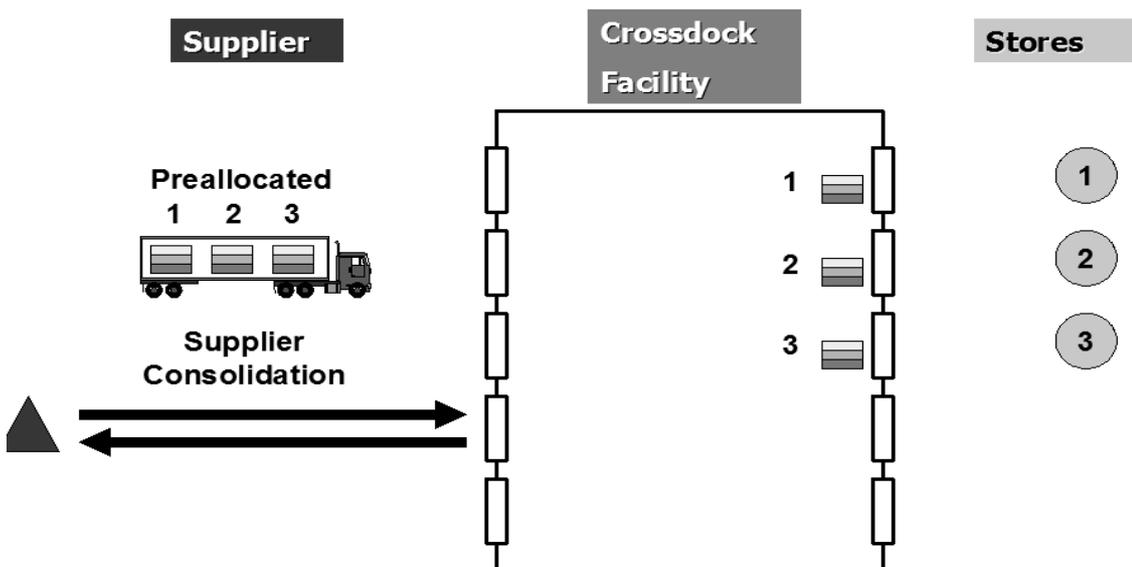


Figure 8.2 Type 2 Crossdocking: pre-allocated CDO-consolidation.

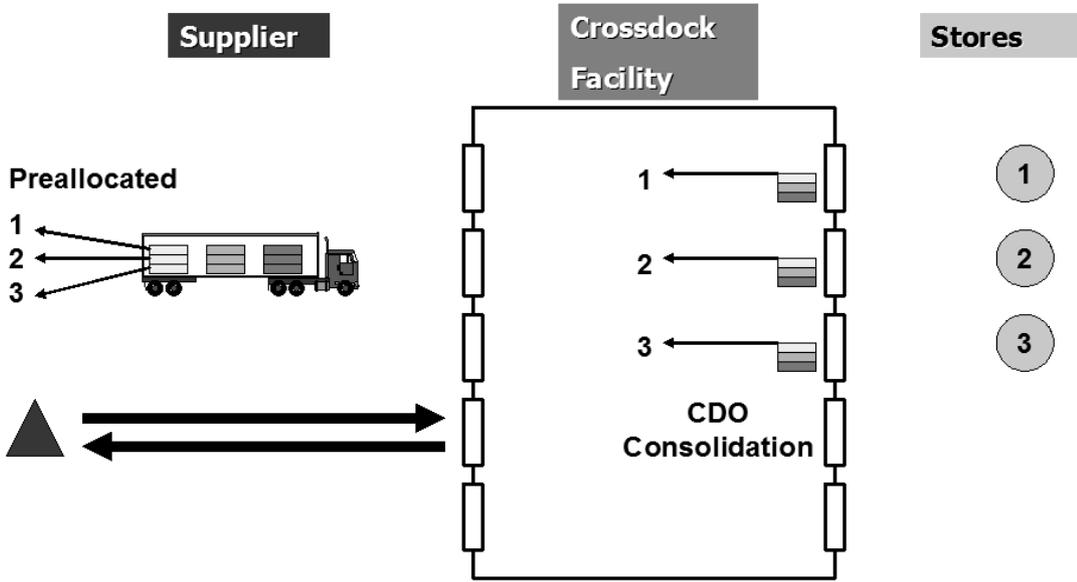
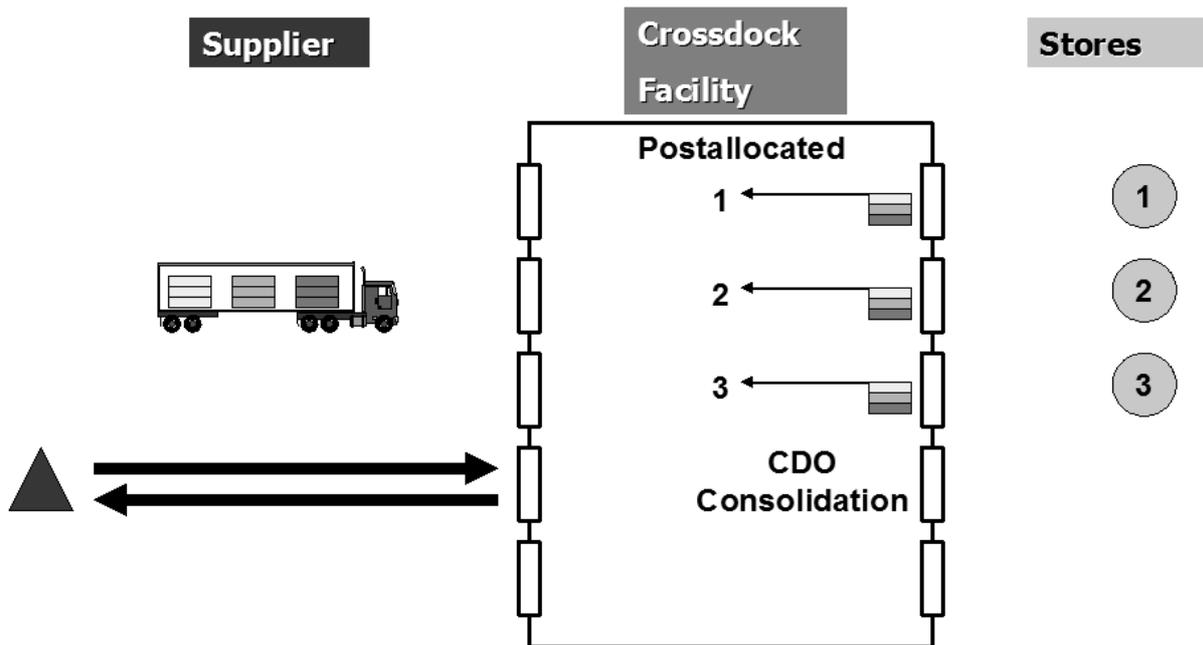


Figure 8.3 Type 3 Crossdocking: post-allocated CDO-consolidation.



3. Appropriateness of Crossdocking

Geoffrey Sisko suggests that products with predictable, high demand and high cubic volume flow, and perishable products are ideal candidates for crossdocking (Aichlmayr, 2001). For example, White (1998) reports that the supermarket chain Asda initiated the crossdocking scheme partnering with Kimberly-Clark, the paper industry giant which supplies high-cube, low-value products such as toilet tissue and paper towels. Choice of these products for the pilot crossdocking program is very appropriate, since these would normally occupy significant warehouse space and cause congestion if traditional warehousing were used (Terrerri, 2001).

4. Prerequisites of Crossdocking

The prerequisites of crossdocking, which present certain challenges, can be listed as follows (Napolitano, 2000; Langnau, 2004):

- **Partnership requirement:** Crossdocking requires total commitment and continuous monitoring at all times by all the parties involved in the crossdocking initiative.
- **Effective communication between parties:** For crossdocking to operate smoothly information flow has to take place smoothly. This almost always requires investment into information systems technology, and into people that will keep the information systems technology and complex operations working. For example, “Wal-Mart operates a private satellite communication system that sends point-of-sale (POS) data directly to Wal-Mart’s 4,000 vendors” (Stalk, 1992).
- **Complexity in managing operations:** The absence of inventories makes it crucial to have a perfect coordination of material flows. Many interrelated decisions at the supply chain and facility level have to be made under numerous resource and time constraints. This is where mathematical models can be of great use.
- **Sharing the costs and benefits of crossdocking:** Crossdocking may result in savings for some parties and costs or risks for others involved in the supply chain. For example, in a successful crossdocking implementation, the CDO benefits from decreased inventories, labor,

and storage space requirements. However, the suppliers involved may have to make significant investment into technology and the retailers may end up with higher inventory levels due to increased lead times (Waller *et al.*, 2006). There should be a complete prior agreement between all the parties on how the costs, savings, and risks resulting from crossdocking will be shared (Kurnia and Johnston, 2001). Another example is the following: The CDO would prefer that the outbound trucks can wait for long time periods such that flexibility is achieved in scheduling the unloading of incoming trucks and the loading of the outbound trucks. However if the trucks are operated by a trucking company, that company would not accept to absorb the cost related with the waiting time of its trucks. Some incentive payment has to be made by the CDO to the trucking company in this case (Schaffer, 1997). Kurnia and Johnston (2001) details the costs, benefits and risks associated with each party in a particular supply chain with crossdocking.

- **Perfect quality requirements:** Suppliers are required to perform perfectly with respect to quality, as inspection has to be significantly reduced at the CF to maintain fast product flow.

5. Industries Where Crossdocking is Applied

Crossdocking has found extensive applications in retail industry, by companies including Wal-Mart (Stalk *et al.*, 1992), Asda (White, 1998), and Sears (Richardson, 2004). Automotive companies reported to implement crossdocking are Toyota and Mitsubishi (Witt, 1998). Crossdocking is also popular in telecommunications and electronics industries, being implemented by companies such as Ericsson (Cooke, 1999) and National Semiconductor (Richardson, 2004). Another industry where crossdocking is adapted is apparel industry (Morton, 1996; Shanahan, 2002).

Third-party logistics (3PL) companies, and especially less-than-truckload (LTL) companies, are frequently found to operate under crossdocking. For example, Columbian Logistics, a 3PL company, serves a large grocery wholesaler by consolidating paper products from four large manufacturers, and distributing them to approximately 200 stores (Terreri, 2001). Bartholdi and Gue (2001) report crossdocking implementations at less-than-truckload trucking companies Southeastern Freight Lines

and Viking Freight System. They illustrate an operations research model that was used for determining how to assign inbound/outbound trailers to dock doors at some of the companies' CFs.

As of 2007, 3PL companies in the US were estimated to gross about \$110 billion, including value-added warehousing, outsourced carriage, transportation management, freight forwarding, and software (Hoffman, 2007). This underlines the importance of crossdocking for the industry.

6. Benefits and Drawbacks of Crossdocking

The benefits of crossdocking can be listed as follows (Napolitano, 2000; Aichlmayr, 2001):

Crossdocking

- Decreases inventory levels due to elimination of storage.
- Enables faster product flow (by eliminating “dwell”, the situation of products waiting statically at the same location) .
- Enables more frequent deliveries.
- Enables faster completion of incomplete orders due to more frequent deliveries (White, 1998).
- Decreases inventory obsolescence due to reduced inventory and faster product flow.
- Decreases labor requirements and costs due to decreased material handling (through elimination of putaway to storage and order picking).
- Decreases inventory damage costs due to less material handling.
- Decreases the amount of space required, and thus increases the handling capacity of the facility.
- Supports Just-in-Time (crossdocking is frequently referred to as the “JIT in distribution”).

- Accelerates payments to suppliers (which is an important argument that can be used to convince suppliers to participate in crossdocking).
- Improves the relations with the supply chain partners.

The major drawbacks of crossdocking occur when the prerequisites listed earlier are not met.

Other drawbacks, which can be considered as challenges, can be listed as follows:

- *Stock-out Risk*: Since the CF with effectively zero inventory replaces the warehouse with positive inventory, any sudden increases in demand, any unavailability of the product at the suppliers, any delays in the supply chain, or any failure to coordinate perfectly results in costly stockout.
- *Union resistance*: The main savings in crossdocking come from decreased inventory and labor costs, where the latter may cause strong resistance among the workforce.

7. Implementation of Crossdocking

At the strategic level, Napolitano (2000) suggests a four-phased framework for making the transition to crossdocking that is composed of assessment and negotiation, planning and design, economic justification, and implementation. It is very crucial that any implementation begins with a pilot program, where crossdocking is initially implemented to cover only a win-or-win subset of products and suppliers. The implementation should then be expanded to include other selected products and suppliers.

At the operational level, the steps involved in a typical retail crossdocking can be listed as follows (Napolitano, 2000; Kurnia and Johnston, 2001; Trunic, 2005):

1. The CDO and the supplier receive order details from the retailer store. If Vendor Managed Inventory (VMI) is implemented, the point-of-sale (POS) data is sent from the retailer store to the supplier (vendor), instead of the order details, and the supplier initiates a shipment when necessary.

2. If pre-allocated supplier consolidation is carried out, the supplier builds store specific pallets and labels/tags them. These pallets may be multi-SKU pallets. If CDO consolidation is carried out, then the supplier prepares just single-SKU pallets (to be sorted at the CF). If pre-allocated CDO consolidation is carried out then each case in the pallet should include the information of which specific store it is heading on a label/tag.
3. The supplier loads the truck that will deliver the shipment to the CF.
4. The supplier sends the Advance Shipping Notice (ASN) to the CDO.
5. The carrier notifies the CDO on the arrival date and time.
6. At the CF, the dock door for inbound receiving is determined and the labor and handling equipment are scheduled to meet the delivery.
7. The dock door for outbound shipment (from the CF) is determined.
8. The outbound carrier is notified of the pick-up time, load description, destination, and delivery date and time.
9. The retailer store is notified of the outbound shipment details.
10. The truck/trailer with the supplier's delivery reaches the CF.
11. Manual checks are performed on a small percentage of the supplier's delivery, to ensure accuracy of the ASN.
12. If pre-allocated supplier consolidation is carried out, then the pallets in the inbound shipment are transferred to outbound dock door/truck/trailer. Otherwise pallets are broken into cases. In the case of post-allocated CDO consolidation pallets are allocated to open orders per destination. Then sorted with respect to each retailer store, and loaded to the outbound truck/trailer from the outbound dock door.
13. The outbound truck/trailer leaves the CF and delivers to the retail store.

Figure 8.4a Steps involved in a type 2 crossdocking operation.

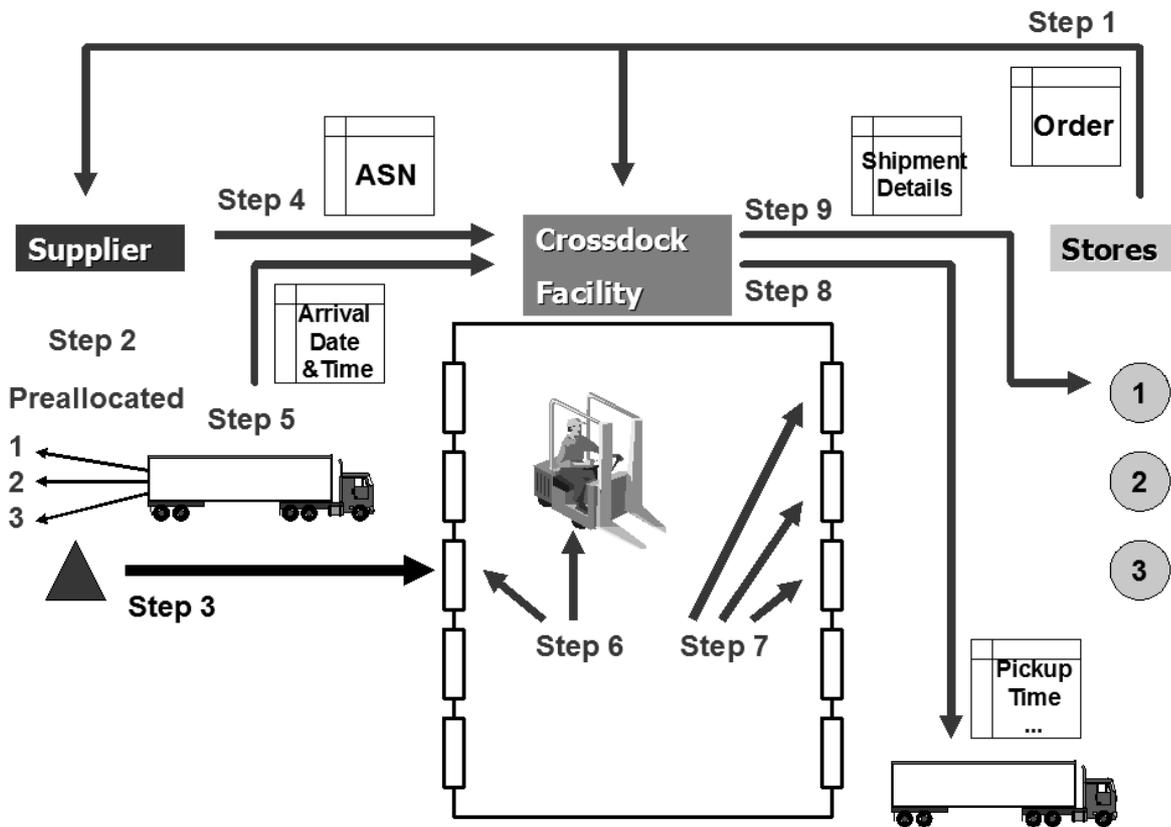
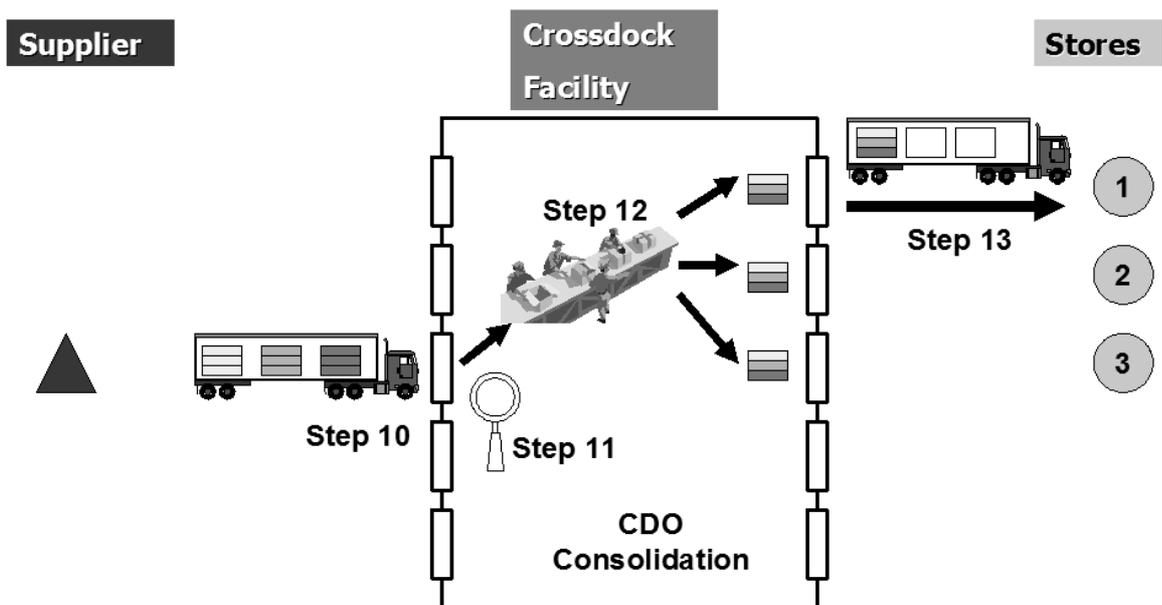


Figure 8.4b Steps involved in a type 2 crossdocking operation.



In (Figures 8.4a & 8.4b), the steps of a typical type 2 crossdocking operation in retail industry is illustrated. Type 2 crossdocking is selected since Ekol Logistics, the 3rd party logistics company that is discussed in the paper, mostly applies this type of crossdocking. In the figures, the material flows are denoted by black arrows and text, whereas the information flows are denoted by grey arrows and text. All information flows are assumed to take place electronically over the internet or an EDI.

8. Case study: Ekol Lojistik

Ekol Lojistik¹ is a leading 3rd party logistics (3PL) firm and a major crossdock operator (CDO) in Turkey. The company operates 13 distribution centers (DCs) in İstanbul, Turkey alone and 5 other warehouses in other cities in Turkey, with a total warehouse area of more than 285,000 m² and a workforce of more than 2000 employees². The company manages a fleet of more than 600 trucks in performing its operations.

The main industries that Ekol carries out crossdocking for can be listed as mass retailing (for a client that we will refer to as ABC), pharmaceuticals, and fast moving consumer goods (FMCG). With respect to the classification given earlier in the paper, the type of crossdocking that Ekol implements mostly is pre-allocated CDO consolidation (type 2 crossdocking), which is referred to as “flow-through” by Ekol managers. The reason that the firm is not able to implement pre-allocated supplier consolidation (type 1 crossdocking) is that most of the suppliers do not wish to undertake the financial and logistic burden of sorting out and labeling their products as pallets before sending them to Ekol’s DCs. Thus Ekol undertakes this burden and carries out the sorting, palletizing, and labeling of most of the products that arrives to its facilities. One other reason for implementing type 2 crossdocking, besides the suppliers’ reluctance, is the problem of quality that is prevalent for certain manufacturing suppliers.

Pre-allocated supplier consolidation (type 1 crossdocking) takes place only for the products of two major international FMCG companies that are delivered to ABC. This accounts for approximately 30% of the volume that Ekol handles at one of its DCs. Ekol also implements traditional warehousing

with putaway, storage, and picking for certain products that arrive as a part of the crossdocking activities. These products are separated from the products that are crossdocked and kept for a certain time period until the demand for them is actualized.

Ekol managers also take pride in managing a “project firm”. Instead of offering a fixed set of options to clients’ requests, Ekol works with clients in analyzing their supply chains with respect to many dimensions and determining a customized solution. For example, Ekol works with data supplied by clients to compute the increase in costs and lead times if pre-allocated CDO consolidation (type 2 crossdocking) is carried out instead of pre-allocated supplier consolidation (type 1 crossdocking). Ekol also quantifies the increase in costs and lead time when traditional warehousing is carried out instead of crossdocking. The increases in costs and lead times depend heavily on the industry, client, product, supply chain, and market characteristics.

One of the basic reasons that ABC considered outsourcing its logistics operations to Ekol was to eliminate the long truck queues that used to accumulate in front of ABC retail stores. These trucks used to arrive from a multitude of suppliers to deliver less-than-truckload (LTL) quantities. In the logistics activities that Ekol executes, the suppliers’ trucks arrive at Ekol’s distribution center (DC) and unload their (mostly non-palletized) loads. Ekol then consolidates these products into pallets and ships them to ABC stores immediately.

Ekol faces many challenges in planning and executing the crossdocking operations for ABC and other clients. Most of these challenges are in fact valid for traditional warehousing as well; however due to stricter time constraints they are more heavily pronounced in crossdocking operations. Some of these challenges and the solutions employed by Ekol can be listed as follows:

Receiving non-palletized shipments: Due to the lack of transportation conditions in Turkey, Ekol typically receives non-palletized shipments. This necessitates a stricter quality control in receiving operations, and more workers for sorting for the crossdocking operations.

Meeting the delivery requirements: The shipments out of the DCs are almost always uni-directional, that is, they involve only one way shipments to retail stores. However, especially given

the very high fuel prices in Turkey (which are approximately three times those in the United States) the revenues would not break even with the costs if Ekol used only its own dedicated fleet. Thus Ekol purchases transportation service from trucking companies. The trucking company for a particular outbound shipment is selected within hours based on whether it has a shipment for the return trip (so that the trucking company will charge only for the delivery trip).

Assuring delivery quality: To assure quality in delivering shipments to retail stores, Ekol prefers to work with a selected group of best-performing trucking firms on a regular basis.

Delayed deliveries: Some suppliers deliver their products with delay. In this case their delivery to destinations is delayed to the next shipment.

The lack of planning by some of the clients: Ekol DCs can become extremely crowded if the clients do not plan their operations properly. For example, the two products that have to be matched for shipping may be arriving in distant time periods, even though they have to arrive in close proximity to match them rapidly and thus carry out crossdocking. The solution that Ekol implements is charging the clients not based on volume alone, but also based on the DC space that they occupy. This indirectly disciplines the suppliers to send their shipments such that they can be coordinated with outbound flow and other inbound flow.

Facility limitations: Land is very scarce and extremely expensive in Istanbul, Turkey. This makes it difficult to find land to build new DCs that will serve crossdocking. Also, almost none of the existing DCs are built for crossdocking in mind at the first place. Ekol thus has to adopt its operations into existing facilities. For example, the crossdocking operations for ABC are carried out at a DC recently acquired from a furniture producer firm. This DC contains docks on only one side of the building, so crossdocking has to be carried out only from one side of the building. However, a DC with dock doors on both (or even all) sides of the building could have been more efficient. Ekol tries to resolve this problem by enforcing standards when renting/buying a semi-finished building that will serve as a DC.

Seasonality in products: Seasonality exists in many product families and products. Ekol alleviates the load that this would put in its distribution operations by diversifying its client portfolio such that the demands of different clients complement each other and the flows are balanced throughout the year for the whole operations.

Quality concerns: Some inbound materials (coming especially from certain countries) to the Ekol DCs have to pass from a more strict quality control. This increases requirements for labor and floor space.

Customs regulations: The customs limit some of the operations of Ekol. For example, sportswear other than sports shoes pass through Halkalı Customs Office, whereas sports shoes are categorized as shoes and pass through Tuzla Customs Office. Even though both of these customs offices are located in İstanbul, Turkey, there is a distance of 75 km between them and a great difference in their distance to each of the Ekol DCs. This situation only increases the coordination burden of Ekol, since now the same demand points may have to be served from two different DCs for two different products.

Traffic regulations: Crossdocking requires fast loading and unloading of materials at the DC docks. To enable this, Ekol prefers using taillifts at the back of the vehicles that connect to the docks and speed material loading and unloading. These equipment typically weigh between 750 kg and 1 ton. However, traffic regulations limit the weight of the load of a vehicle to at most 1.5 tons. Ekol resolves this issue by utilizing the vehicles with taillifts for carrying only low-density products.

One of the greatest challenges for Ekol in planning crossdocking operations is the very short time span available for decision making. Ekol manages its operations with the help of a warehouse management software (WMS) developed in-house. During the interviews with the Ekol managers, the author has noticed that some of the decisions can be made much faster and probably more efficiently through use of appropriate decision support systems. One of these decisions is the problem of loading the vehicles efficiently under various constraints: These constraints include assuring that

- The food items are not loaded next to nonfood items,
- The pallet heights do not exceed 2.2 meters,
- The pallets are loaded on top of each other such as to avoid crushing,
- An SKU (stock keeping unit) is kept in as small number of pallets as possible.

While keeping ABC as a major customer for more than 5 years, the crossdocking operations of Ekol Lojistik has also brought new customers to the company in diverse industries, and has also contributed to the company's reputation overall. Ekol Lojistik has opened five of its 15 current warehouses within the last five years, and has nearly doubled its closed warehouse area. Thanks to its crossdocking strategy and supply chain innovations, in recent years the company has expanded its operations to neighboring countries, as well as the Scandinavian corner of Europe³.

9. Conclusions

In this chapter, the types of crossdocking were identified; the situations and industries where crossdocking is applicable were explained; prerequisites, advantages and drawbacks were listed; and implementation issues were discussed. Finally a case study that describes the crossdocking applications of a 3rd party logistics firm in Turkey was presented, and the challenges faced by the firm and the remedies to these challenges were explained. Since crossdocking requires decision making in compressed time intervals, there is a potential for application of mathematical models and decision support systems that enable making the best decisions in short time intervals.

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¹ <http://www.ekol.com>

² <http://ekol.com/tr/depo-yonetimi/tesisler>

³ <http://ekol.com/tr/kurumsal/kilometre-taslari>