Zappos.com: Developing a Supply Chain to Deliver WOW!
Case Study: How to Alleviate Inbound Transportation Congestion

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Executive Summary

The problem Zappos currently faces is an inefficient inbound supply chain due to uneven scheduling, traffic management issues, and limited visibility into the manufacturers’ supply chains. These factors are very important, and if they’re handled correctly, a lot of time and money could be saved.

We identified three main issues which include uneven inbound deliveries, a lengthy, uncoordinated supply chain, and the fact that most of their current inventory deliveries arrive as less-than-truckload (LTL). Uneven inbound deliveries are caused by many different suppliers who are given a very wide window to make their deliveries. Therefore, Zappos has limited knowledge about when shipments will arrive at the facility. The uncoordinated supply chain is referring to the many stops that a package must take before finally arriving at the final destination. Finally, many of the deliveries are delivered LTL because individual suppliers are not able to fill up a full truckload. All of these issues add cost and time to the overall supply chain.

Based on these issues, we identified three alternatives: focusing on managing delivery schedules, building a consolidation center either in China near the port or near suppliers in the west coast, or building a new distribution center in the western United States.

The first alternative, optimizing scheduling, seeks to optimize the inventory acceptance schedule to balance delivery loads, and gradually tighten delivery windows. This alternative, however, will always be plagued by non-controllable variability inherent in cross-country shipments, and is limited to the flexibility available in the acceptance schedule as is. We also consider expanding the inventory acceptance periods to six or seven days per week, instead of the current five - this adds the missing flexibility into the schedule, but comes at the added cost of additional (or overtime) labor. In the end, expanding the schedule is an option to consider during periods of high product traffic, such as the holiday season, but otherwise is not the most effective option.

The second alternative, consolidation, improves the supply chain by combining shipments from multiple suppliers - either at the manufacturer level in China, or at the supplier level in Southern California. This would significantly reduce the number of inbound deliveries, and allow Zappos a greater control over the transportation of the products they sell. On the negative side, however, this option forces Zappos to take title of the products much earlier than they normally would, and therefore would drastically increase their inventory carrying costs, especially if consolidating at the manufacturer level overseas.

The third alternative, building a new distribution center, would have the obvious benefit of decreasing the amount of trucks coming into each facility. As a result, traffic management difficulties would be eliminated. A new distribution center would save Zappos money by decreasing the distance that many of its shipments are currently traveling. Many of its products are being manufactured in China, then sent to suppliers on the west coast. Those suppliers then have to ship the products all the way to the east coast. Other advantages include increased customer service on the west coast, larger capacity, and greater redundancy. The cost of this option varies dependent on final location, but falls roughly within $3.65-4.10/SF/year. Additional difficulties with this option include the increased complexity of utilizing multiple locations.

We analyzed the alternatives based on two criteria: effectiveness in improving the efficiency of the inbound supply chain (weighted at 60%), and the cost savings associated with that alternative (40%).

Our recommendation is to locate an additional facility in Ontario, California. This would have the quickest impact on relieving the congestion in the inbound supply chain, as well as improve customer service (a Zappos core value) to customers in the western United States. Furthermore, it reduces the lead time for product delivery, both inbound and outbound. The cost of this recommendation is $4.10/SF/year, however, much of this cost is absorbed by the savings in domestic transportation from the suppliers to Zappos (as this facility would now reside within the same general vicinity as them).
The Problem

The problem Zappos currently faces is an inefficient inbound supply chain. Zappos has heavily optimized their outbound supply chain in order to improve customer service. However, the inbound supply chain is equally as important. There are many factors that contribute to this problem including uneven scheduling (which leads to inefficient time management), traffic management issues, and limited visibility into the manufacturers’ supply chains. Addressing these issues is not an easy task, but it is important for the long-term health of the company.

The Issues

There are several issues with the way Zappos currently operates their inbound supply chain. The issues boil down to three main aspects. First, uneven inbound deliveries - some days high to the point of causing traffic problems, and on other days relatively low, leaving inventory staff waiting idly. Second, a lengthy, uncoordinated inbound supply chain that requires many stops along the way before the products finally reach the Zappos fulfillment center. Finally, the fact that most of their current inventory deliveries arrive as less-than-truckload shipments further aggravates the traffic issues on-site.

The first issue, uneven inbound deliveries, is due to the fact that Zappos has many different suppliers (more than 1400 brands in 2008) who are given a wide delivery window for their shipments. Zappos has very limited visibility into the manufacturers’ and suppliers’ supply chains. An order placed based on anticipated supplier inventory at the beginning of a specific month may arrive at any point within that month. This is a considerable source of variability over their inbound supply chain that is currently out of their control. Part of the reason for these wide delivery windows is the fact that Zappos wants to maintain good relationships with its suppliers. The company believes that they shouldn’t ask the suppliers to change from the precedent they’ve already set by holding them to more specific conditions. Furthermore, Zappos only receives shipments from suppliers five days per week, even though the outbound supply operates continuously. This further contributes to the traffic management issues that the company currently faces.

Next, the inbound supply chain typically involves shoes manufactured in China, shipped to a port in China, then to Long Beach, California, distributed to various suppliers throughout the United States (although many are located in southern California), then finally shipped to the Zappos fulfillment center in Kentucky. Unless each of these intermediate stops adds value, the stops are inefficient and incur unnecessary costs.

The last issue is the significant percentage of shipments arriving as less-than-truckload. Not only does this increase the amount of trucks arriving at Zappos, causing unnecessary traffic problems, but it is also economically inefficient (less-than-truckload shipments are charged significantly more per unit than truckload shipments).

Alternative Identification

Our group did a thorough analysis of the case, and we believe that there are three alternatives. The first alternative involves focusing on managing delivery schedules in order to improve the inbound supply chain. This alternative involves several different aspects including the number of days that the fulfillment center accepts inbound inventory, the amount of visibility and communication amongst the companies within the supply chain, and adjusting their relationship and the way they deal with suppliers. The second alternative would require a consolidation center to be built, either near the port in China or in the west coast of the United States near suppliers. The third alternative would be to build a new distribution center somewhere in the west coast in order to cut the amount of deliveries at each facility in half. Although all of these options would require plenty of time and capital, in the long run, they also provide benefits to Zappos that may outweigh the negative aspects.
Decision Criteria

We will consider two decision criteria in selecting the best solution to Zappos’ inefficient supply chain. First, we will look at the effectiveness in solving the problem, and weigh this criterion at 60%. Then, we will look at the total cost savings afforded by each option, and weigh it at the remaining 40%. Since exact numbers are not available, we will assign each criterion a value 1-5, 5 being the highest, based on the estimated net benefit.

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* 1 is most important

Analysis of Alternative #1: Scheduling

A current issue in Zappos’ inbound supply chain, which Tony Hsieh, CEO, has openly recognized, is the variability in inbound inventory deliveries. Some days the inventory deliveries surge and create traffic problems. Other days they drop, and leave workers waiting idly. An interim solution to this variability is to build the functionality for balancing the delivery schedule into Zappos’ operation software. While it doesn’t address the core problem (the percentage of shipments arriving as less-than-truckload shipments, discussed in the next section), it is a quick and inexpensive stopgap.

Zappos set a precedent with their suppliers that they accept a wide delivery window. Ideally, they would gradually tighten that delivery window, especially with suppliers who have proved reliable, but they state that they don’t want them to change that. Which means Zappos needs to approach this from another angle - communication. Zappos needs their suppliers to inform them when their shipments are en route. This information, combined with known transit times for those orders (either contractually agreed upon or calculated based on past performance), can help the inbound scheduling software plan accordingly - possibly by moving flexible deliveries as needed, or by automatically scheduling an “excess inventory team” of contract day-laborers to work on those days when deliveries are above average. Suppliers benefit from sharing this information by saving the money they might lose from a delayed delivery (truck costs, for example).

Another quick solution to free up congestion during inventory acceptance is to expand inventory acceptance to six or seven days, from the current five. While this does bear the additional cost of weekend pay (Zappos pays second-shift workers an additional 9.09% per hour\(^1\), it is likely they would pay weekend workers a similar rate, the net trade-off is positive. Although this would decrease congestion, it could also increase the amount of idle time that workers face. This concern could be alleviated by only expanding inventory acceptance schedules when needed, with a flexible, possibly contract, staff. Another option is to only expand inventory acceptance during the busy holiday season.

The obvious difficulty with any scheduling system, manual or automated, is in exception handling. From weather to loss in transit, there are a wide variety of things that can go wrong with a shipment, and companies that can work around such difficulties have a unique competitive advantage in the marketplace. By expanding the inventory acceptance schedule, and moving flexible deliveries to available slots, Zappos will free up space to allow for these unforeseen variabilities. Should the exception continue for an extended period of time, the scheduling software should be able to accommodate by accounting for the increased transit time.

A Decision Criteria Breakdown is attached at the end of this document. This alternative received a weighted score of 1.60.

**Analysis of Alternative #2: Consolidation**

Consolidation can be broken down into two sections: international consolidation and domestic consolidation. Looking at international consolidation first, most of the brands that Zappos offers originate in China. The current supply chain has manufacturers shipping container-loads of product to Long Beach by boat, then to the shoe companies’ headquarters (largely in the Long Beach & Ontario area) by rail or truck, where they unload their product and send shipments by LTL to their various retailers, including Zappos. To optimize their supply chain, Zappos could consolidate nearer to the source. In this case, a consolidation hub in China would enable Zappos to consolidate their inventory from the manufacturers directly - reducing the shipment cost for the entire journey to Zappos’ fulfillment center. The reduced cost to Zappos could be shared with the shoe companies, who also have the side benefit of saving the space needed for Zappos’ deliveries and allotting it for the traditional brick-and-mortar retailers.

Domestically, Zappos’ suppliers are clustered, with a large cluster in the Long Beach & Ontario area, and another significant cluster in the northeast. By consolidating the multiple LTL shipments from these supplier clusters (using either a third-party logistics firm or their own private fleet), Zappos could decrease the inbound congestion, and optimize transportation costs (as TL rates are significantly cheaper than LTL rates).

In either case, moving the inventory acceptance point earlier in the supply chain puts the burden of transportation on Zappos instead of the suppliers. It also increases Zappos’ inventory carrying costs, as the product remains on their books for the entire length of transit, a substantial increase if coming by container-ship from China.

A Decision Criteria Breakdown is attached at the end of this document. This alternative received a weighted score of 3.60.

**Analysis of Alternative #3: New Fulfillment Center**

The third alternative would be to add an additional fulfillment center in the western part of the United States. This would decrease the time and cost of inbound shipments by reducing the several-thousand-mile gap between the suppliers and the Zappos distribution center, improving customer service for customers in the western United States, and provide Zappos a layer of redundancy in their operations.

At time of writing, Zappos offers 1123 brands². Many of those brands originate from manufacturers in China and are then shipped to the shoe companies - which are highly concentrated in southern California (especially in and around Ontario and Long Beach). This presents a situation where the shoe companies are shipping their products an additional 2000+ miles to the Shepherdsville, Kentucky fulfillment center. By adding an additional fulfillment center in the western United States, a significant percentage of these shipments would travel to a much closer location, reducing cost and transit time.

Since Zappos is an online retailer, the additional fulfillment center does not increase the level of inventory required. Each supplier would ship the same quantity of products. The only change would be where they ship their products. With two distribution centers, half of the suppliers would ship to Shepherdsville, and the other half would ship to the new facility in the west. The traffic management issues that Zappos currently faces would be alleviated, as fewer trucks would travel to each facility. At the individual fulfillment center level, scheduling is simplified thanks to fewer inbound shipments at each location.

A new fulfillment center in the western United States would let Zappos ship most orders to customers in that region within 1-2 days via less-expensive ground shipments. Their current fulfillment center in Shepherdsville takes 4-5 days to ship to the western United States via ground, which requires Zappos to regularly upgrade orders to express

shipping to meet their desired customer service levels. With a center in the west, a separated inventory base, and assuming an even distribution of customers across the nation, each order would now have a virtually equal chance of being served by one-to-two-day ground shipping, or express shipping for customers elsewhere. Whether this saves money depends on Zappos’ distribution of customers. If a majority of their customers reside in the western United States, then this would decrease costs (as those shipments originating from the new facility would no longer need to be expedited). Zappos could further decrease costs by positioning items based on where they are desired most (say, for example, sandals in California, boots in the northeast).

Another advantage afforded by having an additional location is enhanced redundancy of operations. As the supply chain functions right now, if something happens to the current facility that is out of Zappos’ control, operations could come grinding to a halt. However, with multiple facilities, an uncontrollable event at one of the fulfillment centers would only affect a portion of the operations, if any at all.

Zappos has grown rapidly since their acquisition by Amazon.com, Inc., and has added 399,000-square-feet of facilities, in addition to their already-existing 832,000-square-foot fulfillment center. This means that opening additional space in the western United States would also alleviate (at least temporarily) capacity limitations that the company currently faces.

As we see it, Zappos would have two options for locating the new distribution center, either near the port and the suppliers, in Ontario, California or further inland near Salt Lake City, Utah. Where to locate is dependent on several aspects including inbound transportation costs, outbound transportation costs, and the cost to set up a facility at each location.

Inbound transportation costs are affected by how far the products must travel from the suppliers to the new facility. As we mentioned earlier, many of Zappos’ suppliers are located in southern California. Therefore, the transportation costs from those suppliers to a facility in Ontario would be very small, whereas, transportation to Salt Lake City would be much larger. However, for the suppliers who aren’t located in southern California, products would need to be shipped to the suppliers then back to the facility, which would add unnecessary transportation costs. Also, cost per mile for trucking is typically tapered, with higher rates for products that are shipped smaller distances and lower rates for products moving longer distances. Therefore, Zappos would end up paying higher rates for those shorter shipments.

The outbound side of the supply chain is very important to Zappos. According to Zappos, “The final aspect of providing exceptional service was rapid delivery at no additional charge.” (Case study, pg 8) In order to get the products to customers quickly, Zappos pays for overnight shipping by UPS. However, for products that are within one day length away from the facility, Zappos is able to utilize UPS ground. Thus, where to locate the facility based on outbound deliveries may be a large deciding factor. As you can see in the following figures, the one-day reach for Salt Lake City is larger than that for Ontario. Also, if Zappos is willing to use UPS ground shipping for any area that can be reached within two days (which the case did mention as a possibility), the land base that would be covered by the UPS facility in Salt Lake City is substantially larger than that of Ontario.

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In order to find the facility cost, we searched for distribution centers for lease in each location. Although we found a large range of prices in each location, the average price of the locations we found in Ontario came in at $4.10/SF/year, and the average for the locations found in Salt Lake City is $3.65/SF/year.

A Decision Criteria Breakdown is attached at the end of this document. This alternative received a weighted score of 4.60.

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4 UPS U.S. Ground Maps obtained from: [http://www.ups.com/maps](http://www.ups.com/maps)
5 Location data provided by the following websites: [www.loopnet.com](http://www.loopnet.com) and [www.showcase.com](http://www.showcase.com)
Recommendation

Based on our analysis of the available alternatives, we recommend alternative #3, to open a new fulfillment center, as the best method to improve Zappos’ inbound supply chain. By opening a new fulfillment center, Zappos reduces congestion at its current Shepherdsville, Kentucky center, and also allows room for Zappos’ continued growth. The other benefits of this option include reduced domestic shipping distances for the large supplier base in the Long Beach and Ontario region, improved customer service for customers in the western United States, and an added layer of redundancy for Zappos’ operations. As a side benefit, Zappos would have operations within close proximity to their supplier base, which would only further improve their relationships. Negative factors of this option include the land & operating costs of an additional facility, and the increased complexity of operating from multiple locations.

Although land costs are 10.976% cheaper in Salt Lake City, and the coverage for outbound logistics (customers) by two-day shipments is higher, we recommend setting up a facility in Ontario, California, which would cost $4.10/SF/year. Much of this cost is absorbed by the transportation savings from suppliers, since they would no longer have to ship their products to Kentucky, and would instead be shipping intra-city. A portion of the cost could be allocated to improving customer service (a core value of the company) for their customers in the western United States.

Compared to the other alternatives, Consolidation was a close second. That option greatly improves the efficiency of the inbound supply chain, but ultimately adds a significant inventory carrying cost to Zappos’ bottom line. Optimizing scheduling, while a good procedure, is plagued with non-controllable variability, and thus wouldn’t be nearly as effective in the long-haul.

Thus, our recommendation is to add a new fulfillment center as soon as feasible, and begin optimizing the inbound supply chain in that regard.
**Decision Criteria Breakdown**

### Analysis 1: Scheduling

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