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Using Analytics to Improve Delivery Performance
by
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Abstract
Delivery Precision is a key performance indicator that measures Nike's ability to deliver product to the customer in full and on time. The objective of the six-month internship was to quantify areas in the supply chain where the most opportunities reside in improving delivery precision.

The Nike supply chain starts when a new product is conceived and ends when the consumer buys the product at retail. In between conception and selling, there are six critical process steps. The project has provided a method to evaluate the entire supply chain and determine the area that has the most opportunity for improvement and therefore needs the most focus.

The first step in quantifying the areas with the most opportunity was to identify a framework of the supply chain. The framework includes the target dates that must be met in order to supply product to the customer on schedule and the actual dates that were met. By comparing the target dates to the actual dates, the area of the supply process that caused the delay can be identified. Next a data model was created that automatically compares the target dates to actual dates for a large and specified set of purchase orders. The model uses the framework and compiles all orders to quantify the areas in the supply chain that create the most area for opportunity. The model was piloted on the North America geography, Women's Training category, Apparel product engine, and Spring 2013 season, for orders shipped to the Distribution Center (DC). The pilot showed that the most area for opportunity lies in the upstream process (prior to the product reaching the consolidator). In particular the pilot showed that the area with the most opportunity for the sample set was the PO create process. This conclusion was also confirmed with the Running category.

The method developed during the internship provides Nike with a method to measure the entire supply chain. By quantifying the areas in the process, Nike can focus and prioritize their efforts on those areas that need the most improvement. In addition the model created can be scaled for any region, category, or product engine to ultimately improve delivery precision across the entire company.

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1. Introduction

With over 500,000 SKU's, 15 distribution centers, more than 800 manufacturing facilities, a six-month manufacturing lead time, and customers all over the world, Nike’s supply chain is complicated and can be extremely variable. Due to the complex supply chain, the ability to meet customer demand in full and on schedule can often be challenging. However, Nike’s drive for perfection and competitive nature keeps them striving for better product supply performance.

In order to improve, Nike has defined a key performance indicator titled “Delivery Precision” which measures the ability to deliver product to the customer in full and on time. The customer is defined as the retailer, such as Dicks Sporting Goods, or a direct to consumer store, such as Nike Town. This thesis is the culmination of a six and a half month internship in which a method has been developed to quantify areas in the supply chain where the most opportunities reside in improving Delivery Precision.

The Nike supply chain starts when a new product is conceived and ends when the consumer buys the product at retail. In between conception and selling, there are six critical process steps. Currently performance is measured separately at each process step and it is difficult to connect decisions made at the beginning of the process with delivery performance at the end of the process. Nevertheless, the prevailing hypothesis is that the upstream process steps are the main reason for delays in product delivery to the customer.

This thesis will describe a framework for breaking down the siloes created by measuring individual process steps and evaluate delivery performance across the entire supply chain. Additionally, a method using analytics to evaluate the hypothesis will be
described with the goal of determining the process step and behavior that need the most focus in order to improve Delivery Precision.

2. Background

Nike’s mission is “To bring inspiration and innovation to every athlete* in the world (*if you have body, you are an athlete).” The mission can be seen in all aspects of the business, from the detail of design to the focus on improving the supply chain. Nike began over 50 years ago when two men, Bill Bowerman and Phil Knight, had an idea that would eventually revolutionize the athletic shoe industry. While Knight focused on how to sell the shoes, Bowerman experimented on how to make the shoe lighter and faster [1]. Nike has grown to have a revenue of $25 billion/ year and one of the most well-known brands estimated to be worth over $15B [2]. However, there is a saying at Nike that “there is never a finish line” which holds true and can be seen by the aggressive target to continue and increase revenue by over $10B by 2017 [3]. To meet this challenging target Nike must continue to focus on the supply chain to ensure enough capacity and customer satisfaction. This chapter presents an overview of Nike’s matrix organization, and business models, as they pertain to the thesis project.

2.1 The Nike Matrix

Nike has a matrix organization that can seem complicated, but is very effective. The matrix structure is meant to break down managerial responsibility both by region and product. The matrix is comprised of Product Engines, Geographies, Product Categories, and Supporting functions. Any one employee can report to one of these functions with strong dotted lines to one or two others. Therefore, when decisions are made, many people are involved, which slows down the decision-making process; however, in most cases the most
informed and appropriate decisions are made. For more detailed information on the Nike organization structure, refer to Bob Giacomantonio’s LGO Thesis [4]. Below are descriptions of each of the organizations within the matrix, as they pertain to this thesis project.

## 2.1.1 Product Engines

There are three product engines at Nike: Footwear, Apparel, and Equipment. Footwear, as expected, consists of all shoes and sandals and accounts for the largest portion of sales and growth, in 2010 footwear sales grew 11% to $11.5 billion [5]. Apparel’s sales are about half the amount of footwear, at $5.4 billion; however the global apparel market remains more than twice that of footwear, leading Nike to believe that apparel is the company’s biggest growth opportunity [5]. Apparel includes shirts, jerseys, pants, capris, shorts, and other athletic clothing. Equipment is the smallest product engine by revenue and is comprised of products such as baseball gloves and bats, golf clubs, sport bags, socks, etc.

All three-product engines are managed separately, with little overlap. Each has its own sourcing group, which coordinates raw material supply and manufacturing production plans. The current methods for production planning vary between the three groups. In summary, for footwear the Nike planning team and factories collaborate to make a production plan, in which many of the footwear factories only make Nike product. Alternatively, the apparel factories are often shared with other retailers, and Nike procures a certain amount of capacity at each factory based on the predicted demand. The apparel planning team provides the factory a production plan to use as a guide and any changes are then discussed. This thesis will focus primarily on the apparel product engine, since it was the choice of focus for the project.
2.1.2 Geographies

Nike has six different geographies: North America, Emerging Markets, Central and Eastern Europe, Western Europe, and Greater China. The geographies are managed separately and each is responsible for a P&L and key performance metrics. The geographies are responsible for forecasting and demand planning due to their knowledge of the retail trends and changes in their part of the world. A product that is popular in the United States is not always popular in Brazil or Germany, and therefore the geographies are responsible for ensuring the right product is sold in their region. Additionally, each geography has different supply chain nuances, such as Argentina’s ever changing customs requirements. Having management and staff that focuses on learning and solving these geographical challenges provides a large benefit to Nike as a whole.

2.1.3 Product Categories

The categories were developed to provide focus on the product and enhance the brand. The categories goal is to focus on the athlete and develop innovative and performance-built products that tell the Nike story. The categories ensure that there is consistency and connections between the product engines, for example that a pair of soccer shoes matches a pair of soccer shorts. Nike has seen a huge increase in brand recognition and sales as a result of developing the categories. Below, in Figure 1, is a list of the categories with their respective 2011 sales and growth [6].
2.1.4 Supporting Functions

As in every company there are a number of supporting functions in Nike, which include Human Resources, Finance, Legal, and Information Technology. These functions support the entire organization. The sponsor for this thesis project was The Global Operations Innovation group, which is an operations support function that works with the entire organization to improve efficiency in the business.

2.2 Nike Business Models: Futures Model

Nike has multiple different business models for meeting customer demand, which include: Futures, Replenishment, Quick Turn, and Custom Models. The business model of focus for this thesis project was the Futures model, and therefore will be the focus of this section. However, please see Bob Giacomantonio's LGO thesis for information on Replenishment, Quick Turn, and Custom models [4].
The Futures Model is the original model that was used at Nike and is the model that many retail companies use. In the futures business model a customer, which is usually a Nike retailer such as Finish Line or a Nike owned retail store, places a sales order, which state the exact product, and color that they would like. Then Nike combines all of the sales orders and places a purchase orders to the factories. The product is then delivered to the customer once available. At Nike this process usually takes 6 months, but on certain products it can be longer or shorter.

It is often challenging for a customer to know exactly what the trends will be or what they will need 6 months in advance, so orders are sometimes dropped or changed. It is also sometimes difficult to get a customer to confirm an order so long in advance, which means either Nike must take on the risk and produce the material without an order, or wait and deliver the product late into the season. When the Futures Model is executed as planned, it has many advantages. Nike only produces what they know they will sell, and a customer can be guaranteed to get the material in time for the season.

3. The Nike Supply Chain

When Phil Knight started Nike he was focused on two things: create the hottest brand and greatest product. In 2003, Mr. Knight and the rest of the senior leadership team recognized that there would need to be a third focus, Supply Chain, if Nike was to grow and profit into the 21st century. These three key focuses became known as the Nike Tripod, all three legs are needed to support a successful business, see an illustration below in Figure 2.
An effective supply chain is critical to reaching revenue targets, flawless execution in the marketplace, customer satisfaction, and ultimately growth for Nike. The objective of the supply chain is to deliver the right amount of the right product at the right time to the right place, minimizing inventory risk and cost along the way. In order to achieve a high performing supply chain Nike has implemented key performance metrics (KPIs), set targets, and executed projects to reach those targets. The thesis project explained in this document is one of the many ongoing initiatives to improve Nike's supply chain. This chapter provides an overview of Nike's supply chain, a brief summary of the key metrics used to measure the supply chain, and then finally a deeper look at the metric, Delivery Precision, which is the focus of this research project.

3.1 Overview of the Supply Chain

For the purposes of this thesis project, Nike's supply chain can be divided into seven different steps, as shown in Figure 3: Nike Supply Chain. The steps shown are only those that are critical to the overall timeline of the process. Each process step can be broken down further, and will be as needed later in this document.
Figure 3: Nike Supply Chain

The supply chain starts when a new product is conceived, and ends when the consumer buys that product at retail. The steps in the supply chain, from left to right, are:

1. **Commercialization** – The process of developing a concept and turning it into a consistently manufacture-able product. During the commercialization stage, the developers create samples and work to perfect the product. In addition the developers work with the sourcing team and the factories to decide the best factory to source the product balancing quality, cost, and factory capacity, all prior to having a good handle on the product demand quantity. It is critical that this process is completed as scheduled, because any delays can result in a delay to the customer.

2. **Purchase Order (PO) Process** (often referred to as the buying process) – Once the product is commercialized it is ready to be produced. During the PO process the demand planning teams, in each geography, use the actual sales orders received by customers, the product sales forecast, or sometimes other information to create Purchase Orders to the factory. For most orders the goal is to always "make-to-order", however sometimes due to long lead times or inability to gain a firm sales order, a purchase order is created based on the forecast or other information. The POs signal the factory to produce a color and quantity of a certain product. This process is often referred to as the "buy". There are many complications to the PO
process, as mentioned previously. In the futures business model, ideally, a make-to-order ordering policy would be used. However, in reality due to lead time uncertainties, lack of customer orders, and capacity constraints Nike often functions under a make-to-forecast policy. When a forecast does not have a definitive sales order, it is left to the discretion of the “buyer” on whether or not to create a PO for the product.

3. Factory – The factory process step starts when the PO is created and ends when the final product arrives at the consolidator. In between, the raw materials are procured and the product is manufactured. Each factory and product combination has a set lead time, which is updated over time. The factory performance is monitored through a KPI, On Time Performance (OTP), which will be explained in the next section of the document.

4. Consolidator – Once the product is manufactured, in most cases it is sent to a consolidator, which is usually located in the same region as the factory. The consolidator combines Nike products from different factories that are destined for the same location into shipping containers. The lead-time for the consolidator is referred to as Consolidator Processing Time (CPT); the lead-time starts when the product arrives at the consolidator and ends when the product leaves the consolidator, in-transit to its destination. The target CPT is tracked and compared to the actual time it takes for products to be process by the consolidator.

5. Transit – After the consolidator, the product which is inside of a container is transported to a port where it is either shipped by boat or plane to its destination. The final destination depends on the type of shipment; a majority of shipments are sent to a Distribution Center (DC) prior to the final destination, this is known as “DC Shipments”. The other shipments are sent directly to the customer or retailer; this
the type of shipment is referred to as “Direct Ship (DRS)”. The transportation time includes the time it takes to get from the consolidator to the port of entry in the destination country plus the time from the port of entry to the destination (either DC or final customer). The transportation time is monitored and actual times versus target times are evaluated.

6. Yard/DC - In “DC shipments” the containers arrive to the Yard of the DC in some locations (such as the North America DC) and directly into the DC in other locations. The “yard process” includes the processing of the product from the yard into the DC. A product can sit in the yard (within a container) for a substantial amount of time, depending on when the product is needed or can be accessed. Once the product is processed into the DC, it must then be processed through the DC to finally get to the customer. This process step does not exist in Direct Shipments.

7. Customer - Finally, the product is transported from the DC to the final customer. There are many projects focused on improving the DC process time and evaluating the best way to signal and prepare the products that are needed from the consolidator or yard. This process step is not applicable to Direct ship products, since the customer receives the product directly from the consolidator.

Often the process steps prior to the consolidator are referred to as the “upstream” process and the consolidator, transit, yard, and customer are referred to as the “downstream” process steps. Each step in the supply chain is managed separately and functions in siloes, with communication across functions occurring on an as needed basis. This research project focuses on the flow of product from commercialization to when the product arrives in the yard for “DC products” or at the customer for “DRS products.”
3.2 Nike’s Supply Chain Key Performance Indicators

Nike uses a number of metrics to measure the performance of the supply chain and other areas of the business. It is important to understand the various measurements throughout the supply chain. The metrics mentioned in this section are the ones that were emphasized and most often heard during the six months spent at Nike, as a part of the research project. Many of the metrics hold various levels of importance to different groups in the supply chain, and can sometimes encourage the siloed behavior mentioned in the previous section.

The metrics are explained in the table below, starting from the beginning of the supply process with the commercialization process and ending with the metrics that evaluate customer supply performance.

Table 1: Nike’s Supply Chain Key Performance Indicators

<table>
<thead>
<tr>
<th>Process Step Measured</th>
<th>Metric Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercialization</td>
<td>Buy Ready</td>
<td>Measures the amount of products that were fully commercialized by the date needed. This involves ensuring all the materials were selected, tested by the factories, and the product was fully ready to be produced. <em>Note: A new metric called “ready to be purchased” was being implemented, and it measured the amount of products that were fully ready on time. Ready to purchase includes things outside of just the product being ready, which include a price and other necessary items that must be complete.</em></td>
</tr>
<tr>
<td>PO Process (influencing)</td>
<td>Forecast</td>
<td>Compares the forecast to actual orders and determines the accuracy of the forecast. The forecast is used to procure capacity at the factory and critical to the success of a season.</td>
</tr>
<tr>
<td>Process/Factory</td>
<td>KPI</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----</td>
<td>-------------</td>
</tr>
<tr>
<td>PO Process (influencing)</td>
<td>Customer Request Date (CRD) Flow</td>
<td>% of futures order units in each week of the season. It is not possible to produce and ship all products and quantities in the first week of a season, therefore &quot;flow&quot; of sales orders are critical, and the reason a KPI has been created to measure.</td>
</tr>
<tr>
<td>Factory</td>
<td>On Time Performance (OTP)</td>
<td>On time deliveries to consolidators from the factories. The factories and Nike agree on a target date to have the product at the consolidator, which is known as the Original Goods at Consolidator (OGAC) date, the OTP metric compares that actual date the goods arrived at consolidator (GAC) to the OGAC. *In the footwear product engine they also compare Requested (by Nike) Date Goods at consolidator (RGAC) to the GAC as a metric.</td>
</tr>
<tr>
<td>PO Process, Factory</td>
<td>Coverage</td>
<td>Sales order lines covered in full by supply, at start of delivery window. Coverage ensures there is enough product to &quot;cover&quot; the orders.</td>
</tr>
<tr>
<td>Transit</td>
<td>On Time Inbound Transit</td>
<td>Measures on time delivery from consolidator to DC based on target lead times.</td>
</tr>
<tr>
<td>Customer/ Entire Supply Chain</td>
<td>S/DIFOT – Shipped or Delivered in full and on time</td>
<td>Measures Nike's ability to deliver (in DRS products) or ship (in DC Products) products to the customer on the customer confirmed date at the order line level. This measure has multiple versions based on tolerances allowed (for example, it may be the case that 3 days after the confirmed delivery date is ok, so the tolerance would be +3 days).</td>
</tr>
<tr>
<td>Customer/ Entire Supply Chain</td>
<td>Delivery Precision</td>
<td>Same as S/DIFOT except accounts for the orders that are out of Nike's control, such as the product is late due to the customer holding the product, or not being ready to accept the product, even though Nike made it available on time.</td>
</tr>
</tbody>
</table>
3.2 Delivery Precision

Delivery Precision is the focus of the research project and will be the main topic for the rest of this thesis. It is one of Nike's key performance indicators used to measure the performance of the supply chain. Delivery Precision measures Nike's ability to deliver or ship product to the customer in full and on time. Nike started measuring delivery precision in 2004 and recently has set an aggressive target of delivery nearly all products to the customer on schedule.

Delivery Precision is the % of line items (style/color level) that were made available to the customer on the customer confirmed date (CCD) plus a specified number of days of leeway or before (an example calculation is shown in Figure 4). The orders that do not get delivered due to the customer are added back to the total Delivery Precision value. Delivery Precision is measured five weeks after the month-end, for example March delivery precision will be finalized during the first week of May. The measure is reviewed monthly at geography and global supply chain reviews. The measure can be broken down and evaluated at the geography, product engine, category, or at a global level.

There is a root cause associated with the Delivery Precision measure. The root cause is quantified on the schedule line level (size level). The most common root causes are "Coverage/ Availability" of materials from the factory (not to be confused with the coverage KPI), "Customer Holds", "Logistics" delays, "Not in Full", and "Other". The root cause of an order that did not arrive at the customer on schedule is determined through a series of yes/no questions that are aimed at determining the first reason that something happened along the supply chain that caused the product to be late. For example, to determine if the issue was due to a customer hold the following questions are asked: Was the shipment diverted?; Did the customer accept the shipment?; Did the customer have credit issues?; Did
we hold delivery? The answers to these questions, determine whether an order is late due to a customer hold.

Figure 4, below, demonstrates how Delivery Precision is calculated. The order is for a hypothetical “Black Hoody”, where the customer wants a total of 30 units in various sizes. Since the medium black hoodies were delivered 14 days late and Delivery Precision is calculated at the order line, the Delivery Precision is calculated to be 0% in this case. However, the root cause is calculated at the schedule line.

<table>
<thead>
<tr>
<th>Schedule Line</th>
<th>Product: Black Hoody</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>Quantity Ordered</td>
</tr>
<tr>
<td>small</td>
<td>10</td>
</tr>
<tr>
<td>medium</td>
<td>10</td>
</tr>
<tr>
<td>large</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Confirmed arrival date</td>
</tr>
<tr>
<td>small</td>
<td>10/1/12</td>
</tr>
<tr>
<td>medium</td>
<td>10/1/12</td>
</tr>
<tr>
<td>large</td>
<td>10/1/12</td>
</tr>
</tbody>
</table>

On Time: 10  
Late: 10  
Late but within tolerance: 10  
Delivery Precision = 0/30 -> 0%

Root Cause:  
Logistics = 10/30 -> 33.3%  
Not in Full = 20/30 -> 66.6%

**Figure 4 Example of Calculating Delivery Precision and Root Cause**

### 4. Improving Delivery Precision

Key performance metrics are only valuable if they are used to improve performance of the company. Nike’s management team evaluates all KPIs on a regular basis and sets goals and targets on the measures that are deemed to be important and need improvement. Delivery Precision is one of those metrics that Nike’s management team has determined to be extremely important and therefore must strive to improve. This thesis evaluates a method for quantifying the areas in the supply chain with the most opportunity in improving Delivery Precision. However, it is first important to understand the motivation
for improving delivery performance at Nike. This chapter will touch on the current challenges Nike is facing in improving delivery performance, review the literature to explore challenges and solutions found in practice, and explain the motivation Nike has to improve.

4.1 The Challenge of Improving Delivery Precision and Evaluating Hypothesis

Delivery Precision has gradually improved since 2004 when the metric was first introduced, however, Nike continues to strive for perfection. Currently, performance is measured by each process step through use of the various KPI’s, explained in the previous chapter, and it is difficult to connect decisions made at the beginning of the process with delivery performance at the end of the process. However, the hypothesis is that the most areas for opportunity lie in the upstream process steps, and since there is no method for connecting the upstream to Delivery Precision, it is currently impossible to either confirm or deny this hypothesis.

The Root Cause analysis explained in chapter 3 is able to associate the steps in the downstream, consolidator and transit, to a delayed delivery and therefore efforts have been focused on improving these process steps with success. However, if the issue is not in the downstream then it is not clear exactly where it happened, and usually falls in the “other” or “coverage” root cause bucket. For example, if a product was not commercialized on time and therefore the factory could not begin production as scheduled resulting in a delay in supply to the customer, the root cause would be denoted as “coverage”. “Coverage” is a general bucket that does not clearly explain the issue. Many initiatives have been executed with the hopes of improving Delivery Precision; however due to the lack of visibility through the supply chain, it is currently not clear where the problems actually occur, and therefore which projects will actually provide improvements.
4.2 Literature Review

Prior to proposing a solution for the challenges addressed above, it is first necessary to explore the literature to verify the importance of and explore common challenges and solutions for improving delivery performance.

It is clear the importance of measuring delivery performance from an article called "Supply Chain Management, theory, practice and future challenges". The article states that organizations can outperform their competition by exceeding, not just satisfying, the needs of their customers [7]. And another article emphasizes that as supply chains continue to become more and more complex, measuring and improving performance is critical for every business. [8]. Also, according to the article, an important aspect of delivery performance is on-time delivery. This determines whether a perfect delivery has taken place or not, and it acts as a measure of customer service level [8].

In addition both articles agree that measuring and improving performance is a difficult task. The delivery of a product to a customer is a dynamic and ever-changing process, making the analysis and subsequent improvement plan of a distribution system difficult. It is not an easy task to determine how a change in one of the major elements of a distribution structure will affect the system as a whole (according to Rushton and Oxley, 1991, cited in Performance metrics) [8].

However, both articles agree, that the way to overcome this challenge is to have visibility through the supply chain. The Performance Metrics article, state that one of the ways to overcome the difficulty in analyzing and improving performance is to adopt a total systems view with the objective of understanding and measuring the system performance as a whole, as well as in relation to the constituent parts of the system [8]. In the same
article, Gunasekaran, Patel, and Tirtiroglu, explains that delivery heavily relies on the quality of information exchanged [8]. People in an organization should be held accountable for the overall performance, and not only to the entity to which they are responsible [8].

Four authors, John Storey, Caroline Emberson, Janet Godsell, and Alan Harrison, conducted a study to compare the theory to actual practice of supply chain management, and identify barriers, possibilities and key trends. The research was based on a three-year detailed study of six supply chains, which encompassed 72 companies in Europe. The firms in each instance were sophisticated, blue – chip corporations operating on an international scale. They found that the concept of “seamless, end to end” supply management is clearly optimal, however it takes a large amount of effort to “reach through the supply chain” beyond the first tier suppliers and focal firm’s customers. It also requires an unusual degree of coordination between tiers. The articles argues that someone, “a manager” should be in charge of the end-to-end supply chain, but rarely could anyone actually be identified in practice. The pattern found was a number of practitioners who sought to manage “their” parts of the supply chain, normally circumscribed by legacy practice [7].

Additionally they found metrics at a functional level for the benefit of functional targets, “jeopardized the performance of the supply chain as a totality” [7]. A good example was found in an electronics company, where the performance measurement system employed in this supply chain was exemplary in many respects. Metrics were collected at all stages in the supply chain - daily, weekly, monthly and quarterly - and were actively reviewed, as in any good supply chain management system. The measures were used to drive performance improvement and also reward. The shift over the last ten years or so towards metrics that are specific, measurable, achievable, realistic and timely (SMART), has led to managers that expect targets that are wholly within their span of control. This in turn
leads to functionally driven behavior. Returning to the example of the electronics company, measures showed that they consistently achieved their 3-day delivery target. However, in reality, for the sample studied, the large majority of orders were delivered after the date the customer had originally requested, and on average they were 16 days late [7]. This study shows the importance of identifying metrics that evaluate the entire supply chain.

The literature suggests that customer satisfaction is critical to success and customer satisfaction can be, in part, measured by delivery performance. It also validates that improving delivery performance is challenging, however by evaluating the entire supply chain, holding everyone responsible, and implementing KPI’s that promote the correct behavior, it can be improved.

4.3 The Motivation for Nike to Improve Delivery Performance

The motivation for improving supply performance is that as consumer expectation continues to rise, it is critical to ensure that the entire display at retail is available on the floor to tell the Nike story and complete the customer experience. When walking into an athletic retail store today, one will be presented with mannequins dressed head to toe in colorful and attention grabbing athletic gear. As an example, in the women’s section at Dick’s sporting goods a mannequin in a running pose will be displayed with a high performance Nike running shirt, Tempo shorts, socks, and Nike running shoes. When a consumer sees this mannequin and is inspired to purchase the entire matching outfit it is critical that she is able to find each piece in her size. If she cannot, she will either walk (run?) out of the store empty handed or worse, purchase a competitor product.

Competition is also raising the bar of customer service. The CFO of Under Armour, Brad Dickerson, emphasized the importance of Fill Rate during the Q2 2013 earnings call
Fill Rate is the expected fraction of demand served immediately from stock and can be evaluated with the following equation [10]:

\[
\text{Fill Rate} = 1 - \frac{\text{Expected back order}}{\text{Expected demand in one period}}
\]

While Fill Rate is only one portion of the Delivery Precision metric, it does not account for quality, quantity, or timing of the delivery of a product based on an order, it is a good signal of the performance of a supply chain. According to Brad Dickerson, Under Armour has increased fill rates from 60% in 2012 to 80% in 2013 for seasonal products and it remains a focus for the company [9]. With competition increasing its focus on customer service, Nike realizes it must raise the bar to continue being the market leader.

5. Developing Technique for Measuring End-to-End Supply Chain

It is evident from the last chapter that Delivery Precision is critical to ensure customer satisfaction and continued growth; however, the main challenge for Nike is quantifying the areas with opportunity in the supply chain. From the literature it is clear that to improve delivery performance it is necessary to integrate and gain visibility across the entire supply chain. This chapter will propose a method for breaking down the siloes created by measuring each process step independently and quantify the areas in the supply chain that need the most improvement by analyzing historical data. The first step is defining a framework by identifying key dates that measure the end-to-end supply chain. Next the framework will be scaled by the use of a model, to tell the story for an entire season, category, and product engine.

5.1 Defining the Framework
The first step for quantifying the areas of the supply is being able to connect the process steps and answer the questions shown in Figure 5.

![Figure 5: Questions to Quantify Areas for Improvement in Supply Chain](image)

To answer these questions, a framework of dates was identified, and can be seen in Figure 6. The framework includes the dates (or milestones) that the product should have arrived at each step in the process in order to meet customer demand and the dates that it actually did arrive to each step in the process. By comparing the actual dates and the target (or planned) dates it is possible to determine where in the supply process the first issue occurred. This thesis project will focus on determining if the issue occurred in the upstream or downstream process, and then will identify the process step that caused the most units of products to be late to the customer. However the framework can also be used to analyze and determine other factors about the supply chain, such as the area that consistently causes the largest delay. It was also decided to limit the scope to defining a framework for the Apparel Product Engine, since the framework for each product engine varies slightly.

Nike supply chain systems track and manage over 30 different dates that are needed for actively planning and managing orders. The framework of dates used for the project
explained in this document were identified by evaluating each of the active Nike supply chain dates, and distilling them down to the static dates needed to measure physical product flow. Since there is not one organization or person that oversees all of the supply chain system, gathering the correct dates was no easy task and required a number of interviews to determine the system in which the dates were kept. Then it was necessary to use actual examples to validate the ways the dates were used and updated. Overall, the framework was identified by collecting information from several teams throughout the company. The Demand Planning and Inventory Management (DPIM) managers for the North America (NA) Geography were instrumental in explaining the PO create process. The Logistics teams from NA and Emerging Markets (EM) helped to identify the correct dates and explain the critical steps and challenges with transit times. The Apparel Supply Planning team was essential in explaining the correct lead-times and the planning process. Other teams included the Supply and Operations Planning (S&OP) teams in NA and EM, and the Delivery Precision Improvement experts. All teams supported in identifying the correct information technology (IT) systems that the dates and lead-times can be found.

The "actual dates" that a product reaches or leaves a process step are most often recorded in one of the Nike Supply Chain systems, in most cases in SAP. However, the dates in SAP or other supply chain systems that track the "target date" a product should reach a certain process step are often dynamic and updated as more information is available. Hence there is no reliable record on what the original target date was for a completed order. Therefore, for this project we calculate the "target dates" using the expected or planned lead-times based on a given end date. The planned lead times were gathered from the organization in Nike responsible for the respective process step. To identify the correct planned lead-times it was necessary to determine the lead-times used in the supply-planning tool. Due to issues with extracting the lead-times from the supply planning tool, it
was decided to gather the planned lead-times from the source. The method for calculating the target dates based on lead-times is explained in more detail and with an example below. First, it is important to understand the critical dates.

![Figure 6: Framework of Dates](image)

Starting with target dates, "target dates" are those that need to be met in order to get the product to the DC or customer (in DRS products) as planned. To understand the target dates that are used, it is first necessary to understand the planned lead times that exist in the supply chain. Table 2 includes the list of planned lead-times and their definitions; each lead-time is represented in Figure 6.

**Table 2: Target Lead-times and Definitions**

<table>
<thead>
<tr>
<th>Lead Time</th>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations Pad</td>
<td>Ops Pad</td>
<td>For North America (NA) - the time it takes to get from the port at the final destination to the final destination (for example: from the port in Memphis (i.e. train station) to the DC). For Emerging Markets the Ops pad is the time from Port of entry into country to the country DC.</td>
</tr>
</tbody>
</table>
Transit Time | TT | Time from Consolidator to final destination port.
---|---|---
Consolidator Processing Time | CPT | The target time to process product in the consolidator
Factory Lead Times | | The time to produce a product at a specific factory.

From the planned lead-times the target dates can be calculated. The “target dates” are explained in Table 3. Each target date is calculated by subtracting the planned lead-time from the respective downstream target date. The column titled “Calculation” in Table 3 states the exact calculation used to calculate the respective target date.

<table>
<thead>
<tr>
<th>Date (Abb)</th>
<th>Full Name</th>
<th>Definition</th>
<th>Calculation (Date minus lead-time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDD</td>
<td>Statistical Delivery Date</td>
<td>A static date recorded on the PO that signals the time the product should arrive to the DC (for DC products) and equivalent to Customer Request Dates (CRD) (for direct ship products). <em>Note: The SDD is not widely used due to the lack of knowledge on exactly how it is determined, however it is the only static date found for DC products, and it will be used for this thesis project. Due to it being static, if a customer subsequently changes the request or confirmed date the SDD is not updated. Therefore our analysis will determine more products to be late than actually are, but still it is important to understand what caused the delay</em></td>
<td>Not Calculated, all calculations based on SDD.</td>
</tr>
</tbody>
</table>
The "actual dates" are the dates when the events actually occurred during execution of delivery. These dates are recorded in one of the various IT systems Nike uses, but mainly can be found within SAP. The actual dates used for this project are those that correspond to each of the process steps in the supply chain, explained in chapter 3. Table 4, below, explains each of the actual dates used, and they can be seen in Figure 6, under the "actual" section.

<table>
<thead>
<tr>
<th>Date (Abb)</th>
<th>Full Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASED</td>
<td>Actual Shipment End Date</td>
<td>The date the product reaches the door of the DC, should match the SDD if on time. <em>(Goods receipt date, another date Nike uses, but found not critical for the framework, is the date the PO is received with documentation into the DC, after the ASED date.)</em></td>
</tr>
<tr>
<td>AV</td>
<td>Availability Date</td>
<td>The date the product arrives to the yard of the DC.</td>
</tr>
<tr>
<td>ASSD</td>
<td>Actual Shipment Start Date</td>
<td>The date the product should start shipping from the consolidator to its final destination.</td>
</tr>
</tbody>
</table>

Table 4: Actual Dates Explanation
Now that the "target dates" and "actual dates" are identified and explained, they can be compared to determine where in the supply chain the product started to experience delays. The easiest way to explain this is by showing two examples of hypothetical orders. The examples below also validate that the model does in fact find the area in the supply process that must be improved.

In the first hypothetical example shown in Figure 7, below, the SDD is January 10th. From the SDD all other target dates were calculated using the lead-times. For example, the Ideal AV was calculated by subtracting the SDD of January 10th, by the expected yard lead-time of 2 days, resulting in an Ideal AV date of January 8th. All other target dates are calculated the same way; Figure 7 shows the dates and lead-times as evidence. The "actual dates" were obtained from SAP and other Nike supply chain systems.
Using Figure 7 it is also easy to see how the framework can be used to determine where the first delay occurred. Starting at the end of the process, customer/DC process step, it can be seen when comparing the SDD and ASED date, the product was delivered 14 days late. Following the process back and comparing the dates it is seen that the product arrived to the yard 15 days late, started transit 10 days late, but arrived to the consolidator on time, and was purchased 16 days early. In summary, this order was 2 days late in the factory, then took 8 days too long in the consolidator, and 5 days too long in transit, however sat in the yard 1 day less than target, and therefore when added together the order was a total of 14 days late. The issue started in the consolidator, but was also further delayed in transit. Often a transit delay is caused by the order arriving late to the port and therefore missing its scheduled boat, and being placed on a later or slower boat. Therefore, for this thesis project, it has been decided to focus on where the delay started.

Since this concept is the basis for the entire research project, it is critical that it is well understood. Therefore, a second example is shown below in Figure 8.
In this example the product arrived to the customer 9 days late, this can be seen by comparing the SDD and ASED. By following the process from end to beginning and comparing the dates, the transit was 4 days faster than planned, however it took 3 days longer to process the product in the consolidator. But the main issue was the product was planned to be produced and at the consolidator on November 10th; however to give the downstream enough time it should have been planned to arrive at the consolidator on or before October 31st. Therefore the first and main delay with this order is that it was planned later than needed. That is, for whatever reason, the OGAC was set to be 10 days later than it should have been.

An interesting side note to this example is that the OTP, a KPI explained in Chapter 3 which measures the performance of the factory by comparing OGAC to OR, was perfect; however the product still arrived to the customer late. This illustrates that OTP, while a good metric, is not a good indication of Delivery Precision, and by improving OTP does not necessarily mean that Delivery Precision will improve.
5.2 Scaling the Framework

A model was built to scale the framework from evaluating one order at a time to analyzing historical orders for an entire season, category, geography, or any combination. With the framework defined it was possible to build a model to automatically conduct the calculations and determine where in the process there are the most areas for opportunity. The model uses an Access database to combine all the planned lead-times and calculate the target dates and compares the target dates to the actual date. The analysis from Access is then transferred to an Excel file, where final calculations are conducted to determine the process step(s) that must be improved to ensure product arrives to the customer on time every time.

5.2.1 Inputs to the Model

The model works similar to the two examples explained in the previous section, however on a larger scale. The actual dates are collected from the event manager (EMP) report in SAP, see Appendix A for instructions on running EMP Reports. EMP includes every order in the time frame designated and the actual dates for each order. The only date not available in EMP is the Buy Ready Date. The date the product is available for commercialization, known as the Buy Ready Date, is not easily accessible from any system. However, a report is run once a week and archived, which shows the materials that are not yet buy ready. For the purposes of gathering a “buy ready date” for this thesis, the weekly reports are gathered in an Access database, then a query was built to determine the date the material is no longer in the weekly report, and this is the date deemed as the “Buy Ready date” for the product, which is then connected to the relevant orders.

The target dates and lead-times are gathered from various systems and the calculations are conducted automatically in the model. The SDD, which is the basis for all
other dates, is also available in event manager (EMP) in SAP for each purchase order. The transit times and consolidator process lead-times are obtained from Nike’s third party logistics team, APLL. The transit times are based on the average time it takes for a product to travel from an origin country and region combination to a specific country and region destination. The planned factory lead-times are specific to a factory and product combination and are obtained from a Nike Sharepoint database, which is maintained by the sourcing and factory teams. The factory lead-times are updated as more information, such as the actual time that it takes to produce the product, is available. If a time does not exist for a factory and product combination then a generic lead-time is used for the product. The generic lead-time is recorded in an Excel file owned by the apparel supply planning team.

The model automatically calculates all of the target dates for each purchase order in the framework by subtracting the previous date by the appropriate lead-time. The target dates are then subtracted by the actual dates for each order to determine the number of days early, delayed, or if the product is on schedule. The calculation is conducted so that if the result is negative the product was late to the respective process step. By knowing the number of days an order is late or early to each process step creates visibility across the entire supply chain so that the bottleneck in the supply chain can be identified. Appendix B includes step-by-step instructions on updating the model.

5.2.2 Outputs to the Model and calculations

The first step in quantifying the areas for improvement in the supply chain is determining the number of products that were late to the customer based on the SDD. Once this is done, the next step is separating the orders that arrived late to the consolidator, meaning it was late due to an issue with the upstream, and those order that arrived on time to the consolidator and therefore the downstream caused it to be late. As discussed earlier,
often if a product arrives to the downstream late it can become later due to missing the scheduled boat or scheduled processing date in the consolidator. Therefore, it is possible that the product arrived late to the consolidator and then became later as it progressed through the downstream. For the purposes of this project, the product would be deemed late in the upstream and not downstream. For example, if a product arrived to the consolidator 5 days late, but then was further delayed and arrived to the customer 10 days late, the upstream would be responsible for this delay.

After the delay is determined to be an upstream or downstream issue, further analysis is conducted to determine the exact process step that caused the delay. If a product arrives late to the consolidator it could be due to the factory taking longer than planned, the planned date was set after ideal, or both. Further analysis can be done to find the original root cause; Figure 9 shows the path the model uses to do this.

![Figure 9: Reasons for Upstream Delay](image-url)
The diagram is a visual representation of how the model determines the process step in the upstream where the delays start. A product can arrive late to the consolidator due to three things, as stated above and shown in the second tier of Figure 9. From there the model digs a little further to determine if the delay was actually caused by the PO being created late or the product not being buy ready. As an example, if the black hoody order arrives late to the consolidator, factory is late, and the PO was created on time then the factory caused the issue. However if the order arrives late to the consolidator, the factory is late, and the PO was created late, then the PO create process caused the delay. The model then combines all the orders for a specified time frame and quantifies the total units of product that are late due to each process step.

Similarly, if a product arrives on time to the consolidator but late to the customer (according to the SDD), the model analyzes the downstream process step that caused the largest delay. A delay in the downstream is caused by the consolidator taking too long to process the material, the travel time from the origin to destination exceeding the planned lead-time, or the time from destination to the DC exceeding the planned time, as shown below in Figure 10.

![Figure 10: Reasons for Downstream Delays](image-url)
The model evaluates the downstream process step by comparing the date it should have arrived to the date it actually did arrive. Then it calculates the number of days delayed due to each process step and denotes the process step with the largest delay as the area for opportunity. The model then compiles the information and quantifies the number of units delayed due to each downstream process step.

In summary the model outputs the quantity of units delayed due to each process step. From this information the process step with the largest quantity can be identified and project and/or action plans can be executed to eliminate the delay.

6. Piloting the Framework and Model/ Results

The model was built to evaluate the performance of historical orders for any combination of product, product engine, category, or geography. It was first piloted with the North America (NA) geography, apparel supply engine, and Running and Women's Training categories for the spring 2013 season. The pilot was used to test the hypothesis that the current area for opportunity in the supply chain is in the upstream. The data was gathered and model used as explained in chapter 5 and below is the results from each experiment.

6.1 NA, Apparel Supply Engine, and Women’s Training Category Results

The first step in the analysis is dividing the root cause into products late due to the upstream versus the downstream. For the NA, WT, Apparel, the information was placed in the model as explained in chapter 5, and the analysis showed that for DC products that 72% of products that arrived to the DC after the SDD were due to the upstream and 27% were due to the downstream. However for Direct Ship products, 31% arrived to the customer
after the SDD due to an upstream issue and 69% due to a downstream issue. Therefore, the hypothesis was proven to be right for DC bound products, but was inaccurate for Direct Ship products. Below is a visual representation of the results; this is the most effective way to show the areas with the most opportunity.

![Figure 11: % DC Products Late due to Upstream Vs. Downstream Delays](image)

![Figure 12: % DRS Products Late Due to Upstream vs. Downstream](image)

A sensitivity analysis was conducted on the number of days a product arrives late to the consolidator to ensure that the analysis was actually finding the root cause. If a majority of the products arrived only 1 or 2 days delayed to the consolidator and substantially more to the customer then the method is not accurate. However, as seen in the Figure 13, more than 80% of products that are late to the consolidator arrive 5 days late or more, therefore
it is safe to assume that these products did in fact experience a delay that can be rooted to the upstream.

![Figure 13: % of Products Late to Consolidator by Number of Days Late](image)

Even though the hypothesis has been tested, it is still necessary to determine the area in the supply chain that must be improved to ensure orders arrive to the customer on time every time. Since a majority of the products shipped are DC and there is currently visibility available for DRS products, it was decided to only focus on DC products for the pilot. Following the flow presented in Figure 9 and Figure 10 from chapter 5, the next analysis determines the number of products delayed due the factory, planning process (in the upstream) and consolidator, transit, and in country processing (in the downstream). Figure 14 below shows the results for Women’s Training Apparel in NA for Spring 2013. The upstream shows the amount of products late due to planning and late due to the factory, since a product can be late due to both reasons; further analysis was conducted to separate out the real reason. There is always a small amount of data missing that prevents
the root cause to be identified, and therefore the numbers do not always add perfectly. For example, the total of the transit, consolidator, and yard percent's do not add to be the percentage of products late in the downstream, due to 2% of the data missing.

![Diagram showing % Products Late at Each Process Step](image)

Figure 14: % Products Late at Each Process Step

The next step is to determine the number of products late at planning and factory due to the PO Create process. Figure 15 shows the number of products where the PO was created late and therefore were planned and/or produced late. In addition, the products late due to not being commercialized on time are shown. However, there were not buy ready dates available for every product, so the number is under represented, however the best estimate available.
In summary for this sample set, the upstream is clearly responsible for products arriving to the SDD late for DC products. Inside of the upstream 43% of the products that are late can be traced to the PO being created later than needed. In addition, of the 73% late due to planning and/or factory production the PO Create process is responsible for 60%. Therefore, the PO Create process is an area of opportunity and a deep dive should be done to determine the actual behaviors driving the PO to be created later than planned.

6.2 NA, Apparel Supply Engine, and Running Category Results

The exact same analysis was conducted for the Running Category as for the Women's Training Category explained above. The results are similar and shown in the Figures below.

Figure 16 and Figure 17 show that for DC products the delay is caused primarily in the upstream, however for DRS products the delay is caused in the downstream. For the same reasons explained for Women's Training, the focus for the analysis will be placed on the upstream.
While, the transit is a large issue, planning and factory delays combined cause an even larger issue, as seen in Figure 18.
Driving back a step further it is seen that the PO Create process step is delayed 32% of the time an order is late, which is the largest area for opportunity in this supply process. There was not enough buy ready dates available to make an accurate assessment if this is the reason the PO’s are often delayed. However, if this is in fact the reason for the delays it will be discovered while deep diving into the PO Create process step.

As concluded for the Women’s Training analysis, the experiment conducted with the Running category also shows that the largest area for opportunity is the PO Create process step. However, more categories, geographies, and seasons should be analyzed to validate.

7. Conclusion

Improving Delivery Precision is critical to ensure continuous growth and to meet the aggressive targets set by Nike’s management team. As the literature has stated, in order to improve supply performance it is necessary to have complete visibility throughout the
entire supply chain. The method presented in this thesis gives Nike the ability to break down the silos that are created by measuring individual process steps and evaluate the supply chain as a whole. With the ability to measure the entire supply chain, the area with the most opportunity for improvement can be identified and ultimately improved.

The model explained in this thesis gives Nike the ability to measure past performance and determine the areas to focus on for the future. Below is a summary of the main findings of the project and the proposed next steps.

8.1 Key Findings

From the two Pilots conducted, the hypothesis was tested and found to be true for DC Products and inaccurate for DRS products. In order to improve delivery precision for DC products it is necessary to improve the upstream process. In particular it was found that the PO Create process step has the most delays. Through a deep dive analysis the reason for the delays can be discovered.

8.2 Lessons Learned

There were many lessons learned during the duration of the thesis project. One of the main lessons is that forming relationships at Nike is critical for success. This thesis project required the help from people in various organizations and by first establishing a relationship enabled mutual trust and respect, which resulted in open transfer of data and information. In addition, when forming the framework and distilling the many dates recorded at Nike into those needed for measuring the supply chain, it was discovered that the definition of the dates needed to be validated with real data. With so many dates, the definitions have evolved over time and only with real order dates could the definition of the dates be confirmed.
One of the most critical lessons learned from this thesis project for Nike was that the use of metrics can drive different incentives for different areas in the organization. During this project it was discovered that the "On time Performance" metric, explained in Table 1, did not predict the Delivery Performance measure. Therefore, improving On Time Performance would not automatically improve Delivery precision because On Time Performance simply measures how well the factory met the delivery date that they were requested to meet. It does not measure if the requested date meets the date needed in order to meet the customer requested date. The framework developed in this project made the impact of each metric used in the organization on Delivery Performance easily understood and explainable.

8.3 Next Steps

Analysis on further data should be conducted to validate the PO create process step is in fact the largest area for opportunity. The model should also be expanded to include the Footwear Product engine. In addition an extensive deep dive should be conducted to determine the exact behavior, which causes product to be delayed to the customer. In the future the model should be expanded to predictive analysis. The goal would be to find an issue prior to it happening and fix it before the product is delayed to the customer.
9. References

http://nikeinc.com/pages/history-heritage

Accessed December 18, 2013.  


Appendix A – Guide to Running an EMP Report in SAP

1. To run the model for a certain season/ category combination, it is first necessary to have the respective line plan. The line plan can be gathered from various systems or asking directly to the category or geography person responsible (the Brazil, Mexico, and NA line plans are included in the folder).

2. First it is necessary to set up the EMP report with the correct fields and order of fields. To do this, follow the instructions below:

3. Open SAP and search for EMP (Event Manager), then double click on EMP (see screen shot below)

4. Enter username and password (just be provided to you once you have access from CUP).
5. Once logged in, double click on “Inbound Visibility Dynamic Query”

6. In the “Purchase orders tab” enter the purchasing group
7. Enter all material numbers from the respective line plan (scroll down to find "material" section). You can also enter the PO number or other information that is known.

8. In the "other" tab, ensure that "Display inactive documents" is selected. This allows historical data to be shown.
9. Select the lay out that was saved for this project.

10. Once it displays, click on the spreadsheet link and select “spreadsheet”.

11. Click the green check mark.

12. Select “Table” and click on green arrow...

13. Select “Microsoft Excel” and click on green arrow...
14. Click on the green arrow when it says “save the data in spreadsheet”...

15. Once the spreadsheet appears, immediately save it, and remember the location it was saved.
Appendix B – Guide to Updating the Delivery Precision Analysis Tool

1. Run EMP, as explained in Appendix A

2. Select the right Model Type for the Geo/ Country and Category being evaluated

Each different geography and category has different nuances to how they plan, execute, and report supply. Through the initial analysis three different types were discovered and the model was adjusted to support. Therefore, we have three different types of models that can be used depending on certain factors. Below is a guide on which model to use depending on list of factors.

The three different types are:

**Type 1** – Majority of manufacturing and consolidators in Asia with ownership change at the consolidator.

**Type 2** – Material is produced in Honduras and Nike does not take ownership until it arrives in the US (Miami).

**Type 3** – Destination Port Description is used to determine the destination region instead of "destination description" for calculating transit time and ops pad.

3. Add EMP Report to Folder

Each model has a folder associated with it; the folder includes all of the inputs for the model.

- The model is located on Nike Shared Drive.
- Then choose the appropriate model.
- Save the entire folder to a location that you would like

![Folder Structure Image]
- Open the folder and delete the EMP.xlsx file

- Open the EMP file that was saved from the previous step. "Save as" the file to the folder, ensuring that it is titled "EMP.xlsx".

4. Ensure all other files are up to date and relevant for the analysis

- The other files in the folder are used to update the model. It is critical that these files are updated often and contain the relevant data for the category/geo being evaluated. Below is an explanation of each file in the folder. **Note: when updating the files, ensure that all tabs, file names, and column names are exactly the same as in the original version of the respective document:**

  o **AccessFile_20130703** – This is the model which conducts all date and comparison calculations; it will be explained further below.

  o **BuyReady.xlsx** – This is a spreadsheet that compiles an entire season worth of "Buy Ready Reports. The reports include all of the material that is NOT buy ready. Therefore, in the BuyReady.xlsx spreadsheet the materials that are not buy ready and the date the report was run is captured. The access database runs a query to determine the date the material was no longer on the list and deems this as the "Buy Ready" date. If another season is needed, then new reports with the appropriate dates will need to be copy and pasted into this spreadsheet. **Note: This does not tell the entire story about ready to purchase.**

  o **Lead_Times_and_Minums.xlsx** – This spreadsheet includes the lead times of each factory and product style combination

  o **PCT.xlsx** – The PCT spreadsheet includes a list of PCT codes and the generic lead times, so when the specific factory/style combination lead time does not exist, this one should be used.
- **PCT_Style.xlsx** - Used to connect the PCT code to the style.
- **TT.xlsx** - Includes the transit time from a region/country to a region/country transit times.
- **CPT_IMP.xlsx** - Includes the consolidator process times for the consolidator.
- **Region Codes.xlsx** - Connects the Destination description, Destination Port Description, Origin description to the appropriate Destination Region, Country or Origin Region code. The code is needed to determine the correct transit time. Run the Access Model.

- Once all of the documents are updated, open the access database:

   - Click on each "Import" button to import the documents.
   - Click on the buttons on right hand side labeled with 1-5 (in order) to update all calculations. Note: For buy ready there is NO space between the season and year (i.e. SP13).
The access database is now be updated with all of the new information, however each sheet in the database should be reviewed to ensure the information was updated and calculated successfully.
Transfer Data to Excel for Analysis

- Once all is updated and looks accurate, open the "Precision_Table" by double clicking. This folder includes all of the information consolidated, target dates calculated, and target and actual dates compared. It is now necessary to transfer this information to excel for final calculations and to determine where opportunities exist.

- Inside the same model folder that was originally used above there is a file called "NA Running Spring 2013 Analysis Final.xlsx", which will be used for the final analysis.

- Open the file

- Highlight all data from Row 3 down and columns E (PO Number) to AQ (CRD vs SDD), do not highlight any of the columns to the right of AQ with calculations.

- Click "Delete" to delete all the data. Do not delete the titles.

- The columns to the right of AQ should have calculations and look like the following:

- Return to the access file on the tab called "Precision_Table", and select all of the columns.

- Copy the information from access.

- Return to the excel file (make sure to save the excel file), and paste the access data (from sheet "Precision Table") into cell E3 of tab "Data Sheet".
The column title will be pasted with the data from access. Use this to compare the columns and ensure all the columns are the same. Delete the newly pasted titles, by entirely deleting row 3.

Ensure that the calculated columns (AR: ASED-AV → BH: Downstream) have the same number of rows as the data just pasted.

Interpreting the Output

- The tab "Summary Analysis" includes all of the important analysis. The calculations used to calculate the number can be seen in the excel file.

- In summary the Analysis starts at the top, right, with an overview of all of the data for the season/Category. Following the arrow to the right, the top, left box shows all of the late products and the location that the first issue to make the product late occurred. See screen shot of output below.

- Next, the two bottom boxes calculate the amount of material that met each scenario in the upstream and downstream. The box to the bottom, right, is the amount of material that was late at that particular process step.