some loose notes for decision making

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What is decision making?

From an information processing perspective, decisions typically represent the many-to-few mapping of information responses. That means that a lot of information is perceived and evaluated in order to produce a single choice, or a single decision.

Uncertainty: results from the probabilistic nature of the world. Simply put, we can almost never predict with confidence what the consequences of actions and decisions will be. We can approximate them, but the more complex the decision, the less accurate our prediction. A negative aspect of uncertainty is termed risk – that is possibility of bad outcomes.

Time: one-time decisions are for example purchases, and evolving decisions are for example managing treatment choices for a chronic or complex disease, or any other situation where information is being updated as the decision making occurs in real time.

Expertise: we trust experts with more difficult decisions because they have the previous experience.

What is a good decision?

So what makes a decision a good one?

One possible source might be the **expected value** - correctly predicting or assessing the expected value during the decision making process, as confirmed by the consequences of our decision.

Second, we might look and **hindsight bias** – as we say, hindsight is always 20/20, which refers to perfect vision. Hindsight bias is a tendency to believe that we knew something all along – that in the moment we were making a decision, we actually knew how the situation would play out.

Third, we have models of expertise – if we assume that experts in certain fields are known for good decision making, then we can possibly look up to them for guidance on what is the best decision given the situation or circumstances. It is important to note however that experts do not always make the best decisions, and they are not immune to mistakes.

Are we rational decision-makers?

Absolutely not, but we'd really like to think that we are.

Individual differences

Individual differences can influence how choice architectures play out in the market. Choice architects will have to design decision environments faced by decision-makers in light of knowledge about the decision environment (this is already being done) but also with knowledge about the characteristics of targeted decision-makers and how they will process and draw meaning from information, or what their goals are. In some cases, the right choice architecture may differ by these individual characteristics. This is CRITICAL for your work as a user experience specialist or a human factors specialist. The implication is that the intuitions of choice architects will not always be enough and that choice architectures should be tested in diverse populations of interest.

Satisficers and maximizers

Iyengar, Wells and Schartz's (2006) study compares decision satisfaction between maximizers (people who explore all possible option to choose the optimal decision) and satisficers (people who settle on the first satisfactory option).

In this study, researchers followed graduating seniors from 11 colleges and universities in the united states. And to give you a bit of context, university education in the United States assumes completion of a four year bachelor's degree, where students in their final year of education are called seniors. The academic year runs from September to May, and students usually being their job search for post-graduation opportunities in the fall semester of their senior year. The idea is that you want to start your new job as soon as possible after you graduate in May, which means that for some students job offers usually start coming in around February.

So the researchers followed up with their participants at three different time points:

- First in November of senior year, when students were talking to career services and begin post-graduation job search. The researchers had them fill a questionnaire that assessed their maximizing versus satisficing tendencies, and answer some simple questions, like How many jobs are you applying to? How much are you relying on other people (friends, career services)? How terrified are you?
- Second follow up took place in February of senior year, when students were in the process of completing applications and getting offers. Researchers asked them questions like How many interview offers did you receive? How much do you compare yourself to peers? How terrified are you?
- And lastly, the third time point took place in May of senior year, when students were accepting offers. Researchers asked if students wished they applied to more jobs, How frustrated they were, and lastly what offer they accepted.

And the results showed that participants who showed maximizing tendencies were also more focused on needing to expand their job search as much as possible – applying to more jobs, and different kinds of jobs. They also expanded their job search to involve friends, for example to do mock interviews, and consulting with career services. As a result, maximizers received more interview invitations, which was used as a proxy for job market performance. But they also reported being much more anxious and frustrated throughout the job seeking process when compared to satisficers.

Maximizers were showing interesting patterns of behavior: in November, they were planning to apply for more jobs. At high ranking universities there was not much difference between how many jobs maximizers applied for compared to satisficers. Whereas at lower ranked universities maximizers applied to significantly more jobs that satisficers. This difference between universities can be driven by the fact that high-ranking universities have more resources available for student, such as career consulting, and those resources are easy to access too. Lower ranking universities often have less funding, and therefore fewer resources for students to rely on, which means that only driven students are going to reach out for professional help and therefore apply for more jobs.

Then in February, despite having applied to many jobs, maximizers fantasized more about jobs they were not pursuing.

And in May, maximizers reported that they wished they had pursued more options.

Traps we fall into

Too much over confidence will often be associated with lower metacognitive ability.

How do these three things affect how we interact with technology, or products? How should we as user experience and human factors professionals taking those into account when we design or test products and devices?

Do people recognize inaccurate information?

Rapp and colleagues' (2014) work demonstrates that experimental attempts to discourage people from using inaccurate representations do not achieve much success. Introducing strategies for identifying and correcting misinformation did not eliminate use of misinformation. First, their participants made twice as many incorrect judgments after being exposed to inaccurate information as compared to the number of judgments made in conjunction with accurate information. Second, when explicitly asked to evaluate statements as accurate or inaccurate, participants showed a reduced use of misinformation – but despite the benefits, the use of misinformation was never completely eliminated.

Nudging

Nudging is a concept in behavioral economics, which proposes that positive reinforcement and indirect suggestions can influence the decision making of groups and individuals. The concept was popularized in the 2008 book by a behavioral economist named Richard Thaler, and a legal scholar named Cass Sunstein.

Thaler and Sunstein define nudging as: Thaler & Sunstein (2008, p. 6): "... any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting fruit at eye level counts as a nudge. Banning junk food does not."

Oxford dictionary defines nudging as gently prodding someone, for example with one's elbow, to attract the other person's attention. To give a nudge also means giving someone a very gentle push towards a particular action, also metaphorically.

So the argument here is that the way a choice is presented will influence what a decision-maker chooses.

Self-nudging

You identify a problem, or a behavioral pattern you want to break, and you incorporate environmental changes that will encourage you to follow through with the change.

Ethical problems:

- autonomy: some nudges typically work better in the dark; but that way the person being nudged is actually being deceived or manipulated, which undermines their decision-making autonomy
- reducing agency: behavioral change that is not attained through conscious self reflection or judgment, nudges bypass the process of deliberative thinking – for example, when you have policy interventions, people are aware of them so they can scrutinize them, criticize them, hold governments accountable
- nudges that are the opposite of the decision maker's intended action: for example, I do not want to eat dessert, but everything in the restaurant is designed to nudge me towards cake

Practically, nudges make it difficult to obtain reliable information about chooser's true, unbiased preferences; like we discussed with regard to default, when there's a decision required, there are always some consequences.

Choice architecture

So the nudge here towards portion control would be controlling the size of the plate.

In the Wasink and van Ittersum (2013) study participants were making perceptual judgments about the portion size of soup as it was presented in different size plates.

First, participants were presented with a bowl of soup, or a petri dish of soup, which was a baseline size of soup in this experiment. The petri dish had a diameter of 9 centimeters, and was fully filled with soup, so that the size of the soup disc was also 9 centimeters.

Next, participants walked to a different table, where they were randomly given one of seven white bowls, and a container with soup. The task was for participants to pour enough soup from the container into a bowl to replicate the size of the petri dish – so essentially they were eyeballing a 9 centimeter diameter of soup in a white plate. The bowls used for this experiment ranged in size from large to small. The smallest bowl, bowl number 7, had a diameter of 12 centimeters, while the largest bowl had a diameter of 36 centimeters. The black bars on the graph represent measurements of soup diameter that participants poured.

After the short break, participants were reminded of what 9 centimeters of soup diameter looked like in the petri dish, and then they went to the third table. On the third table, there was a bowl already filled with soup. Participants had to determine whether the diameter of soup was smaller or larger than the target diameter in the petri dish.

As a result, the authors observed negative (answer was a certain percent *smaller* than the correct answer or the objective measurement) and positive (answer was a certain percentage *larger* than the correct answer or the objective measurement) biases. The biggest bowls in the set of

random bowls, elicited positive serving bias, and negative estimation bias. This means that when participants were asked to pour 9cm of soup into a large bowl, the diameter of the serving that they poured was 12 or 13 percent larger than 9cm. On the other hand, when participants had to guess how much soup was already in the pre-filled large bowl, they tended to estimate that pre-poured soup diameter as 10 percent smaller than 9 centimeters. This effect reversed for smaller bowls. When participants were pouring soup, they on average poured less soup than needed, that is their final serving had a diameter of 11 or 9 percent smaller than 9 centimeters. On the other hand, when participants were judging a pre-poured portion of soup in a small bowl, their judgments estimated the soup's diameter to be 12 or 9 percent larger than 9 centimeters.

So we see here that, in summary, the size of the bowl nudges us towards skewed judgments of portion size. Interestingly enough, education of this bias mitigates the serving bias, but it does not eliminate it entirely.

Expected value

Take the scenario where I make bet **a** repeatedly. I can *theoretically* expect to earn \$9 every time I make bet a. I played the bet a100 times and reported 20% wins and 80% losses. I earned 20 x \$45 = \$900. On average, I earned \$9 for every one of the 100 bets that I made.

Take the scenario where I make bet **b** repeatedly. I can *theoretically* expect to earn \$7.5 every time I make bet b. I played the bet b 100 times and reported 25% wins and 75% losses. I earned 25 x \$30 = \$750. On average, I earned \$7.5 for every one of the 100 bets that I made.

But surprisingly, people tend to choose gamble B over gamble A, even though gamble B has lower expected value.

Failure of decision analysis: Ford Pinto

A great example of how attempting rational decision-making in the face of a very emotionally loaded topic (death in car accidents due to bad design) can backfire.

Query theory & endowment effect

Query theory explains the endowment effect in the following way:

When a person is asked to decide how much money they are willing to spend on a product (buyers), or how much money they are willing to sell the product for (sellers), they go through a series of mental queries. And the order of those queries is identical between buyers and sellers, but the content varies slightly.

The first step is considering the advantages of the current state. So if I am a buyer, that means I do not own a mug yet, so I will ask myself – what are the reasons that I do not own a mug? And when I am a seller, that means I do own a mug, so I will ask myself – what are the reasons that I do own this mug?

The second step is considering the opposite state of affairs. If I am a buyer, I will think about why I should own the mug, and if I am a seller, I will think about why I should not own a mug.

If I am a seller, I first think about all the reasons to own the product, and second I think about the reasons to not own the product. The product ownership query comes first, so it is a stronger one than the second query, which is product loss. So my first query – the one where I own the product – is stronger than my second query, where I do not own the product, so I think the product has higher worth, and therefore should cost more money. On the other hand, if I am buying, then first I think about all the reasons I do not own the product, and second I think about all the reasons why I should own the product. My first query – the one where I do not have the product – is stronger than my second query where I do own the product. So my first query trumps the second query, and I think the mug is not worth that much money.

In the experiment by Johnson and colleagues (2007), participants were showed a mug, and they were then assigned to one of two conditions:

- Selling condition: the mug was their to keep but that they will later have an opportunity to sell it to the experimenter for some amount of money
- Choosing condition: they would be later able to choose between receiving the mug and receiving some amount of money

First, authors demonstrated that participants really showed the endowment effect: sellers demanded more money for the mug, compared to choosers.

Then the authors looked at what participants said as they were debating whether to sell the mug or not, or whether to choose the mug or money. Sellers produced more positive thoughts about the mug and more negative thoughts about the money, whereas choosers produced more negative thoughts about the mug and more positive thoughts about the money. So it seems that the content of the queries was in line with the experimental condition the participants were assigned to.

And lastly, the order of queries stipulated by the query theory was also demonstrated. Sellers were more likely to start by talking about positive thoughts about the mug, whereas choosers were more likely to start off by talking about the positive thoughts about money. As you remember, the content of the first query is allegedly playing a stronger role in decision making here, so it confirmed the query theory that participants who owned a mug first focused more on the value of owning a mug.

This study is a simple example of how a particular decision making theory can be tested experimentally in the laboratory. It is a simple, but neat demonstration of how to induce certain decision making conditions in the research laboratory, to test whether a theoretical model of information processing finds applicability during an actual decision making.