CAPSTONE 2.0™

Real World Connections

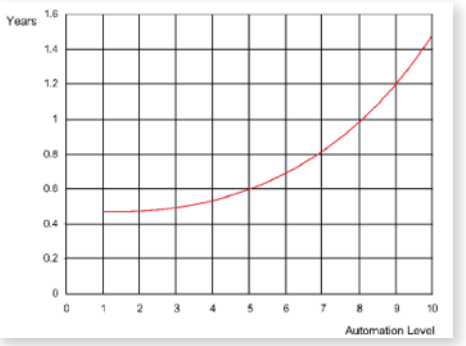
Application in Capstone2.0 *versus* Real-World Application

Why Is Purchasing Capacity More Expensive Than Running a Second Shift?

Application in **Capstone2.0**

Capacity represents the space in a manufacturing plant that allows a company to produce units of their product(s). Adding capacity is equivalent to buying additional space in your facility, which brings long-term benefits but is also a costly investment. In Capstone2.0, companies can run two different shifts over the course of the day. You can imagine one shift starting in the morning and another in the evening, which allows companies to produce two units of their product for each unit of capacity.

Each day, employees working the second shift receive 50% higher wages, which increases the company's labor costs by 50%. However, companies have already paid for all period costs, or the overhead to keep your plant running, so any units produced during a second shift will receive a free ride on fixed expenses. After factoring in the upfront cost of purchasing capacity and the cost of running a second shift without the burden of period costs, it is generally most cost effective to run a second shift.



Real-World Application

In the following **article**, supply and demand issues impacting the oil industry are discussed. One company, Pioneer Natural Resources, needed to adjust its well design while drilling for oil, which substantially raised the company's period costs. In this instance, the cost required to find a new well and purchase equipment to set up a new oil rig outweighed the $400,000 cost to change the well design. As the change in well design increased the drilling time by five days, it will likely employ a second shift of workers in order to keep up with the market demand.

What Impact Does Reliability Have on My Material Costs?

Application in **Capstone2.0**

As part of the customer buying criteria, the reliability of each product is represented in hours. The higher a product's reliability, the longer the product will last. The reliability of each product is directly correlated to the product's material costs. The reliability rating for existing products can be adjusted to have a longer or shorter shelf life.

Customer Buying Criteria		
Low End Segment		
Price	$14.50-$24.50	53%
Age	Ideal Age =3.0	24%
Ideal Position	Pfmn 2.2; Size 17.8	16%
Reliability	MBTF 12,000-17,000	7%

Specifically, each 1,000 hours of reliability adds $0.30 to the material cost. Positioning a product's reliability outside of the range in the customer buying criteria will decrease demand. Each 1,000 hours of reliability that is above or below the primary segment's range on the customer buying criteria will decrease demand for those customers by 10%.

Real-World Application

In this **article**, the use of leather seats in vehicles is considered. As a durable material, leather has remained a staple for interior car design. Despite this, the article notes, "The problem with leather, for those whose budgets lean more toward non-premium beer than Champagne, is that it can add thousands of dollars to the sticker price."

As the article discusses, leather is more durable and therefore an appealing feature in high-end vehicles. However, suppling premium materials that last comes at a price causing these features to be more prevalent in high-end brands. The lesson? Consider the customer you are trying to appeal to when determining your product's reliability.

Why Does the Age Change Based on My Product Revisions?

Application in **Capstone2.0**

As part of the customer buying criteria, product age plays a role in the sale of each product. The "age" of a product refers to the perceived age by customers. When a product is moved on the perceptual map, customers perceive the repositioned product as newer and improved but not brand new. As a compromise, the perceived age customers have of the product is cut in half. If the product's age is 4 years, on the day it is repositioned, its age becomes 2 years. Therefore, you can manage the age of a product by repositioning the product. It does not matter how far the product moves.

You might be asking why wouldn't a customer want the latest, greatest thing. For one, price is a massive consideration. Newer products tend to be more expensive when they are released in the market because they cost more to make. However, some customers prefer a product that has proven its value in the market over time, which gives it an air of reliability. This is a characteristic of low-cost customers. Before they decide to spend hard-earned money on a product, they want to ensure this is a worthy purchase.

Real-World Application

Tide laundry detergent has been around since the 1950s. However, when consumers go to the grocery store, they do not think of Tide as a product that is more than 60 years old because Tide is constantly updating the design of its existing product. For example, Tide introduced a slight change to the detergent's composition to reduce color fading. This makes the laundry detergent appear to be newer, even though Tide has only made a small change to the product.

This slight change to reduce color fading is comparable to any adjustments made to your product's size or performance.

You are still selling the same base product, but consumers now see it as new and improved, which can increase their demand of the product.

How Can I Capitalize on Situations with Unmet Demand?

Application in **Capstone2.0**

What happens when a product generates high demand but does not have enough capacity to meet demand? Unfortunately for the company in question, this leads to a stock-out where the company runs out of inventory for the product. The company will lose sales that should have been its, but, even worse, customers hungry to buy the product will now turn to competitors' products. Because companies produce on a monthly schedule, stock-outs can occur in any given month. If each company in the industry is short on supply during any month, a seller's market emerges. In a seller's market, total demand cannot be met, so sellers have the freedom to make different marketing decisions.

Top Products in Low End Segment

Name	Market Share	Units Sold to Seg	Revision Date	Stock Out	Pfmn Coord	Size Coord	List Price	MTBF	Age Dec.31	Promo Budget	Cust. Aware-ness	Sales Budget	Cust. Access-ibility	Dec. Cust. Survey
Ebb	20%	2,007	1/15/2021		3.0	17.0	$20.00	13000	5.60	$1,050	58%	$1,015	35%	18
Acre	17%	1,671	5/24/2016		3.0	17.0	$21.00	14000	5.60	$900	53%	$900	33%	15
Bead	17%	1,671	5/24/2016		3.0	17.0	$21.00	14000	5.60	$900	53%	$900	33%	15

How can you be sure of a seller's market? You can't, unless you are certain that industry capacity, including a second shift, cannot meet demand for the segment. In a seller's market, there are a few things a company can do to reduce demand while remaining profitable: increasing prices and reducing marketing budgets. Companies can increase prices outside of the regular segment range because there is unmet demand regardless. No company can meet the needs of the entire segment, so anyone can raise prices to maximize profit on each unit sold. Additionally, they can reduce their spending on promotions and sales because customers will demand the products regardless.

Real-World Application

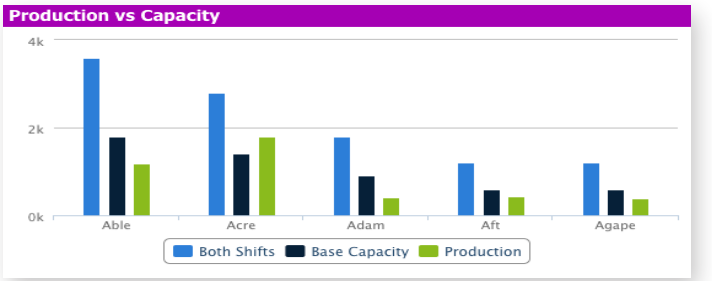
In the following **article**, luxury fashion retailer Hermes is discussed. As Hermes handbags require specific high-grade leather, production is a timely process leading to a low supply. Marissa N. Stempien, the fashion editor of **JustLuxe.com** said, "The Birkin is an extraordinarily well-made bag. Each one is handmade by trained craftsmen and can take over 18 hours to make, and that number can be doubled if working on exceptional pieces such as those accessorized with diamonds." When supply is low and demand high, prices skyrocket in response.

Like situations when you don't have enough capacity to meet demand, Hermes is limited in the number of handbags they can produce. To offset the opportunity cost associated with this issue, Hermes handbags have a much higher retail value. This will drive down demand (to ensure they can supply enough) and drive up its profits.

Why Does It Cost More per Unit to Add a Second Shift?

Application in **Capstone2.0**

Each production line's capacity is listed as first shift capacity, which is the number of units, in thousands, that can be produced each year by running a single eight-hour shift. In Capstone2.0, companies can run two different shifts over the course of the day. You can imagine one shift starting in the morning and another in the evening, which allows companies to produce two units of their product for each unit of capacity.



If companies need to increase production, they can choose to schedule a second shift. Second shift workers arrive at the end of the first shift and work a full eight-hour shift. Each day, employees working the second shift receive 50% higher wages, which increases the company's labor costs by 50% and requires it to use more employees to cover the shift.

Real-World Application

For employers, hiring and retaining employees that work beyond the standard nine-to-five job can be a difficult task. One way to offset this and make the second shift more appealing is through offering pay premiums.

According to **SHRM.org**, "Organizations with 24/7/365 operations face the challenge of recruiting and staffing employees to work beyond standard day shifts. An effective practice used by many US employers is using shift differentials—pay premiums to compensate employees for working shifts other than regular weekday hours."

Shift differentials can also be referred to as shift premiums. As second shift hours are typically worked between 3 p.m. and 8 a.m., the shift premiums are used to attract employees to work these irregular hours.

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Why Is It Best to Fund Major Investments with Long-Term Financing?

Application in **Capstone2.0**

Long-term assets, such as plant capacity and automation, provide benefits to your company for years to come, but often not in the short term. In the simulation, changes to capacity and automation take 1 year to implement, so the benefits are not seen in the calendar year. As the benefit will increase each year, investments into long-term assets should be funded by something that can also be paid off over time, such as long-term debt and/or stock issues.

Bond Market Summary

Company	Series#	Face	Yield	Close$	S&P
Andrews					
	11.0S2022	$6,950,000	11.0%	99.55	B
	12.5S2024	$13,900,000	12.2%	102.42	B
	14.0S2026	$20,850,000	12.8%	109.13	B
Baldwin					
	11.0S2022	$6,950,000	11.0%	99.55	B

Long-term debt is issued as a 10-year note. Companies taking out a 10-year note are only required to pay off interest on a yearly basis until the full payment is due, 10 years later. Issuing stock allows you to raise capital by selling shares to the public. These shares are not required to be repurchased, but they can be through the stock retire option. As both options supply your company with cash and do not require that cash to be returned the following year (as you would see with current debt), they are the ideal way to raise capital for an asset that will not give an immediate benefit.

Real-World Application

In the real world, purchasing physical assets like plant capacity and automation (seen as PP&E on financial statements) are referred to as a capital expenditure (or CAPEX). As **Investopedia** explains, "If an expense is a capital expenditure, it needs to be capitalized. This requires the company to spread the cost of the expenditure (the fixed cost) over the useful life of the asset."

Capital expenditures are closely evaluated by shareholders to ensure there is enough distributed cash flow. In the following **Seeking Alpha article**, the cash flow of Teva is discussed. As capital expenditures increased for the company, their free cash flow fell, causing them to cut dividends. If Teva had raised capital, rather than relying on cash from operating, they may have still been able to offer the dividend.

How Can We Build a Perfect Product That Is Profitable?

Application in **Capstone2.0**

To consumers, a perfect product looks for the following:

- Be at the ideal position (the segment drifts each month, so this can occur only one month per year), Be priced at the bottom of the expected range,
- Have the ideal age for that segment (unless they are revised, products grow older each month, so this can occur only one month per year), and
- Have a reliability specification at the top of the expected range.

Your customers want perfection, but it is impractical to have "perfect" products. In many cases, you will have to settle for "great" products. The better the product, the higher the costs. If you break down the customer buying criteria, you can see this holding true. Being aligned with the ideal spot and having a high reliability increases your material costs.

Customer Buying Criteria		
High End Segment		
Ideal Position	Pfmn 9.8; Size 10.2	43%
Age	0 years	29%
Reliability	MTBF 20,000-25,000	19%
Price	$29.50 - $39.50	9%

If you were to price at the bottom of the expected range, it would be difficult to achieve a healthy margin. Your task is to give customers great products while still making a profit. This is tough to do, but you're not hopeless.

Real-World Application

In the following **article**, *Forbes* discusses maintaining a balance between meeting these customer expectations while remaining profitable in the e-commerce industry. One company, Casper, has done this well by providing mattresses directly at consumers' doors. In this instance, Casper is able to provide consumers with high-quality items at low costs.

However, overhead cost had to be cut elsewhere in order to achieve a healthy margin. Casper's business model provided this by eliminating the brick-and-mortar model that is traditionally associated with purchasing a mattress. In doing so, they have eliminated the cost of not only a storefront but also salespeople to maintain that storefront.

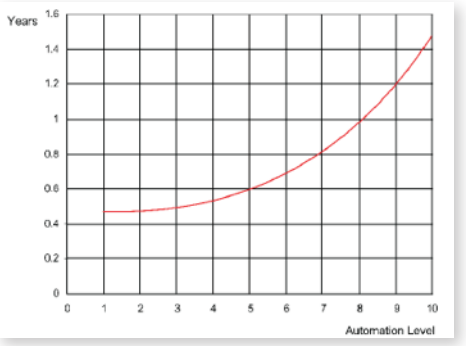
Similar to what you experience in the simulation, something has to be sacrificed for the customer in order to ensure you're making a profit. In this instance, customers lost the ability to try multiple mattresses in one day with the assistance of a salesperson. In return, they could afford to purchase a high-quality mattress at a more affordable price.

Why Does Automation Increase My R&D Cycle Time?

Application in **Capstone2.0**

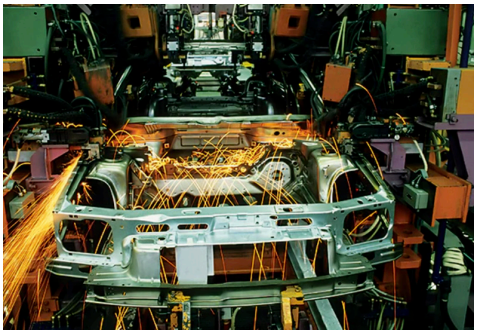
As you raise automation, it becomes increasingly difficult for R&D to reposition products at short distances on the perceptual map. For example, a project that moves a product 1.0 point on the map takes significantly longer at an automation level of 8.0 than at 5.0. But why?

When you decide to increase your plant's automation, you are essentially retooling machines to speed up and improve the building process. Out the door goes some of the workers needed to build the product, and in comes new machinery that does the same work faster and more reliably. With that new machinery comes changes to how products are made. To ensure products are created without defects, R&D designers must consider how to integrate the product's design into the new machinery, which takes additional time as the machinery becomes more complex.



Real-World Application

In the following **article**, the evolution of automation is discussed. General Motors is praised for their visionary approach to automation in the 1980s. While they were one of the first in the automotive industry to capitalize on automation, the initial impact of automation was not strictly positive. Relative to their competitors, like Toyota, their market share slipped. The article answers, "What went wrong? GM failed to account for the indirect labor costs, operators and technicians needed to transition to automation."



The transition to automate a production plant was not accounted for. Imagine this: The robotics that put an engine together must consider the weight and specifications for each component that makes up the engine. If one of these components is changed slightly, the calculation that the robotics use to piece the engine together will need to be recalibrated.

Why Are My Sales Lower Than the Competition Even with a Higher Customer Satisfaction Score?

Application in **Capstone2.0**

In any month, a product's demand is driven by its monthly satisfaction score. Assuming it does not run out of inventory, a product with a higher score will outsell a product with a lower score. A customer survey score reflects how well a product meets its segment's buying criteria as well as the company's promotional efforts.

Typically, the "best" product (from the customers' perspective) in the market tends to lead in sales but that does not always happen. As mentioned, this can happen as a result of a stock-out. This can also be impacted by the revision date of your products.

The satisfaction score shows you as of December 31 how satisfied the customers were with each product line. If a product has a late revision, then it may be more appealing at the very end of the year while overall sales were slow until the product's release.

Customer Buying Criteria

Criteria	Expectations	Product Able
Age	2 Years	2.1
Price	$20.00-$30.00	$29.50
Ideal Position	Size 16.0 Pfmn 4.0	Size 13.2 Pfmn 6.8
MTBF	14,000-19,000	17,000

Promotional efforts

Sales Budget	Promo Budget
$1,600	$1,100
Customer Accessibility	**Customer Accessibility**
77%	92%

Customer Satisfaction Score

30

Real-World Application

The iPhone is a great example for this. As we know, the iPhone is regarded as an industry leader. Despite this, Apple frequently experiences stock-outs after releasing an updated iPhone. This is usually a result of poor forecasting.

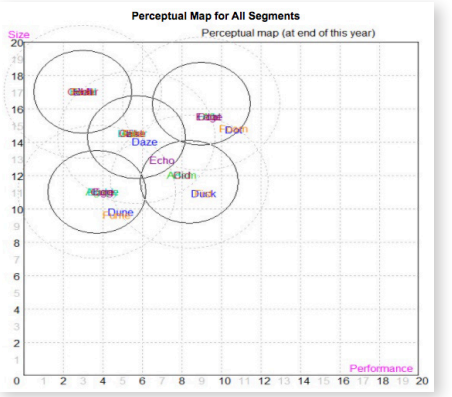
When comparing two market leaders, Apple and Samsung, you can view how release date can impact sales despite customer preference. The Samsung Note 8 was released in September with the iPhone 8. However, the iPhone X was not scheduled to release until two months later, in November. As the hype surrounding the iPhone X far exceeded the iPhone 8, it would be a reasonable assumption that many users will wait until November to purchase a newer Apple smartphone.

In that case, the overall sales that Samsung receives through the end of the year could surpass the sales of the iPhone X, regardless of the customers' preference. However, going into 2018, the iPhone X is poised for strong sales.

Why Can't I Revise My Product in R&D?

Application in **Capstone2.0**

Generally, the longer the move on the perceptual map, the longer it takes the R&D department to complete the project. Project lengths can be as short as 3 months or as long as 3 years. Sometimes this depends on how far the product is moved; the further away from its current specifications, the longer the revision will take. Project lengths also increase when the company puts two or more products into R&D at the same time; each R&D project will take longer to complete. Finally, the product's automation level also affects project lengths; the higher a product's automation, the longer the revision will take.



In most cases, it is preferable to keep your revision dates within the current year. If the R&D project extends into the next year, you will be unable to make any further updates until the first update has finished. As decisions are entered on January 1 of the year, projects that do not finish until after that date will not be able to be adjusted further.

Real-World Application

In the following **article**, updates to the iPhone X are discussed. One of the major updates to the iPhone X includes facial recognition software. Apple consistently provides an updated iPhone once a year in the fall, usually between October and November. To a certain extent, consumers have come to expect these updates.

The expectation for new technology is similar to the drift rate of both segment circles on the perceptual map; customers seek improved technology year after year. Expectations aside, once a project has begun, further adjustments to scope impede the current projected launch date and therefore are not feasible. If Apple decided to also include a slightly larger camera in the iPhone X, then their initial launch of November 3 would be impossible. Once a project is in development, that project cannot be changed without changing the manufacturing of the product and impacting the initial update.