MENTAL FATIGUE AND CONSUMER CHOICE

EKAM KAUR

Abstract. In this paper, we discuss the relation of mental fatigue and consumer choices – this is how fatigue affects customers' search for products and decisions on which products to buy. It turns out that making many shopping decisions is tiring for customers and this fatigue affects the quality of subsequent decisions. We then look at theoretical utility models which capture this fatigue by incorporating factors like associated product searching costs and taking breaks. Finally, we discuss some strategies which businesses can apply to help these tired customers make better decisions.

1. Introduction

Everyday, consumers have to make tons of decisions from tons of choices, and it is a mentally tiring process. When you add in their prior or existing fatigue, it is often a dreadful process. So in this paper, we look at how does fatigue affects some of these decisions, namely in how consumers decide between the vast set of available products.

It is a known phenomenon that too much choice is in fact bad for customers. Too much choice makes customers overwhelmed and turn away from actually purchasing. The anticipation of having to choose from so many different options is often scary. It turns out that even if customers do decide to purchase from a large set of options, their decisions are likely to be suboptimal for them. This is because looking through a large set of options means making many decisions. Since cognitive resources are limited, making these decisions tend to fatigue customers. This fatigue along with the fatigue customers already carry worsens the quality of future decisions. It also makes

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customers more certain of their feelings and increases one's self-perceived effort put into making the decision. We look into this data later.

So, making many decisions is both bad for customers and they tend to avoid this as well. Customers do this by "procrastinating", meaning they take breaks in between browsing for products. Oftentimes, this means customers entirely leave searching for products and choose the option of no purchase. (We look at this data later.) However, this means that customers can't have many of the products which would benefit them, and overall reduces the quality of their shopping experience. To deal with this, we look at some strategies businesses can use to both increase revenue and make customers more satisfied. This is how businesses can help combat consumer fatigue and aid customers in making better purchasing decisions.

We also move on to looking at the effects of fatigue in terms of utility theory, which is something standard economic theory does not capture. Standard theory assumes that consumers will always be rational and always choose their best option no matter the costs. Of course, this is clearly not true. Customers have limited resources, and there are costs of "choosing the best option". So we try to improve these utility models to cover these behaviors.

2. Choice and Consumers

To begin, we give an overview of choice of products. This refers to choosing among the wide selection of items shoppers have available. Standard economics says that choice is a great thing as it encourages competition and gives buyers the opportunity to choose products most suitable to them. However, much of psychological literature (and personal experience) says that too much choice can be bad. This is the idea that consumers are overwhelmed or fatigued by the innumerable options available and have a hard time choosing which product is best for them; this often makes consumers not buy anything at all. This phenomenon is called choice overload or choice paralysis.

For starters, we look at the famous jam experiment dating back to 2000, which coined the term. Back in 2000, psychologists Iyengar and Leppar set up two different jam display tables. One with 6 kinds of jam and the other with 24. The one with more variety generated much more attention, but did poorly when it came to actual purchases. Specifically, the larger jam stand attracted about 60% of passing customers and smaller one 40%. However, only 3% of those customers purchased jam from the larger one while around 30% did from the smaller one. This really shows the overwhelming effect more choice can have when it comes to analyzing products and making decisions. Consumers also have their own mental fatigue from their personal and professional lives which only makes purchasing decisions more complicated, and sometimes leads consumers to making irrational choices. To see the relation of actual fatigue and shopping decisions, we look at more specific studies later in the paper. This includes how shoppers take frequent breaks and generally try to avoid making decisions.

3. How consumers react: Satisficer vs Maximizer Attitude

So even though there are costs associated with shopping for products (and these costs are similar for most people), customers still have different attitudes toward finding the right items.

A big part of this is how much a customer has a maximizer attitude and how much he has a satisficer attitude. So what does this exactly mean?

A maximizer attitude is always wanting to maximize your utility. This means choosing the best product available no matter the costs. A satisficer attitude on the other hand is just wanting to meet a certain utility goal. This means simply finding a product that is "good enough" to meet your needs.

Customers tend to be some degree of maximizer and some degree of satisficer. However, most people tend to be more on the maximizer side. As one might expect (and

prior studies show), maximizers face more choice paralysis than satisficers. This is simply because choosing the best choice out of all choices is a lot harder than finding a choice that is satisfactory. When the choices are large in number, this paralysis really comes to play.

Next we look at some actual studies of consumer behavior. The studies look at different directions of consumer behavior and tell us different aspects of the relation of fatigue and choice.

4. A Few Studies

In this section, we look at a few different studies which explore very different things, but help us understand the effects of fatigue.

The first study is Ursu et. al (2022) [1] which observes that consumers often take breaks while browsing online and these breaks are largely related to mental fatigue. Specifically, mental fatigue increases the number and the likelihood of taking a searching break. We call these short breaks "search gaps." The experiment in this study looked at the apparel industry, but this should generalize to other industries as well. The study had over 4600 participants and looked at all their browsing history and focused on when they were shopping for apparel. This data collection took place during a 10 week period and all browsing data was collected via a browser extension.

The researchers looked at this data to see how customers were searching the same types of products over their entire search (including breaks). One search session is defined to be a time period of online activity where any inactivity interval is at most 30 minutes. A "spell" is searching sessions a consumer makes while looking for a certain type of product. This is when a customer initially starts searching to when he decides whether or what to buy.

According to the data in the study, more than 40% of its participants took at least 1 break in their spell. Among those who did take a break, these consumers took an

average of 3 breaks. Interestingly, 76% of search spells led to no purchase, while 11% of spells contained exactly 1 item purchased, and 13% contained at least 2. Also, the median length of a search gap was less than 4 days indicating that this was a short "procrastination break". Interestingly, around 90% of participants chose to do other online leisure activities (like social media or checking email) right after taking a search break. Customers spent more time and made more clicks on these leisure websites than on shopping websites. This shows that customers took a break not because they didn't have time to keep browsing, but because they were tired and didn't have the cognitive resources to continue. Customers instead chose to do something less demanding and less fatiguing.

Additionally, since the researchers did not have control over the actual amount of fatigue the consumer was facing, they looked at two possible fatigue proxies. These were consumer demographics and website characteristics. Prior research has shown mental processing declines with age and that older customers tend to make better decisions when faced with fewer options. So we can believe that age positively affects proneness to fatigue. Supporting this, the data did find that age is positively correlated with the number of search gaps. Additionally, customers who visited websites which were slower to load or harder to read (which should lead to more fatigue) had more search gaps.

We may also consider alternative explanations for search gaps and one of these is that consumers were undecided on what to buy. However, we can likely rule this out as more than 70% of customers did not revisit websites, and almost never the same products.

Given all this evidence, we can see that mental fatigue is an important factor in taking search breaks - the more fatigued a customer is, the more likely he is to take a break. Of course, this means that fatigued customers tend to spend more resources (like time and energy) while shopping than they should.

So in total, we can see that shopping is a demanding cognitive task which increases mental exhaustion. This fatigue decreases the motivation to continue searching for products and purchase items which would make the consumer better off. Taking breaks means the customer takes longer to make decisions, which means he uses more cognitive resources in the process. Now the customer gets even more tired and takes even longer to make any subsequent decisions (see Pignatiello et. al 2021 [5]), and this is a vicious cycle.

Next, we look at consumers' reactions after having to make an additional decision while shopping. We do this by considering consumer reaction to the Pay-What-You-Want (PWYW) model from the study conducted by Wang et. al (2022) [2]. In the PWYW model, consumers essentially choose what price they want to pay and this has to be approved by the seller. Note that sometimes this price is allowed to include 0. This model has shown to be attractive to buyers since they get to choose their own price and purchase products for low prices. Of course, the rational customer would choose the lowest price possible but in reality when facing social pressure (like identity or self-image), most customers end up choosing a fair price. But choosing a fair price is an effortful and resource demanding task. So if the perceived cost of this is too high customers may avoid the PWYW model entirely. Prior research has also shown that additional decisions to make cause customers to lose motivation (see Pignatiello et. al 2021 [5]).

When mental fatigue comes into play, this motivation should be even lower as fatigued customers are known to have higher perceived decision costs and make poor decisions (see Pignatiello et. al 2021 [5]). So fatigued customers should be even less inclined to choose their own price and opt for such a model.

To test these hypotheses, the researchers ran different studies with the participants being undergraduate students. The first of these tested whether participants were actually more attracted by a PWYW model than a fixed-price model. As expected,

participants had a significantly higher attitude toward the PWYW model. On the other hand, when asked for their inclination to actually buy a product, the PWYW model had a significant negative effect. This implies that although the PWYW model is attractive at first, it in fact discourages participants from buying products.

The second study tested effects of fatigue. Here, the students were split into groups based on whether they rate their purchase intentions of a product before a fatiguing task or after. This product was also given in both price models, fixed and PWYW. Similar to before, purchase intentions under the PWYW model were lower (at a significant level) than those under the fixed-price model. This effect was much more significant in the high fatigue subgroup. This observation again highlights that fatigue plays a crucial role in consumer inclination to actually buy a product.

To see the effect on actual purchases, the researchers hired people to sell university mascot toys in both pricing models. Additionally, since people tend to get more tired throughout the day, the item was sold in the morning and in the afternoon. As expected, there was a significant negative effect on purchases in the PWYW model than the fixed price model ($p < 0.001$). However, this effect is much stronger later in the day. So fatigue should negatively impact the want to make extra decisions (assuming time of day is a reasonable proxy).

So this pricing model which is shown to be attractive to customers at first, performs quite badly when we consider actual customer purchases. Just having to make one extra decision (to decide the price) overwhelmes the customer. As we see above, this is often the deciding factor in choosing to buy or the choosing the easier no purchase option. When the customer's existing fatigue comes into play, these extra decisions significantly hinder a customer's will to make a purchase further.

We use this study as an analogy to the many decisions a fatigued consumer has to make while browsing for items and finally deciding whether or what to purchase. These decisions include whether to keep searching, stop searching, or purchase a previously

seen product. Each additional decision a customer has to make while looking for products decreases his motivation to continue the process and fatigues him further. In other words, the more decisions a customer has to make, the more likely he is to choose the deferral option.

In fact tired consumers are also more certain of their choices and are hence more likely to make wrong ones. Specifically, they are seen to have higher confidence in their choices and increased self-perception of how much effort they put in.

We look at this phenomenon via the experiments in Wan et. al (2010). In each of these experiments, researchers asked undergraduate students in Hong Kong to complete certain tasks and respond to one short advertisement.

Some students were given a more depleting task and others were given a less depleting task. To ensure this attempt to differentiate the groups was successful, the students in the former group did report higher fatigue than those in the latter group.

In the first experiment, the students were shown a snack advertisement. All students were then asked to report their attitude toward the product as well as their certainty of this attitude from a scale of 1-9. The researchers found that there was no significant difference in the actual attitude between the depleted and non-depleted students ($p > 0.22$). However, there was a significant difference in attitude certainty: the depleted students reported higher values of confidence than non-depleted students ($p < 0.001$). This provides evidence that fatigue doesn't cause customers to feel differently about products but it does affect how confident they are of their feelings. This is important since their confidence ultimately affects their buying decisions. Indeed, when the participants were offered to purchase the product for a relatively cheap price, depleted participants feeling positively about the item were more likely to buy than non-depleted participants feeling the same way ($p < 0.05$). Running further regression analysis, the researchers found evidence that this attitude certainty explains the broader positive correlation between fatigue and purchase.

In a second experiment, participants were similarly split into a depletion group and a non-depletion group, and then given a short advertisement. This time, they were also asked to report how much thought they think they put into analyzing the advertisement. Like the first experiment, there was no difference in the attitude itself and there was a difference in attitude uncertainty. However, depleted participants reported higher levels of perceived thought than non-depleted participants. This hints that depletion increases one's perceived elaboration, which increases attitude certainty. Indeed, there has been much evidence of this in prior literature. However, these experiments also dismiss the idea that depleted customers may be more confused and hence less certain of their feelings.

To check whether depleted participants weren't actually putting more effort than non-depleted participants, the researchers conducted one last experiment. They tried to directly manipulate the participants' beliefs about depletion and self-perceived effort. They told one group that depletion increases self-perceived effort, and the other group the opposite. This manipulation happened after the participants had processed the ad. They did indeed find that depleted participants in the first group reported higher confidence in attitude and depleted participants in the second group reported lower levels. Similarly, non-depleted participants in the first group reported lower levels of certainty and higher levels in the second group. Since this direct manipulation was able to affect the beliefs of the students, and the students reported similar values of other variables, the earlier findings are backed by more evidence.

This study is useful to us as it again shows that making many decisions can be bad for us. Making decisions over a long period of time has shown to increase fatigue, and this fatigue again worsens the quality of future decisions. This fatigue causes higher confidence in our choices and can lead us to making the wrong decisions (the ones that make us worse off). Fatigued customers should also be more easily convinced of false information because of this greater confidence in attitude. In fact, this should also

mean that tired customers are more likely to turn against their own beliefs. Altogether, since cognitive resources are limited, customers should avoid making a large number of decisions while shopping.

In summary, these studies show that fatigue negatively impacts consumers' shopping experience and more generally, decision making.

The three studies explore different things but all show that making a large number of decisions (which is a result of large choice) is something that customers avoid and should avoid. Decision making is a demanding task and quickly fatigues customers. On the other hand, fatigue also increases the costs of every subsequent decision and increases the likelihood of procrastinating. As we have seen, fatigue also makes customers more certain of their attitudes and thus increases the chance of making bad decisions. These studies are also consistent with prior literature (see Miller 1956 [6]) stating that customers can properly analyze no more than 5-9 products at a time.

5. Looking at Fatigue via Utility Theory

Next, we look at theoretical models considering these findings through the lens of utility theory. Also, the search models we consider are sequential, meaning that customers search for products in a sequence.

First, we define some terms from utility theory that we will use throughout this section.

Definitions from standard theory:

- Domain: the set of all alternatives. This means all the choices a customer could make.
- Menu: the set of all possible choices a customer could make - ex: which product to buy, or not buy at all. Note: this is a subset of the domain.
- Utility function: denoted as $U(a)$ and is the numerical benefit placed on choice a.

- Choice function: denoted as $C(M)$ and is the set of choices the customer is observed (or tends to) to make.

Important note: as a reasonable measure of utility, we define it as the satisfaction gained from an item.

Now standard utility theory does not consider fatigue or search costs and assumes the customer has a pure maximizer attitude. This means that the customer is willing to look through and properly analyze the entire menu of products and then choose his best option no matter how long the menu is. The number of decisions to make or the customer's attitude towards making a purchase is not considered.

Formally speaking, this means that the customer will always choose the choice function

$$C(M) = \operatorname*{argmax}_{a \in M} U(a).$$

In other words, this is the choice in the menu M with the highest utility given the customer's utility function.

We also define the value of a menu M as

$$V(M) = \max_{a \in M} U(a).$$

This is the maximum utility an item has in the menu.

Now notice how this implies that larger menus are always better. Since we just take the item providing maximum utility, browsing more items will make us at least as much better off. This model has no penalty for the large number of items a customer must process.

Standard theory simply defines "deferral" as choosing to buy nothing when the items in a menu do not meet a certain utility goal - ie. that no product on the menu is satisfactory enough to be worth purchasing. Now if for a small menu, there is an item worth buying, then this implies that if we keep looking for products, there will still be

an item worth buying. So if we don't use the deferral option for small menus, we also don't use the deferral option for large menus. Clearly, as we have seen, this is false: the more items to process, the more likely it is that the customer's fatigue gets in the way, and leads them to deferring.

Thus, better utility models must somewhat penalize larger menus, say by having some kind of (small) discount factor for every subsequent item one has to process. These models also must define the option of deferral differently considering the fact that consumers may choose to defer simply because they are overwhelmed.

We have also seen that tired customers are more certain in their decisions and believe that they have spent more thought making them than they actually have. This leads to lower quality decisions and often making the wrong choices. Analyzing menus requires cognitive resources and hence increases fatigue. This should mean that as a customer browses through a large menu, his quality of decision (perceived utility of an item) decreases. This is another reason why large menus should in fact be penalized.

Now all the reasons we mention above are related to fatigue which is a big cost associated with browsing large menus. Other costs, include the actual time spent browsing, the resources spent, as well as the opportunity cost to do other things. In the basic model Blashek and Noor (2020) [4] propose, this cost $K(n)$, where n is the size of the menu, is linear in n. Namely, this is $K(n) = c \cdot n$ for some constant c.

This implies every decision should have a constant cost. More specifically, it should have a constant time spent, energy used, and the opportunity cost of not doing something else. Given the prior research we have looked at, this should not be true. Namely, the time and energy spent for every decision made (or item processed) should slightly increase. Say the time to process the first item has cost c (this is the baseline cost). Then we can say the next item should have cost $c + k$ for some tiny k. For example, k could be 0.0001. The third item should have cost $c + 2k$ and so forth. In general, then i^{th} item should have cost $c + (i - 1)k$.

So for a menu with n items, the total cost is

$$K(n) = \sum_{i=1}^{n} (c + (i-1)k) = \frac{k}{2}n^2 + \left(c - \frac{k}{2}\right) n.$$

We can change the variables and simply say

$$K(n) = an^2 + bn.$$

for some constants a and b. In other words, $K(n)$ is quadratic in n.

In reality, the k (additional time spent per product) will not be constant. There are many other psychological behaviors affecting how long one takes to make a decision. However, the above representation still gives us a good idea of what the costs might approximate.

Of course, we can be more precise and consider larger degree polynomials as well. For example, if we model the cost of the i^{th} item as a quadratic in i, then the total cost will have degree 3.

Another possibility is to think of the cost as penalizing for every subsequent decision made. This means that if the first item has cost c, then the next item should have cost $c \cdot k$ where k is slightly greater than 1 (say, $k = 1.0001$). In general the i^{th} item should have cost $c \cdot k^{i-1}$ For a menu with n items, the total cost should be the sum of a geometric series, namely,

$$K(n) = \sum_{i=1}^{n} ck^{i-1} = c \cdot \frac{k^n - 1}{k - 1}.$$

As n grows large this cost blows up, and makes the choice of browsing is not worth it.

In general, the exact way we define the cost or the constants we use are not that important, and we just denote it as $K(n)$.

Now when is cost considered too high? This should be when the expected total utility a customer gains from a search is less than the expected cost. When this cost is too high, a customer can either take a short break or decide to not shop at all.

So how exactly do we define a customers expected utility from shopping? First, recall that a utility function U is the numerical utility a customer places on each of the choices available. A customer's true utility function is the true valuation a customer has of each item.

On a given day, the utility function a customer uses while shopping might not be his true utility function. This is due to many reasons. First as we have seen, the more decisions a customer makes, the quality of each decisions decreases. This means that as a customer analyzes more items, the likelihood of placing wrong utility on each subsequent item increases. So the utility placed on later items browsed is likely to be incorrect. Existing fatigue also causes customers to wrongly assess their utility. There are many other psychological reasons as well. For example, since customers search products in a sequence, if the most recent items a customer browses are particularly terrible, then the likelihood of placing a higher utility on the next item increases. So in reality, the utility function a customer uses should deviate from his true one.

So the utility function should in fact be sampled from some distribution D. This distribution should consider the factors we listed above. We can say that the expected utility function (the expected sampled utility of each product) is the mean of this distribution. Call this function F. Since the customer is somewhat rational (he chooses his best choice), the expected utility from browsing should be the maximum value F attains. Namely,

$$\text{Expected utility} = \max_{a \in M} F(a).$$

So for a menu M with n items, we might say that a customer should search only if the expected utility is greater than the expected cost. In other words,

$$\text{Initial Choice} = \begin{cases} \text{search} & \text{if } \max_{a \in M} F(a) - K(n) > 0 \\ \text{don't search} & \text{otherwise} \end{cases}.$$

However, this requires that if a customers wants to search, he will have to search the entire menu (to ensure he can get the maximum utility item). This is against our initial goal. In fact, this model does not at all consider breaks or the option of stopping entirely. Additionally, this model does not explicitly include motivation or fatigue over time. For example, a customer could start his search with a lot of motivation, look through say 30 items, become tired, and then choose to purchase the best out of those 30. So instead, we need reassess options after every item.

Specifically, it should incorporate the following factors.

- How much a customer is a satisficer and how much he is a maximizer after every item
- Motivation and fatigue after every item
- Whether the customer should take a break or even stop his search entirely.

First, after every item, a customer needs to decide whether he wants to continue searching, take a break, or stop. The customer should choose the option providing the highest expected benefit.

How could we calculate the benefit of searching? First, say that we have looked through i items so far. We can consider the utility of the next $i + 1^{\text{st}}$ item to be sampled from the distribution D, we discussed earlier. Denote this utility as u_{i+1}. (The first item has utility i_0) We also have a cost associated with analyzing the item. Let this be denoted as k_{i+1}.

Now we also need to consider the motivation and fatigue the customer at this point in time (after analyzing i items). We let these be variables and denote them as m_i and f_i, respectively. Additionally, we should consider the customer's attitude, meaning how

much he is a satisficer and how much he is a maximizer. We let these two be variables as well, and denote them as s_i and mx_i, respectively. Note that s_i and mx_i will likely depend (at least somewhat) on the customer's attitude toward the previous items.

Now without the additional factors we introduced above, we could say that the benefit associated with searching is $u_{i+1} - k_{i+1}$. Incorporating the above factors, one possible model is to say

$$\text{benefit of searching} = m_i \frac{mx_i}{s_i} \cdot u_{i+1} - f_i \cdot k_{i+1}.$$

We propose this because of the following. First, having more motivation means a customer holds a greater for the utility. Having more fatigue, on the other hand, means that a customer has greater value for the associated costs. Additionally, a more maximizing attitude also exaggerates utility while a more satisficing attitude weakens undermines its value. Of course, for this model to make some sense, the ranges for all variables need to appropriately defined. The values of satisficer and maximizer levels should be smaller since we take the ratio of the two (which adds a lot of variability). We may also place constants in front of both terms (utility and cost) as needed.

Next, we move on to the option of taking a break. After taking a break, we should expect a customer's fatigue levels to significantly decrease and motivation to increase. So we let the new fatigue and motivation levels of taking a break after the i^{th} item be denoted as $f_{i,\text{new}}$ and $m_{i,\text{new}}$, respectively. We could also say that the fatigue should be minimal, and therefore omit the variable entirely. However, we choose to keep it anyway.

Customers still retain prior information and feelings after a break, so we can assume that the maximizer and satisficer levels are the same as before. (Namely, they are still mx_i and s_i.) Additionally, we consider the cost to be "reset" back to the baseline level c.

So the value of taking a break can be written as

$$m_{i,\text{new}} \frac{mx_i}{s_i} \cdot u_{i+1} - f_{i,\text{new}} \cdot c.$$

There may be some additional benefit of taking a break as well. For example, customers might get an instant comfort of relaxation after leaving the demanding task of searching. We denote this additional benefit as b_i.

Additionally, taking a break means taking longer time to make a purchasing decision. As we have seen, this reduces the quality of the decision. So as a penalty, we multiply the utility of this option by some discount factor β.

Taking both these into account, we have

$$\text{benefit of taking a break} = \beta \left(m_{i,\text{new}} \frac{mx_i}{s_i} \cdot u_{i+1} - f_{i,\text{new}} \cdot c + b_i \right).$$

Lastly, there is also an option of stopping the search. This simply means choosing the item providing highest utility the customer has previously browsed. So after looking at i items, we have

$$\text{utility of stopping} = \max_{t=1}^{i} F(a_t),$$

where $a_1, \ldots, a_i$ denote the i items.

Note that there are no costs or other variables needed in this option.

Now out of the three options we choose the one providing most benefit (which we computed above). The utility (or value) we get from making a choice is the maximum of the three quantities above. Namely, the value after looking through i items is

$$V_i = \max\{\text{continue, take a break, stop}\}.$$

This model meets our goal of incorporating fatigue and breaks. It also allows us to reassess our options after every item we analyze.

6. Better Business Strategies

Next, we consider fatigue from the view of businesses. Specifically, we discuss some business strategies that have shown to help with fatigue.

Our main point throughout the previous sections was that customers don't like making many decisions (and it's also bad for them). So businesses must make decision making as simple as possible for customers. Indeed, this is what the surveys conducted by Corporate Executive Board (which had over 7000 consumers) found. The surveys looked over 40 different variables that could affect customers' purchase decisions (including price, reputation, consumers' perception) and found that decision simplicity was by far the key. In fact, the surveys found that a 20% increase in decision simplicity results in a 86% increase in purchase likelihood and 96% increase in customer loyalty. So a large part of selling a pleasant experience comes from the efficiency and simplicity of it.

Now simple decision making includes how efficiently customers can get trustworthy information about products and how easily they can choose/compare different products. It also includes how easily customers can navigate through products, make (repeated) purchases, and so on.

First, we look at simplifying decision making by reducing choice overload. As we have seen, this means reducing the choice available so the customer does not feel overwhelmed and has an easier time choosing. The idea is that customers should not have to make endless comparisons between (possibly irrelevant) products, and instead businesses handle this for them. They do this by keeping the best and quality products only. So a business should be able to clearly answer why they are selling something. A popular example of this was when Procter & Gamble reduced their Head and Shoulders collection from 26 choices to 15, sales on these shampoos went up by 10%. Additionally, when Golden Cat cut out their 10 worst performing cat litters, their profits boosted by 87%. So often cutting out the bottom few products makes customers happier and

businesses more profitable. Prior research indicates that this number is around the bottom 10-30% of stock. Of course, this is a win for businesses as well because they don't have to offer so many different products. However, as we saw earlier, less choice is not particularly attractive to customers at first. Hence, building customer trust and a strong consumer base is important. This trust also lets businesses keep less selection since customers have confidence that the business will only keep quality products.

That being said, variety is still important and more specifically, offering the right choice of products is key. This means offering enough to satisfy your target audience but make comparison between different choices easy. Customers should easily be able to tell the difference between similar looking products, and these differences should be clearly communicated. Popular ways of doing this include side-by-side comparison charts and listing pros/cons of different options. Again, the key is to display only relevant information to keep the decision making process simple. It is also crucial group items by category and be able to filter products based on the customer's exact preferences. (Again, the categories or filtered results should not be overwhelming).

Offering these conveniences (like product comparisons) is useful but often not enough. For example, even with a full comparison chart, decision making is still tough. This is a because a customer still has to decide which features are most important and go through them. Even more, the customer is still not able to narrow down to one choice. Instead, tools that allow customers to weigh different features are much more helpful. Examples include product guides and asking customer specific questions about their needs. Such tools help understand the customer's preferences and narrow down to what is most suitable.

Another effective strategy is to personalize customers' purchasing paths. This means, for customers who are just beginning their search, businesses should help them get more (transparent) information to learn about the products and decide which best suits their needs. For customers who are further in their search, it is helpful to provide

them with specific recommendations based on their preferences. Having the "right" set of personal recommendations is really useful in helping a confused customer be more confident in his choice. It is worth mentioning that the number of personal recommendations should be small, say 4-5. Tired customers should be able to between the recommendations without difficulty. Prior search has shown that customers can analyze about 5-9 products at a time (see Miller 1956 [6]). We choose the lower end of this range since customers anticipate more options to look through later and don't want to spend so much energy right away.

Apart from reducing the number of decisions customers have to make, it is also important to market properly. First, messages should be relevant. According to the 2023 Optimove survey (which had 450 consumers), 62% of consumers said that relevancy was the number one factor in opening an email. Most customers are willing to spend at least some time analyzing relevant messages, so it is important that businesses send customers only what they want. Hence, it is definitely useful to ask customers their preferences and tailor personalized content accordingly.

Messages should also be clear and straight to the point so fatigued customers can easily process them. Attention spans can be as short as 8 seconds, and even less for tired customers. According to the Optimove survey, 66% of consumers said they wanted fewer marketing messages and 27% said they felt they were bombarded by them. So it is really important for businesses to keep their messages simple and not overwhelm customers.

For example, in email messages, it might be better to present just one offer instead of multiple. This way customers better (and fully) understand what they are getting and save making a few comparisons. This makes customers more confident of their purchase and assures them that they are getting a quality deal. Keeping such messages short and simple also makes customers look forward to them.

Additional factors like time of day are important as well. Customers are more likely to process advertising in the morning when they are less fatigued, rather than later in the day.

7. Conclusion

So in this paper, we looked at how fatigue effects consumers' choosing and purchasing decisions. First, even though more choice seems to be attracting at first, it is overwhelming for customers when it comes to making actual purchases. Customers instead find the option of "not choosing" easier.

We discussed how this is related to decision making in general, that customers tend to avoid decisions whenever possible. This is because making many decisions requires the input of limited cognitive resources, and hence increases fatigue. This fatigue then takes a toll on subsequent decisions by reducing their quality and requiring more resources. We also saw that making many decisions increases customers' self-perceived thought and makes them more certain of their choices. This often leads to wrong decisions. So in fact, making decisions is something that customers do avoid and often should avoid as well.

The main studies we looked at explored different things but all showed customers tend to procrastinate and defer decision making whenever they can. Particularly, we saw that customers tend to take frequent breaks when browsing and mental fatigue a large driving factor of this. This also means that customers spend more resources searching for products than they need to. In the study of the PWYW model, we saw how costly customers think making one extra decision (having to decide the price) is. It can be so overwhelming that customers want to avoid the pricing model entirely (even though they found it attractive at first).

As we saw, the standard utility model assumes that customers will always choose the best option on the menu no matter how large or complicated the menu is. The problem

with this is that there are costs with making decisions (like fatigue, resources used, time spent) and these need to be considered as well. We add on to the standard utility model by accounting accounting for some of these costs. Firstly, we penalize large menus by assigning them high costs (so this option is often not worth it). Additionally, we give customers the option of taking a short break. We also incorporate variables like fatigue, motivation, and consumer attitude. Moreover, the variables and choices are reassessed and recomputed after analyzing each item.

Finally, we looked at some general business strategies to help customers reduce fatigue and feel more at ease. The key ideas here were to simplify decision making as much as possible and market properly to not overwhelm the customer. Examples of these strategies include personalizing a purchasing path and offering specific product guides.

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