Forecasting new product revenues

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Abstract This paper discusses real-life experiences in developing revenue forecasts for biopharmaceutical clients. The importance of forecasts based on emerging information about the product, market conditions and the competitive landscape is emphasised.

Keywords: costs, customer base, investments, product, revenue forecasts

Introduction

When determining the potential value of new products, L.E.K.'s approach is based on three factors: forecasts of revenue, estimations of costs and investments, and the discount rate that should be applied to account for systematic risk. In our experience, forecasting revenue can be the most challenging task of the three for managers at all levels of an organisation. Whether it is a new product utilising new technologies or a product line extension, developing trustworthy information from a broad range of internal and external sources is a necessity.

The importance of thorough, well-grounded revenue forecasts cannot be underestimated. Critical issues that depend on these numbers include:

- R&D prioritisation;
- capital requirements;
- cost structure and resources;
- sales and marketing budgets;
- earnings estimates to appropriately set market and investor expectations.

Accurate forecasts early in the product development cycle can make the difference between a yes/no decision on the project or influence other development pathways. Forecasts for pre-market technologies are also an imperative when considering acquisitions, alliances or licensing opportunities.

The tools and techniques that are used to forecast revenues are applicable to a broad range of industries and situations. For more than 17 years, L.E.K. has used its rigorous fact-based approach to products as diverse as broadband services to orthopaedic devices.

In this paper, real-life experiences in developing revenue forecasts for therapeutic biopharmaceutical clients are discussed. The importance of necessary forecasts based on emerging information about the product (used here to include services, technologies and intellectual capital that can generate revenue), market conditions and the competitive landscape is emphasised. The reader should draw the appropriate link to their own industry and situation.

The revenue-forecasting model

The L.E.K. approach to forecasting product revenues looks deceptively simple:

Customer base × total penetration
× product's share of base penetration
× price per unit × units per year

However, this basic formula raises complex questions, including the following:

- Are all customers the same? If not, how should they be segmented?
- How will the customer base change over time?
- What percentage of the customer base is currently under-penetrated?
- What market share can be expected? How is this affected by marketing expenditures? By changing technology trends? By new product introductions? By competitor reactions?
- How do you most accurately estimate a small share of a large market?
- What should be assumed for product price? How do price changes affect the probable market share?
- How quickly will the product sales 'ramp up'? When and why might sales flatten or decline?
- How will changes in product features and benefits affect projected sales?

To demonstrate how L.E.K. addresses these questions, the process and the issues considered in each of the elements of the formula are elaborated.

Customer base

The first factor in developing a forecast revenue model requires determining the **customer base,** or number of *potential* customers for your product. This can be achieved by first discerning whether prevalence or incidence best fits the product's sales volume profile. Prevalence, the total number of potential customers at any one point in time, is the appropriate choice if the product will be purchased by the same customer on a recurring basis (eg a life-long AIDS therapy or an Internet access subscription). Incidence, the number of new potential customers each year, is appropriate if the product serves a one-time acute event (eg a heart attack) and is generally easier to estimate. For an unpenetrated market, customer base forecasts for long-term services may require a 'stock and flow' analysis (Figure 1). This may conclude that the product revenues record a one-time hump from the backlog of a large unserviced customer base which will drop off dramatically as needs are met.

Another aspect of determining the customer base is to pinpoint the exact user your product will serve. This is achieved by correctly identifying customer segments. When the forecasting model assumes a low market share, small changes can produce wide and unreliable swings in future forecasts of total revenues. Dividing a customer base into smaller groups can avoid this outcome. Accurate customer segmentation may also allow you to

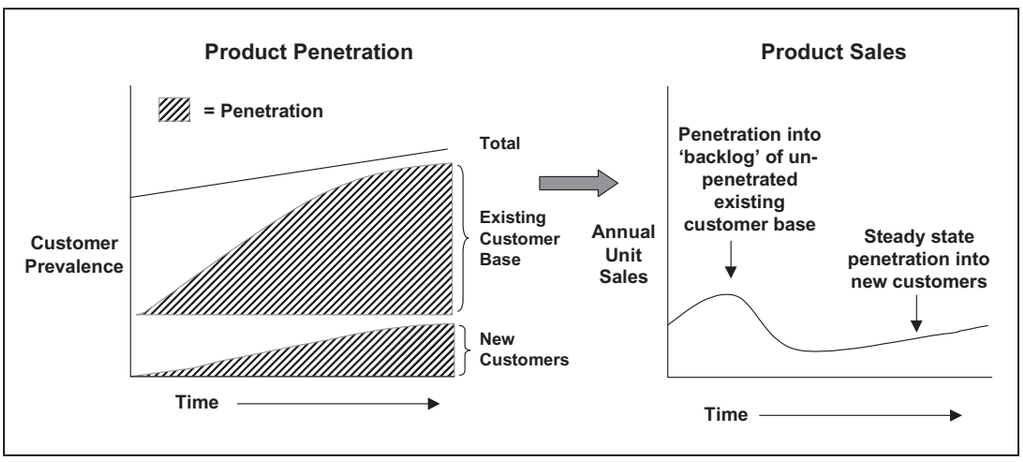

Fig. 1 Stock and flow analysis of customer base

determine the most attractive 'early adopter' segments and adjust penetration forecasts accordingly.

For example, rheumatoid arthritis (RA) affects 2.1 million people in the USA and is considered a relatively common condition. However, it is best to segment these people into three groups: those who have very severe RA, those who have a moderately severe condition, and those who are mildly affected. L.E.K. analysed a product that was appropriate for patients with severe illness and was not designed to compete with the over-the-counter or prescription treatments typically used for mild RA. This allowed us to base the market share estimates on the 525,000 severe RA patients, or 25 per cent of the total RA patient base.

Customer bases change over time. In many industries, historical data about an emerging market may not exist or may provide an inadequate forecast for future growth. In these situations, identifying and analysing the major independent growth drivers provide the most effective approach to predicting changes. Table 1 outlines how L.E.K. used this approach to estimate future growth of 8 per cent in the diagnosed patient base for symptomatic osteoporosis patients.

Total penetration

Total penetration is the percentage of the customer base currently being served by *all* available products that would be categorised with your product.

Penetration is particularly important if the target audience is being under-served by current products. Therapeutics that created new markets because the customer base was poorly served include hormone replacement therapy, anti-hypertensive medications and cholesterol-reducing products. The videocassette recorder, personal computer and Internet services are classic technology examples.

To illustrate this point, before Merck introduced Mevacor in 1987, cholesterol-level awareness and testing were low. Mevacor and subsequent drugs created a critical mass of studies that proved the link between high cholesterol and death from heart disease. Over time, rapid diagnostic tests were developed. The American Heart Association issued guidelines that helped build awareness of physicians and patients which in turn increased testing. This created a market base we now take for granted. Figure 2 shows the market growth enabled third and fourth market products to enjoy similar or greater sales than the first product to market.

Estimating both the peak penetration, the maximum percentage of the customer base ever using any product, and the time it will take to achieve are key facets of predicting product revenue. To establish these estimates, the catalysts of penetration must be identified.

Continuing with the cholesterol example, L.E.K. examined the key factors that influenced the use of cholesterol drugs. These included patient symptoms such as

Table 1 Qualitative growth drivers in osteoporosis patient base

Factor/driver	Relative impact on market growth
Increasing age of population	↑
Increased physician awareness of osteoporosis	↑↑
Improved access to diagnostic equipment	↑↑
Increasing use of osteoporosis diagnostic kits	↑
Higher incentive to diagnose due to increased effectiveness of treatment options	↑
Increased patient awareness and demand for bone mineral density (BMD) scans	↑
Increased support from healthcare payers	↑↑
Second generation preventative treatments reducing the number of patients with severe osteoporosis	↓
Estimated future growth	+8%

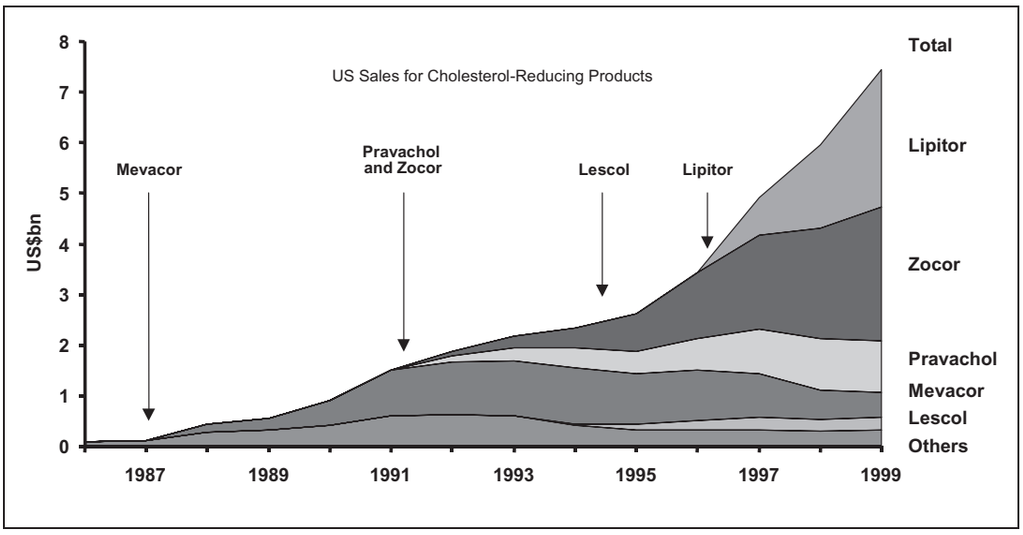

Fig. 2 Mevacor creates a new market

the presence of coronary heart disease, 'good' cholesterol (HDL) and 'bad' cholesterol (LDL) levels. Figure 3 demonstrates product penetration into patient segments with the most severe criteria (high LDL and low HDL) were correctly predicted to have the greatest penetration and have the most rapid uptake.

Product's share of penetration

Product's share of penetration, or market share, refers to the percentage of the total penetration that *your* product will possess. Estimating a product's potential market share versus competitors requires clearly comparing the features and benefits of each

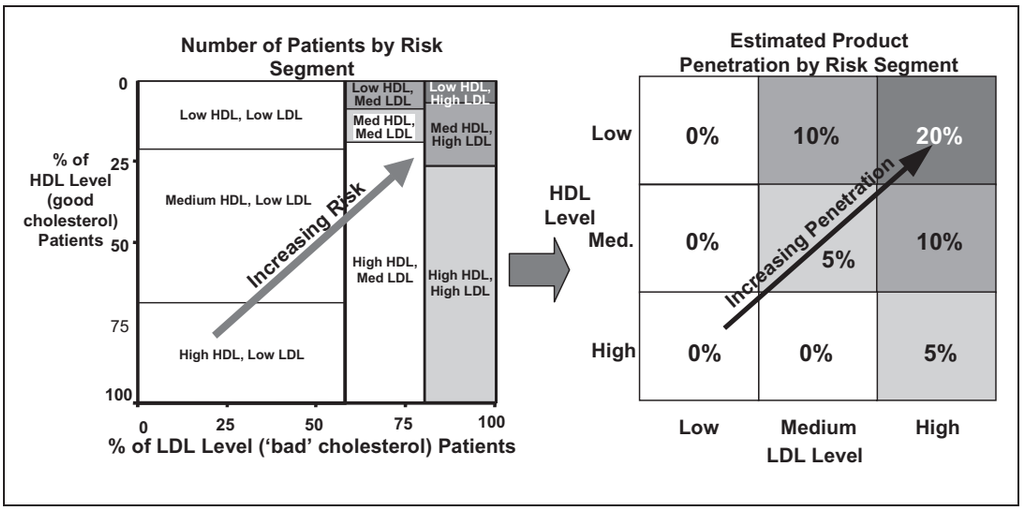

Fig. 3 Drivers of customer base penetration for anti-cholesterol products

product from a customer perspective. Secondary factors such as marketing efforts, production capability and distribution logistics are also important, but the analysis should always begin with the products themselves and the customers they will serve. The three-step process that L.E.K. has developed to determine this market share percentage is as follows.

Step 1: Estimating your product's peak market share

The first step in estimating your product's peak market share is to define the features and benefits of the product to provide a systematic means of comparison. An example of how two anti-viral products for influenza were compared is shown in Table 2.

Primary research with input from key purchase decision-makers for the products (in this case, general practitioners) provides the best estimates of likely market share. Of course, if the product is still under development, its features might not be completely understood. In these circumstances, a small number of the product's probable characteristics should be tested. These can be created by collaborating with the development group. They best understand the key attributes and can gauge the probability of product expectations.

It is also necessary to consider market share dynamically – competitors today are not necessarily the same ones the product will face tomorrow. In fast-cycle industries, new competition can come from anywhere at any time. Conversely, the long clinical trial periods for pharmaceuticals mean that surprise competitive introductions are unlikely. Where possible, competitors' pipelines should be monitored and the timing and probability of their new product introductions analysed. While it may be difficult to estimate the attributes of the competition's future products, revenue forecasts should be constantly updated as new information comes to light.

Pricing is critical when estimating market share. However, price is not always the most important product attribute. In the anti-influenza comparison example, Relenza had a lower price point, but it was Tamiflu's formulation and improved efficacy that proved to be the key determinants of relative product share in that market.

Step 2: Estimating ramp-up, or penetration rate, to your product's peak share

The second step is to estimate how quickly your product sales are likely to ramp-up to peak market share. The rate of uptake by customers is often driven by factors over and above the ability of the new product to address currently unmet needs. Key questions to consider include:

- Does the customer recognise that they have a need or an unmet need?

Table 2 Anti-influenza comparisons

Features	Relenza	Tamiflu
Formulation	Dry powder inhaler	**Capsule, oral formulation**
Indication	**For adults and adolescents**	For adults only
Efficacy	1–1.5 day reduction	**1.3 day, more consistent reduction**
Safety	May cause bronchospasm in people with severe asthma or chronic obstructive pulmonary disease (COPD)	**Well tolerated, but high-risk patients have not been studied**
Price per course of treatment	**US$37**	US$44
Sales efforts	Significant direct to consumer (DTC) advertising during 'flu season	Difficulty in getting Food and Drug Administration (FDA) approval for DTC advertising, but detailed with 3,000 sales reps and heavy sampling
Market share	25%	**50%**

Bold type indicates advantage.

- Does the product require a significant change in the customer's behaviour?
- Will the product create other costs or complications for the customer?
- Does the product purchase process fit with customers' current buying processes?
- Does the purchasing decision-maker have a budget for the product?
- Are the product's technology standards being universally adopted?

Estimates of ramp-up will also be influenced by how the competition reacts to your introduction. They can initiate market awareness campaigns, conduct special promotions or expand their distribution to combat a new product entry. The costs and support required to overcome these competitive reactions are usually underestimated. Anticipating competitive moves and understanding their impact can help budget resources appropriately. We typically assume an average product will take 4 years to reach peak share, based on historical penetration rates. This can be visualised using Figure 2 which shows that Mevacor reached maximum sales after 5 years as the first product in its class. Note that product revenues continue to grow (opposed to market share) beyond the 4-year estimate due to further geographical spread and label expansion.

Another factor that affects uptake is product replacement. If the new product is following one or more established products that have a long life cycle, or there are other barriers to switching, a more dynamic uptake is calculated.

Every industry has unique market dynamics that determine the speed of product sales ramp-up. For example, in the pharmaceutical industry, the ramp-up of drug sales within a specific geography is likely to depend on:

- speed of customer and physician acceptance (often dependent on product novelty and results, as well as the level of conservatism of the relevant physician segment);
- speed of reimbursement coding and formulary/payer acceptance;
- sales roll-out (dispersion of relevant call points versus sales capacity to reach these call points);
- marketing roll-out (key conferences, advertising expenditures, timing of articles, association recommendations);
- training requirements (if any);
- timing of additional data, such as additional publications, increased patient data over time, phase four studies, label expansions, such as new indications or new dosage forms;
- miscellaneous factors such as physician board recommendations, and related product introductions such as diagnostic tests.

Step 3: Estimating long-term share decline

For long-term forecasts, the third step is to study the ramping down of market share. Two major items that negatively affect future share are new market entrants and loss of patent protection. Technology improvements, government regulations and demographic changes are other long-term trends that can affect product share.

There is currently a lot of debate about product penetration cycles and how share decline is accelerating in the pharmaceutical market primarily because of increased competition. In broad terms, the *length* of the cycle of product ramp-up and decline is dependent upon the uniqueness of the product, the level of competition and other barriers to share competition. These include physician loyalty, distribution tie-up and regulatory barriers. As competition in the pharmaceutical market continues to accelerate and product enhancement technologies improve, we are likely to see penetration cycles continue to decline.

Overall, a product's market share is one of the most uncertain assumptions of the revenue calculation. L.E.K.'s systematic approach, which we have briefly described and is summarised in Table 3, helps reduce this uncertainty.

Table 3 Steps for estimating market share

Step 1	Determine peak share by: • analysing product attributes v current competitors, use primary research with customers to estimate potential peak share of penetration; • assessing impact of potential new product introductions on peak market share; • adjusting potential peak share by non-product factors such as relative marketing strength or distribution strength
Step 2	Estimate timing of ramp-up of product sales to peak share based on factors such as: • speed of customer and/or vendor acceptance; • sales and marketing roll-out; • technology roll-out; • training requirements; • label and/or indication expansions, etc.
Step 3	Estimate long-term share decline by analysing: • future novel competition including likely timing and probability of market entry and potential product attributes; • future generic competition.

Price per unit

The optimal **price per unit** for a product needs to be determined before an accurate revenue forecast can be developed. Product pricing assumptions can also have a major impact on volume forecasts.

The level of pricing analysis depends on the stage of development of the product. For example, developing forecasts for a product in development as part of a prioritisation exercise will not require as accurate a forecast as doing so for a launch plan. In some markets where the competing products are very similar, the pricing bandwidth is narrow and may not be a critical factor.

For early stage products, we recommend looking at the prices charged for comparable products and estimating the premium or discount that a new product would deserve given the relative value that customers and influencers will attach to its attributes. Value to the customer is the key driver of pricing. Alternatives to purchasing the product in question extend beyond competing products – customers usually have other options, for instance, purchasing nothing. Table 4 illustrates top-level pricing analysis for a clinical stage oncology product examined in terms of its predicted attributes versus competing products.

For later stage products, L.E.K. investigates the price–demand curves in key customer segments to determine which price points will maximise revenues and gross profits. How demand will change in response to price is likely to vary by customer segment. For example, a treatment for people who are severely ill is likely to be less price sensitive than a treatment for those who are mildly ill.

Product pricing in healthcare is particularly complex because of the interplay among decision-makers – the physician prescribes the drug, the patient takes the drug, and the insurer or hospital pays the bill. Cost–benefit analysis and reimbursement strategies have become increasingly important inputs into pricing decisions for prescription pharmaceuticals.

When forecasting product revenue over many years, we must also look at pricing issues that affect revenue decline. As noted earlier, product patent expiration or the lowering of technology barriers generally results in share declines. This may also affect product price as generic or commoditised competitors substantially reduce category prices.

Units per year

This metric is usually taken into account as a part of the analysis of price per unit. At L.E.K. we have found that there are two

Table 4 Comparing attributes to estimate price: illustrative

	Attributes						
Drug	**Median survival (months)**	**Response rate (%)**	**Time to progression (months)**	**Cardiotoxicity (%)**	**Primary adverse effect**	**Preparation process**	**Average direct price per cycle (US$)**
Taxol	16.5	30–57	5.5	Negligible	Neurotoxicity	Single step mixing process	1,400
Taxotere	16.4	50–65	5.8–7.5	Negligible	Neurotoxicity	Multi-step mixing process	1,500
Herceptin	20–24	38–50	7.2	7 (single agent)	Mucositis, diarrhoea, nausea	Single step mixing process	1,400
Doxil	18–21	43–46	9	10	Hand–foot syndrome	Single step mixing process	1,800
Doxorubicin	16.4	43	5.5	21	High incidence of anaemia and nausea	Single step mixing process	100 (generic)
Target drug	18–21	43–46	5.2–7.6	9	Mucositis, diarrhoea, nausea	Multi-step mixing process	1,400–1,600[a]

[a]The target drug, because of its higher median survival rate and good response rate, among other characteristics, can be priced at between US$1,400 and 1,600.

additional issues to consider that depend on the product's characteristics:

- **Frequency of use as encouraged by a vendor or advisor.** Manufacturers recommend how often a user should replace or service a product. However, many products need a service provider to perform that maintenance. Does the product have a robust network of vendors or a service network that will encourage the frequency recommendation over time? For example, in drug development situations we ask physicians if they would prescribe the recommended dosing and would they try to increase or decrease the dose over time as they gain experience with the product.
- **Compliance by the end-user.** Units consumed per year depend on the extent that end-users follow an advisor's or vendor's recommendations. Factors such as pricing, ease of use, convenience of replacement and user profiles can help determine compliance. In our drug development example, we ask physicians if they feel patients would comply with the recommended dosing. Medications with inconvenient dosing and delivery or delivery-related adverse effects cause some patients never to fill the script, to skip doses or to 'drop off' over the course of time must be taken into account in revenues projecting.

Summary

The discussion above shares some points to consider when generating robust revenue forecasts for novel products. Note that the revenue forecasts may require several additional scenarios based on:

- alternative product profiles;
- varying competitor scenarios;
- other industry factors that might strongly affect customer penetration *or* market share *or* price (eg association recommendations, regulatory issues).

If possible, we recommend a check and balance approach be used on the final forecasts. These can be done simultaneously or after completing the above steps:

- benchmark revenues for other products in the same category; and/or
- benchmark revenues for analogous products in other categories.

Keep in mind that generating forecasts for new products is complex. It is critical to make the forecasts as reliable as possible because many critical strategic, operational and financial decisions that can significantly affect value creation will depend on their accuracy.