Decision Processes

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Behavioral Decision Making

- **behavioral decision making** research: how do people make decisions and judgments
- **Methodology:** Experimental Psychology
- **Background fields:** cognitive psychology, social psychology, economics, consumer research
- **Today:** a primer into some essential parts of the field relevant for HTI research...

How to make good decisions?

Normative theories: How one should combine information to make the best (optimal) decisions

Descriptive theories: How can we best describe scientifically how people make decisions in everyday life?

Normative Decisions…

Descriptive theories

The normative rules assume that decision makers:

- Search and use all available information
- Are fully rational
- Have sufficient processing resources

In real life people do not have sufficient time or resources to search for all information and combine these (via difficult computations) into an overall value judgment

Preference construction

Decision makers often do not have articulated preferences. Preferences are formed online, during the decision process.

Doing so they often violate principles of invariance:

Description invariance:
Preference should not be dependent on the description of stimuli, if they are normatively equivalent

Procedure invariance:
Logically equivalent elicitation procedures should result in similar preference orderings

Framing example (Exp 1)

Gain-frame

Assume yourself richer by 300$ than you are today. You have to choose between:

- Sure gain of $100 [72%]
- 50% chance to gain $200
  50% change to gain nothing [28%]

Outcomes:
•$400 for sure
•Even change at $300 or $500

Loss-frame

Assume yourself richer by 500$ than you are today. You have to choose between:

- Sure loss of $100 [36%]
- 50% chance to lose nothing
  50% change to lose $200 [64%]

Outcomes:
•$400 for sure
•Even change at $300 or $500

Framing

Framing:
description differs: framing in terms of gains or losses

Descriptions are normatively equivalent

Outcomes are evaluated in isolation and therefore coded as losses or gains

Framing is a robust phenomenon:

- Within and between subjects
- Experts and lay people

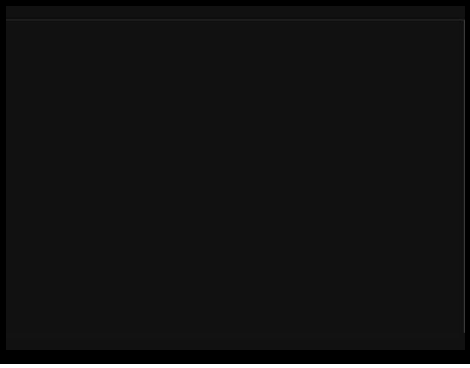
Loss Aversion

Prospect Theory (Kahnemann &Tversky, 1979)
Losses loom larger than gains

The relative position of an attribute to a reference determines whether an attribute value is considered as a gain or a loss

- Endowment effect
- Reference effects
- Status-quo bias and Default effects

Endowment Effect (Thaler)



Loss Aversion in choice

Same difference between two options is given greater weight if viewed as a difference between two disadvantages (losses) rather as a difference between two advantages (gains) (Tversky and Kahneman, 1991)

Present job serves a reference point

Job	Social contact	Daily travel time
Present Job A	Isolated for long stretches	10 min
New Job X	Limited contact with others	20 min
New Job Y	Moderately sociable	60 min
Present job B	Much pleasant social interaction	80 min

Ref A: 70% for X

Ref B: 66% for Y

Defaults

We often encounter default choices

- Opt-in: take action to make something happen (receive emails, get additional insurance, etc.)
- Opt-out: take action to NOT make something happen

Participation rate

- q Notify me about more health surveys 48%
- q Do NOT notify me about more health surveys 96%

Why are defaults so strong?

- Framing (Loss aversion, status quo change)
- Default is seen as an implicit recommendation (source of information)
- Cognitive and physical laziness
- Default is subject of comparison

Implications of defaults: policy!

Organ Donation (Johnson & Goldstein, 2003)

People are hesitant to make an active choice and are likely to select defaults

- Opt-in countries (e.g. Netherlands) have low numbers of registered donors (10-20%) and less actual donations
- Opt-out countries (e.g. Belgium) have high numbers of donor (80-90%) and more acutal donations

Implication of defaults: consumers

How does one handle defaults in interfaces and on websites (privacy issues)

- Facebook: showed member purchases by default… causing a swift reaction by members!
- National railroad in Europe: include seat reservations as a default with ticket: reservations increased from 9% to 47%!

Implications of defaults: customization

- Mass defaults
  - Benign defaults: best guess with least risk (maxi-cosi seats)
  - Hidden-option (to prevent incorrect choices)
  - Random defaults (can help finding best defaults)
- Personalized defaults
  - Persistent default (based on past choices)
  - Smart defaults (based on profile information)
  - Adaptive defaults (based on real-time information)

Eliciting preferences

Different ways of measuring preferences:

- Choice task
- Rating judgments (quality, satisfaction)
- Pricing judgments
- Matching (making equal)

Procedure invariance: either of these procedures should result in similar preference orderings: if an option is preferred in choice, it should also be assigned a higher rating/pricing

Choice and Rejection (Shafir, 1993)

You currently have two vacation options that are reasonable priced. The travel brochure gives only a limited amount of information about the two options.

Choose: Given the information available, which vacation spot would you **prefer**?
Reject: You can no longer retain your reservation for both spots. Given the information available, which reservation do you decide to **cancel**?

Spot A	**Spot B**
average weather	lots of sunshine
average Beaches	gorgeous beaches and coral reefs
medium-quality hotel	ultra-modern hotel
medium-temperature water	very cold water
average nightlife	very strong winds
	no nightlife
Choice: 33%	67%
Reject: 52%	48%

Dictionary Example (Hsee, 1996)

Dictionary A
Entries: 10.000
State: like new

Dictionary Example (Hsee, 1996)

Dictionary B
Entries: 20.000
State: torn cover, otherwise like new

Dictionary Example (Hsee, 1996)

Dictionary A
Entries: 10.000
State: like new

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Entries: 20.000
State: torn cover, otherwise like new

Evaluability Hypothesis

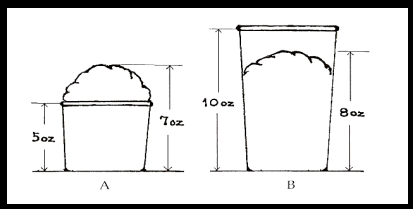
Weight of an attribute increases with the **evaluability** of the attribute

Some attributes (e.g., number of entries) are hard to evaluate separately

Dictionary: weight of the 'entries' attribute increases from separate to joint evaluation, causing a **preference reversal** between JE and SE mode.

Implications of evaluability: less is better!

Separate: WTP significantly more for A
Joint: WTP significantly more for B
(objectively B is more valuable)



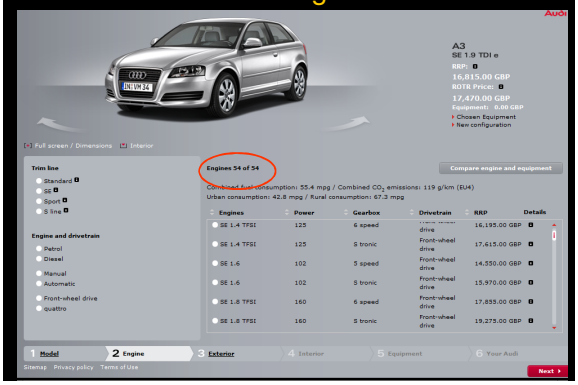
What about Decision Processes?

More on defaults: Product customization
- Cars, computers, phone plans
- Bundles of attributes

Order of sequence of attribute decisions should not affect the final 'bundle'

But decision making requires effort and depletion of mental capacity can influence subsequent decisions
- More depletion will result in more default choices for attributes

Car Configurator



Study (Levav et al.)

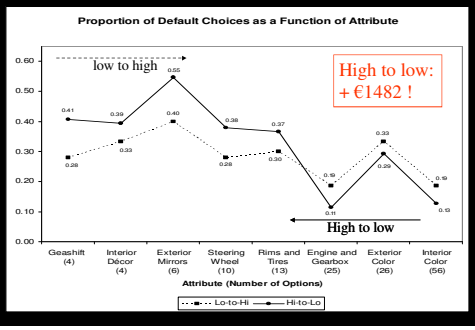
Car configurator (67 decisions!)
- customers can go back
- Default for each attribute (usually the cheapest)

Manipulation
- Hi-to-Lo group
- Lo-to-Hi group

Dependent: default choices on each stage

Target attributes
- Interior color (56)
- Exterior color (26)
- Engine and gearbox (25)
- Wheel rims/tires (13)
- Steering wheel (10)
- Rearview mirror (6)
- Interior decor style (4)
- Gear shift knob style (4)

Results: more defaults after depletion



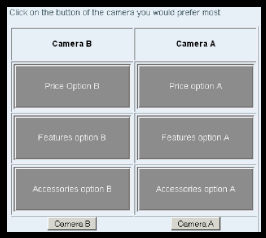
My Own Research

MouselabWEB: Process tracing tool for process tracing on the internet

Monitoring information acquisition patterns of decision makers

Theoretical:
Building more precise cognitive models of the Decision making process

Applied:
Insight into Consumer Decision Making



Replace the SUV?

BMW X5 3.0SI 200KW 4WD
1 liter per 9.8 km

BMW 523i 140KW
1 liter per 13.7 km

Replace the Family Car?

Volkswagen JETTA 1.4TSI 90KW
1liter per 15.6 km

Toyota PRIUS 1.5VVTI 57KW
1 liter per 23.3 km

What whould you decide?

Replace SUV?

- from 1 l per 9.8 km to 1 l per 13.7 km

Replace family car?

- from 1 l per 15.6km to 1 l per 23.3 km

What whould you decide?

Replace SUV?

- from 1 l per 9.8 km to 1 l per 13.7 km
- translates into: **10.2 l/100km** to **7.3 l/100km**

Replace family car?

- from 1 l per 15.6km to 1 l per 23.3 km
- translates into: **6.4 l/100km** to **4.3 l/100km**

The MPG Illusion

Fuel efficiency is becoming a hot topic

Standard metric in the USA is Miles Per Gallon (MPG), comparable with liter per km (for the Dutchies: 1 op X)

European standard has been l/100km for decades

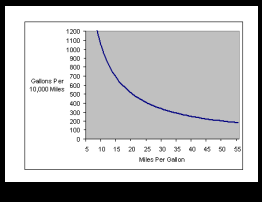
Which standard is better to assess fuel efficiency of a car?

Problems with MPG

Larrick, R.P., & Soll, J.B. (2008). The MPG Illusion, Science, 320,1593-1594

People expect gas consumption to be linearly related to MPG

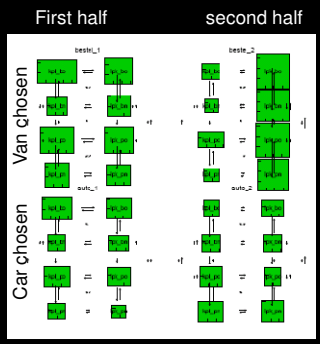
actual relation is curve-linear (1/x)



MPG Illusion: looking at the process

		km/l	l/100 km
Van	Old	1:8	12.5
	New	1:12	8.3
Car	Old	1:14	7.1
	New	1:26	3.8

Results: Van 35% (right)
Car 59%
eq 6%



Application: online customer reviews

The role of customer reviews in online consumer decision making (using process tracing to observe actual review reading behavior)

Some topics:

Relative impact of positive and negative reviews on decision

Order effects in review presentation

Thank You!

Questions?

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Endowment effect

Sellers receive a 'Mug'
- They have to choose between receiving a certain amount of money for the Mug or keeping the Mug

Choosers do not receive a 'Mug'
- They have to choose between receiving a certain amount of money or receiving a Mug

Both groups gain something: the only difference is the possession of the Mug

Endowment experiment

Sellers make sequential choices between:

sell mug for $1	keep mug
sell mug for $1.25	keep mug
....	...
sell mug for $9.25	keep mug

Median selling price: $7.12

Choosers make sequential choices between:

receive $1	get mug
receive $1.25	get mug
....	...
receive $9.25	get mug

Median selling price: $3.12

Choosing candidates: The programmer study

Evaluations of two job candidates for a computer programmer position expecting the use of a special language called KY.

	Candidate A	**Candidate B**
Education	B.Sc. computer Sc.	B.Sc. computer Sc.
GPA (0-5)	4.8	3.1
KY Experience	10 KY programs	70 KY programs

Mean WTP (in thousands):

Joint	$ 31.2	$ 33.2
Separate	$ 32.7	$ 26.8

Riskless Framing: Asian Disease

US is preparing for unusual Asian disease, which is expected to kill 600 people. Two alternative programs are proposed to combat the disease. Assume that the exact scientific estimates of the two programs are as follows:

Gain-frame:
prog. A [72%]: 200 people will be saved

prog. B [28%]: 600 people saved with p=1/3
0 people saved with p=2/3

Loss-frame:
prog. A [22%]: 400 people will die

prog. B [78%]: 0 people die with p=1/3
600 people die with p=2/3

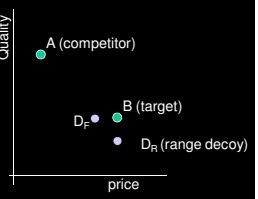
The influence of additional options

principle of *independence of irrelevant alternatives*
- preference ordering between two options should not be altered by the introduction of additional alternatives

Context effects: asymmetric dominance and extremeness aversion

Examples Asym. Dominance

Option	Price	Quality
A (competitor)	$2.60	70
B (target)	$1.80	50
D_R (range decoy)	$1.80	40
D_F (freq. decoy)	$2.20	50



No decoy: P_B = 44%
Range decoy: P_B = 66%
Freq decoy: P_B = 52%

Examples of compromise

35 mm Camera	Set 1 (n=106)	Set 2 (n=115)
Minolta X-370 Price: $ 169.99	50%	
Minolta Maxxum 3000i Price: $239.99	50%	
Minolta Maxxum 7000i Price: $469.99		

Note: Participants had reviewed 5 cameras, including these three, prior to making the choice in both conditions (thus not due to an effect of different states of information)

Compromise in the wild…