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A research review of decision biases relevant to the product development process

A thesis submitted in partial satisfaction of the requirements for the degree of Master
of Science

in

Management

by

Jessica Outlaw

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Professor Wendy Liu, Chair
Professor On Amir
Professor Karsten Hansen

2014

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University of California, San Diego

2014

DEDICATION

I dedicate this thesis to my family and friends.

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ABSTRACT OF THE THESIS

A research review of decision biases relevant to the product development process

by

Jessica Outlaw

Master of Science in Management

University of California, San Diego, 2014

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The goal of user-centered design is to match product features with the needs and capabilities of individuals. While much has been written about the role of empathy in allowing product designers to understand their customers' needs and capabilities, empathy gives an incomplete perspective on the product design process. Empathy alone does not address systemic decision biases of consumers, partly because designers are subject to many of the same biases. The current work addresses this gap

in product designer and consumer perspectives using behavioral decision theory. Behavioral decision theory (BDT) is the descriptive study of human choice behavior. There an opportunity to enhance designer understanding of consumer decision processes by integrating BDT into the product development process. The contribution of the current work is two-fold. First, I present relevant biases in the product development cycle from the perspective of designers. The second part is a research review of important consumer decision research on the construction of preferences and cognitive effort. I propose that BDT can be integrated into product development to enhance the consumer experience by using reference dependence, choice architecture, and cognitive effort as design tools. The limited scope of the current work does not allow for a comprehensive review of all applicable decision biases, it is intended to raise awareness about some of the most relevant decision biases to product designers.

Chapter 1

Introduction

Flawed design has been blamed for accidents such as the 1978 Three-Mile Island oil spill (Norman, 7), the Air France crash that killed 228 passengers in 2009 (Wilson 2012) and patient deaths from radiation overdoses (Bogdanich 2010). In part due to these high-profile disasters, user-design has flourished. User-centered design is defined as matching the product design to the needs and the capabilities of users (Norman, 9). Designers strive to bring deep insights about user needs, wants, capabilities, and decisions into the product's development process. Identifying customer needs is an important element in the process and can include interviews, focus groups, or observing customers using prototypes (Ulrich and Eppinger, 56-57). Designers can use to refine the product using the implicit and explicit customer feedback.

In *Wired to Care: How Companies Prosper When They Create Widespread Empathy*, Patnaik claims that product success depends product designers being capable of empathizing with their product's users (2009). While empathy is important in understanding consumer pain and subsequent needs, it is an incomplete perspective on the product design process. It does not address systemic decision biases of consumers, partly because designers are subject to many of the same biases.

There an opportunity to enhance designer understanding of consumer decision processes by integrating behavioral decision theory into the product development process. Behavioral decision theory (BDT) is the descriptive study of human choice behavior (Takemura 2014) and has been used in large-scale behavior

change. Examples include increased voting participation by framing it as personal identity (i.e., being a voter) versus a behavior (voting) (Bryan, Walton, Rogers & Dweck 2011) and greater income tax compliance rates when people are reminded of the social norm of their peers paying on time (Hallsworth, List and Metcalfe 2014). Secondly, BDT has illuminated systematic discrepancies in consumer preferences. Integrating BDT into the product development process will enhance consumer experience of goods and increase market adoption.

Scope of the current work

The current work presents a research review of decision biases that have been explored in BDT that are relevant to consumer-facing product design. Consumer products, such as mobile phones, clothes, or cars are unique in that people tend to form emotional attachments to them, and have a high sense of control. Secondly, ownership of these products can influence a person's own identity and be used to send signals to the people around them (Warde 1994). The intended audience of the research within is people working in the product development process. I use the term "designer" throughout as a blanket label for anyone involved in the product development process.

The goal of the current work is to introduce a new perspective on decision-making as it relates to product development to an industry audience. It is applicable for designers who are creating an innovative product with no predicate, versioning an existing product that their company sells, or trying to break into a competitive landscape with a "me-too" product.

The contribution of the current work is two-fold. First, I present relevant biases in the product development cycle from the perspective of designers. The second part is a research review of important consumer decision research on the construction of preferences and cognitive effort. I propose that BDT can be integrated into product development to enhance the consumer experience by using reference dependence, choice architecture, and cognitive effort as design tools. I examine those elements of BDT given their importance in product design. The limited scope of the current work does not allow for a comprehensive review of all applicable decision biases. I discuss the implications of decision biases in product development.

Features of Good Decision Makers

Since designers are just as human as the consumers they are serving, it is valuable to be aware of the decision biases to which we are all susceptible. I am discussing the following biases because I believe they are among the most relevant for those involved in product design.

Design for the Future, Not for the Past

“The portable music market is gone and it was already leaving when we started.”

Robbie Bach, former Microsoft Executive on the Zune

The Zune, the failed Microsoft MP3 player, was an inferior competitor to the Apple iPod (Rosoff 2012). In hindsight, Robbie Bach, the executive who led development of the Zune wishes he had spent Microsoft resources making a great music service for mobile phones instead. The Zune is an example of a product

created to copy an existing item in the marketplace, but the marketplace was changing too rapidly for it to create a foothold for itself.

The broad availability of data on consumer website visits or buying patterns can lead designers to believe that they have a full understanding of consumer behavior and their ability to predict product success. However, retrospective data has limited use in predicting future behavior. Microsoft focused on how successful the Apple iPod had been to date instead of recognizing the changing landscape of digital music.

Reviewing data about consumers and competitors post-hoc poses a risk of confirmation bias. Confirmation bias is the tendency to prefer or seek out information that supports existing beliefs. Designers should strive to have a perspective that allows for dis-confirmatory information to influence their work. The large amounts of consumer data available make it easy for designers to cherry pick for information that only confirms their existing beliefs instead of challenging them. However, it can propel incorrect or incomplete notions of consumer needs forward.

Review Failures and Successes

Survivorship bias, the logical error of only evaluating successful projects (e.g., those that survived to the end), rather than all projects leads to a skewed understanding of what makes a successful project. If a company is going to review all of the competitor products on the market, it is limited because it does not have access to all of the failed products that were cut in development and never launched. Some companies, such as BP conduct “post-project appraisals” of both successful and unsuccessful projects to learn how to improve company performance (Gulliver

1987). Such a systematic approach to reviewing failures and successes is useful because it considers all projects, not just the most recent projects, nor the most available projects in memory.

Beware of Unfettered Optimism

The failure rate of new products is 50%, and even higher for products classified as innovative (Gourville 3). While optimism can be a positive force that motivates designers to persist past obstacles, it can also lead people to overlook flaws in design. It is important to pause and ask if your optimism is supported by the quality and type of information around you. Ask yourself if there is disconfirming evidence that challenges your optimism.

One method for bringing up, and hopefully addressing, project weaknesses is called the “Project Pre-mortem.” The project team is assembled and asked to imagine that the project has failed, and the group is asked to come up with reasons why. The purpose of the Pre-mortem is to create a list of plausible reasons why the project went astray and subsequently what could be done to correct it (Klein 18). This Pre-mortem reigns in optimism and has been hailed for undermining groupthink and leading to creative problem solving to addressing the issues raised (Kahneman 265). It is a specific form of gathering information that does not already confirm your existing beliefs.

Planning Fallacy

The planners of the Sydney Opera House estimated a \$7MM budget and a six year time horizon. In reality, it cost \$102MM and took 16 years (“Sydney Opera House,” 2014). The planning fallacy is derived from the observation that when

individuals estimate when projects will be completed, they tend to be overly optimistic. Specifically, they rely on the best-case scenario (Kahneman and Tversky 1979) for the current project instead of considering how long or how much similar projects were in the past. Examples of projects that have gone over budget or beyond time estimates abound in product development circles. A software industry survey found that 71% of projects were over budget or late; the projects that had cost overruns were over by an average of 43% (Standish Group 2004).

There are effective measures to counter the planning fallacy. The general advice is to take the perspective of someone who is not familiar with the details of the project. It is the details and specificities known to the estimator that lead to greater optimism (Buehler, Griffin and Ross 2002). Beyond taking the perspective of an outsider, speak to an actual project outsider who completed a similar project and ask how long and how much it was.

Don't Look for Patterns that Aren't There

The 1976 discovery of a rock formation on Mars that was shaped like a human face served as proof of intelligent life on the planet. Subsequent, higher resolution photos taken by NASA showed the rock formation to be as abstract as most other canyons in the same Cydonia region of Mars (Lidwell, Holden and Butler 121). People have a tendency to find order and meaning in the stimuli around them. Yet, it does not mean that there is one consistent narrative that explains the pattern observed.

“Chance is lumpy,” is the first law of statistics (Ableson 1995). It means that patterns can often be explained by chance or random processes. Ableson notes,

“Attributing a data set to mere chance is deflating” (21). To avoid feeling deflated, individuals tend to look for explanations of variability in data without fully acknowledging that small samples contain tremendous variability. Secondly, large samples contain so many variables that it would be surprising if significant correlations were not identified among them. To help rule out chance as an explanation for patterns, designers should strive to replicate their findings through experimentation whenever possible.

The Curse of Knowledge

Product designers are experts in their field, which makes them capable of pushing the boundaries of what is possible. The downside of such expertise is that designers may fall prey to “the curse of knowledge.” It represents our diminished ability to remember what it is like to be a novice after we are experts. One psychology experiment demonstrated the curse of knowledge by assigning participants to be “tappers” or “listeners” (Heath and Heath 2006). Tappers were asked to tap out the rhythm of a well-known song (e.g., “Happy Birthday”) on a table, and listeners guessed what the song was. There was a vast asymmetry between how well the tappers thought the listeners could identify the song and how well the listeners actually did. Tappers estimated that listeners could guess the song correctly half of the time (50%). However, listeners corrected guessed correctly once every 40 songs (2.5%). The tappers of the songs hear the rhythm so clearly as they are tapping that it is very difficult for them to comprehend the task from the listeners’ perspective.

As the psychology study above demonstrates, after “we are given knowledge,

it is impossible to imagine what it's like to LACK that knowledge” (Heath and Heath 2007). Think of a large remote control with many buttons on it. The person who created the remote control can say how each button is used. Does she imagine that novice consumers can do the same? What are the implications of her beliefs about consumers in her design?

Summary

The previous section has been addressed to designers on what decision biases they should monitor for internally. It is not a comprehensive review of human decision biases, but it is the basis of understanding common biases that product designers have or may encounter. By taking a future oriented view, checking optimism using an outsider perspective or conducting “Project Pre-mortems,” and testing multiple explanations, product development can be improved.

Whereas the previous section has been addressed to designer biases, the following describes decision processes that consumers employ. By incorporating the consumers’ approach to decision-making into product design, products can be more satisfying to use and enjoy better market adoption.

Consumer Decision Processes

The theme of the decision research presented below is two-fold. Firstly, consumers are actively constructing their preferences at the time they come to decision points. That is, individuals do not possess strong, inherent preferences for many choices, but construct them depending on the situation (Bettman, Luce and Payne 1998). Secondly, cognitive effort is an important variable that influences

decision outcomes. Individuals tend to be cognitive misers (Allport 1954). As such, consumers strategically trade off cognitive effort and decision accuracy in order to minimize the cost to themselves and maximize their gains. I begin with an overview of preference construction and introduce reference dependence and choice architecture. Afterwards, I discuss cognitive effort and its importance in decision-making. I chose these topics because of their relevance to product design; having an understanding how they impact decision-making can directly influence the framing or content of choices in a consumer-product interaction.

Preference Construction

For many choices, individuals construct their preferences at the time of their decision, rather than drawing from strong, inherent preferences (Bettman, Luce and Payne 1998). Actively constructed preferences can be systematically reversed once the decision context changes, even if the choice options remain the same. There are three main elements of preference construction (Dhar and Gorlin 2013). First is how the question is being asked (task effects). Second is how the options are described (framing effects). Lastly, is how the options are presented (context effects). A comprehensive discussion of each of these effects is outside of the scope of the current paper. See Payne, Bettman and Johnson (1992), Bettman, Luce and Payne (1998), Amir and Levav (2008) for further reading.

A study from the literature on product recommendations illustrates preference construction in a consumer product domain. Study participants provided a list of their favorite music CDs to the study coordinator (Cooke, Sujjan, Sujjan and Weitz

2002). Next, they were given music recommendations that were designed to contain items from their preferred list plus new, unfamiliar music. Subjects were randomized to either obtain item-specific details about the unfamiliar music, or not, and then asked to rate their likelihood to purchase the new music. The results showed that when participants had less information about the unfamiliar music, they rated it more favorably. More information lowered subject evaluations and led them to ignore the favorable context the new music was presented in. The lesson for designers is to discover if their product will be considered next to items known to be attractive to the consumer. Designers should use that answer to help decide how many details to give about their own product.

Reference Dependence

Consumers do not evaluate their choices in isolation. Instead, they consider their options in contrast to their reference point at the time of the decision. Changes in reference point will be encoded as either gains or losses. This is an important concept because it indicates that a consumers' well-being is a relative instead of an absolute measure. Stated differently, changes to their well-being will be considered only in the context of their current reference point. Reference points have been studied in consumer decision-making and two interesting principles have emerged, loss aversion and diminishing sensitivity (Kahneman and Tversky 1979).

Loss aversion predicts that losses loom larger than gains. In other words, losses have a stronger impact than equivalent gains. In order for an individual to accept a chance gamble of losing \$100, they will have to be offered \$200 on average

(Tversky and Kahneman 1991). Loss aversion suggests an explanation for why the QWERTY keyboard, an inferior product to the Dvorak keyboard, maintains its market dominance. The key layout on the Dvorak keyboard allows for a 30% typing speed increase with fewer errors and stress injuries than a QWERTY keyboard (Lidwell et al. 151). Despite the advantages of the Dvorak keyboard, experienced QWERTY typists have proven unwilling to spend the 100 hours needed to train as Dvorak typists (“Dvorak Simplified Keyboard,” 2014). Switching does not necessarily incur any monetary cost since most QWERTY keyboards can be reprogrammed as Dvorak. The loss of 100 hours of efficient typing time, plus a loss of feeling competent as a typist have been used to explain why the conversion rate to Dvorak is so low. QWERTY typists prefer their existing layout and do not switch despite the performance gains from the Dvorak keyboard.

Risky gambles and QWERTY keyboards are not isolated cases of losses feeling stronger than gains. Researchers have shown that humans generally feel “bads” more strongly than “goods” (Baumeister, Bratslavsky, Finkenauer and Vohs 2001). The origin of bads/losses and goods/gains feeling different has been explained as being evolutionarily adaptive to our ancestors, meaning that humans who were better at responding to threats (vs. positive opportunities) were better able to survive. Baumeister et al. established that the strength of bad impressions, bad social interactions, bad feedback, and even bad parenting outweighed good counterparts (2001). A second finding was that people were more motivated to change from a bad to a neutral state than they were from a neutral to a good state. One lesson for product designers is that people may be more motivated to adopt

products that help them move out of a negative state (versus into a positive state).

In the product development realm, losses looming larger than gains is an argument against promising features to customers that you cannot deliver. Sometimes product attributes will be leaked to customers to generate interest in a new product. However, firms should be cautious about building customer interest in features that never materialize. From the perspective of the end consumer, having been promised a feature that is later removed will feel worse than receiving it, or never having considered it an option. This advice may be especially relevant for designers raising money on crowd-funding platforms like Kickstarter where individuals pledge money in advance of product development (“Oculus Rift,” 2012). For products already in the marketplace that are being modified, designers may choose to give advance notice of changes that consumers could feel as a loss and encourage them to adopt new patterns of product use.

The second principle of reference dependence is diminishing sensitivity, which means that the impact of both gains and losses decreases as their sizes increases. The magnitude of a change of \$100 is large in the context of doubling your assets from \$100 to \$200. However, the same size increase from \$900 to \$1,000 is less impactful (Kahneman, 282). In other words, consumers make judgments based on relative instead of absolute changes. Diminishing sensitivity is relevant to designers who are considering which features to include in their products and the principle should be used to focus attention on the attributes that are most important to include, not the features that would be nice to have.

Diminishing sensitivity offers a strong argument against feature creep, or the

ongoing scope expansion of a product's capabilities. Many designers are familiar with the Pareto Principle, also known as the 80/20 Rule. It is the idea that 20% of features drive 80% of product use (Lidwell et al., 12). The Pareto Principle predicts that many of the features that designers spend hours creating on the behalf of the consumer will go unused. Besides the wasted efforts of the designers, research in BDT has examined how too many product features can decrease customer satisfaction. "Feature fatigue" is perpetuated when consumers purchase complicated gadgets, but then feel overwhelmed by the products' complexity (Thompson, Hamilton and Rust 2005). A balance between functionality and ease-of-use is necessary. The principle of diminishing sensitivity suggests that the best use of a designer's time is improving the usability of the product's core features rather than developing interesting side attributes.

Reference Dependence and the Kano Model

The impact of reference dependence in consumer products can be understood through the lens of the Kano model of product development and consumer satisfaction. The Kano model divides product features into satisfiers (gains) and dissatisfiers (losses), among other dimensions (Vargo, Nagao, He and Morgan 2007). The principle of loss aversion predicts that consumers will react more strongly to product features they dislike (dissatisfiers) rather than ones that they like (satisfiers). Another note is that features in the Kano model can change from satisfiers to dissatisfiers over time. For example, when automatic car locks were first introduced consumers viewed them as a premium feature (a satisfier). Today, if a new car lacks automatic door locks, its absence will be coded as a dissatisfier. The prevalence of

the automatic door locks today has changed the consumer's reference point.

Separate Gains and Aggregate Losses

The presentation of gains and losses to consumers has a recommended structure in decision-making research. Gains should be separated so the evaluation of each has the greatest possible positive impact on the consumer. Secondly, losses should be aggregated; having a loss integrated with another has a smaller negative valence than having each loss considered separately. Credit card cycles have been cited as an example of integrating losses (Thaler 1985). Throughout the month, consumers can make multiple purchases on their credit cards and at the end of the billing cycle they only have to pay one bill.

Bravely Default is a video game where the designers have incorporated the principle of separating gains. In each 24-hour period, there is a limit to how many attacks your allies can make on your behalf, plus how many items you can collect. The result of the 24-hour limit is that players are motivated to return every day to send allies to attack, and collect new items. An empirical study of how much players enjoyed Bravely Default versus a comparable game that did not have the daily limitations would help answer what is the exact impact of separating gains. However, the current theory would predict that players who faced the 24-hour limitations would stay engaged in it for a longer period of time.

Summary

The principle of reference dependence teaches many important lessons to product designers. The first is to be extremely cautious about which product features are added, or even promised to customers. The customer will feel the loss of such

features strongly and aversively. Second, consumers have stronger motivations to adopt products that move them out of a bad state rather than into a good state. Third, any feature can be coded as a gain or a loss so consider how changing features will affect the consumer. Fourth, losses and gains feel different to consumers; specifically, losses feel stronger than equivalent gains. Designers should systematically separate gains into smaller chunks (e.g., consider multiple releases) and integrate losses into a single larger piece where possible.

Choice Architecture

“If you indirectly influence the choices other people make, you are a choice architect.” - Thaler and Sunstein 85

The preceding section on reference dependence explored how encoding options as either gains or losses influenced choice. The following section discusses how framing, or context, of the choice to the decision-maker influences him or her. When people do not have an existing preference, selecting the best option takes time and effort (Tversky and Kahneman 1974). People actively construct their preferences using task characteristics, the choice context and a description of options (Simonson 2008). Product designers are in the role of choice architects as they are making products. Important product design questions can be explored using choice architecture: What should the default settings of the product be? How many features should the product offer? How can I increase the appeal of a design?

The following section presents three facets of choice architecture: default

settings, joint vs. separate evaluation, and no-choice options. To establish the importance of choice architecture, here is an example of how easily consumers construct their preferences and how unknowing they are about the origin of their constructed preferences. In one experiment, consumers were asked to judge the quality of four pairs of nylons (Nisbett and Wilson 1977). When consumers were asked to say which pair of stockings was the best quality, the right most stocking was picked four times more than the left most stocking. The customers did not realize it, but all four pairs of stockings were identical. The results show there was a large effect of the left-to-right ordering of the nylons. When the experimenter asked the participants directly if the order affected their choice, the consumers denied it.

The previous study exemplifies of the power of choice framing. Choice architecture is most relevant in circumstances when people do not possess strong inherent preferences and are relying on reference points or their context for decision cues. The best choice architecture allows people to discover their preferences. One metaphor for appropriately mapping consumer choices to consumer welfare is being at an ice cream store and sampling many different flavors before ordering your cone (Thaler and Sunstein 93). How can you give your customers feedback and help them match their preferences with what your product offers? The following section gives examples of how the relative preference among options is affected by the alternatives, or lack of alternatives.

The Power of the Default

Imagine you have just purchased a new software package and are asked the

following question during set up.

“Do you want your Indexing Service to be Automatic, Manual, or Disabled? Choose one of the following options.”

Automatic (RECOMMENDED)

Manual

Disabled

Which of the options would you choose? The Automatic one since it is already selected? Because it's in bold typeface? Because it is recommended by the software developer? This is an illustration of how default options influence choice. Why are default options so popular among decision-makers? Three possible reasons have been offered: 1. It is the least effortful choice, 2. The default signals an endorsement that can be implicit or explicit, or 3. Reference dependence (Dinner, Johnson, Goldstein and Liu 2011). The theory of reference dependence represents the default option as a set point and the surrounding options are then coded as losses or gains. Moving away from the default option can feel like a loss (e.g., Automatic to Disabled). Consumers exhibit loss aversion, as described in the reference dependence section, and are motivated to avoid losses. (Tversky and Kahneman 1991).

Status quo bias can help explain the high impact of default settings. The status quo bias predicts that consumers want to stay at the status quo because changes invoke a feeling of loss aversion; losses loom larger than gains in their estimation. In

a field experiment in car insurance purchases, drivers in New Jersey were offered cheaper insurance as the default and drivers in Pennsylvania received a more expensive type of policy as the default. In both states, despite being able to switch to the alternative type of car insurance, drivers preferred the status quo (Kahneman, Knetsch and Thaler 1991).

What happens if the consumer herself is the one who sets the default option, instead of the New Jersey Insurance Board or some other entity? It turns out that even if the consumer is the one who sets their own status quo, they still exhibit a status quo bias. In a sequential study, participants made a choice in Part 1 of the study that became their reference point in Part 2 (Samuelson and Zeckhauser 1988). In Part 2, subjects were given additional information about the decision situation and then asked if they would like to switch their choice to the alternative. They exhibited inertia in making a change away from their status quo in Part 2 of the study. In a different study that examined what would happen if the status quo were randomly assigned, researchers found the chance status quo enjoyed the highest popularity (Samuelson and Zeckhauser 1988). These two examples illustrate the almost magnetic pull the status quo has on the consumer.

Given the power of defaults and status quo bias, what increases people's willingness to adopt new products? It is important that your products' value is easily perceived and understood by the consumer. If a person has any preference for a presented alternative, the status quo bias is attenuated. Secondly, minimize switching costs to the greatest extent possible to decrease resistance to change.

Third, offer only a limited number of options to weaken the status quo bias. The larger the set of alternatives presented in the choice set, the stronger the status quo bias (Samuelson and Zeckhauser 1988).

Joint versus Separate Evaluation

The choice context, or the set of alternatives being evaluated by the decision-maker, can influence which choice the person makes. Joint versus separate evaluation is a context effect driven by whether the person is considering an option in isolation, or if it's actively being compared to alternatives. Separate evaluation (SE) includes situations where different individuals view different options, but each individual only sees a single option, or individuals evaluate only once choice at a time (Hsee, Loewenstein, Blount and Bazerman 1999). The theory as to why choices between joint versus separate evaluation differ is because people are in different evaluation modes. Consider a study where participants were asked to make a hiring decision about a two candidates for a computer programming position. The only information available about the candidates was how many KY programs they had written in the previous two years and their GPA based on a 5-point scale (Hsee 1996).

Candidate J: Written 70 KY programs, GPA 3.0

Candidate S: Written 10 KY programs, GPA 4.9

The study participants were randomized into three different groups who saw either the information on Candidate J, Candidate S, or both; finally, they were asked to state their willingness to pay for the salary of the candidate. In joint evaluation

(JE) mode, Candidate J was offered a higher salary ($M = \$33.2K$ vs. $M = \$31.2K$ for S). However, Candidate S received higher salary offers in single evaluation mode ($M = \$32.7K$ vs. $M = 26.8K$ for J). One reason for the reversal is that attributes that are difficult to evaluate (e.g., “How many computer programs written in KY demonstrates the right amount of experience?”) are more relevant in JE. Yet, in SE, it is the easy to evaluate attribute (e.g. “What is a good GPA on a 5-point scale?”) that has a greater impact in decision-making.

As a product designer, consider which product attributes consumers will judge your product on. Are they dimensions that are easy to understand like size or color? Or, are they attributes that are harder to make sense of such as processing speed or memory size? If they are the latter types of features, design for the consumer to be in a joint evaluation mode at the time of the decision. If the features of your products are easy to interpret, then design for the consumer to be in single evaluation mode. Be prepared for preference reversals (as seen with Candidates J and S above) if customers are viewing your product features in differing contexts.

The Option of Doing Nothing

The previous cases of default options and joint versus separate evaluation highlight the importance of the framing of choices in consumer domains. Could a no-choice option also affect choices in a meaningful way? Consider the following question from a study by Schrift and Parker (2014).

On the next screen is a word search puzzle. You can quit at any time and be paid for every correct word that you have found. Do you prefer to search for:

A. Famous Actors

B. Capital Cities

C. Prefer not to participate

The number of words found and the overall time spent on the puzzle were measured and then compared to three other conditions: subjects who were forced to search for actors or cities, or subjects who could choose between actors or cities (but did not have an explicit third option not to participate). The researchers showed that subjects who viewed the no-choice question persisted for a longer period of time compared to any other group. The same subjects also found more words on average, but the difference was not significant from the other conditions. Presenting the choice not to participate increased persistence on a task.

Schrift and Parker claim that the mechanism for the effect comes from self-perception theory, which states that people form attitudes after observing their own behavior (Bem 1967). In this study, participants who rejected the option not to participate strengthened their own belief that the word search puzzle was a worthwhile task. Subjects did not see the no-choice option as just another alternative; the rejection of the no-choice taught them something about their own preferences and they subsequently worked longer on the task. Designers working on sign-up pages or product conversions might experiment with the effect of no-choice options. The presence and then the rejection of no-choice may signal the consumers' interest to themselves.

Summary

How will customers evaluate the features that your product offers? Will the features be interpreted as gains or losses from the consumers' reference point? The

preceding section has explored how the context of the choice affects consumers. Choice architecture is a useful instrument in product development because it can help designers influence how their design is perceived and increase its appeal. Designers should use the tools of choice architecture cautiously and strive to be helpful to consumers rather than self-interested. Consumers who have purchased a complicated software program appreciate good default settings (Thaler and Sunstein 87). Choice architecture is powerful in part because of the implicit trust that consumers are giving designers to act in their best interest.

Cognitive Effort

The amount of cognitive effort required by a task can change an individual's decision and how he feels about that decision. Psychology research describes individuals as "cognitive misers" who like to conserve mental effort (Allport 1954). The effort-accuracy trade-off describes consumers' preference for choices that are low in effort, but high in accuracy (Payne, Bettman and Johnson 1993). Generally, the accuracy of a decision is positively correlated to the level of effort that the consumer makes. Consumers are trying to balance their goals of saving themselves effort, and being as accurate as possible. Therefore, the type of situation exerts a strong influence on how much cognitive effort an individual is willing to expend. For choice tasks where the individual feels a low amount of investment, effort will decrease and accuracy will suffer.

Good product designers are highly concerned with the cognitive effort

necessary for product functionality. They aspire to create products that are easy-to-use and easy-to-understand. The perspective of designers has been that the best products need no instruction manual (Davis 1989). Making products that require low cognitive effort is important because it is a factor in new product adoption. Later in this section, I discuss how consumer expectations about cognitive effort shape their willingness to engage with new products.

Addressing cognitive complexity is an important step in the design process. Products at almost any level of cognitive effort can achieve success if they find the right audience. Kool, McGuire, Rosen and Botvinick found that if subjects had task-specific knowledge or were incentivized with money, individuals reversed their preference for low effort (2010). Dropbox is a successful cloud storage service, but it is cognitively murky. Is it a folder on your computer or a storage website? How often is it backing up? How do you know that the back up was successful? (Lieb 2013). On the other hand, Shazam, the song identifying application, is cognitively simple. Open the app when music is playing. Push a button and get immediate feedback that the app is working. Lastly, your device buzzes when it finds your matching song (Lieb 2013). There are advantages to being a low cognitive effort product, but it is not a necessary condition to offer a good product.

The construct of cognitive effort has been examined by BDT and offers some interesting insights into using cognitive effort as a variable that can be manipulated to the benefit of the consumer. Indeed, it is possible that designing a product with a higher level of cognitive complexity could be useful in the right circumstances. As in the other sections of the current work, the following review of research carries a

disclaimer that it is significantly limited in scope. The following three topics were selected based on their importance to the product development process: metacognitive experiences, processing fluency, and expectations about cognitive effort.

Metacognitive experiences

Schwarz reviewed the consumer judgment and decision-making literature and concluded that there is more to thinking than just the content of our thoughts (2004). We use our own subjective experience of thinking as information. For example, Winkielman, Schwarz and Belli asked study participants to recall either four or twelve events from their childhood and then to rate the quality of their memory (1998). Listing twelve memories is much more difficult than listing four; using the cue of difficulty, the people who recalled twelve events rated their own memories as being worse!

In a separate study in a product domain, participants were asked how easy it would be to list two or ten reasons for choosing a microwave oven or a digital camera (Novemsky, Dhar, Simonson, and Schwarz 2003). Just considering how easy or difficult it would be to complete the listing task influenced subsequent choice. Participants rated the listing ten reasons for choosing a product as being more difficult and subsequently deferred choice until a later date 61% of the time (vs. 49% for people in the two reason condition). The implication is that ease-of-retrieval influences our judgments, and we might not be aware of such an accessibility bias.

Another example of consumer inferences based on accessibility of information is illustrated below. It adapts a task from Schwarz (2004). Please

answer the following question before continuing.

List six outstanding new restaurants in your metropolitan area.

Was it difficult for you to complete an entire list of six restaurants? Was it because your city does not have many new restaurants? Or, is it because you never try new restaurants? Were you distracted by something else during the task of listing restaurants? Each of these explanations is offered by Schwarz as a plausible reason for why people find this assignment challenging (2004). By drawing the inferences “I don’t eat at new restaurants,” or “I got distracted” the difficulty of the task no longer informs opinions about Chicago restaurants. The relevance of this exercise for product designers is for them to consider that if they are giving consumers a task, what is the metacognitive experience that goes along with its completion? Using the previous example, if a consumer infers “My city only has bad restaurants,” what are the implications for satisfaction? Consumers make different decisions depending on what inferences they make about the ease or difficulty of the task. This is especially important for designers who are experts, and may be subject to the curse of knowledge, to consider since they may find product use tasks easier than novices.

Processing fluency

Having established that a person’s experience of task difficulty influences their subsequent beliefs and choices, the next section moves into processing fluency. Processing fluency is the ease with which information is processed. Processing fluency acts as a signal to consumers the level of mental effort required to understand it. One manipulation of processing fluency is perceptual fluency, e.g., if the font is hard to read due to blurriness or low contrast.

The film documentary devoted to the Helvetica font illustrated the proliferation of a single, high fluency font used by many American brands such as American Airlines, American Apparel, and Jeep (Hustwit 2007). I propose that a designer's devotion to fluency could be misplaced depending on the product's intended use. Visual designers already have a large repertoire for creating fluency or disfluency. Items related to legibility, such as text size, spacing, typeface or contrast could be experimented with to create the desired effect with consumers (Lidwell et al., 124). If disfluency is the goal, there are also a variety of visual interference effects that slow down mental processes by initiating competing cognitive effort. One example of this type of interference is the Stroop task where individuals are asked to name the color font of unmatched words of colors. For example, the word "Red" will be written in blue font and a correct answer from a study participant is "Blue" (Lidwell et al., 114). What could the possible benefits of making consumers work harder to understand your product be?

When people encounter disfluent information, they spend more time attending to the stimulus and explore it more thoroughly (Thompson et al., 2013). Greater time and concentration can lead to improvements in performance when they are relying on the information and better memory subsequently (Alter, Oppenheimer, Epley and Eyre 2007). Product designers who are involved in communicating items of high importance or risk may consider using disfluency as a tool. For example, if a product requires a warning label, disfluency could help signal riskiness to the consumer (Song and Schwarz 2009). The human intuitions about fluency or disfluency can help designers communicate appropriate information about

their products to consumers.

Expectations About Cognitive Effort

Consumers' expectations about cognitive effort alone can shape their willingness to adopt new products. Billeter, Kalra and Loewenstein demonstrated that consumer beliefs about how long it would take them to learn how to use a new product predicted how willing they were to engage with it (2010). Billeter et al. showed that consumers exhibit a systematic bias to underestimate how quickly they will acquire new skills for operating products. Since consumers pessimistically believed themselves to perform at a novice skill level for a lengthy interval, they were reluctant to try new computers, cell phones, or sports equipment. Consumers attached themselves to an outdated self-concept, leading to devaluation of products. Consumers' own beliefs about their own ability to learn how to use a product misled them to draw incorrect conclusions about how well they enjoy or perform a task. The lesson for designers is to provide help consumer persist through the early phases of product use until they reach a level of cognitive mastery.

Summary

The amount of cognitive effort required by a product can affect the choices about that product. Consumers use their own experience of cognitive effort and processing ease to form attitudes and make decisions. Processing fluency signals to consumers the amount of mental effort required to complete a task. Furthermore, consumers may not be aware that they are being influenced by the variable of cognitive effort, as demonstrated in the childhood memory study (Winkielman et al., 1998). Consumer experience of cognitive effort is not static over time either. The

amount of cognitive effort can decrease as consumers adapt to disfluency or learn difficult tasks. Human intuitions about fluency or disfluency can help designers communicate appropriate information about their products to consumers.

Conclusion

The contribution of the current work is to address a gap between the perspectives of product designers and consumers. Since designers are subject to many of the same decision biases of the intended users of their products, it makes it difficult to fully empathize with them. Using results from behavioral decision theory, I have attempted to bridge the understanding of designers to the decision-processes of consumers.

The research presented assumes that individuals are acting in their own self-interest in constructing their own preferences and making the accuracy-effort trade-off. It is understandable that since people are constrained by limited attention, resources like time or money, or access to imperfect information that they use decision contexts to inform their choices. This decision strategy tends to result in satisfactory outcomes, even though it may not lead to optimal outcomes. Consider the earlier example of the QWERTY versus the Dvorak keyboards; performance considerations are dominated by consumer preferences.

The research reviewed here is extremely limited compared to the broad contributions of behavioral decision theory. I selected the research topics of reference dependence, choice architecture, and cognitive effort due to their potential to improve product development processes, which will hopefully lead to improved product designs, successful market adoption, and more satisfied consumers.

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