

Customizing Prices in Online Markets*

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Abstract

Dynamic pricing is the dynamic adjustment of prices to consumers depending on the value these customers attribute to a good.

Underlying the concept of dynamic pricing is what marketers call price customization. Price customization is the charging of different prices to end consumers based on a discriminatory variable.

Internet technology will serve as a great enabling tool for making dynamic pricing accessible to many industries.

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1. Introduction

It's a cloudy day in Manhattan - and there is a 60 per cent chance of showers. Sidewalks are filled with people and business continues as usual. Umbrella vendors have put themselves up at street corners, lifting some of their umbrellas in the air. Just \$5 buys you an umbrella, at least as long as it doesn't drizzle. However, this price rockets to \$15 as soon as the first drops start falling. Nevertheless, people happily buy at the higher price ... This situation probably depicts the concept of dynamic pricing at its best. Dynamic pricing is the dynamic adjustment of prices to consumers depending on the value these customers attribute to a good. In the Manhattan example, as long as it doesn't rain, people's willingness-to-pay is rather low. There is no need to buy now, which is correctly reflected in the prices vendors charge. However, as soon as it starts raining, the benefit of having an umbrella surges dramatically which is again picked up in the vendor's price.

Underlying the concept of dynamic pricing is what marketers call price customization. Price customization is the charging of different prices to end

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consumers based on a discriminatory variable. In the above example, the key variable that allows for the pricing differential is the weather. For example, the Coca-Cola Company is experimenting with dynamic pricing in the form of vending machines that automatically raise the price if the outside temperature rises and that offer a discount once it starts to chill. Another factor that has long justified price customization is purchase quantity. Discounts are given to those who buy in volume. A third type is the result of targeting consumer segments. For example, price-sensitive students receive discounts on software packages in the hope that they will continue to buy once they leave university. A fourth, classically, exploits time differences. For example, public utilities alter their energy rates to commercial users according to the time of day. A special form of time pricing is yield pricing, which is typically used by airlines. The closer the departure date of a flight, the higher the price charged for the ticket. Relatively less price-sensitive customers such as business buyers prefer the added flexibility of booking late, notwithstanding the greater expense.

Price customization has become an important component of today's pricing practices and is hardly questioned by consumers. The most ideal form of this practice, however, has not been implemented so far. Economists view the buyer's willingness-to-pay as the ultimate discriminatory variable (or first degree price customization). At least theoretically, this approach maximises firms' profits in economic terms and is therefore superior to all the other methods mentioned above (Armstrong and Vickers, 1999).

Given that the system is so appealing in theory, what's the catch? The downside of customized pricing based on customers' willingness-to-pay looms large: implementation is extremely difficult. Besides finding out about individual willingness-to-pay, the sheer administrative cost of establishing individual prices has so far proved prohibitive. Haggling and dealing may be common in a Middle Eastern kasbah, but is impractical in a modern Western retail outlet.

However, according to believers, all this is going to change in an online environment: the internet facilitates breaking down the traditional barriers towards price customization. As Forrester's Carrie Johnston has said, the time has come for firms to personalise prices to individuals. Jupiter Communications predicts that e-commerce transactions which involve dynamic pricing will leap to \$7bn by 2004. One-to-one pricing is supposedly just around the corner.

□ *Consider the example of the Seattle Mariners which, with the help of technology from @The Moment Inc., a San Mateo based company, experimented with a new system to sell tickets to three Mariners baseball games. By creating an online marketplace they allowed the price of the tickets to fluctuate with the demand for the tickets. Baseball fans could check out the marketplace and find out what the game tickets were selling for at any given moment. They could either purchase right away or they could register a lower reservation price at which the tickets were automatically purchased in case the price fell to that level. Without yielding any specific numbers, management claimed higher revenues as compared to the tickets' face value.*

However, casualties can be observed elsewhere.

□ *For example, in September 2000 Amazon experimented with prices on more than half of its top-100 DVD's. Depending on the particular movie and the discount offered prices paid by customers varied by up to \$15. Customers found out about this practice and the news spread like wildfire in internet newsgroups. Anger was expressed at the company, with people saying that they felt hoodwinked by the random prices. Thus, by experimenting with one of the new wonder-tools of e-commerce. Amazon suddenly found itself on the defensive in the press. Earlier that year, customers had found out that Amazon was experimenting with prices for a popular MP3 player - offering discounts randomly to different customers. After the latest embarrassment, the e-tailing Meister has promised to ban blind price fluctuations.*

Thus, while the new technology liberates certain constraints of the offline world, the power of the consumer to look through elaborate new pricing schemes is on the rise as well. Without doubt, while the concept of online dynamic pricing has received significant attention, implementation can become quite tricky. The goal of this article is therefore to analyse when and how it becomes a serious tool to consider as part of the online marketer's tool chest. I will develop some boundary conditions as to when dynamic pricing makes managerial sense (and nonsense!) in an online environment.

For any type of price customization to work, five conditions must hold - regardless of whether the context is Old- or New-Economy. The conditions are that:

1. customers must be heterogeneous in their willingness-to-pay;
2. the market must be segmentable;
3. the potential for arbitrage is limited;
4. the cost of segmenting and policing must not exceed revenue increases due to customization;
5. violations of perceived fairness must not be committed.

2. Condition 1: Customers Must Be Heterogeneous in Their Willingness-To-Pay

The most basic condition is that customers are willing to pay different prices for the same goods or services. Some are prepared to pay a high price, others will only be willing to buy at the lowest price available. These differences in willingness-to-pay can be explained in a number of ways, including: the opportunity cost of time, the need to extend search efforts, the product risk different people are willing to assume, and different perceptions of brand names and value. In most markets this heterogeneity applies. It is particularly marked where brand name products and generic products co-exist (e.g. many groceries, apparel, tyres). The same goes for markets where the price range (lowest to highest price for a particular product) is broad and search efforts are rewarded. Undifferentiated product markets such as commodities are examples of where willingness-to-pay is unlikely to vary much.

The question is what effect does an online environment have on these pricing issues? The current (limited) empirical evidence points to more heterogeneity in willingness-to-pay. This is of course due to the increased price sensitivity of consumers when shopping online. For example, several studies have indicated that customers exhibit a higher sensitivity towards online prices in comparison to offline shopping (Rangaswamy et al. 1999, Bakos and Brynjolfsson 2000). Furthermore, the volume of information and the fact that only a proportion of the population has online access leads to greater heterogeneity in willingness-to-pay. This view is echoed by Porter (2001) who contends that the internet is likely to lead to more competitive markets with lower profit margins.

3. Condition 2: The Market Must Be Segmentable

While many product markets exhibit considerable latitude in customers' willingness-to-pay, exploiting the opportunity is another matter. For example, no mass market lends itself well to price customization since all customers are treated the same. Grocery markets without loyalty programmes provide an example: every customer pays the same for a particular product because the retailer has no means of recognising customers who might be willing to pay more. Two factors have helped firms in the 'old' economy. One is the ability to establish a linkage with a unique customer, typically in the form of a specific customer account number or the customer's address.

□ *For example, Florida-based Catalina Marketing Inc. has developed a system that tracks people's grocery purchases over time using their credit card number. The system tracks the content of the shopping-baskets and thereby builds an individual's purchase history over time. Manufacturers can now use Catalina's database for micro-targeting coupons to, say, the loyal buyer of the competitor's brand.*

Remember, offering coupons is one way to price-discriminate between different customers. The coupon is printed out at the checkout register and can be utilized on a later purchase occasion.

The other factor that has helped 'old' economy firms to segment their customers is self-selection. In many buying situations, consumers may identify themselves as being a target candidate for price customization. For example, by selecting the advance booking date for an airline ticket, customers reveal their degree of flexibility in relation to time and thereby in part their willingness-to-pay.

The web has significantly improved a firm's ability to segment a market in terms of willingness-to-pay, notably by tracking individual customer purchases through the internet. Building up profiles over time allows firms to assess consumers' price sensitivity and then to start marketing campaigns either to individuals, or more likely, to segments that have varying degrees of willingness-to-pay. For example, while a price-sensitive online grocery customer might always sort products by price before choosing, non-sensitive customers might employ choice strategies that are driven by brand name, nutritional content, or another non-price variable.

Furthermore, calculating average prices paid by product category and linking this over time is reasonably easy. Using this information, the supermarket can build relevant target profiles for new premium brand introductions versus cent-off coupons.

A much more profound effect can be achieved through so-called consideration set marketing. The rather small consideration set (as opposed to rather large awareness set) is the set of products that a shopper might consider nearly equally for inclusion in his or her shopping basket. After going through an evaluation routine of the products in the category, shoppers reduce the possible choices to the consideration set. For example, consideration sets in the packaged goods industry have been shown commonly to consist of two to five products. One reason why marketing in the 'old' economy is so inefficient is precisely because the consideration set of consumers is not known to retail managers. The only thing that is typically known to the vendor is the product the consumer actually chose and bought. When a store knows something about a customer's consideration set it can direct its marketing effort with much more precision. Consider for example two customers who are in the market for a mountain bike (see Figure 3). Both customers have narrowed their choice to a model by TREK, a quality-oriented manufacturer of mass-market bikes. Knowing only the outcome, one would not be able to distinguish the buyers in any way and would treat them as equal. However, their search behaviour is tremendously revealing about the context of their choice. While Consumer A ends up choosing that particular bike because it is a premium brand. Consumer B's choice was that of a value-oriented shopper. The inference is that consumer A's willingness to pay is in all likelihood higher than that of consumer B.

Tracking the information search and browsing path of the two buyers is a by-product of the web. Knowing the choice context via the consideration set allows managers to shed light on their customers' willingness-to-pay! Thus, firms' inability to extract information about willingness-to-pay in the 'old' economy suddenly becomes much less of a problem using consideration set marketing in the online world. Moreover, even without choosing any product, as is the case when people search for information about products, tracking the browsing path yields very valuable information about the consideration set.

4. Condition 3: Limited Arbitrage

The third condition for customized pricing to work is that consumers' ability to arbitrage is limited. That is, a person who bought a product at a lower price should not be able to resell it for a profit to customers who have a higher willingness-to-pay. If this condition does not exist, firms have no incentive to discriminate on price. A cheap airline ticket, however, is loaded with restrictions and made out to a specific person so cannot be resold at a higher price. In many other categories arbitrage is not a problem because the cost is not worth the effort.

While the web does not change the arbitrage criterion, there are some situations in which the internet effectively creates the conditions for potential arbitrage.

□ *For example, the UK electricals retailer Comet has a policy of matching competitors' prices in a given region. The company employs price customization based on geographical location: having a very low price for a washing machine in one region does not prevent it from having a higher price for the same appliance in another region. However, given that consumers typically do not know about the prices in other regions, arbitrage does not present a problem. Given the boundary-less nature of the internet, however, should Comet.com charge the lowest price available across the different regions on the web? Clearly, this is an undesirable strategy.*

Thus, by creating transparency, online environments can actually help destroy existing well-oiled price customization schemes.

5. Condition 4: The Cost of Segmenting and Policing Must Not Exceed Revenue Due to Customization

The fourth criterion that is necessary for an effective price customization scheme is a reasonable cost of implementation. In an 'old' economy context, many potential price customization schemes were undermined for this reason. They were simply too expensive to introduce. Airlines probably have some of the most sophisticated price customization schemes (part of their so-called yield management approach) which cost millions of dollars to implement. They have been highly successful because these schemes lead to higher load-factors and to greater revenues than before. Other industries have only recently followed - the example of Catalina Marketing in the grocery industry has already been mentioned.

Technology, of course, has been a huge help in this regard notably in relation to web businesses.

□ *Take Priceline.com, which allows travellers to name their price for an airline ticket booked at the last minute and get for example a ticket from Houston to Los Angeles for \$290 rather than the \$1,200 full fare. Founder Jay Walker uses complex software that enables major airlines to fill unsold seats at marginal revenues.*

While Internet-based businesses are often seen as creating new pricing pressures for existing organisations, many aspects of Priceline.com's business model are actually attractive for the airlines. The online company, for instance, constitutes an agent through which they can generate additional revenues on seats that would have previously gone unsold. Transactions through Priceline.com, moreover, do not influence those buyers with high willingness-to-pay since a number of serious restrictions are attached to the cheaper tickets. Travellers cannot specify an airline and they must be flexible with respect to departure times and stopovers. The fundamental reason for Priceline.com's success, however, is its ability to keep the transaction between airline and customer a private matter. The company effectively limits the internet's detrimental effects of increased customer transparency, a point I

will develop in the next section. @TheMoment Inc., Catalina Inc., and Priceline.com are all companies that have demonstrated how dynamic pricing schemes have become more feasible thanks to new technology. The removal of this hurdle is on its own likely to inspire a large number of new price customization schemes in future.

6. Condition 5: Notions of Perceived Fairness Must Not Be Violated

The fifth condition that must hold for a customization programme to work concerns the fairness a buyer perceives when he or she is dealing with a vendor. Perceived fairness is when the buyer feels that both parties in a transaction have gained. In the process of buying a used car buyers often perceive unfairness because they lack important information on the car's history in order to make an educated judgment.

Perceived fairness has become a more important issue in the 'new' economy and managers will jeopardise their customized pricing programmes if they do not pay attention to the risks. It is, moreover, a necessary condition for success. Even if the other four conditions have been met the programme will be doomed if the perception of fairness is not there. Much will depend on whether the supply of a good or a service is limited or not. For example, a seat on a particular airline is certainly a perishable item and thus limited in supply. The plane has only x number of seats and once these seats are sold or once the plane takes off, these seats are forever unavailable. On the contrary, a particular mountain bike or a packaged grocery product is in much greater supply. Distribution bottlenecks and production stoppages notwithstanding, these goods are available on an unlimited basis, at least theoretically.

I would suggest that implementing a price customization scheme based on willingness-to-pay becomes much more feasible when a product is limited in supply than when it is not. Remember the case of airline pricing (increasingly the same thing is happening with hotel rooms and rental cars). Travellers have come to accept that passengers sitting in a neighbouring seat may have paid half the price they paid — or perhaps double. We all feel happy when we appear to get a bargain but we do not generally bear a grudge against the airline if the price seems steep. We acknowledge that the prices of individual seats on an aircraft are sold under varying conditions — whereas one ticket booked 21 days in advance with a cancellation penalty may cost \$400, another ticket for the same flight bought seven days in advance with no penalty for cancellation might cost three times as much. It is these restrictions to which a consumer attributes the price differences and, as a result, perceives the price to be fair.

By contrast, consider how Amazon.com charged consumers different prices for exactly the same DVD. The physical product is the same - as is the airline seat. However, the supply of DVDs is unlimited and that's what makes the difference in the eyes of the customer. The knowledge that Amazon sells at different prices provokes resentment and a feeling that the company is profiteering at the consumer's expense. Even though they do not know the details of Amazon's profit margin, they can be pretty confident that the price Amazon pays for a batch of

DVDs does not vary much. Feelings of betrayal may be exaggerated in Amazon's case because of the company's image as a consumer champion. It is not surprising that buyers of Amazon products were angry once the practice of charging different prices for the same DVD became known.

There are still ways of avoiding the downside of differential pricing, even where supplies of a product are plentiful. A key requirement, of course, is to keep the transaction between customer and firm a private matter. Catalina Marketing ensures that rebates for one customer are completely unknown to other buyers. Likewise, only Priceline.com and the airline know how much individual customers have paid for their tickets. In theory Amazon's transactions are only known to the specific shopper and the company but they became public nevertheless, probably as a result of irate shoppers drawing attention to the discrepancy and expressing their opinions online. Most large consumer goods companies get feedback of this kind from at least one website put up by disenfranchised customers (e.g. Starbucked.com and Walmartsurvivor.com). Companies about to embark on price customization schemes should be particularly conscious of the age-old adage in marketing: relationships are built up over time but they can be destroyed in a single transaction.

A second strategy is the separation of offline and online operations as illustrated by BN.com, the online subsidiary of bookseller Barnes & Noble Inc.

□ *The company clearly recognised the dangers of charging differential prices for the same goods and how this could damage existing customer relationships - so when it established the online activity in 1997 it was both legally and operationally independent from the mother. That decision has been greeted sceptically by those who felt it should be cross-promoting and leveraging its brand name, but the decision was entirely prudent from the perspective of not alienating its customers. With BN.com charging lower prices than Barnes & Noble for the same books, there was no option but to split. Doing otherwise might have been to risk perceptions of a lack of fairness and a consequent loss of customers.*

A third response to increased transparency is to engage in product 'versioning', which involves introducing variations on the same underlying product (Shapiro and Varian 1998). Online auctions, such as QXL or Ebay are little more than price customizers which succeed by cashing in on people's different willingness to pay. Perceived fairness is much less of an issue here because virtually no purchase (say of a second hand washing machine) can be replicated as is. It is thus possible to justify varying prices. The fourth approach is to put a time limit on the product's availability or to make it 'perishable'. Discriminatory pricing in these circumstances - practised by the travel industry for decades but potentially possible in other sectors - makes sense.

7. Forms of Dynamic Pricing

I have outlined five general conditions that must be met for the implementation of successful price customization strategies. Based on the degree to which the five conditions are satisfied, firms can consider the implementation of two different versions of dynamic pricing: the weak form and the strong form.

Weak Form of Dynamic Pricing

In the weak form of dynamic pricing, prices do change over time but they do not change between customers. In this case a product market becomes closer to a stock market where the price changes as a function of supply and demand. The earlier example of ticket pricing for Seattle Mariners baseball games fits this category. The fact that prices change over time is publicly stated and customers do know what is happening. Customer animosity is avoided by the fact that all shoppers pay the same price if they purchase at a given time. Thus, the issue of perceived fairness (or the lack thereof) is much easier to deal with. The only perceived unfairness issue that might arise is that shoppers might wonder, 'What would I have paid if I had bought earlier/later?' That is, attribution of fairness in the mind of the buyer might occur along a single dimension. The key issue for companies lies in the technological execution of auction-type or yield management-type solutions and in the compatibility of their products with this approach. As already discussed, products that are limited in supply, perishable, or versioned are best suited for this approach.

Strong Form of Dynamic Pricing

In the strong form of dynamic pricing, prices change over time and between customers. From the consumer's point of view the situation becomes much more random. Amazon.com's DVD pricing experiment fits this category. The fact that prices change is withheld from the consumer and shrouded in secrecy. Animosity is likely to be created if buyers find out about this practice at any given time. Thus the issue of perceived fairness is much more fundamental than it is when the weak form of dynamic pricing is being applied. The attribution of perceived fairness (or the lack thereof) now occurs along two dimensions: prices may change over time and across customers. It becomes a potential double whammy. The key for companies lies again in the technological execution. But more importantly, firms must ask themselves about the significance of durable customer relationships in their particular business. If relationship building is key to the business, then the strong form of dynamic pricing is probably not the right option.

8. Implications

The arrival of price customization schemes has many implications for managers. The following discussion highlights the multi-layered repercussions.

- Internet technology will serve as a great enabling tool for making dynamic pricing accessible to many industries. However, while a technological implementability is a necessary condition it is no justification in and of itself: feasibility does not necessarily mean that it is also beneficial. Amazon can provide lessons on this.
- Price customization is not for every-body. If the bulk of your business depends on repeat transactions with a loyal customer base, you are likely to run into severe difficulties if you want to customize based on willingness-to-pay. Consider instead the numerous other price customization options that are at your disposal (e.g. time based, volume based, segment based, etc).
- Walk before you run. Before implementing a fully-fledged strong price customization scheme, get your (and your customer's) feet wet with the weak version.
- Ask yourself: how easy is it for the customer to find out? If you can't reliably conceal your dynamic pricing policy then you should rather switch to the weak form where everybody knows that prices do change.
- An additional difficulty is that consumers' willingness-to-pay is not fixed. This may change significantly with the same shopper depending on the occasion when he or she is making a purchase. For example, most people once in a while buy a gift for someone else when they are shopping for goods for themselves. In the same vein, information on a customer's willingness-to-pay gets considerably distorted if it is based on pricing information from higher-priced gift items.
- One solution might be to create artificial limits on product availability. If you want to establish dynamic pricing, product differentiation based on limited availability is helpful.

□ *For example, increasingly, firms are selling 'versioned' items or 'limited editions' of the same product. The extreme case is of course the limited edition of one, a selling art perfected by Dell. Every computer it sells is unique because it reflects the unique set of choice options exercised by each buyer.*

When products become unique, they are also hard to compare on pure price terms.

- We will see a dramatic impact of dynamic pricing practice on price comparison engines (for example Bestbookbuys.com, Shopper.com). When price offerings vary by consumer, which price does the search engine pick up? Or - even more interesting - price comparison engines might develop a feature that runs multiple searches per query and yields the absolute lowest price. This would pose a whole new threat to dynamic pricing schemes.

Overall, managing the most advanced form of price customization, the one based on customers' willingness-to-pay, is everything but easy. Managing the tension between the increase in the firm's ability to effectively price customize and the customer's ability to see through these measures is essential. It's certainly not as straightforward as some make-believers suggest and more importantly, it is not for

every situation. The good news is that by applying existing rules from marketing and economics, we can detect and specify the appropriate business contexts for making dynamic and discriminatory pricing schemes work.

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