

# Improving financial forecast through customer behavior data

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The behavioral forecasting methodology implemented at a mobile telecom operator



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Many listed and non-listed companies are ruled by forecasts about their revenue and profits. But significant deviations between forecasts and reality are extremely common. These deviations can have severe consequences on a company's stock price, its brand image, and its workforce. Mlcompany discovered that these forecasts can be improved relatively easily by using more granular data and more advanced forecasting methods. Based on this breakthrough, Mlcompany developed a forecasting methodology that strongly improves the financial forecasts of organisations. This article describes the first implementation of this methodology for a mobile telecom operator.

Many corporations and listed companies are ruled by predictions about revenue and profits. These predictions—also called forecasts—are made monthly or quarterly, and their publication may result in sudden fluctuations in the stock market, especially if the announcement runs contrary to previous predictions or statements.

For example, in July 2016, Lufthansa’s stock value plummeted by 20% at the DAX30 due to a profit warning. The stock price of this challenger is hitting a record low now in at least the last five years. Another example is the stock of Fugro. The geotechnical offshore company communicated a profit warning in August of this year. Subsequently, Fugro’s stock price plummeted abruptly by 15% in just one week.

We can see that forecasts have considerable importance for shareholders. Moreover, they may have a dramatic impact on employees. Fugro will shrink its workforce by 2,500 this year, out of 11 thousand employees. Earlier this year, telecom company Nokia announced they would slash more than 20 thousand jobs after a profit warning that stated second quarter losses would climb noticeably and be higher than expected.

Despite the significance of the year-end expectations for many companies, the methodology for making an accurate forecast frequently falls short. A common pitfall is using averages at a high dimension level instead of monitoring and modelling changes in customer behavior. The increased availability of customer behavioral data (“Big Data”) could make forecasts much better and more reliable (see frame).

Erratic Communication Behavior in the Telecom Market

The mobile telecom market has changed substantially due to the rise of communication apps such as WhatsApp. This has led to a decline in the number of text messages sent, and as a result, the revenue of telecom providers has also declined. Telecompaper announced that their profits from text messages have deteriorated sharply since 2013. The many profit warnings of the providers illustrate the lack of accurate forecasting tools, and that they could not foresee this trend. Business controllers are used to basing their forecasts on total revenue development, which ignores the underlying fluctuations of customer behavior. Because they ignore this data, they are surprised by the “sudden” shrinkage in revenue.

MIcompany has used this surge in customer data to develop an exact methodology for forecasting business results, which we call Behavioral Forecasting. This article will explain this methodology and its huge benefits for the elementary components of forecasting. The operationalisation of Behavioral Forecasting in practise can be illustrated using the following example. In 2012, our forecast methodology was implemented at a leading mobile telecom provider. Before 2012, this provider was struggling with analysing the deviations between forecasts and actual results in the mobile market, and it was very labour intensive to produce these analyses for both the total number of customers and detailed customer segments. The available financial forecast models made it difficult to forecast the impact of an abrupt transformation in customer behavior on the telecom provider’s revenue. This crucial impact can be predicted through Behavioral Forecasting, and the provider began using our methods for three of its brands within the consumer market. Recently, our methodology has also been rolled out to the business market.

Behavioral Forecasting Differs from Traditional Financial Forecasting Models

Behavioral Forecasting deviates from traditional methodologies in four ways, which are explained in the figure below.

First, Behavioral Forecasting is based on customer behavior and how it translates into financials. Second, Behavioral Forecasting uses Big Data to build up the forecast model granularly. Third, it applies time series analysis to model seasonal patterns. Finally, the methodology is

self-learning, because it continuously improves by analysing the latest results. Below, each benefit is explained using examples.

Behavioral Forecasting Predicts Customer Behavior and Translates it into Financials

In contrast to Financial Forecasting, customer behavior is the center point of Behavioral Forecasting. In order to forecast customer behavior, its drivers are analysed and determined. Drivers are the most important “influencers” of customer behavior. In the case of a mobile telecom provider, the kind of mobile phone people use is a driver of customer behavior. For example, a customer using an iPhone 6 will use moderately more data and send fewer text messages

than the same customer using a Nokia 6300. To identify these drivers, data about customer behavior is needed. The Behavioral Forecasting methodology analyses aggregated source data, including invoices. Using figures and insights from these data, we can see that changes in call, text, and data usage are often caused by a customer changing his or her mobile phone, which is often driven the customer’s renewing his or her plan (see frame).

These data cannot only determine customer behavior, but also the financial impact of this behavior. Invoices can easily be matched to the profit and loss accounts. Not every single transformation in customer behavior affects revenue

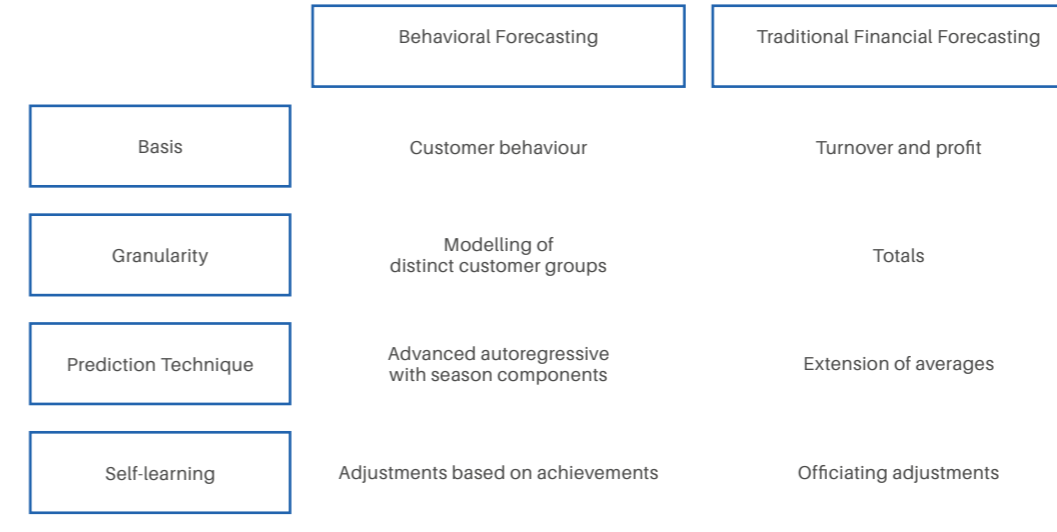


Figure 2. Improvements on the four pillars of Behavioral Forecasting versus Financial Forecasting

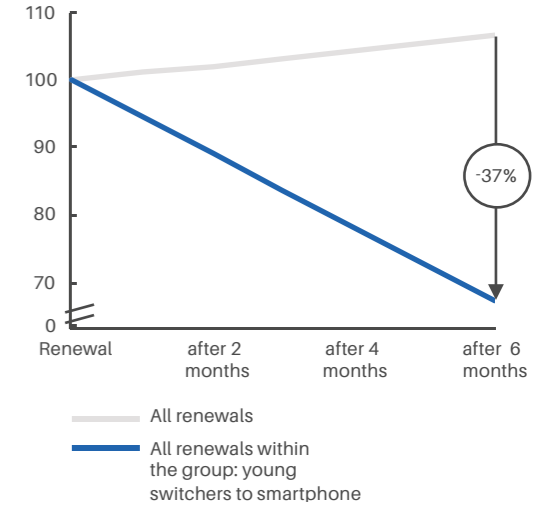


Figure 1. The decline in text messages within the customer group “young smartphone switchers” is 37% larger than for the total customer base

Figure 1 shows the shift in total text messages sent (as an index) after renewal in 2011. The decrease in average text usage on the total customer base (the blue line below) is negligible. We can even see a slight rise.

When analysing this customer behavior for a specific customer segment, such as young customers switching to a smartphone, we see the opposite: a considerable plummet in text usage and an upsurge in data usage simultaneously. Text messaging has been swapped for WhatsApp, Twitter, and Facebook. In order to forecast changing customer behavior accurately, it is essential to build it up from underlying homogeneous customer groups.

or profits. For instance, a customer who only uses 50 minutes of the 100 he has have each month will pay exact the same amount even if he begins to use 90 minutes per month. But if he exceeds his bundle allowance by using 120 minutes, he has to pay for the 20 minutes outside of his monthly bundle allowance, which is always more expensive. This shift in behavior has a financial impact for both the customer and the telecom provider. Table 1 illustrates this case.

Forecasting based on invoice data has an additional advantage: the management, financial controllers, and marketers all reap the fruits of the forecast. The management detects the direction of the total revenues in the long run, the controllers determine the total revenues using the underlying elements, and the marketers use the customer behavior to derive the product modifications that have to be made in order to meet the customer's needs.

**Behavioral Forecasting is Granular**

The second pillar of Behavioral Forecasting is granularity. As previously mentioned, in the Financial Forecasting methodology there is a lack of a granular perspective on customer behavior. Behavioral Forecasting, on the other hand, can analyse customer behavior to understand its fluctuations. Using totals alone, the way Financial Forecasting methods do, may cause the results to be skewed by small customer groups that are not representative of the customer base as a whole (for example, the “early adapters” often behave differently than the main customer base). This results in a snowball effect which will skew the revenue predictions (see frame on the first page). By using Behavior-

	January	February	March
Number of minutes in bundle at the beginning of the month	100	100	100
Dialed minutes	50	90	120
Total costs customer	€10	€10	€14
'periodic' subscription fees	€10	€10	€10
additional costs for calling besides the bundle	€0	€0	€4

Table 1. Financial impact for a customer using a 100 minute bundle (€10) and an out of bundle tariff of €0,20 per minute

Forecasting, we can measure several customer flows, like inflow, outflow, and the “stable” customers, and understand how customer behavior differs between these groups.

If the forecaster at the telecom provider would like to forecast the customer outflow or how many customers are expected to renew their contracts, he can use the number of customers that will be out of contract as a predictor. Next, he can compare the behavior of the customers who renew from those who leave the company and those that do nothing at all (“sleepers”) and apply these insights to his forecast. An increase in customers leaving the company does not automatically imply bad performance; it could be the result of a campaign that was launched a year before. The out of contract base and the outflow of customers will be relatively high; this is also called a cohort effect.

**Behavioral Forecasting Applies Time Series Analysis**

Extrapolating year-on-year averages is a forecast methodology widely used by businesses. Analyses based on daily data, also called time series analysis, expose a lot of variations between years. Therefore, uncovering seasonal trends and patterns is the third building block of Behavioral Forecasting. In the traditional forecasting methodologies, the effects of holidays and weekends on customer behavior and revenues are not included. However, they need to be incorporated in order to distinguish seasonally dependent behavior from seasonally independent behavior. Behavioral Forecasting adopts what we call day equivalents in order to accurately estimate the seasonal effects on

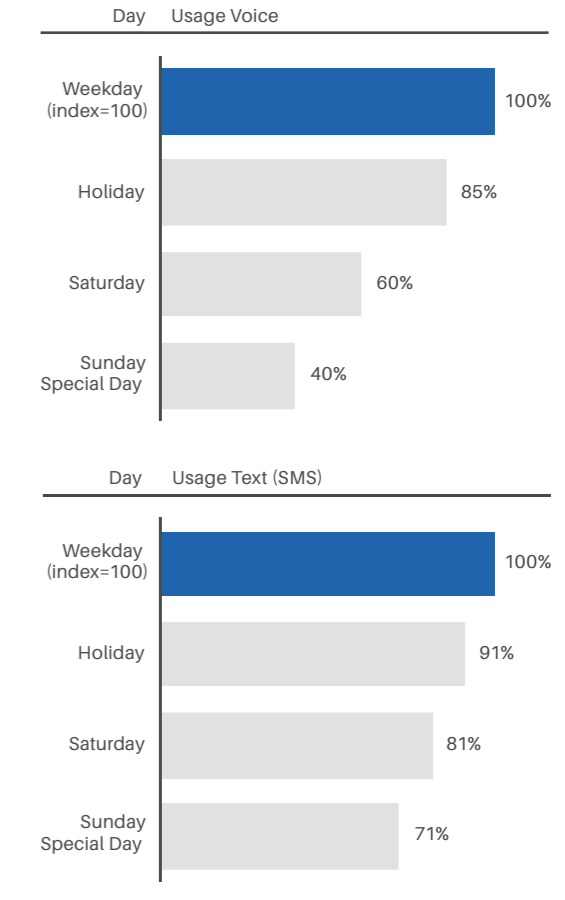


Figure 3. Impact of types of days on customer behavior

customer groups. An example is the impact of a weekend relative to a working day on customer behavior. On Sundays, customers cut down on mobile calls by 40% when compared to a weekday. Customer behavior is also different during the holidays. Figure 3 illustrates the effects of weekends and holidays relative to a working day. The graph clarifies the substantial deviations in customer behavior between the days. Months containing relatively more weekend days or special days are low traffic months. A forecast that incorporates these seasonal effects has a considerably more reliable outcome than a forecast that extrapolates year-on-year averages.

Modeling seasonal patterns has an important benefit: a solid assessment of seasonal effects is essential when announcing expectations to the shareholders. For example, in the telecom industry, the revenue from roaming has a clear seasonal pattern based on holiday periods. If in the first year, a holiday takes place in the third quarter, but in the next year it occurs one quarter earlier, the corresponding roaming revenue will shift to the second quarter. The new forecasting methodology helps to accurately estimate the quarterly roaming revenue.

#### Behavioral Forecasting is Self-Learning

The ability to learn from forecasting errors is the fourth pillar of Behavioral Forecasting. Considering the abrupt fluctuations in customer behavior, a reliable and stable forecast should have the ability to learn from the gaps between what was predicted and what actually happened. Therefore, granularly monitoring forecast error is a necessary component of

our methodology. By inspecting the underlying customer segments, the customer segment that contributes the most to the gap between prediction and results can be determined. In doing this, risks and opportunities can be identified at an early stage. This component of our methodology, which we call deviation management, is an essential part of Behavioral Forecasting that enables a forecast to quickly adapt by incorporating the latest results. Figure 4 represents a simplified example of deviation management. For a specific month, the forecast is compared to the actual results. The intermediate blocks explain the sources of the total difference. Although the total deviation is only +0.8, the underlying blocks show three substantial delta's (+2.0, +1.0 and -1.0). These are areas of concern that will help in strengthening the forecast model. In this way, the forecast of all combinations of drivers can be compared with the actual results, and thus be improved. The number of combinations can easily reach 5 thousand.

Substantial deviations in small revenue components, such as the roaming revenue, can often disappear when focussing on the bigger picture. Therefore, the forecasters of the telecom provider must analyse the underlying products and revenue drivers to investigate what events correspond with a significant forecast error. The model can then use this error to improve its forecasts.

#### Applications and Results of Behavioral Forecasting

Behavioral Forecasting is the foundation for business planning where the annual plan and

corresponding targets are determined. In the case of the telecom provider, the quality as well as the accuracy of the plans have improved dramatically. Before the implementation of the methodology, a considerable deviation between the forecast and actual results was common, and it took a lot of time and effort to explain the gap and to calculate its impact on the year end expectation. Now the forecast better approaches the actual results, and the source of differences can be directly analysed. Moreover, the methodology can provide insight into the impact of the differences for the next two years.

Finally, Behavioral Forecasting helps to make things transparent by improving a fundamental issue in setting revenue targets. For one mobile label, the revenue target set was so ambitious that even tripling sales could not reach it. Because the forecast is build up from customer flows, the feasibility of these targets can easily be reviewed. Because we can see both the actual and the predicted number of sales with their corresponding revenues, we can set more accurate revenue targets.

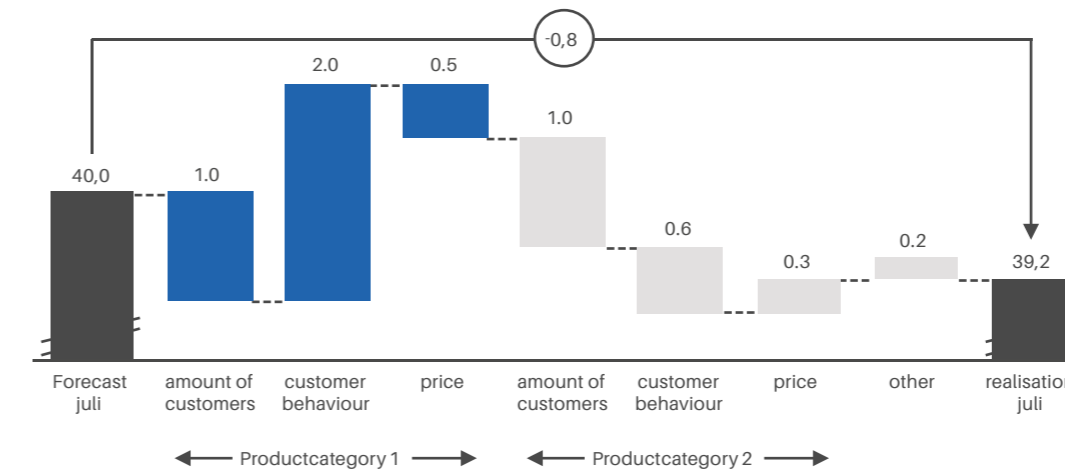


Figure 4. "Deviation Management"

1. The average human has one breast and one testicle (Des McHale)
2. Granular, means that from total perspective can be deep dived into the underlying building blocks and branches. A granular perspective on the customer base gives insight in all underlying customer -segments, -groups and -flows which jointly define the integral customer base
3. Analyses based on these data satisfy the conditions of the "Wet bescherming Persoonsgegevens"
4. From a marketing Intelligence point of view, a cohort customers means a predefined set of customers that started or ended their subscription. In general, a cohorts (cohortes), is a division in the ancient Roman army