Marketing Science 23(2), pp. 180–191, © 2004 INFORMS

Predicting Sales Takeoff for Whirlpool's New Personal Valet

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The introduction of really new products creates many dilemmas for managers. Initially, they must develop a launch strategy in the face of great uncertainty about the product's potential. After launch, they need guidance about whether to pull the plug on a new product with lackluster sales (prior to takeoff) or persist with a product that could ultimately be a failure. Our results and model of the takeoff in sales of new products provide some guidance on these complex managerial decisions.

Prior to our study on sales takeoff, a manager's only recourse to analyzing new product growth would have been diffusion models. However, these models have typically used new product sales beginning at or around the takeoff, have assumed takeoff, and have not explicitly modeled it. In contrast, our model addresses the time from commercialization until takeoff, thus providing insights during the period of greatest uncertainty.

Whirlpool Corporation used our model to guide their decision making in the testing and launch of a completely new consumer durable, the Personal Valet.

Key words: sales takeoff; new product growth; product management; sales forecasting; market response models; innovation
History: Processed by Gary L. Lilien, ISMS Practice Prize Editor.

Company and Problem Background

Whirlpool Corporation is the world's leading manufacturer and marketer of major home appliances. Every year, it sells $11 billion of appliances under 11 brand names in more than 170 countries. In the 1990s, Whirlpool developed the first new appliance category in 30 years. The product is a laundry appliance called the Personal Valet Clothes Vitalizing System (www.personalvalet.com). It is the first in a new category of appliances: a substitute for dry-cleaning service. It can be placed in bedrooms, walk-in closets, or laundry rooms because it runs on standard 110-volt electricity and does not require any water lines or other special hookups. Through a patented process, the Personal Valet smoothes wrinkles and cleans odors from virtually every fabric, such as wool, silk, cotton, leather, suede, and synthetic clothes, thus eliminating two primary reasons for trips to the dry cleaner. It cannot remove visible stains, but only about one-quarter of the clothes taken to dry cleaners need to have visible stains cleaned. Treating up to three items of clothing at a time in the Personal Valet takes 30 minutes or more, depending on the cycle selected. The product costs about $1000, including installation.

The Personal Valet satisfies the majority of consumers' needs for dry-cleaning services, without the time and expense of going to the dry cleaner. Currently, U.S. consumers spend over $8 billion annually on dry cleaning services, and ironing is the second most disliked household chore, just behind washing windows. Thus, the Personal Valet has the potential to significantly increase consumer welfare through cost savings, increased convenience, and reduced drudgery.

When we began working with Whirlpool in 1996, our initial work on sales takeoff (Golder and Tellis 1997) had not yet been published, so there were many unanswered questions about the market response to really new consumer durables:

What is the typical pattern of early sales for new durables?
Is there a takeoff?
What is the time to takeoff?
Does takeoff have systematic patterns?
Can we model and predict takeoff?
Can we manage the timing of takeoff?
How do we price the product?
How much should we spend on advertising?
How should we distribute the product?

Approach to Solution

We began our analysis in this project by expanding the data set beyond the 31 categories included in Golder and Tellis (1997). We sought to include additional kitchen and laundry appliances and more recent categories. The broadened data set includes carbon monoxide monitors, bread makers, espresso machines, PDAs, and scanners. Based on our expanded data set, we developed insights and recommendations in three key areas.

Patterns of Early Sales and Takeoff for Really New Consumer Durables

Our answers to Questions 1–4 above are summarized in a number of descriptive statistics and sales curves (Golder and Tellis 1997, 2004). Overall, these findings indicate that it takes several years to reach a distinct takeoff in sales. On average, the time-to-takeoff is 10 years, and sales at takeoff increase more than 400%. Golder and Tellis (1997, 2004) report many additional findings on unit sales, price declines, price points at takeoff, and penetration. For kitchen and laundry appliances, average time from commercialization to takeoff is 15.6 years, but only 5.8 years for the subset of these categories introduced after World War II.

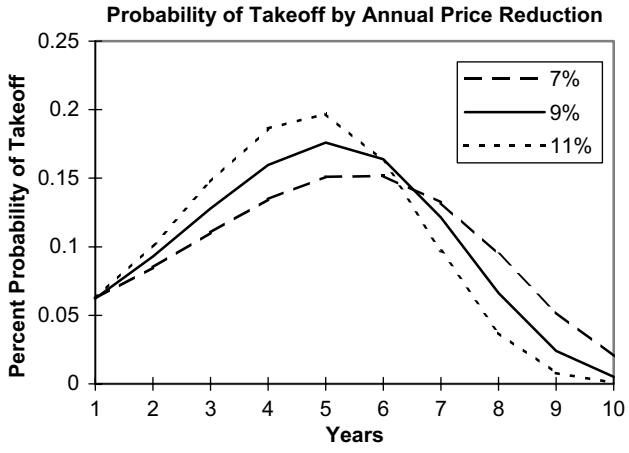
Modeling and Managing Takeoff

Prior to our work on sales takeoff, managers may not have been aware that a dramatic takeoff was a common occurrence with new durables. Since this takeoff is the critical event in the life of a new product, our model of takeoff was of particular interest to Whirlpool in answering Questions 5–7 above.

The most important result from our model was the determination of the marginal probability of takeoff over time. As inputs to the model, we used managerial judgments about planned price declines over time. Also, we evaluated a variety of scenarios about market penetration over time based on historical patterns of penetration for relevant subsets of categories. Figure 1 is representative of the results generated in this analysis. The percentages are three different annual price reductions. Penetration for all three curves is the average penetration in each year for a representative set of kitchen and laundry appliances.

Using such analyses, Whirlpool could evaluate how different pricing strategies would impact the probability of takeoff for the Personal Valet. Note that larger price reductions increase the peak probability of takeoff and shorten the time at which the peak occurs.

Figure 1 Annual Price Reduction



We predicted the year of takeoff to occur when the cumulative probability exceeded 50%. In addition, our research indicated that price points of $1,000 and $500 could be relevant for the Personal Valet's takeoff. Overall, based on our analysis of similar categories and Whirlpool's planned strategy, we expected that the time-to-takeoff would be about 10 years.

Impact on Other Elements of Marketing (Distribution and Advertising)

While our model did not include marketing variables other than price, the prediction of a long time-to-takeoff had important implications for other marketing variables (Questions 8 and 9 above). In particular, low levels of advertising and focused distribution would keep costs under control during the initial period of low sales.

Implementation Challenges

The prediction of a long time-to-takeoff and the strategy resulting from this prediction led to two general concerns. First, how could we be sure that we were using the right set of products as the standard for the Personal Valet? After all, alternate products could lead to different parameter estimates and different penetration paths over time than the ones we were using. We addressed this concern through a variety of sensitivity analyses and found that several plausible alternate products led to the same conclusions. For managers considering other types of products, we provide some guidance by showing various median times to takeoff in Table 1.

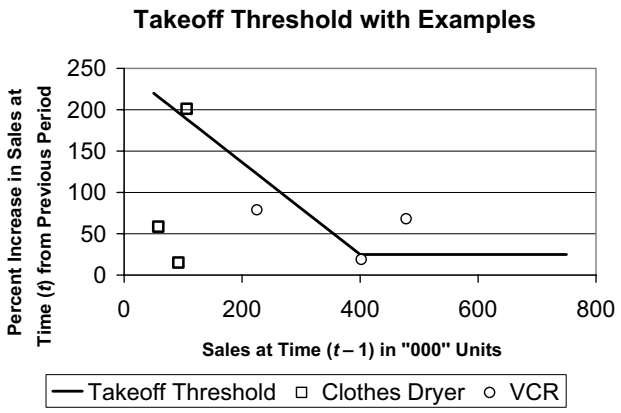
A second concern was whether it was possible to validate the takeoff as it occurred or whether it would only be known one or two years later. To address this concern, our threshold rule for takeoff can be useful (Golder and Tellis 1997). This rule can classify whether a new product's sales growth relative to the previous year's growth in sales is high enough to

Table 1 Various Median Times to Takeoff

Categories	Sample size	Median years until takeoff*
All	40	8.5
Pre-World War II	16	15.0
Post-World War II	24	5.5
1965 and later	21	5.0
1980 and later	11	4.0
Kitchen and laundry	14	12.0
Time saving	24	8.5
Leisure enhancing	19	8.0
Electronic	21	6.0
Nonelectronic	19	15.0
High price at commercialization (>$950)	19	9.0
Low price at commercialization (<$950)	21	5.0

* Year 1 is the year of commercialization.

Figure 2 **Sales Increases for Clothes Dryers and VCRs at Takeoff and in the Two Years Prior to Takeoff**



signal a takeoff. A takeoff means that the category has transitioned into the growth stage of the product life cycle. Here, sales can be expected to increase substantially for about eight years, on average (Golder and Tellis 2004). In contrast, a false takeoff would be a reasonably large sales increase, except that the product would continue in the introduction stage of the product life cycle.

Here are the steps that managers should take to apply the threshold rule in evaluating their new product. First, they should remember that the threshold rule is relevant only after a category is being sold; it cannot be used to predict takeoff prior to commercialization. Second, companies can then plot the percentage increase in sales versus base sales in the prior year. Third, the first data point above the threshold signals the takeoff. This rule was accurate in more than 90% of the categories in Golder and Tellis (1997). Data points well above the threshold indicate higher probability of takeoff. In Figure 2, we plot sales increases for clothes dryers and VCRs at takeoff and in the two years prior to takeoff. The threshold rule helps to differentiate between large sales increases that do not signal a takeoff from those that do.

Impact of Results on Whirlpool's Decision Making

Our work for Whirlpool had several effects. Without our model, Whirlpool would have likely forecasted linear sales growth. These forecasts would have predicted much higher sales than the product is currently generating. This discrepancy between unrealistic expectations and actual sales may have put pressure on managers to pull the plug on the Personal Valet.

With our model, Whirlpool has a greater understanding that really new products require a number of years to takeoff. The analysis with our model predicted that the Personal Valet would take about 10 years to takeoff in the mass market. (Note that laundry dryers took 20 years to reach about 10% household penetration, and microwave ovens took about 15 years to reach that penetration level. Even though most of us cannot imagine living without these appliances today, their penetration of the market did not happen quickly.)

This understanding led Whirlpool to be more cautious in its launch strategy. In August 2002, they launched the product into only the Contract Channel (i.e., contractors who build or remodel homes) and not into the mass market. According to Dave Herbert, Whirlpool's director of new business development, "Whether you are building a new home or are interested in having a Personal Valet system installed in your current home, your local ACD (authorized contract distributor) is an ideal place to learn more about it." This focused distribution strategy provided an excellent route to sell the Personal Valet while the market as a whole had almost no awareness or knowledge of the product. Such a cautious approach would limit losses and give the product time to succeed.

In contrast, TiVo spent more than $200 million on sales and marketing for their new product. Yet, after 4 years, the product did not takeoff and achieved less than 1% cumulative penetration. Similarly, the peak annual pretakeoff advertising was at least several million dollars for fax machines, pagers, carbon monoxide monitors, microwave ovens, CD players, cell phones, and camcorders. Such expenditures contributed to early losses. Instead, building awareness and word of mouth in focused markets can help when the firm is ready for its mass-market launch.

Transportability of Model and Results

Our model and results on the sales takeoff can be usefully applied to many other new products including the much-publicized Segway scooter, DVD recorders, HDTV, and personal video recorders like TiVo. Managers of such products can benefit from the median times to takeoff, the application of the threshold rule, or the application of our model for predicting takeoff. In this section, we address two additional key questions.

What if my new product never takes off?

All of the new products in our current data set eventually had a takeoff in sales. However, our model can still be used to help managers decide to pull the plug on a new product. Consider a situation where the model indicates a high probability of takeoff, yet the product has not taken off. Here, managers could

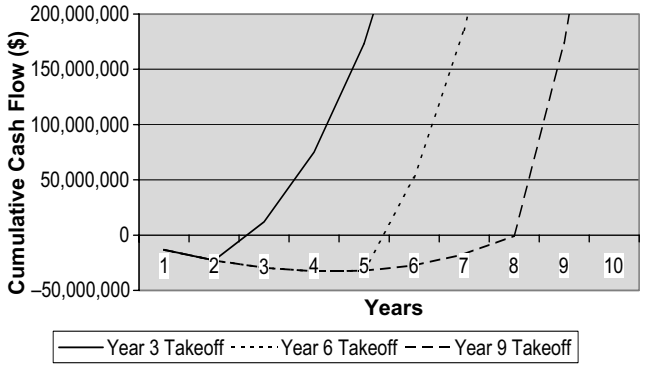
conclude that their new product is unlikely to takeoff as have the successful products in our sample. In addition, our threshold rule can be used to determine how far away the product is from achieving the conditions necessary for takeoff.

How long will it take to achieve positive cash flow?

Several variables impact the duration to achieve positive cash flow or become profitable. We developed a simple spreadsheet model of this process, which is available from the authors upon request. Data for the variables in the model come from several sources. First, unit sales and growth rates over the product life cycle come from Golder and Tellis (2004). Second, cost declines over time can be estimated from experience curve effects (Abell and Hammond 1979, Day and Montgomery 1983). The first two inputs are for the U.S. market. Managers can easily use the model for other countries by using input from those countries (e.g., Tellis et al. 2003). Third, each company must provide prices, initial costs, and marketing expenditures. Finally, we consider three different predictions about the time to takeoff (3, 6, and 9 years), based on results in Table 1.

The following specific data are used to calculate the cumulative cash flow curves in Figure 3:

Figure 3 Takeoff as Critical Event in Future Cash Flow of a New Product



Based on Company Input

Price at commercialization: $500.

Annual % price decline: 7%.

Manufacturer's cost/price at commercialization: 90%.

Annual marketing expenditures: $15 million.

Based on Previous Research

Experience curve %: 80% (see Abell and Hammond 1979 for summary).

Sales at commercialization: 34,000 units (Golder and Tellis 2004).

Annual growth rate during introduction stage: 31% (Golder and Tellis 2004).

Growth rate at takeoff: 428% (Golder and Tellis 2004).

Annual growth rate during growth stage: 45% (Golder and Tellis 2004).

As easily seen in Figure 3, the takeoff is the critical event in the future cash flow of a new product. Even after years of cash outflow, cumulative cash flow turns positive at takeoff. After takeoff, cash flow increases dramatically. These results indicate that firms should strongly consider lower prices and higher marketing expenditures, even with larger losses, in order to achieve a faster takeoff. Authors have long emphasized the importance of such a financial analysis (e.g., Kotler 2003).

Conclusion

There is tremendous uncertainty about the potential success of really new products and the right marketing strategy to achieve that success. For Whirlpool, our findings and model of the sales takeoff helped to resolve at least some of this uncertainty with their new Personal Valet. Much research remains to be done on new products, but our model does provide a scientific basis for generating insights on the sales takeoff by incorporating historical data and managerial input.