New Product Forecasting Using Structured Analogies
Table of Contents

Introduction .................................................................................................................. 1
The Challenges of New Product Forecasting ............................................................... 1
The Structured Analogy Approach ............................................................................. 1
An Example of Forecasting New Product Sales ......................................................... 3
Summary ...................................................................................................................... 6

Content for this white paper was provided by Michael Gilliland, Product Marketing Manager for SAS Forecasting. It is based on a patent-pending method of new product forecasting developed by Michael Leonard, Tom Dickey, Sam Guseman and Michele Trovero.
Introduction

New product forecasting (NPF) is a recurrent challenge for consumer goods manufacturers and retailers. There are many kinds of NPF situations these organizations can encounter:

- Entirely new types of products.
- New markets for existing products (such as expanding a regional brand nationwide or globally).
- Refinements of existing products (such as “new and improved” versions or packaging changes).

There are many NPF approaches available to try. Some of the common ones include:

- Executive opinion – top management provides the forecast.
- Sales roll-up – a bottom-up poll of the sales force.
- Delphi method – a structured formal process for anonymously gathering forecasts and building a consensus.
- Prediction market – anonymous wagering used to gather group opinion.
- Analogy – expecting a new product to behave like similar products from the past.

All of these methods use judgment to some extent and there are good reasons why. Judgment compensates for the lack of historical information because we are dealing with new products with no historical sales. Judgment also compensates for lack of future information – it may be too difficult or costly to conduct market research tests, or to quantify such things as the direction of fads and fashion trends.

The Challenges of New Product Forecasting

While use of judgment is necessary in new product forecasting, it has its disadvantages as well. Judgment is frequently biased with over-optimism, or allowing recent events to have unwarranted impact. Judgment is also clouded by personal or political agendas, where the forecast is used to represent the forecasters’ wants or needs rather than what they honestly believe will happen.

As an example, if a sales rep knows his forecast is going to be used to set the sales quota, there is a natural tendency to forecast low – to set a low quota that is easier to beat. If a product manager wants to introduce a new product, there is a natural tendency to forecast high – at least high enough to meet any hurdles for getting the new product approved for development. (Have you ever heard of anyone forecasting a new product to fail in the marketplace?)

The Structured Analogy Approach

The use of analogies is a common NPF practice. We see this in the real estate market, where an agent will prepare a list of “comps” – similar houses in the area that are on the market or have recently sold – and use this to suggest a selling price.
SAS has a new patent-pending approach to NPF that combines the use of analogies with structured judgment. This “structured analogy” approach:

- Includes guided statistical analysis that incorporates human judgment.
- Attempts to remove judgmental bias by providing a historical context for each decision.
- Attempts to validate and test the decisions.
- Drives choice of analogy by a statistical process.

The structured analogy approach requires two types of data: product attributes (for prior and new products) and historical sales (for prior products). Product attributes can include many things, such as:

- Product type (toy, music, clothing, shirts, etc.).
- Season of introduction (summer item, winter item, etc.).
- Financial (own price, competitor price, etc.).
- Target market demographic (gender, age, income, ethnicity, etc.).
- Physical characteristics (style, color, size, etc.).
- And many others.

Historical information on past new product introductions is also needed. Here are scaled thumbnails of the first eight weeks of sales for 100 new DVD releases:

![Figure 1: Scaled thumbnails of the first eight weeks of sales for 100 new DVD releases.](image-url)
The structured analogy process for new product forecasting has six main steps:

- **Query step**: Find a set of candidate products that have similar attributes to the new product.
- **Filter step**: Manually remove inappropriate or outlier products from the set of candidate products.
- **Cluster step**: Cluster the candidate products according to their sales pattern, and manually select the most appropriate cluster to serve as the surrogate products.
- **Model step**: Select the most appropriate statistical model for the cluster of surrogate products, and extract the statistical model features.
- **Forecast step**: Use the extracted statistical model features to forecast the new product.
- **Override step**: Make manual adjustments to the statistical model’s forecast.

### An Example of Forecasting New Product Sales

Let’s work through an example of forecasting sales of a new DVD movie release. The Query step begins with selecting a publicly available data set on historical DVD sales, and then specifying the attributes of prior DVDs that match the new DVD. In this case, the new DVD is an R-rated horror movie, so we decide to specify two attributes: “Horror” for the Genre, and “R” for the MPAA rating.

![Figure 2: Specifying attributes for candidate products.](image)
Note that we are using judgment to determine which attributes are most relevant – the system is not going to tell us this. However, the system does automate all the work of extracting the R-rated horror movies from the data set of all DVDs, and these form our pool of candidate products.

The output from the Query step is a profile overlaying the initial sales of all the candidate products, along with a list of all the candidates.

Figure 3: Overlay of candidate product sales over their first 20 weeks.

Judgment again comes into play in the Filter step, as we decide that *Dawn of the Dead* is an outlier, and uncheck it to remove it from the candidate pool.

Figure 4: Remaining candidate products (after filtering).
The Query step let us explore candidate DVDs with similar attributes, and the Filter step allowed us to make a judgment on inappropriate candidates to be filtered out. After the filtering is applied, the Cluster step clusters the remaining candidates according to similarity of their sales patterns. Judgment again comes into play, as the user selects a surrogate cluster based on the anticipated sales pattern for the new product. In this case the R-rated horror movies fell into three clusters, and the first was chosen. We are now ready for the Model step.

![User-selected cluster of surrogate products.](image)

The Model step generates a statistical model that fits the surrogate cluster. The user has access to a variety of models to utilize, including diffusion, mixed, smoothing, Bayesian and others. After the model is selected, the Forecast step generates a forecast for the new product, which is shown below in blue overlaid on the surrogate product histories.

![Forecast model predictions overlayed on surrogate products.](image)
Judgment has been used throughout the structured analogy process and is used once more in the Override step where manual adjustments can be made to the statistical model forecast.

Figure 7: Users can override model predictions.

After any manual overrides are made, the new DVD forecasts can be exported to downstream planning systems.

Summary

The structured analogy approach can be useful in many, but certainly not all, new product forecasting situations. It attempts to improve on human judgment alone by automating the historical data handling and incorporating statistical analysis. The software makes it possible to quickly extract candidate products based on the user-specified attribute criteria. It aligns, scales and clusters the historical patterns automatically, providing an easy to understand visualization of past new product behavior. This visualization helps the forecaster realize the risks, uncertainties and variability in new product behavior, so that the organization can make the appropriate decisions based on these uncertainties.

Judgment is always going to be a big part of new product forecasting. A computer will never be able to tell us whether lime green or Day-Glo orange is going to be the hot fashion color next season. But judgment needs assistance to keep it on track and as objective as possible. The role of structured analogy software is to automate the data extraction and processing work, provide visualization of the historical context for judgments and make the NPF process as efficient and objective as possible.
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