Case Study: Customer Consumption Forecast

The Problem

A client was looking for ways to make their field sales force more productive. The client's territory sales reps spend nearly 100% of their time in the field, meeting with customers in their geographic area. There were approximately 50 sales reps covering the entire United States. Sales reps in major metropolitan areas did not have to travel significant distances, while reps in more rural areas, might have to cover three or four states; consequently, the importance of getting as large a "bang for the buck" when a sales rep physically visited a customer was important. We decided that the sales reps needed a tool to help them identify customer order trends, that would include 12-month shipping history down to the individual items being ordered, the last shipment, quantity in last shipment and some analytics regarding the last shipment.

The Solution

We used the client's sales data warehouse to download all the customer activity, by sales rep, with the shipment dates for each product. We then created an Excel VBA program that would go through and look at the shipping trends for each product for each customer within a sales rep's territory and summarize the following information:

Units Consumed Per Day: The program would look at the time from each shipment starting with the earliest shipment, within the rolling 12-month window, and determine how many days passed until the next shipment. Then the program would divide the units shipped by the number of days to the next shipment to estimate the units consumed per day for that shipment. So if a customer ordered 25 units on January 25, 2011 and then reordered 28 units on March 14, 2011, then the units consumed per day would be 0.521 units per day (25 units / 48 days = 0.521). If the customer ordered again on May 20, 2011, which is 67 days after the March 14 shipment, then the units consumed per day would be 0.472 (28 units / 67 days = 0.472). The program would look at each shipment, through the last shipment, which for this example can be assumed to be December 12, 2011, and includes 22 units.

Average Units Per Day: After calculating the Units consumed per day for each shipment, the program would then determine the average for all the shipments. So in this example, there were 9 shipments, including the December 12, 2011 shipment. The average Units consumed per day for the eight shipments (the ninth shipment is the one that we are analyzing) is 0.450 per day over the 12 months of history.

Standard Deviation: After calculating the Average Units Per Day, the program also calculates the standard deviation for each product, by customer. In this example, the standard deviation is 0.205.

Days Since Last Shipment: For this example, we assume that the report is being run on February 14, 2012. As of our report date, it has been 64 days since the December 12 shipment of 22 units. So if the customer was to call and reorder today, their consumption would be 0.344, which is below their average rate of 0.450.

Z Score: The key question at hand is: What is the estimated probability that the customer has burned through the December 12 shipment? Once we know that probability, we can decide whether or not it is worthwhile to visit or contact the customer regarding their supply. If the probability returns 50%, then we can use the flip of a coin to decide whether or not it is time to

contact the customer. But, if the probability is over 85% (this value is a bit arbitrary) we can feel relatively confident that the customer is out or has decreased their usage significantly, because only 15% of the time the sales rep will be wasting a call. We know that, given the customer's average burn rate, the customer should have consumed 29 units as of now (0.450 * 64 days = 28.8 or 29). We now want to know if the differential between the to-date-estimated consumption rate of 0.344 for the ninth shipment and the rolling-12 month average of 0.450 units per day average for the eight earlier shipments, exceed our 85% probability threshold. To determine the probability, we convert our data into a Z statistic by dividing the difference between the actual and average units consumed, by the standard deviation. This will give us our Z statistic that conforms to a normal distribution with a mean of 0.00 and a standard deviation of one. Our Z statistic was -0.517 ((0.344 – 0.450) / 0.205 = -0.517). The Z statistic indicates that as of February 14, the customer's consumption is about 0.5 of a standard deviation to the left of the 0.450 average. Using the following Excel function, = 1 – NORMDIST(-0.517) returns approximately 0.70 or 70%. This means that we can be 70% sure the customer has consumed their last unit, but this still does not rise to the 85% level that we established as our threshold. We now check to see what the probability will be next month on March 14. At March 14, it will have been 93 days since the December 12 shipment. At 93 days, the per day consumption rate will be 0.237 (22 units / 93 days = 0.237 units per day). At 0.237, the Z statistical will be -1.04 ((0.237 – 0.450)/0.205) = -1.04). Again using our =1 - NORMDIST() function, we get 0.85 which does get to the 85% threshold. Therefore we know that if the sales rep calls on or after March 14, there will be an 85% or better probability that the customer has consumed the final unit of the December 14 shipment.

The Application

As we mentioned earlier, this Excel application had two primary benefits, the first of which was providing sales reps with the ability to evaluate which customers needed to be called on a given day. The second was that it enabled newly hired or transferred sales reps to get a quick snapshot of their new sales territory by showing which customers used what products at the most recent volumes. So a new sales rep could pick up the report and ascertain who needed to be called first and what that customer purchased, as well as what their typical order size for all products looked like.

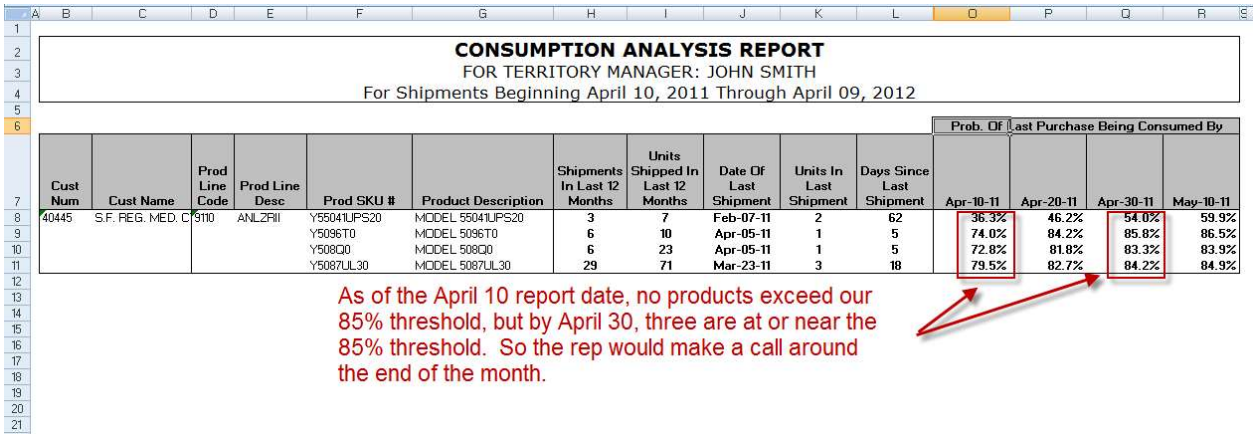
This application required a bit of code, which we are not going to get into here at any length. We will just work through the major components. This application required five worksheets. The worksheets were as follows:

Summary: This is where all the final calculations and information are summarized. This application was also set up to generate a report for each sales rep and email that report to the sales rep and their regional manager. The VBA application references the worksheets that are referenced below to organize the shipment data.
ProdHier: This worksheet contains the product hierarchy for all the models numbers with each product's respective product line. This is used to structure the report by product line.
Customer: This worksheet contains all the customers and which sales rep the customer tiers beneath. This worksheet is used to create the Summary worksheets by sales rep.
Reps: This worksheet contains all the sales reps, their email addresses and the name and email address of their regional manager. The latter is used to send a copy of the report to their regional manager as well.
Results: This worksheet contains all the shipment history for the past 12 months. There are columns for shipment date, customer number, model number and units shipped. The application has an algorithm to go sort and process the shipments by sales rep, by customer, by product line, by model number to generate the forecast probability. In this

case, the 65K row limitation in Excel is not a constraint. If it was, then we would leverage Access to maintain many of the files above and pull the shipment history by sales rep into Excel and process the summary file.

The Result

The final report needed to include the sales activity for all the sales rep's active customers, over the past 12 months, and group the products sold by product line. On the right side of the report, there are four columns giving the probability as of the report date, April 10 in this case, as well as the probability 10, 20, and 30 days out, equating to April 20, April 30 and May 10. For this customer's four products within the ANLYZRII product line, the sales rep should call around April 30 when three of the four products exceed our 85% threshold. The report appeared as follows:



CONSUMPTION ANALYSIS REPORT
FOR TERRITORY MANAGER: JOHN SMITH
For Shipments Beginning April 10, 2011 Through April 09, 2012

											Prob. Of Last Purchase Being Consumed By			
Cust Num	Cust Name	Prod Line Code	Prod Line Desc	Prod SKU #	Product Description	Shipments In Last 12 Months	Units Shipped In Last 12 Months	Date Of Last Shipment	Units In Last Shipment	Days Since Last Shipment	Apr-10-11	Apr-20-11	Apr-30-11	May-10-11
40445	S.F. REG. MED. C	3110	ANLZRII	Y55041UPS20	MODEL 55041UPS20	3	7	Feb-07-11	2	62	36.3%	46.2%	54.0%	59.9%
				Y5096T0	MODEL 5096T0	6	10	Apr-05-11	1	5	74.0%	84.2%	85.8%	86.5%
				Y508Q0	MODEL 508Q0	6	23	Apr-05-11	1	5	72.8%	81.8%	83.3%	83.9%
				Y5087UL30	MODEL 5087UL30	29	71	Mar-23-11	3	18	79.5%	82.7%	84.2%	84.9%

As of the April 10 report date, no products exceed our 85% threshold, but by April 30, three are at or near the 85% threshold. So the rep would make a call around the end of the month.

As you can see, the report also includes information about the past 12-month shipments with the number of shipments, total unit quantity represented in all those shipments, the date of the last shipment, units in the last shipment and days since the last shipment as of the report date. With this information, the sales force was able to prioritize their customer visits and gain some very valuable insight into their customer order habits. A side benefit was the value that this report provided to new sales reps taking over a new customer or territory. A new sales rep could use their consumption analysis report to very quickly ascertain what customer purchased which products and at what frequencies. All this is in addition to getting a little help determining when the best time was to contact a customer about new orders.

If you have an interest in a similar project or think that you could benefit from some additional business analytics, give us a call at 818.436.0781 today.

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