Key benefits of
dynamic pricing
for the food retail industry

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Dynamic pricing - the process by which the price of a specific product fluctuates based on a predefined set of conditions - has the ability to transform revenue management in brick and mortar retail. And while dynamic pricing is common in e-commerce, hospitality, and other consumer applications, food retailers have been slow to adopt similar pricing strategies. However, technological progress has lowered the implementation barrier and heightened the imperative for progressive pricing.

Technological innovations such as machine learning, Artificial Intelligence (AI), industrial IoT (IIOT), and consumer IoT are reshaping the food retail industry. Albeit, we've not yet reached the ideal of intelligent automation, and the food supply chain is still burdened with communication breakdowns, tenuous (or no) traceability, transportation delays, and hit or miss inventory control systems and processes (to name just a few).

However, the substantial uptick in the food industry's ability to gather consumer and product data via a plethora of touchpoints, e.g., sensor data, RFID tags, geolocation, smartphone apps, video monitoring, etc., shows great promise in helping to solve one of the major problems plaguing the food supply chain: **food wastage.**

Per a report issued by the United Nations' Department of Economic and Social Affairs, the global population is projected to increase to almost **10 billion people over the next 30 years**[1]. It is imperative that we create a sustainable food supply system that can feed an additional 3 billion

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human beings. While the economic, environmental, and social ramifications of adequately feeding more people may appear to be a distant concern, it is not. We're in the midst of this problem right now.

On a global scale, food loss or food wastage constitutes 33% of the total food produced for human consumption[2]. In particular, food waste at the consumer level tends to be a phenomenon that mainly exists in developed countries. More specifically, in the U.S., consumer food waste comprises 31% of the food supply[3], and this continues despite reduction efforts by the USDA and U.S. Department of Agriculture.

Another salient point is that the U.S. retail food sector generates 8 million tons of waste[4] each year, representing a value loss of roughly $18 billion. Consequently, not only are we needlessly diminishing the food supply, but food retailers are experiencing unnecessary financial forfeiture.

What is Dynamic Pricing?

One way to combat the food wastage at the retail level is to enact dynamic pricing models. Dynamic pricing is a key strategy used across many industries (more on this below) where **the price of a specific product fluctuates due to a predefined set of market conditions, product features or other environmental influences.** The pricing may shift on an hourly, daily or weekly basis. Or, it may be triggered by a specific consumer behavior. For example, dynamic pricing has been used in e-commerce settings to encourage shoppers to purchase products they've moved to their "baskets", but haven't yet followed through with the purchase.

In general, price adjustment parameters and outcomes largely depend on the particulars of the industry. Of course, at a fundamental level, consumer demand is one of the largest drivers of the ongoing price adjustments. Uber's "surge pricing" is a prime instance of the supply vs. demand dynamic pricing model. But, other contributing factors add an aggregate impact as to the who, what, how, when, where, and why of dynamic pricing:

- Seasonal, time of day, day of the week;

- Competitor pricing;

- Customer location;

- Where the customers are with respect to the Buyer's Journey.

The main objective, and benefit, for all sectors deploying dynamic pricing is to maximize revenue while also striking a balance between the product or service supply and consumer demand. Indeed, recent research conducted in China suggests that platforms "adopting dynamic pricing strategies have **a significantly higher level of demand compared with platforms adopting static strategies.**"

As such, although consumer perception of product or service quality, quantity, and scarcity have a hand in their purchase decision-making, pricing plays a key role in either encouraging or discouraging consumer behavior.

Current industries that use dynamic pricing

In the digital age, most consumers have already been exposed to dynamic pricing: airline tickets, hotel rooms, ride-sharing, eCommerce, etc. Certainly, dynamic food pricing, particularly for fresh produce, won't precisely align with the dynamic pricing models of other industries. But, grocery retailers can gain greater insight into consumer behavior and dynamic pricing strategies by studying the successes and failures of other industries.

Ride-Sharing: Uber and Lyft

All, if not most, ride-sharing providers utilize surge pricing, which uses a multiplier produced by their algorithm. As demand goes up and driver supply decreases, the multiplier is adjusted accordingly. In turn, this may incentivize more drivers to sign on and pick up passengers, thus increasing their earnings capability. There are other factors that Uber, in particular, takes into account through its algorithm such as the current battery life of a user's phone, traffic patterns, the passenger's location, and transaction history[5].

Hospitality: Airbnb and hotel pricing

Airbnb offers a Smart Pricing option to its "hosts" which automatically changes the listing price relative to the supply vs. demand within the host's locale, seasonality, listing type, and other data points that Airbnb doesn't reveal. Hosts are expected to set a minimum and maximum nightly amount; this ensures that, even if the demand levels drops, the host retains some profitability at the bottom price level. Furthermore, Smart Pricing can be turned off, and Airbnb reserves the right to shut off the feature "during events like natural disasters, emergencies, or political unrest."

It's important to note a salient difference between the dynamic pricing models, and how quickly they've

materialized in one sector vs. another. Consumables (food, clothing, etc.) tend to be short term assets that, once sold, become the responsibility of the consumer. Homes, hotels, and airlines contain large fixed asset costs for maintenance, repair, and replacement -- which are less than the same expenditures for an independent contractor using their own vehicle as an Uber or Lyft driver.

eCommerce: Amazon

While the ride-sharing segment is a prime example of dynamic pricing for service-oriented enterprises, Amazon's pricing model is more aligned with the retail food industry. According to Business Insider, Amazon adjusts product pricing up to 2.5 million times each day[6]. This translates to a **price adjustment every 10 minutes, resulting in a 25% increase in Amazon profits**.

But, unlike the food retail industry, Amazon is a fully digital environment that caters to over 200 million users whose every click and transaction is recorded and analyzed by Amazon algorithms. Nonetheless, Amazon is an excellent prototype for how the food retail sector can achieve optimal and real-time dynamic pricing (once it attains a similar digital ecosystem throughout the brick and mortar configuration).

In a broader context within the food retail industry, as supermarkets begin to capture more consumer purchasing data, this data can be used to make accurate real-time pricing decisions. The main takeaway here is that consumers, in general, have been exposed to dynamic pricing models in other sectors. This means that **they're familiar with the basic concept of shifts in pricing and are likely to be open to similar models in the retail food sector**.

Dynamic Pricing in the Food Retail Industry

There is no "one-size-fits-all" approach to dynamic pricing. We're in an age where algorithms (particularly machine learning and AI-powered mechanisms) are becoming more agile and accurate. Indeed, their capacity to "learn" about the nuances of human dynamics, e.g., behavioral and psychographic, is rapidly improving. However, applying this technology to the food retail industry has definitive challenges which can be classified into two primary systemic problems:

◦ Lack of standardized data which AI and machine learning need for pricing accuracy;

◦ Absence of a fully digital environment where all data is gathered electronically so AI can analyze the comprehensive number of factors that feed into various dynamic pricing models, e.g., projected spoilage time frames (also known as dynamic shelf life[7]), consumer demand vs. price elasticity, and delivery times for product replenishment.

Unfortunately, the data and digital problems hold true for the entire food supply chain, over which retail grocers have limited or little control. This issue can be mitigated, as much as possible, by retailers pushing implementation on a smaller incremental scale such as choosing a specific selection of produce for dynamic pricing deployment. Why start there?

Consumer demand for food product traceability[8] is flourishing. Between a growing concern for increasing food safety (1 in 10 global consumers fall ill after eating contaminated food[9]) and decreasing the negative environmental impact of agriculture, consumers now want to know the exact food source and how it's being handled along the food supply chain[10]. This is a boon to food retailers as **digital traceability is the main data aggregation component**. When consumers can easily pull up food data via their mobile phones, including information about how it's produced, processed, spoilage timeline, possible allergens, macro and micronutrients, any existing food recalls, and real-time pricing, this will provide a positive feedback loop for broader digital adoption throughout the food supply chain.

Consumer spending is the sine qua non of global influence. As more consumers move to purchase food products that provide the aforementioned traceability, those suppliers and retailers who are slow to adopt this technology will suffer (or continue to experience) deleterious financial consequences, i.e., significant loss of revenue in terms of food wastage and reduced consumer spending[11].

Current use cases for retail grocer dynamic pricing

Due to the investment requirements for a fully digital traceability and dynamic pricing system, there are

currently only a few examples of retail grocers who are beginning to venture into dynamic pricing.

Wasteless

A direct example of dynamic pricing within the food retail industry comes from Wasteless who, in 2019, partnered with a food retailer in Italy. The goal was to reduce food waste by 25% and, in turn, increase revenue by 25%. After 12 weeks, **Wasteless was able to produce a 39% reduction in waste and helped the food retailer achieve a 110% revenue increase.**

Walmart

Undeniably, Walmart has access to far more resources than most other grocers (although Amazon's move into the food retail sector may eventually outpace Walmart[12]) and it has recently leveraged those resources to establish the Intelligent Retail Lab (IRL). Located in Levittown, New York, this novel brick and mortar -- powered by AI -- can automatically identify all products (no matter where they are located in the store) and then compare product quantities[13] in relation to predicted "sales demand." As of now, the AI store is in test mode as Walmart intelligentsia analyzes the costs vs. benefits of launching additional high-tech stores.

Amazon Go

Once again Amazon and Walmart are locked in a battle of capturing the food retail market via value-added technology. Although the exact details of the technology used in Amazon's Go stores haven't been disclosed, their "Just Walk Out Technology" combines computer vision, sensor fusion, and deep learning which senses and records when items are removed from shelves. Consumers can simply walk in, pick up their items of choice, and leave, after which they'll send a receipt and receive payment via the consumer's Amazon account. There's no news as to whether Amazon Go items are dynamically priced. However, Amazon does link the in-store item prices[14] to those listed on Amazon; so, in light of the fact that Amazon's digital marketplace provides dynamic pricing, this points towards in-store dynamic pricing as highly likely.

Walmart and Amazon are the most current and noticeable models of dynamic pricing for the food retail sector. However, any successes levied from their high tech storefronts will send a clear signal to other food retailers: adapt or be squeezed out of the market.

Primary benefits of dynamic pricing for food retailers

Numerous benefits exist for food retail dynamic pricing protocols. First and foremost is **substantially reducing food wastage**. As the food nears its projected spoilage date, incentivized pricing adjustments will automatically occur based on the pricing models that combine several other relevant input values: item type, competition pricing, brand strength, current inventory, impending inventory, seasonality, time of day, consumer shopping patterns (at the group and individual levels), consumer responsiveness to price thresholds and individualized offers, etc.

The same data can be used to send personalized in-store or pre-purchase offers to consumers to capture revenue at a particular price point, e.g., before the price is dropped below a certain loss threshold. This will **buoy revenue generation when sales are slow and potentially create higher demand**, especially if this approach is combined with data such as the minimum and maximum each customer is willing to pay (yet another benefit of using AI for dynamic pricing).

If food retailers use technology similar to the tools deployed by Walmart and Amazon Go, where inventory adjustments are automatically accounted for via cameras and sensors, labor costs will also diminish. There will be **no need for manual inventory auditing or reconciliation and department managers will receive real-time updates and reports** as to inventory levels along with product re-supply recommendations.

Dynamic pricing implementation for grocers

The aforementioned are only a few examples of many other benefits that can be directly attributed to food retail dynamic pricing. But, before any of the advantages can be realized, grocers need to implement a higher level of digitization and develop pricing models that are most applicable to each product.

Digitization

AI technology relies on copious amounts of data gathered via digital means (on the front end). Moreover, the data needs to be safely stored (on the backend), analyzed for accuracy, and then pushed to the pricing algorithms. All current point of sale (POS) and inventory systems have all of the necessary data needed to quickly implement a dynamic pricing program.

With regard to data storage and computation (IT infrastructure), cloud service providers, Amazon, Microsoft, and Google, have a far larger capacity for the amount of data that will be flowing through the in-store tech devices. As such, using one of their platforms, as opposed to on-premise systems, will help to further reduce costs.

Ultimately, however, without a digital ecosystem, dynamic pricing efforts may not fully produce the expected financial benefits. While this sounds like a monumental task, it doesn't need to be carried out all at once. As stated above, start small. Whether testing dynamic pricing for fuji apples or selecting one of the smallest retail stores (with high traffic) as a high-tech test case, grocers need to sandbox the digital infrastructure required.

Once the system is fully evaluated and any problems are resolved then slowly expand to other products or stores.

Pricing models

Establishing pricing models runs hand in hand with digitization planning. But, this is an easier process since most grocers already have datasets that include at least basic customer information, price adjustments over time, current inventory levels, future shipment data, product seasonality, and (possibly) which brands are more or less popular.

The effortful phase begins with identifying, aggregating, and testing the applicability of other data points. Examples include competitor pricing, individual customer preferences, mapping customer purchases on a per-item basis to their Buyer's Journey route, correct shelf life estimations, minimum and maximum pricing incentivization, and any other potentially useful input values.

Keep in mind that these are 2nd tier data points which are not necessary for deploying a robust dynamic pricing program. They can be added, if wanted or needed, at a later date.

One thing to keep in mind is the sensitivity customers have to price shifts between the time they insert the product in their shopping cart and when they arrive at the checkout. A majority of customers will become agitated if the price of their Fuji apples suddenly increases at the point of sale. Grocers will need to ensure that a stopping point is in place for adjusting prices upward (it would be surprising if customers would argue against paying less for an item at the point of sale).

Conclusion

Summarily, retail grocers have an important role to play in helping to diminish food wastage. It's clear that tons of perfectly viable food is shuttled to the garbage heap while there are many throughout the world who go without sustenance on a daily basis. With the projected population growth, the number of people going hungry has a high likelihood of expanding. Food wastage also negatively impacts the environment through increasingly unsustainable farming practices.

Although most food retailers have no direct jurisdiction as to how the food is produced, they do have influence at the customer level. Customers drive product demand. Dynamic pricing is one such influence that can incentivize customers to purchase more or less of an item. Dynamic pricing is tied to a broader digital environment that will allow improved monitoring and controlling of the store's food wastage amounts. Certainly, there is more work to be done throughout the entire food supply chain. But, successfully implementing the technological innovations discussed herein at the local level will eventually impel supply chain partners to follow suit.–

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