

Embracing price elasticity: Manager's guide to demand-based price optimization



“ In the time of personalized real-time offerings, price is still the major factor considered by customers while making purchases. Leveraging the full potential of pricing is essential for every retailer willing to keep customers loyal and hit business goals at once. This whitepaper will help you find out why the future of retail belongs to demand-based price optimization and how you can start capitalizing on price elasticities.”

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Table of contents

1. Why does pricing matter?
 - 1.1. What impacts sales
 - 1.2. Pricing is the key
2. Introducing price elasticity of demand
 - 2.1. What is price elasticity of demand
 - 2.2. How to calculate PED?
3. Demand-based price optimization: League A of Pricing
 - 3.1. Demand-based pricing optimization: how it works
 - 3.2. How to get prepared to implement a demand-based pricing solution
 - 3.3. Demand-based pricing in use: cases & numbers

1. Why does pricing matter?

Last year, the global retail revenues hit the point of \$ 25T and this result is fairly impressive. However, when speaking of the industry profit one should not forget that, in many cases, retailers are still using the basic traditional approaches to pricing. And that means that retailers are losing billions of dollars annually.

Prices are the main communication interface between the business and the customers and if you think for a moment of increasing market transparency and the growing number of Alpha and Zeta generation shoppers **looking for optimal and personalized experience everywhere**, you'd eventually realize that the problem of pricing is underestimated.

In this section, we're going to explore the three major levers underlying the growth flywheel, find why pricing is the most powerful, yet often mistreated power of the business, and touch upon an 'impermeability of the future' problem.

1.1. What impacts sales

Let's look at the business growth flywheel built upon the key sales drivers. There are three main (and what's most importantly effective) levers that can be used to promote almost any kind of business. They are Awareness, Availability, and Relevance. The task for the business is to figure out how to manage them.

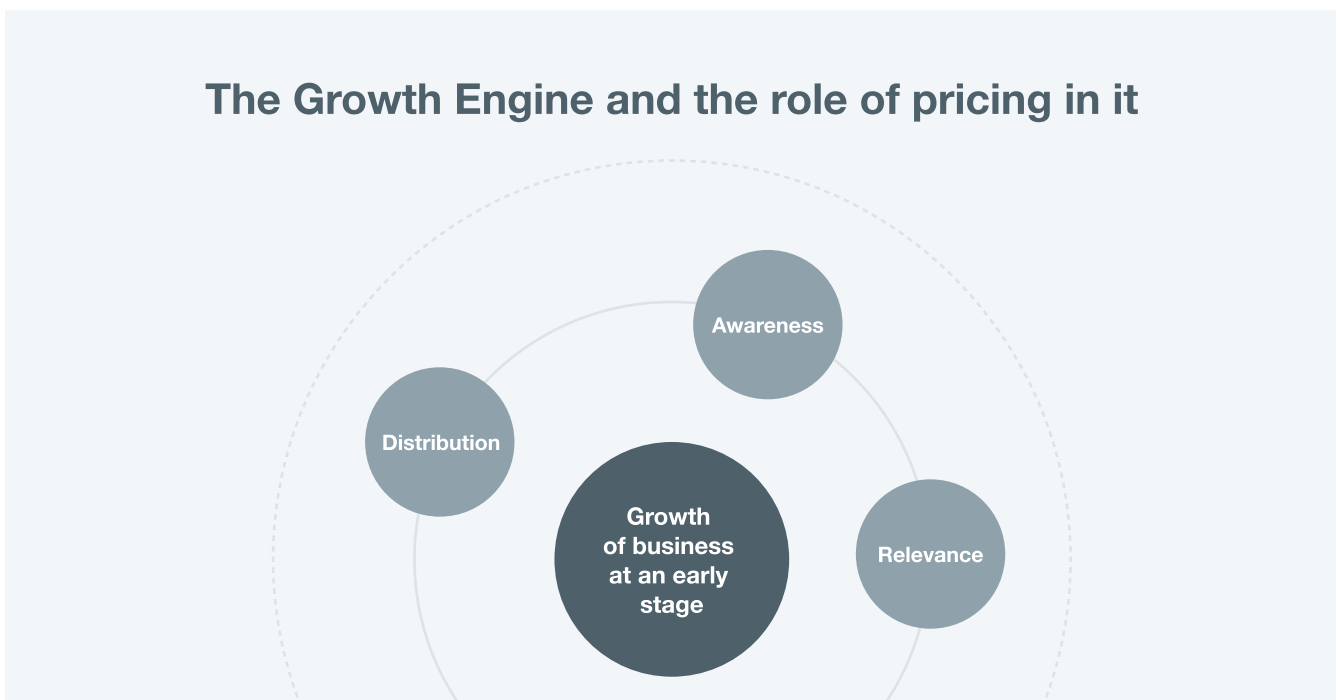


Image 1. Business growth engine

And that is a hardly trivial task. Imagine a business at an early stage. To grow it, first of all, the major focus has to be made on Awareness (or the buyer's knowledge of your brand) and Distribution (availability of the products on the shelves at the right points of sales, etc.) These two factors act on the principle 'more is better'.

As for Awareness, it's no secret that the more potential customers know about the brand, the better it is. And the principle is the same with distribution: the more points of sale or POS you cover, the higher the chances are that consumers will buy your product or service.

That's why when a business is at the very beginning of its journey, the maximum attention should be paid to advertising and distribution crafting.

Then an interesting thing happens. If a business invests in these two levers, it ends up realizing that every invested dollar brings less and less return.

In practice, it means that the indicators are starting to reach saturation. Simply put, one cannot reach more than 100% of the people living in a chosen area or more than 100% of the targeted market segment.

The result is that the business is reaching a plateau. And that's the time when the next driver comes into play: Relevance.

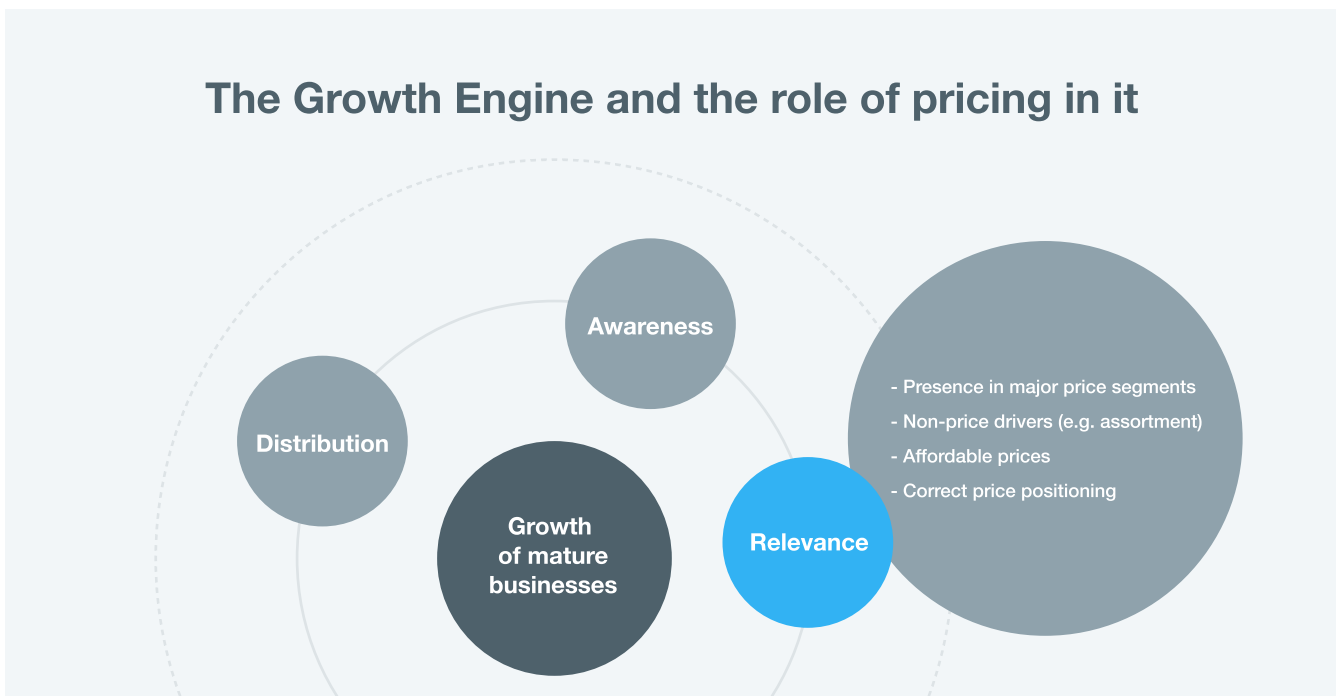


Image 2. Business growth engine

Relevance driver works on a slightly different principle than Awareness or Availability. Instead of 'more is better', the idea here is 'optimal is better' And the management's success in bringing this principle to life depends on several indicators.

The Relevance driver, Relevance is influenced by many factors, e.g. an assortment segmentation. The business needs to understand which segments are on the market and how to make a relevant offer to customers within each of them.

The segments themselves can be divided into price niches, taste niches, consumer needs niches, and others. What it means is that the business has to understand an industry and its rules.

Assortment management is the crucial component associated with the leverage of a Relevance driver in retail. Imagine a business operating a certain optimal amount of SKUs.

The business knows for sure that the market has three basic needs, which are met by three products from the assortment. And if the fourth product is introduced, it will not generate as much growth as the third product introduced before. Simply because the market is already satisfied with the available offerings.

Of course, there still might be exclusive niches that can be filled with another product, but portfolio expansion may not necessarily drive the growth. That's why being aware of the optimal width of the portfolio is crucial for every business.

Now, let's look at prices. We can't claim that the high price is always better for business. But, on the other hand, we can't say otherwise, that the low price is better because it directly affects the level of your income. The rule 'optimal is better' comes into play again.

The prices should be both **affordable** for the customer and **beneficial** to the business.

If growth drivers are managed properly, the successful businesses move through growth stages progressively.

Let's take a closer look at each stage of this journey.

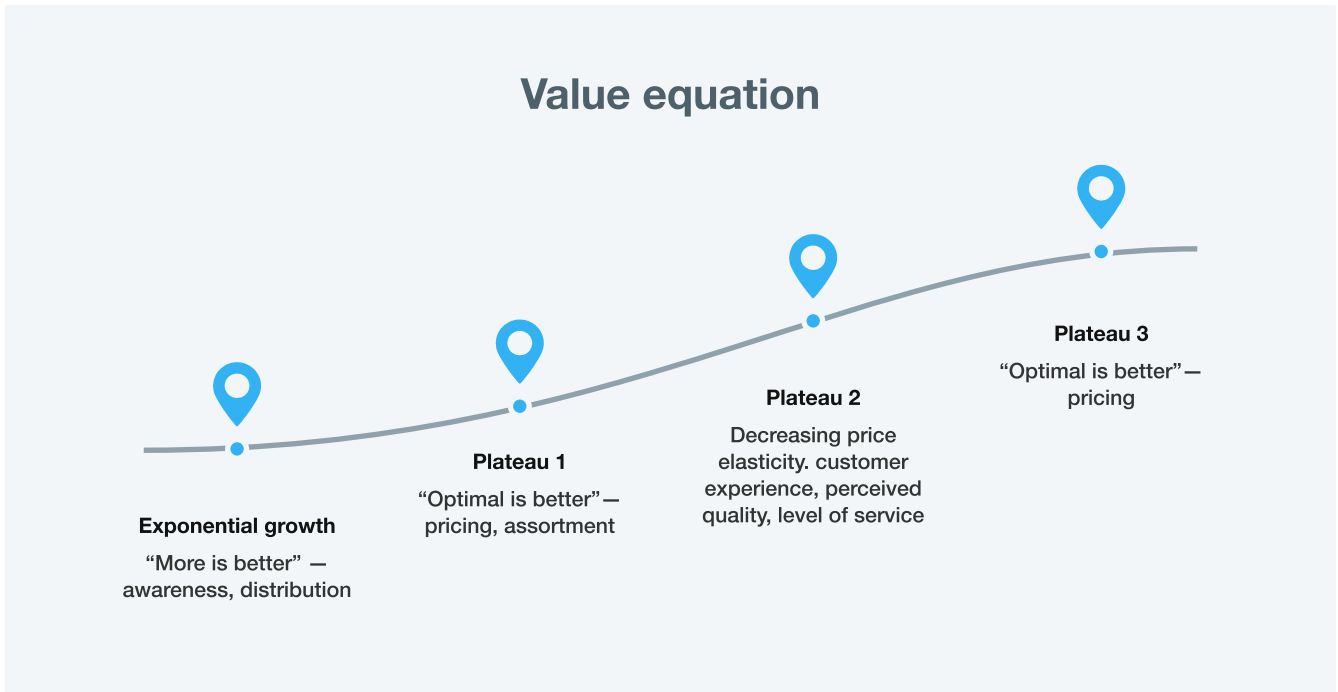


Image 3. Value equation

The first one is an exponential growth stage. Everything is quite simple and clear here. There is an investment, there is payback, there is awareness and availability.

Then, the first plateau comes, when the business starts to optimize offerings and assortment. Practically, it means taking out the products that don't bring enough sales or added value to the portfolio, and so on.

The next stage is progressive growth. The question here is: what to do next when prices and assortment are already optimal and the distribution is close to full saturation?

The new growth drivers have to be activated. The task of a brand or marketing manager is to reduce the price sensitivity of customers. That means making the brand more valuable in the eyes of buyers. This stage affects all the available improvements in service levels and everything that is part of the customer experience or CX.

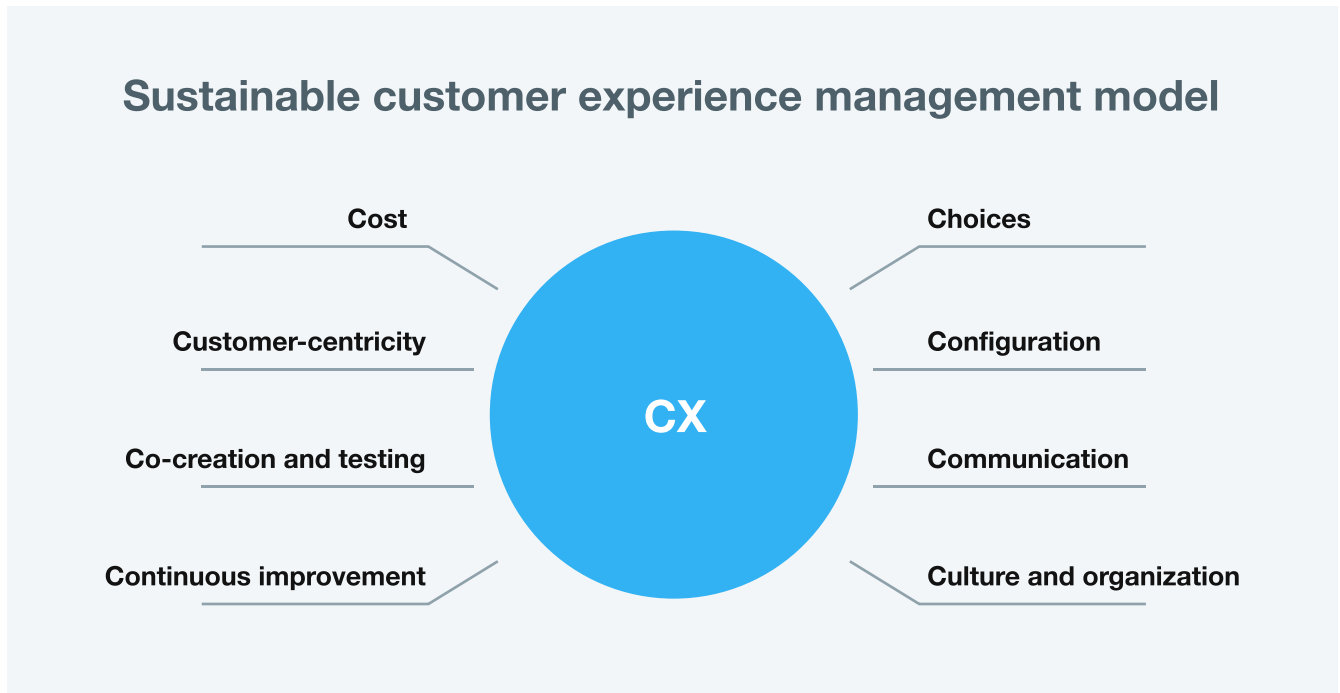


Image 4. The 8Cs framework for customer-centered transformation by [Deloitte](#)

As soon as the business achieves a particular result in customer experience, it gains **more freedom to increase the prices because of the earlier investment in the brand.**

At this point, the prices can be harmlessly increased by 5-10% or even more only because of the positive brand perception.

1.2. Pricing is the key

Let's figure out why pricing is crucial for business growth.

Here is the fact: a price change of 1% results in an average change of 3% in sales. That is, by increasing or decreasing the price correctly by 1%, a business can lose or vice versa get 3% of additional sales. That makes the price the most influential sales factor in the entire marketing mix.

In comparison, a change of 1% in availability (distribution) can bring only a 0.7% increase in sales.

The impact of marketing and advertising is less explicit because it covers a brand media reach, Gross Rating Points, Target Audience GRPs, etc. Generally, a brand with an average promotion and reaction to advertising will receive only 0.05% of additional sales out of 1% change in advertisement investment.

Therefore, in terms of prioritization, the business should start with the prices, then focus on distribution, and only then deal with media budgets.

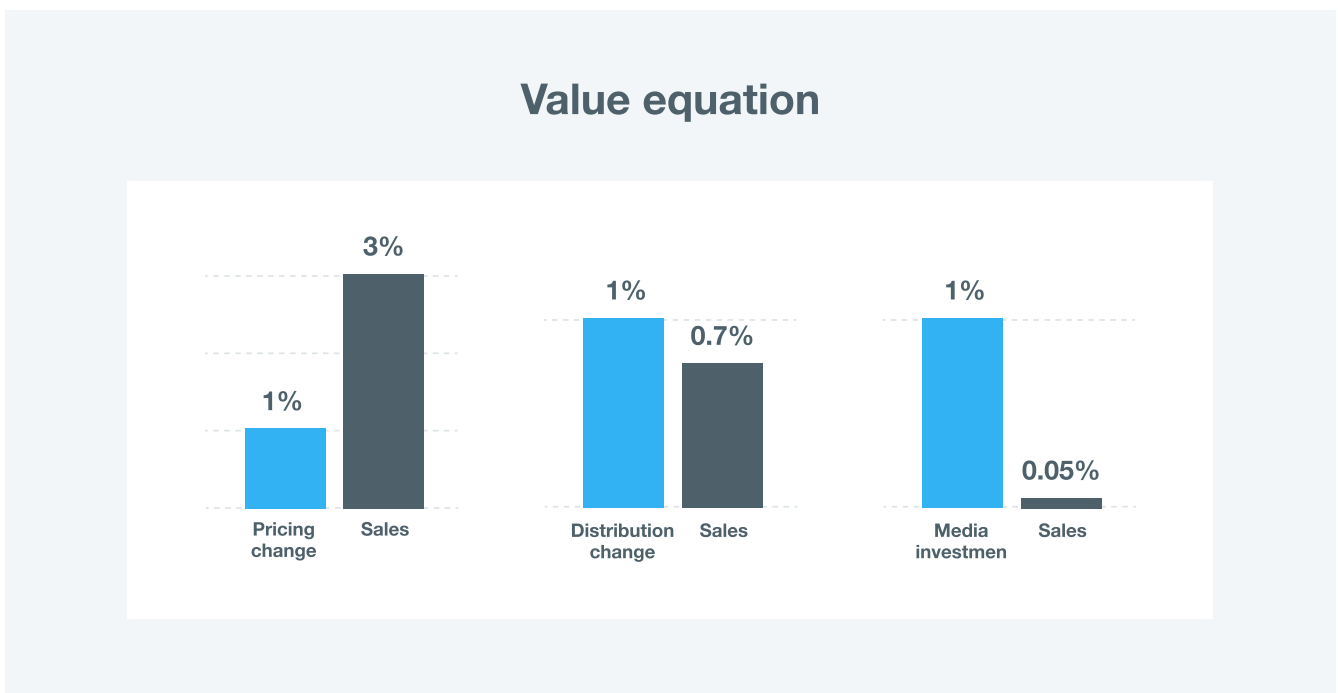


Image 5. Impact of key business growth drivers on sales

These numbers are the average numbers which may be different depending on a wide range of factors and metrics chosen as a benchmark.

For example, the analysts from McKinsey, state that a price increase of 1%, if volumes remained stable, would generate an 8% growth of operating profits.

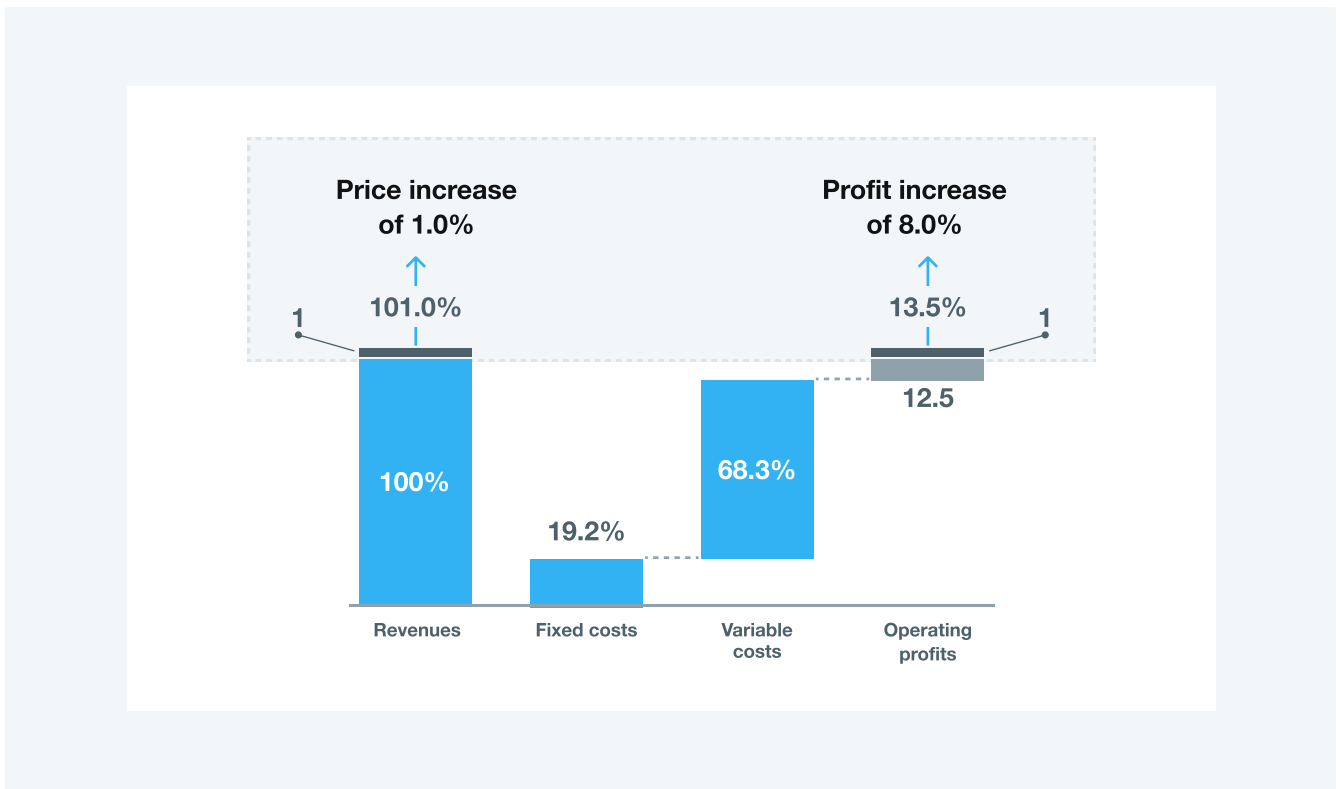


Image 6. Impact of price increase on profit growth. Source: Compustat, [McKinsey analysis](#)

Regardless of which reference points or calculation approaches are chosen, the experts agree that the driver of pricing is the fastest and most effective means of growing key business indicators.

And once the business decides to fix pricing, it has to define which prices would be considered optimal ones and which success indicators or metrics should be prioritized.

There are three key indicators.

- ✓ Revenue or total turnover in value terms. This indicator complies with the "more is better" principle.
- ✓ Cost (purchase prices, logistics costs, and so on). Obviously, the smaller costs are better for the business.
- ✓ Price that should have an optimal value. Prices affect almost each of the business KPIs.

Prices affect all sales KPIs:

Revenue = sum (selling price*number of items sold)

Gross profit = sum ((selling price-cost)*number of items sold)

Demand (sales in items) is elastic to price changes (reacts to prices)

Conclusion: everyone wants to know the optimal prices.

Image 7. Prices' impact on KPIs

The crucial role of prices stems from the fact that they affect revenue and sales volume.

Every retailer has a portfolio with a particular price for each product and the number of sold items. These parameters are interrelated.

Prices also affect profits. This indicator equals the revenue minus the purchase and logistics costs. And it is also the same with gross profits and SKUs' sales volume.

The business needs to define the metrics to be grown and adjust the prices accordingly.

So what's the problem with getting to know the optimal prices?

The short answer is that it's not that easy to know how demand may change in reaction to a new price, not only for specific SKU but also for the other products impacted either explicitly or implicitly.

The problem is "impermeability of the future"

Demand reaction to price changes:

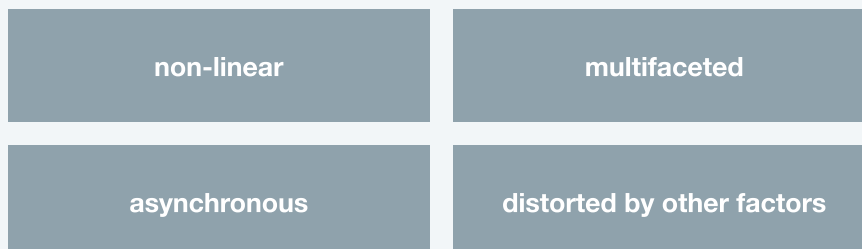


Image 8. The “impermeability of the future” problem

To get a more comprehensive answer, we must look at the concept of price elasticity of demand.

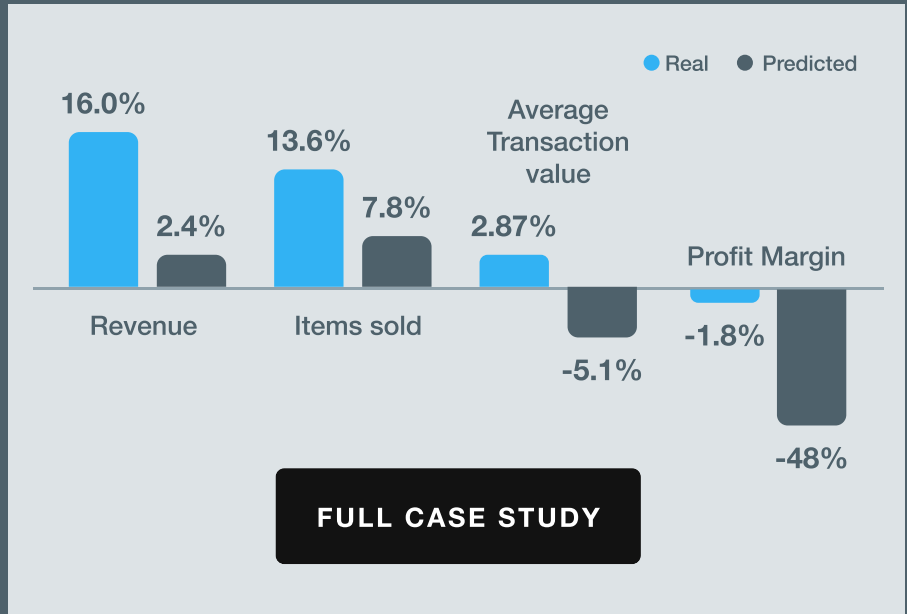


Consumer electronics

\$400M in revenue,
117 stores.

Test & Control group:
1 product category
10 stores vs. 10 stores.

Target: increase
revenue and protect
gross profit.

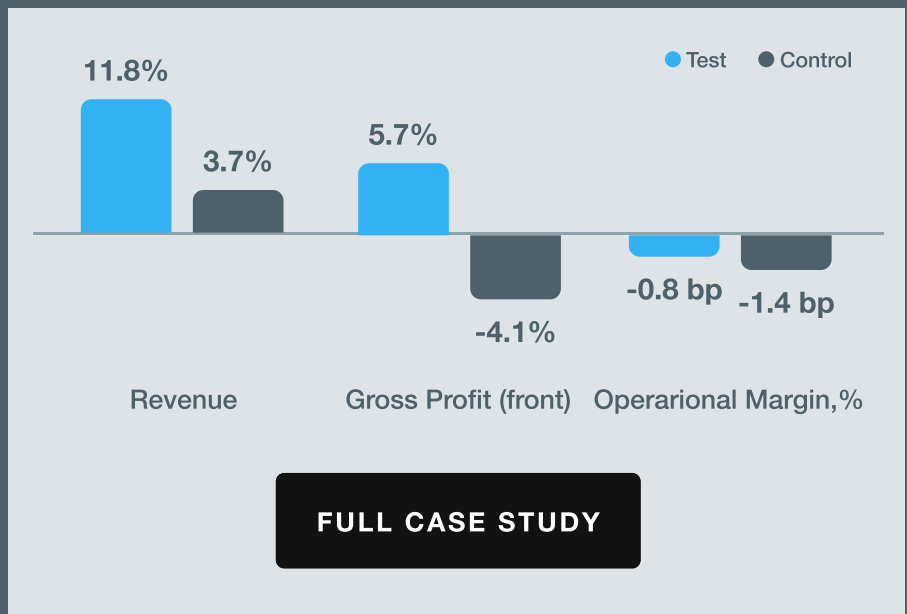


FMCG retailer

\$200M in revenue, 104
stores with 41 pricing
zones.

Market test: 1 category
vs 1 category within 104
stores, 41 pricing lists
managed.

Target: maximize gross
profit while protecting
revenue.

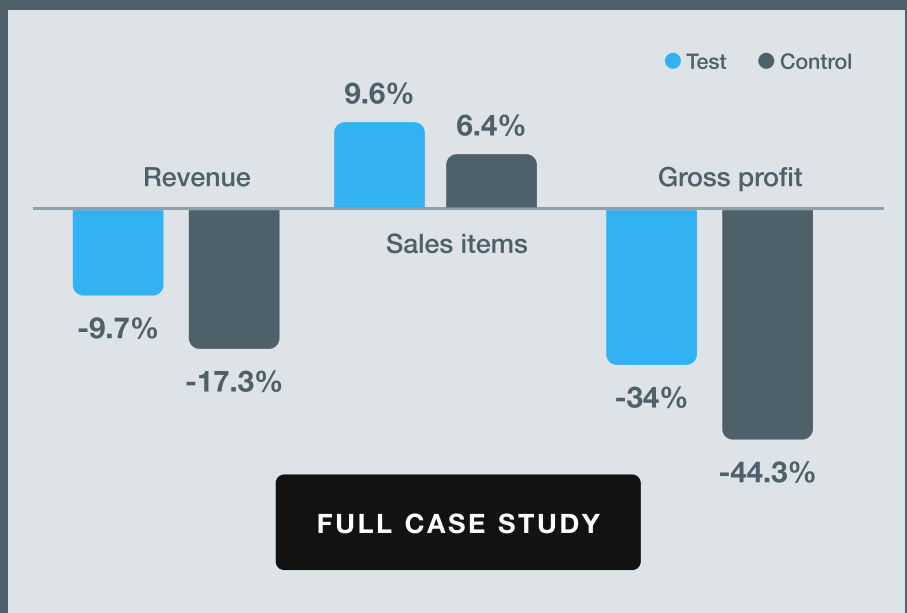


Fashion retailer

\$200M in Revenue,
114 stores.

Market test: 4 Brands
across all stores.

Target: sell out old
stock while protecting
gross profit.



2. Introducing price elasticity of demand

Not all products react to a new price in the same way. For some products, a change in price may hardly have a significant impact on its demand and sales volume.

In contrast, for another product, even a slightly changed price may turn the demand upside down.

The price elasticity of demand is the name of the phenomenon. The concept marks the correlation between the change in demanded quantity of a product and a change in its price.

SKUs in a retailer's portfolio are not just numbers or codes that can be treated in the same way. Every product has its specific identity which is defined by the number of parameters. And price elasticity of demand is one of the crucial characteristics underlying the product role, performance, and sales potential.

Being aware of price elasticities of demand and an ability to manage them properly is crucial for the businesses willing to leverage optimal prices so they can keep customers loyal while hitting business goals.

2.1. What is price elasticity of demand?

Let's look at the definition of price elasticity of demand again. That is the correlation between the change in demanded quantity of a product and a change in its price.

This definition appears to be rather simple, yet when it comes to practice, the concept of price elasticity of demand may turn out to be full of uncertainties and rabbit holes. An examination of three simplified examples showcasing different types of elasticity may help to understand the concept profoundly.

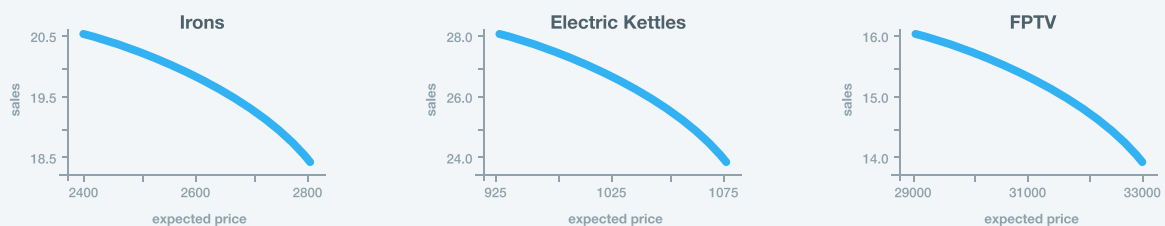


Image 9. Linear reaction of demand

Let's forget for a moment that the impact of price on the demand is nonlinear supposing it is. What do charts on the screen show? These are the three categories with real sales data: irons, electric kettles, and TV sets. The mean value of each curve marks the current price. So, the impact of price appears to be direct and evident if we consider the number of items sold within each category. And that's the point: the lower the price is, the more items are sold and vice versa.

But the highest number of items sold is not the ultimate goal the business may want to achieve. Managers strive to increase revenue and gain more profit, right? Eventually, even though sales react to a price change in the same way on average, i.e. the price elasticity has negative coefficients, the slope is significantly different in every single case.

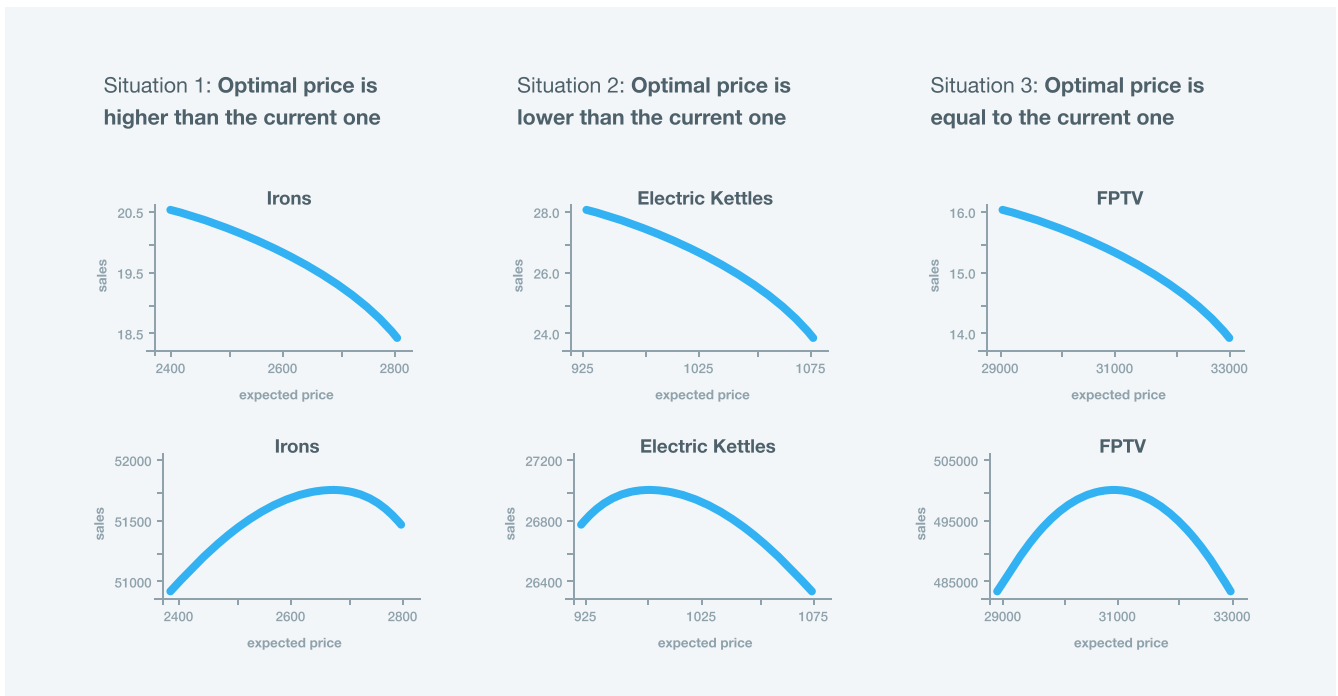


Image 10. Nonlinear reaction of demand

If we assume that revenue is now the key metric and multiply the price by the number of products, we may get three fundamentally different situations per every product.

In the case of irons, the maximum revenue is gained after the price is increased by 100 currency units. If the price continues to increase, the revenue would decrease. Reducing the price would have the same effect. That's how we've found the optimal price point.

Now, the second case. It seems to be similar to the first one. Still, if we'd multiply the change in the price by the difference in the projected number of items sold, we'd get the maximum revenue with the price reduced by 50 units. If the price is decreased, the revenue drops and vice versa. Here is the optimum; we can see it with the naked eye.

And the third case: TV sets. We multiply the number of items by the change in price and what we get is that the revenue drops in case of both price increase and decrease.

If the business reached the plateau stage, it would most likely have to deal with the law of large numbers. Especially if it sells the products of mass consumption. What it means is that changing any variable by two or three percent would bring a tangible effect on total revenue. The effect stems from the fact that large groups of buyers need such products.

Now, let's complicate our examples and get a little closer to real-life cases. That's when the complexity of price elasticities of demand comes into play.

With a linear reaction, we can imagine the proportionality of changes in prices and demand. In the non-linear response to a price change, the so-called price thresholds can make the demand go crazy.

Situation 4: Presence of price thresholds

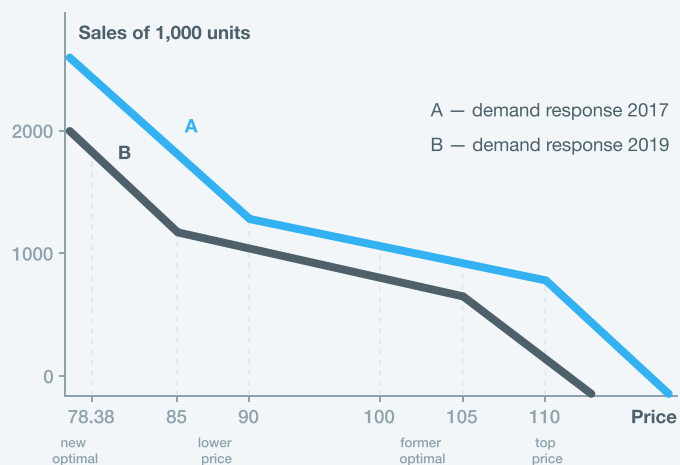


Image 11. Price thresholds

Reaching a threshold means that the demand begins to either increase sharply or fall drastically. But unfortunately, it's not that easy just to sit down and calculate the reaction of demand to price changes.

Firstly, the reaction of demand is non-linear. That means that, for example, if the price rises by 5%, sales can drop by 3%. Or when the price is increased by 20%, a 40% drop in sales might happen. There are no limits for the difference and that might become a problem for a business.

Secondly, demand response to the price change is multifaceted. It includes the impact of the price indicated on the price tag; the effect of how the price tag works in the context of other prices; the influence of the products by which the buyer compares prices, etc.

So, the price itself is not a single factor that affects sales, but a whole set of factors.

Thirdly, the response of demand is asynchronous. It means that the new price cannot work immediately after it is displayed because of a so-called buying cycle. Imagine, it lasts three months for a particular product.

During the first week after the price is changed, it will be noticed by only one-tenth of the buyers. Then, another one-tenth of buyers will mark it in the next two weeks and so on. And it means that a price impact would change during the entire period of three months before it is stabilized.

And finally, the reaction is distorted by other non-pricing factors. It means that if two elements are changed at the same time (for example, a price is increased and an advertisement campaign is launched), they can neutralize the impact of each other.

For instance, advertising can lead to positive changes, while price increase can lead to negative ones.

One of the ways to gain more control is by understanding the concept of price elasticity and calculating products' own and cross elasticities properly.

2.2. The methodology of linear regression or how to calculate price elasticity of demand

Before speaking of the right methodology to calculating price elasticity of demand, let's look at one common mistake that many managers make when they have to evaluate a price elasticity of demand. If you search for a price elasticity formula on the Internet, you may find a basic formula that suggests finding price elasticity by dividing the change in quantity demanded by the change in price.

This formula might be good to explain and illustrate the general principle behind the price elasticity concept, but using it practically in real life can be misleading and even harmful for the business. The reason is that it does not take into account many additional factors and parameters that have to be considered while calculating price elasticity.

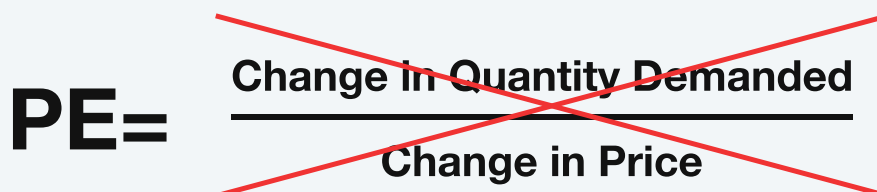

$$PE = \frac{\text{Change in Quantity Demanded}}{\text{Change in Price}}$$

Image 12. Price elasticity calculation mistake

Hopefully, there are more reliable ways to calculate elasticity. And the methodology of linear regression is one of those. Linear regression method is used to build a representation of how changes in an independent variable, e.g. prices, relate to changes in a dependent variable, e.g. items sold.

In order to calculate the price elasticities of demand using the method of linear regression, the business has to have the records of at least several price changes and their sales figures for a particular period of time. Of course, the more historical data is available, the more accurate the representation and final results would be.

The image below shows examples of how the different types of correlations between the price change and sales might look after applying the linear regression method.

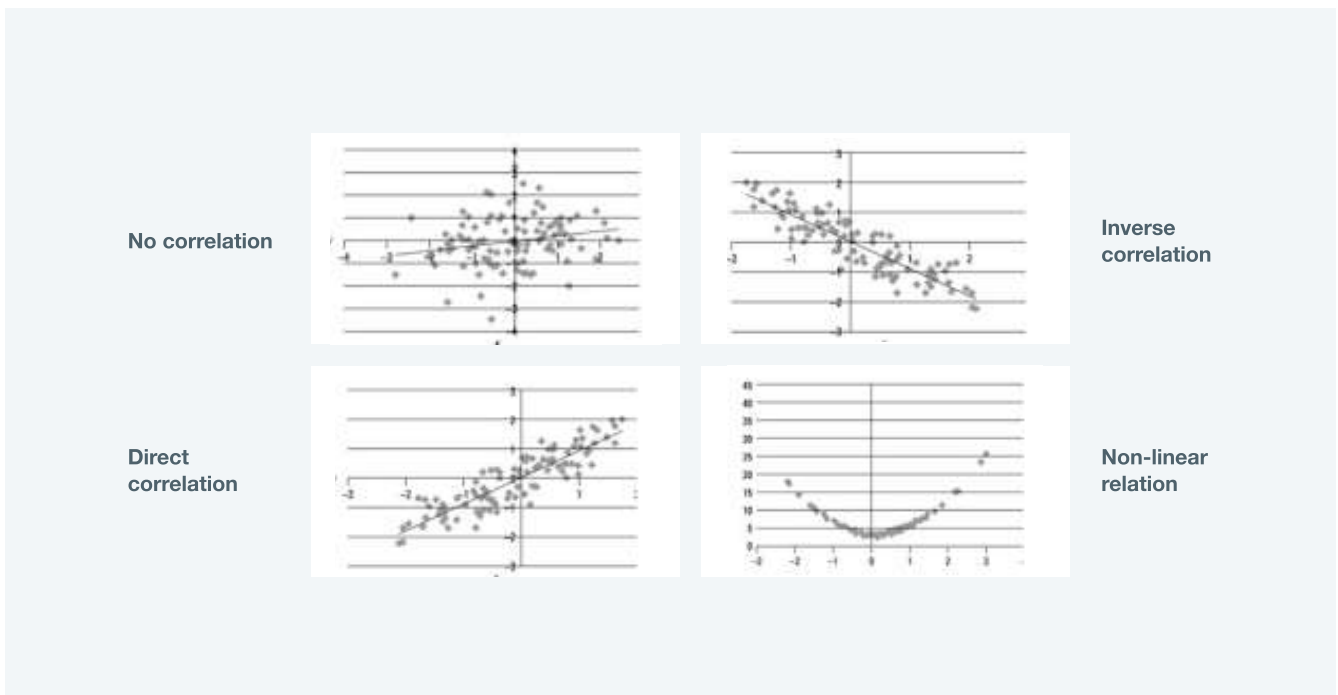


Image 13. Regression based on historical data analysis

Linear regression is a rather affordable methodology as a regression graph can be built even in an Excel spreadsheet. However, the portfolio size may turn out to be a limitation for the method's manual use. Building a graph for a dozen products is not a problem. But for a portfolio with hundreds or thousands of SKUs, the human-centric manual calculations of price elasticity might become a significant challenge. If all these calculations fall on the shoulders of pricing managers, they could hardly find enough time to focus on strategic business tasks. And that's where tech-driven price optimization comes in handy.

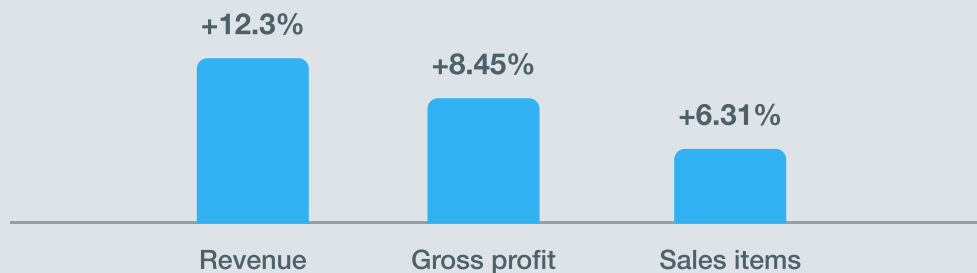


DIY retailer [430 stores]

Problem: no clear pricing approach to maximize revenue and profit margin; absence of predictive solution for execution of pricing strategy; saving profits during the low season; speed up the repricing process

Solution: regular elasticity-based price recommendations combined with consultancy

Success criteria: increase revenue by 4-6% while keeping gross profit; increase average transaction value; retain transactions number



[FULL CASE STUDY](#)

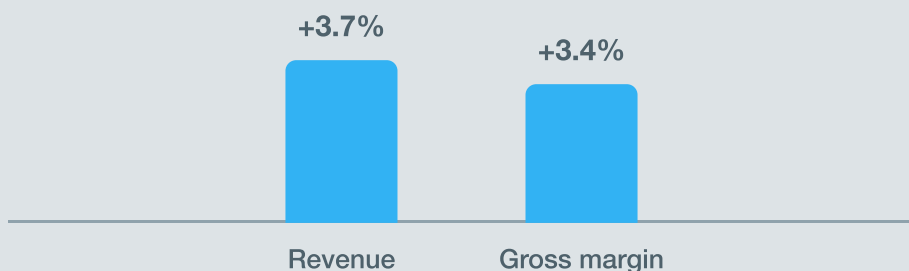


Home Decor [\$100M in revenue, E-Commerce]

Problem: labor-intensive repricing process, high business seasonality, lack of intelligent solution for making data-driven pricing decisions.

Solution: regular demand-driven price reduction recommendations for gross margin protection and more predictable sellout.

Success criteria: smooth inventory sellout while protecting revenue and gross margin.



[FULL CASE STUDY](#)

3. Demand-based price optimization: League A of Pricing

Businesses cannot effectively manage price elasticities on the portfolio level by relying on traditional pricing approaches. Maybe, except for the case when there are only a few SKUs offered in the assortment.

However, even in such a case, the manual calculations may turn out to be a rather risky approach because the roles of products in the assortment tend to change. Simply put, the product which used to have inelastic demand yesterday may today become remarkably vulnerable to any price changes because of the changing consumer behavior or new similar products introduced to the market.

Even more, in their reaction to demand, the products are not self-sufficient. Each SKU not only has its own elasticity but there are also more or less explicit cross-dependencies with the demand for other SKUs in the portfolio.

The advanced technology powered by the latest AI and ML algorithms are capable of constantly recalculating billions of possible price combinations based on each product's own and cross-elasticities. This approach is used for demand-based price optimization.

3.1. Demand-based pricing optimization: how it works

Advanced demand-based pricing engines are powered with neural networks measuring products' own price elasticity and cross-elasticities to ensure that goals on both the product and the category level are achieved.

Remember the linear regression method to calculate price elasticities?

Now, imagine an engine capable of building such a regression for hundreds and thousands of products simultaneously with the results being recalculated right after new data is added or any factor impacting demand is changed.

Such algorithms can be applied to separate assortment groups, which allows parallelization and scalability.

The accuracy of every recommendation is achieved through context-dependent price elasticities and a high-performance solver capable of shoveling through billions of possible price combinations to find the right one.

Competera crafts **optimal prices** using a unique neural network with a prediction accuracy of 90-98%

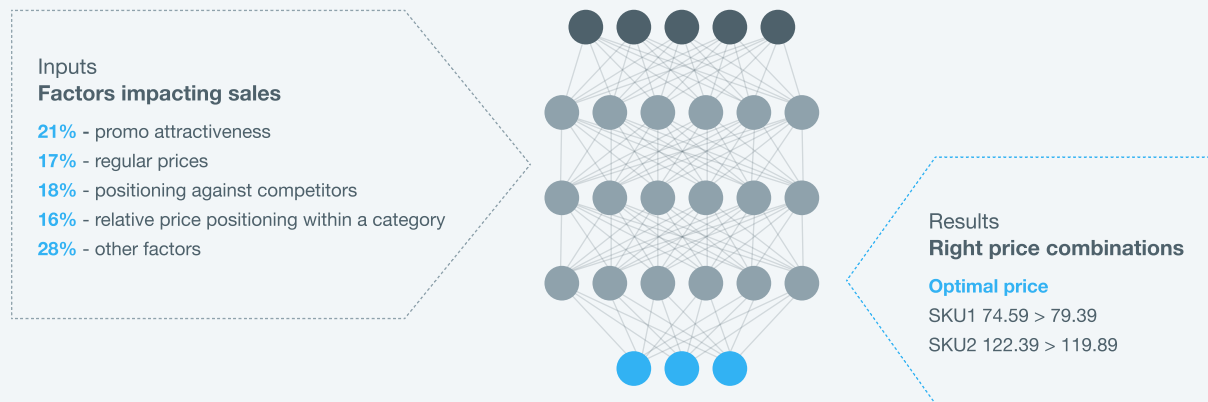


Image 14. Algorithmic pricing

The pricing solutions powered by the latest-generation neural network ensure the integrity of results with the price effect prediction accuracy of 90% and above.

The high accuracy of the result is secured while the algorithms recalculate and consider not only the elasticities of demand but also dozens of other pricing and non-pricing factors, e.g. weather, promo, competitors' prices, etc.

In contrast, a manager who sets the prices manually can consider no more than three different factors at once. That's why demand-based price optimization is the League A of Pricing.

3.2. How to get prepared to implement a demand-based pricing solution

When it comes to implementing a demand-based pricing system, the business has first to analyze its own specific needs and requirements and then decide which system or vendor offers the best-fitting solution. There are four essential domains of criteria we recommend to consider before implementing a particular demand-based pricing system. These are functional, strategic, technical, and economic domains.

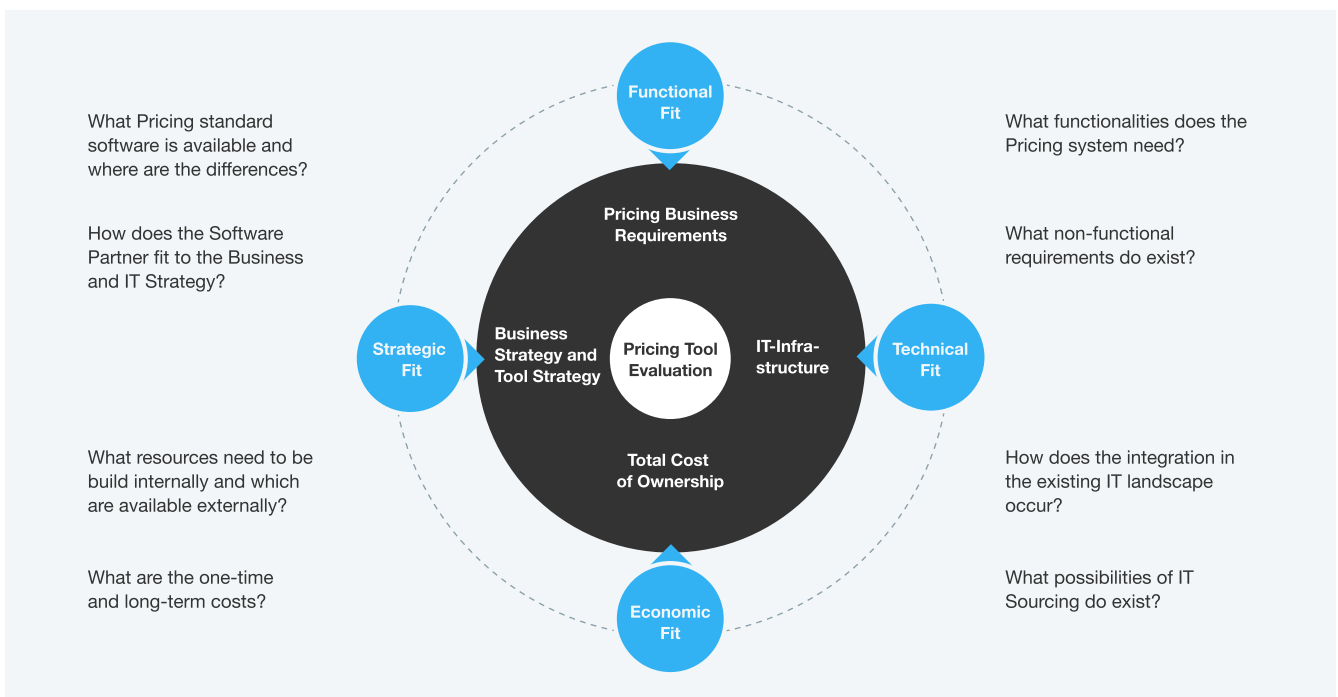


Image 15. Pricing system evaluation

Obviously, an implementation of a demand-based pricing system requires some preparation and forethought. First and foremost, the business has to have a large and reliable dataset.

The more accurate data you have the better. Once the dataset is in place, a retailer has to choose the best-fitting AI-driven solution capable of processing the data to generate insights and recommendations based on that.

The components constituting the dataset needed to switch to demand-based price optimization may differ in each specific case. The standard set of data includes historical sales and promo data of at least the last two years. The data on historical price changes as well as SKUs' stock availability and product descriptions might also be required. Even if you are not going to switch to demand based pricing tomorrow, collecting and organizing data properly would definitely be a good idea.

After the dataset is in place, the business has to choose either to build an in-house AI-driven pricing system or find a best-fitting third-party vendor specialized in demand-based pricing solutions.

The point is that setting prices for the entire portfolio based on thousands or millions of data points is something which can hardly be done effectively without utilizing the power of AI algorithms.

Finally, it should be noted that even the most advanced AI-based pricing solutions cannot substitute human beings. The implementation of demand-based pricing software changes the role of a pricing team but the key strategic decisions are still to be made by a manager or other stakeholders.

That's why before implementing a demand-based pricing system, the business has to make sure it has a dedicated team of specialists ready to supervise the software integration and use as well as have the final say in the strategic decision-making.

To get prepared for the demand-based price optimization solution's implementation, it is vitally important to avoid the typical mistakes businesses make while adopting advanced technologies. Let's look at the most critical issues and find out how to tackle them.

First of all, every price optimization system starts with a test run that allows trying out the capabilities of the algorithms and engines.

For the test run, retail teams should thoroughly choose the test and control groups.

The typical mistake here implies choosing stores that have different product mixes and sales patterns. This difference can play a negative role in achieving the test run goals.

For example, part of the stores may predominantly sell the retailer's private-label products, while they may not be available in the other stores. In the end, the final results would be misleading.

To avoid this mistake, one should carefully study the sales structure for each of the stores, identify key product groups in greatest demand, and analyze the procurement of goods. After that, test and control store groups can be selected properly.

Another issue often appears in the next step of the solution's implementation and refers to the choice of the right pricing strategy for reaching the business goals.

To go through this stage without risks, the business should develop a pricing strategy in advance, together with a competent pricing architect.

One thing which should never be disregarded while defining the pricing strategy is the level of promo pressure.

That's because a significantly different reaction to promo in different stores may indicate the need for re-clustering the product range both in the test and control groups and in the retail chain as a whole.

The implementation results can also be significantly affected by the product scope entrusted to the solution. It may simply be insufficient for the system to fully unroll and apply all the potential to grow the intended financial indicators.

To achieve all the set goals for the growth of key indicators, it's vital to consider the number of SKUs and revenue under management delegated to the solution.

Insufficient volumes may significantly limit the system's ability to generate elasticity-based optimal prices.

If a business is aware of these critical issues, the effectiveness of the solution would be out of risk.

Once the test run is complete, the pricing engine's effectiveness is evaluated and a comprehensive price optimization rollout gains the green light.

Get to know how much
profit ML may bring
to your business

GET CALCULATIONS

The screenshot shows a user interface for a business calculator. It features three main sliders: 'Revenue' (set to 900 mln), 'Locked assortment' (set to 15%), and 'Margin, %' (set to 35%). There are also toggle switches for 'Revenue' and 'Margin' and a dropdown menu for 'What is your industry?'. The interface is clean and modern with a white background and green accents.



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