

ALLEN TECHNOLOGY

SUCCESSFUL PRODUCT DEVELOPMENT

Part 2—Costs and Profit Impact of Product Development: Product Revenue

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INTRODUCTION



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We will embrace the mindset that products are significant corporate assets and quantify return on assets (ROA) rather than the traditional return on investment (ROI).

Producing future growth and profits for your firm requires research and product development (PD). As stated in the previous white paper in this series, “Part 1—Costs and Profit Impact of PD: Cost of Personnel,” there are many components to doing PD well. Measuring costs, especially the cost of your personnel, is important; just as important is understanding your product revenue.

In this second part of our series on the costs and profit impact of PD, we’ll explain what makes up a product line and how to correctly calculate your product revenue to help you further understand your product development-return on assets (PD-ROA). We’ll embrace the mindset that products are significant corporate assets and quantify return on assets (ROA) rather than the traditional return on investment (ROI). This allows us to adequately account for the costs associated with developing these assets (aka products) to truly understand our PD-ROA.

Your products are your assets, so let’s understand the revenue stream those assets can bring to your company.

QUANTIFYING PRODUCT/ASSET REVENUE

Without being overly simplistic, the purpose of a product is to satisfy customer needs. If a new product does not meet a valid need or an old product stops successfully meeting its users' needs, the product is not generating any value. Understanding how to calculate the value of your product enables you to effectively assess its ROA. The true cost of PD, including the personnel costs discussed in part one of this series, is directly correlated with the value your products bring to your firm.

A company will most often quantify the value of its products in terms of three components:

- Total revenue generated by the product
- Profit contribution
- Strategic value the product can offer the firm

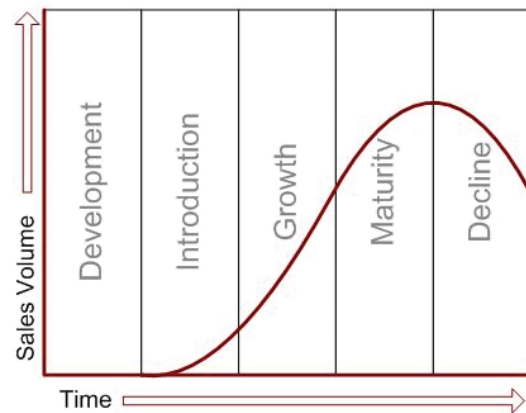


Quantifying the total revenue generated by its product(s) allows a company to more effectively predict its PD-ROA.

The first component is considered a marketplace valuation with the total revenue generated by the product being the total amount of money that customers are willing to exchange for the product. The second and third components make up the value of products more specifically for PD firms or those creating the products being exchanged. To assess PD-ROA, we'll focus on the first element, the total revenue generated by the product. Quantifying the total revenue generated by its product(s) allows a company to more effectively predict its PD-ROA.

The best model for estimating the revenue of a product is the product life cycle. A product follows a standard revenue path from initial introduction through a growth phase to its final decline. Although the classic product life cycle model (Graphic A) is neat and simple, we enter an imprecise world when we try to estimate the future revenue and profit impact of a product's complete life cycle. Our new challenge in quantifying a wide range of potential products' ROAs is estimating the highly variable and uncertain future revenue they will create. Begin with the standard product life cycle represented below:

GRAPHIC A. CLASSIC PRODUCT LIFE CYCLE



The curved red line represents the revenue generated by a product at any point in time. The area below that line represents the cumulative amount of revenue the product generates over its entire lifetime. Four attributes of the revenue curve define the product's maximum cumulative revenue: the rate of growth in the early stages, the peak point of sales, the rate of decline, and the total length of the product's life.

The questions become how do we maximize a product's total revenue during its lifetime, and how do we accurately forecast that revenue? The answer first depends on understanding your specific type of product and its competitive strength in the market—its market share. Once you understand your market share, you can better predict your product revenue and maximize it over the product life cycle, ultimately allowing you to predict your PD-ROA.

UNDERSTANDING TYPES AND MARKET SHARE

PRODUCT TYPES

Common economic techniques and market data can be used to estimate the size of a given market (which is a subject far beyond the scope of this paper). Alternatively, you can define the various categories of products that exist and identify your product's market share potential. Most products exist within an ecosystem of complementary products and services, each of which influences the others' sales and prices. By studying the dynamics of your own company's ecosystem, you may discover fruitful opportunities to be creative in not only your core product but also its complementary products.

Your product development effort can fit into five types of products:

- **Breakthrough product:** A unique new product that creates demand where it did not previously exist (e.g., the iPad). The product wins 100 percent of market share until competitors enter the new market. The challenge here is estimating the size of this entirely new market and the speed of its overall growth. Estimating requires understanding deeper market trends, comparisons to the performance of past breakthrough products, and establishing reasonable bounds before narrowing down to a forecast. Once competitors enter the field, additional estimates can calculate the lost market share and the effect of price pressures over time.
- **Brand extension:** A completely different product category within an existing product line (e.g., the Apple Watch). Typically, the product is an extension of a firm's product line either upmarket or down-market in both price and capabilities. It frequently entails entering new market segments with fresh dynamics and market potential. The task here is identifying which competitors are most vulnerable to your initiative and how easy it is for customers to make a product change. Identifying these factors will give you a reasonable estimate of your potential market share success.



Correctly identifying which product type your PD efforts are working toward can help you optimize profits.

- **Product extension:** A small variation on an existing product (e.g., the iPhone X). Typically, small changes in features, prices, packaging, or capabilities will create small changes in revenue. Although product extensions create more revenue, they also frequently reduce the revenue of current products, a process commonly referred to as cannibalism. This revenue reduction needs to be considered when defining the success of a new product.
- **Substitute:** A product that can be easily substituted for another (e.g., Android phones in place of iPhones). The demand for this type of product is directly related to its substitutes. It follows that if the price of one product goes up, the demand for the substitute increases.
- **Complementary:** A product that is tied to the success of another (e.g., the iPad and App Store). As the price of one product declines, demand for complementary ones will increase. Here, projecting the pricing of the complementary products that your product is dependent upon will help you identify both market share and the overall size of the market.

Whether you are working on one or multiple types of these products, understanding how each product type can affect your overall revenue will help you understand the PD-ROA for your firm. Furthermore, correctly identifying which product type your PD efforts are working toward can help you optimize profits. This identification process gives you the opportunity to incorporate a product extension or a complementary product into your efforts where you may not have previously considered it.

PRODUCT REVENUE IMPACT AND MARKET SHARE

Once you identify which product type you have in mind, you can begin to estimate its market share potential and its revenue impact. Graphic B offers an analytical approach to refining the revenue opportunity of a new product over its lifetime based on each given product type and revenue impact scenario. In practice, you would adjust your predicted profits for each product type by considering the revenue impact scenarios noted below.

- **Market revenue:** Estimate the number of units to sell and multiply that number by the sales price per unit. For highly competitive industries such as the cell phone industry, most products have only a one-year time frame to earn 90 percent of their lifetime potential, but in other industries the time frame may last far longer.
- **Competitive/market share impact:** This number comes from the industry's total sales. Your competitive market share is your firm's percentage of the industry's total sales.
- **Strategic/brand impact:** Consider the impact of your brand on your revenue numbers. If you have a very strong brand impact (think Apple iPhones), then you can have more than 100 percent in this category—you

may be lucky enough to absorb all the cannibalism of your products as upgrades to your newer products (or an even higher percentage if you can take market share from competition).

- **Product line cannibalism:** Calculate the losses due to new products in your lineup “eating up” profits from older models. This is the percentage of sales you lose to your own newer products.
- **Confidence factor:** This is the potential revenue reduction based on your level of confidence in your product(s). If you are highly confident that you will be able to sell your product at full price, use 100 percent. If you can demand a premium price, the number could be higher, but if you have a large competitive market, the number could be lower. This factor is to help adjust expected revenue.

When you consider all the market instances alongside your product type, you can effectively understand your product line, its potential market share, and the revenue impact for your firm. When you also take into account the true cost of personnel as discussed in the first paper in this series, you can predict your PD-ROA.

GRAPHIC B. ANTICIPATED PRODUCT REVENUE MATRIX

Product Type	Market Revenue	Competitive/Market Share Impact	Strategic/Brand Impact	Product Line Cannibalism	Confidence Factor
Breakthrough	Forecast based on historical product examples inside and outside this market.	High initial share of a new market, declining over time.	Total increase in revenue among all products, current and future.	Reduction in revenue among current and future products.	Subjective probability of the first movers' market share in a mature market.
Brand Extension	Estimate the size of the new market segment this product will enter.	Forecast the maximum share achieved over the product's lifetime.	Identify the revenue impact on your existing product revenue streams.	Calculate the reduction in current revenue from similar projected products.	Estimate confidence based on brand reputation and competitive position.
Product Extension	Estimate any change in the market size from introducing the product.	Estimate the marginal increase in market share.	Calculate the increase in revenue (if any) across all products.	Estimate the reduction in current revenue due to the new version.	Reduce revenue by a factor of risk you foresee.
Substitute	Identify the current market size and determine whether the substitute product affects it.	Rigorously determine to what extent the market will accept the substitute.	Estimate the impact on brand reputation and the broader product line revenue impact.	Determine the reduction in current product revenue.	Recognize the challenge of introducing a “me too” product in a competitive environment.
Complementary	Identify underlying market trends that may drive price changes for complementary products.	Estimate the probable market share for the complementary product, given its competitive strength.	Quantify the revenue impact on current products including market growth and market share.	Estimate the revenue loss this product may create, if any.	Discount revenues based on the predictability of your estimates.

CALCULATING PRODUCT REVENUE AND PD-ROA

We now have an effective approach for calculating your product revenue and PD-ROA.

Market Revenue =

(total market size × market share × [sales price – unit cost of goods sold (UCOGS)]) × (brand impact – cannibalism) × confidence factor)

Product profitability =

market revenue – total cost of goods sold (TCOGS);
where TCOGS = (total market size × market share × UCOGS)

PD-ROA =

product profitability / cost of product development personnel; result can be expressed as a value or multiplied by 100 to get a percentage

ACTION STEP

Take a moment to determine your market revenue and product profitability using the formulas on this page. Once you've determined your own values in these areas, calculate your product development-return on assets (PD-ROA).

For example, we could take a simplified view of the Apple iPhone in the US market. In 2019, the total market for cell phones was around 75 million units. We can take an average purchase price for Apple's products (high end of market) of around \$800 per unit with a unit COGS of \$320 (around 40 percent). Because of the strong brand recognition and loyalty of Apple customers in the US, we can assume a very strong brand impact, which we are estimating at around 160 percent. At a minimum, this offsets the 60 percent cannibalism expected from each new yearly launch of Apple's new phone. Because Apple can generally command its asking price for hardware and does not have to resort to heavy discounting, we can argue the confidence factor on pricing should be 100 percent.

Apple also spends around \$16 billion annually on R&D, of which around 50 percent is related to the iPhone and around half of that could be assigned to labor and personnel costs (the other 50 percent would be tooling, chip development, etc.) We'll assign around \$4 billion as the cost of product development personnel.

CONCLUSION

A product is one of your firm's most critical assets because it will produce a future stream of revenues and profits. That's why it's important to set your company up for greater chances of success by projecting the PD-ROA you can expect before beginning the effort of product development.

Your PD-ROA depends on two primary factors:

1) the cost of your personnel and 2) your product revenues and costs. You can find hidden costs in personnel overhead management or downtime that drastically affect the cost of each employee. We found the cost of an employee to be closer to 2.6 times the employee's salary, rather than the standard 1.45 used by most companies—making the cost of a mid-level ME jump from \$80,000 (straight salary cost) per year to \$204,801.58 (fully burdened) per year.

Accounting for both the true cost of your personnel and your product profitability enables you to predict your PD-ROA more effectively.

This is important because failing to understand your costs, product lines, product revenue, or market share makes for risky and unpredictable PD efforts. Although all business includes risk and uncertainty, identifying risks in advance and minimizing them as you proceed allows you to produce a good estimate of the return you can expect from investing in PD.

We believe product engineering should be a high-payoff activity, one that provides you with higher-than-normal ROA compared to most other assets in your firm.

If you calculate your PD-ROA based on the cost of personnel and product revenues but you do not see a significant ROA, it's time to optimize your team productivity levels. We'll cover this topic in the third white paper in our series on successful product development: "Overcoming Product Development Productivity Pitfalls."