

Forecasting Pharmaceutical Sales without Big Data

“Big Data” seems to have become the panacea to answer all kinds of questions, ranging from sports and entertainment (i.e., predict the winner of a tennis match by analyzing first serve percentage, forehand winners, and unforced errors against a particular opponent) to business (i.e., what product offer is most likely to generate the next sale to a particular customer). In healthcare, Big Data has gained use across a number of applications as well, including predicting medical outcomes, managing risk, and of course forecasting drug sales.

The Basic Idea behind Big Data Analytics

Without getting too deep into the mathematics, Big Data Analytics basically works like this: We collect all kinds of information – often millions of data points for hundreds or thousands of variables – which we may or may not believe actually drive the outcomes we want to model. These outcomes (or dependent variables), are assumed to be influenced by some number of factors that we don’t really know or understand. We then collect all this data in a large database and allow mathematical analysis (with a lot of computing power) to tell us what factors directly or indirectly influence our outcomes. We do not need to be very discriminant (in fact we *should* not be) when selecting the factors (or independent variables) that may influence our outcome of interest. After all, data has become relatively abundant and we are better off letting the mathematical analyses tell us whether particular variables matter or not – rather than letting our own bias distort the results.

The analysis essentially establishes the relationship between the independent and the dependent variables. This then allows you to model or predict what will happen to the dependent variable as you change the inputs to the mathematical formula – this can be done using a number of different techniques, including trend analyses, simulations, what-if scenarios, etc. The objectives of such big data applications can be (1) to better predict a complex outcome based on a number of more ‘predictable’ factors, (2) to test different inputs to provide some idea of possible future scenarios and prepare for them, or (3) to identify leading indicators that allow you to narrow down the list to more likely future scenarios as more information becomes available.

Unfortunately, we don’t always have “big data” to work with – in many therapeutic areas patient volumes, prescriptions, and underlying data that might explain prescription patterns is not readily available, if at all. Despite significant advances in data collection – including EMR data, claims data, prescription data – information for niche markets and many geographic regions remains spotty, expensive, or is simply not accessible to pharmaceutical companies.

The solution is to develop a much simpler, yet still powerful model to help us understand market dynamics and model potential outcomes – using logic to mirror the steps taken by Ph.D. level mathematicians with large computing power and even larger data sets.

- Determine market potential for a new therapeutic category
- Project sales forecasts – for existing in-market or pre-launch products
- Evaluate different marketing strategies on their probability of success
- Model ROI on marketing investments (or calculate a net present value, NPV)
- Allocate resources across different markets, products, geographies



Based on years of experience with building and using various forecasting and decision support models, Cogent has identified a few simple, but critical steps to develop the right tool to make critical investment decisions, project revenues, or evaluate alternative marketing strategies. The key is to leverage all available information and your own experience (plus that of other team members) to mimic what a computer program with tons of data can do mathematically:

6-Step Process to build a powerful Decision Support Model without Big Data:

1. Decide what you want to model (i.e., forecast revenue, project ROI, etc.) – this is your dependent variable
2. Think through the factors that MOST influence your model output (i.e., dependent variable)
 - a. Use your experience and judgment to focus on the most important factors (after all, we do not have unlimited data, or computing power)
 - b. Assimilate all available data and decide whether to conduct some focused research to fill any critical gaps – last, use benchmarks from analogous situations as a guide
3. Develop a logical model that captures the relationships you expect to see between your independent variables and the modeled outcome
 - a. Most of the time, one does not have to resort to complex relationships and regression factors (i.e., *how much* does Y change when you change X) – it is often enough to stick with simple relationships that can be observed or tested empirically down the road to validate or fine-tune the model
 - b. As a rule of thumb, try to capture those variables that you believe you can influence (i.e., those “leverage points” that become objectives in your marketing strategy)
4. Test the model by entering known data where we have both the inputs and outputs
 - a. For new launch products with no historic data, model the sales of a competitor
 - b. Calibrate the model by ensuring known inputs generate actually observed results – a critical step when data is incomplete, biased, dated, or from multiple data sources.
 - c. Continue to tweak the model until you are comfortable that it generates a reasonably accurate output for a set of given inputs
5. Use the model to learn: Models often reveal surprises – do not ignore these surprises or jump to conclusions that the model is wrong. Check your assumptions, pressure test the logic, double check the data, and if everything still appears sound, then have an open mind to consider that there may be some dynamics that “conventional wisdom” does not see. Some of these surprises may be things like:
 - a. Certain market segments offer more / less potential than we expected
 - b. Long-held beliefs about diagnosis rates, compliance, and similar may be mathematically impossible
 - c. Gaining share with new patients may not drive growth as quickly as switching existing patients to a new treatment
 - d. Raising / lowering prices does not change revenue as much / as little as expected due to price elasticity of demand
 - e. Specific business opportunities are larger / smaller than assumed
 - f. Timelines to achieve a positive ROI or NPV are longer / shorter than anticipated – some investments will never pay off
6. Once the basic model is in place, use it often & use it continuously – learn over time and improve the model
 - a. Do a **Sensitivity Analysis** to determine how different variables affect your “forecast”



- b. **Track** inputs and outputs over time **& Evaluate** whether the relationships you created hold true or can be fine-tuned
- c. **Scenario Plan** for major changes in the market and see how they would impact your business results – solicit SME (subject matter expert) perspectives to help you understand how selected model inputs may trend or change as a result of external events
- d. Use the model to build **Organizational Alignment** around business goals and ways to achieve those - it builds a shared understanding, generates valuable discussion, and ultimately achieves ownership and commitment to move forward in unison

What is the best structure for a forecasting or market potential model?

We have to make some basic choices concerning the model structure – inputs must be selected based on data availability and quality. Equally important is the context of the current business situation.

Modeling Approach	Useful when ...	Less useful when ...
Patient-based model	<ul style="list-style-type: none"> - Disease is under-diagnosed or under-treated. - Competitor products are used across many indications / treatment types 	<ul style="list-style-type: none"> - Modeling a ‘me-too’ product or generic - No “leverage points” other than market share gains will drive product uptake
Competitor cannibalization model	<ul style="list-style-type: none"> - Product is an almost exact replacement for a competitor product 	<ul style="list-style-type: none"> - Product’s target patient profile differs from those of competitor products - New, different patients are expected to be treated with the product
Trend analysis model	<ul style="list-style-type: none"> - A long history of previous sales exists - No significant changes in the market are expected 	<ul style="list-style-type: none"> - New products enter the market - Changes in reimbursement, treatment guidelines, etc. are expected

The modeling approach has to take into account the market environment and business strategy to serve its purpose best. The table above provides an initial guideline – however, in some situations, the best choice may be a combination of the above approaches. For example, use a patient-based model as the core, but add trend analyses to project selected inputs (e.g., market share). In addition, building in “Key Events” or “Milestones” may permit modeling discontinuities in the forecast. “Monte Carlo” probability modeling may be useful to model the likelihood of certain events taking place. The possibilities are plenty – the key is to **keep it as simple as possible, but not more simple than necessary.**

Following these guidelines can generate a useful tool and process to make forecasting and business planning more objective, efficient, transparent, flexible, and ultimately more accurate as the models are updated with actual results from actions taken. Using the right models to create a fact-based, transparent forecast will avoid the significant costs associated with decisions not fully accepted, over- or under-investments as a result of a wrong forecast, and most importantly missed opportunities.

In order to reap the full benefit of forecasting models and other decision support tools, Cogent Consulting has developed a new generation of [online models](#) to improve reliability, manage access, foster collaboration, and keep information secure and up to date for all approved users. Please don’t hesitate to reach out to us for a personal demo or discussion at info@kogentconsult.com.