MSc in

Intern

Negot

THINKING, FAST AND SLOW

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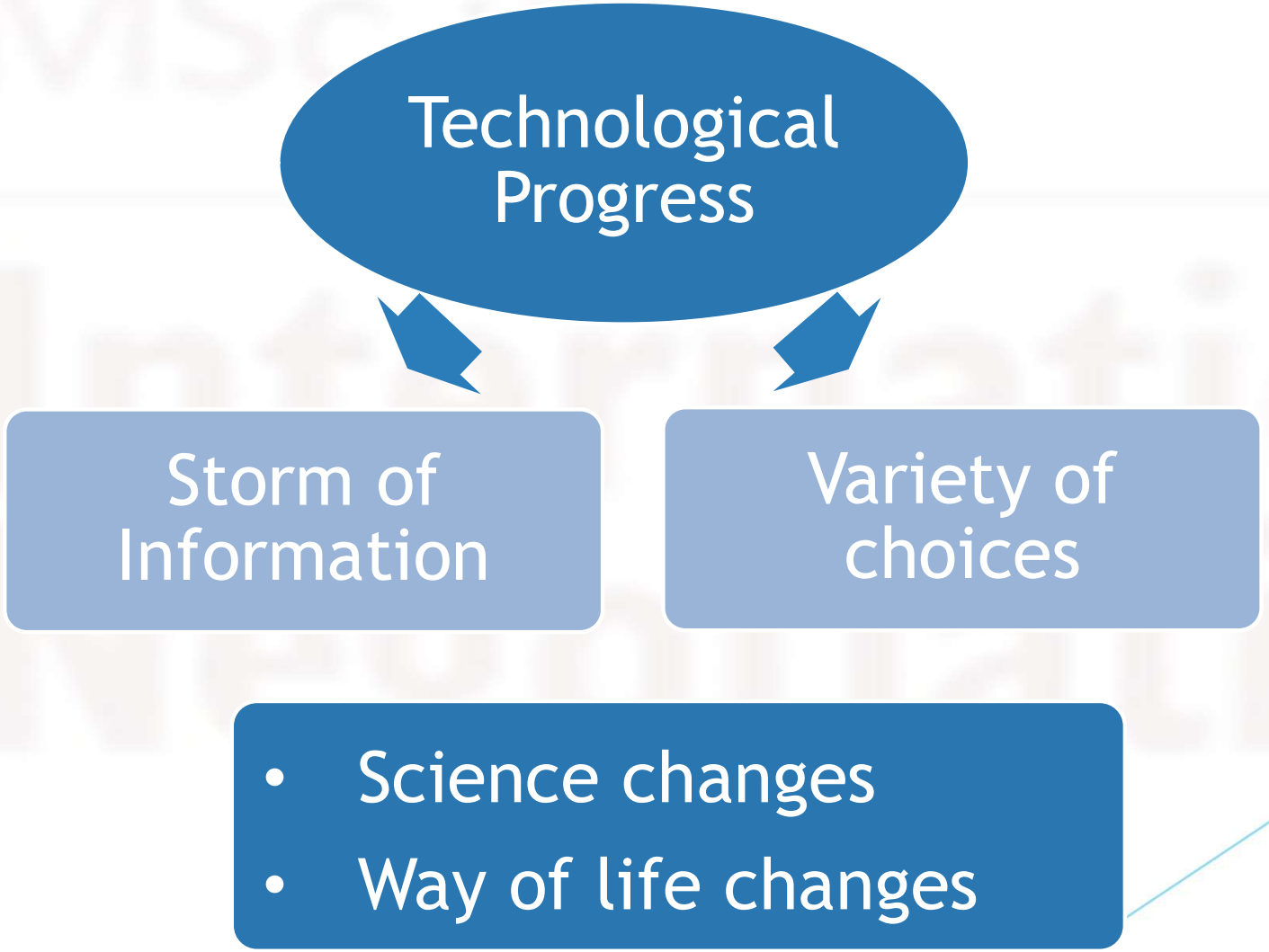
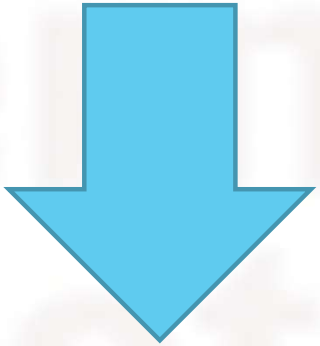
WINNER OF THE NOBEL PRIZE IN ECONOMICS

Automation


Technological Progress
Storm of Information
Variety of choices
Science changes
Way of life changes

Simple math

- Rapid technological evolution
  - Life changes fast



Impossible to process any *available* information

In practice

- To make decisions we use **part of the available information**

  ⇨ *practical rules*

  - necessary but inefficient
  - often lead to errors
  - errors are repeated

⇨ Success strategies are unique but failure strategies are repeated

In practice

spontaneous search and intuitive thought lead to heuristic answers

"Heuristic": simple procedure that helps find adequate, though often imperfect, answers to difficult questions ("Eureka")

"I always go grocery shopping in the same store"
"I use the same password throughout"

heuristic answers ⇒
repeated mistakes (cognitive biases)

Thinking, fast and slow

- Two types of beings: *Economic vs Human*
- The Ultimatum Game
  - A proposer is placed in control of a money amount and has to make an offer to a responder
  - If the responder accepts, both receive their share
  - If the responder declines, nobody receives any money
  - When proposers offer between 40% and 50% of the amount, the split is almost always accepted
  - *Against economic logic*, responders reject 'low' offers
  - When the proposal falls to 20% of the amount it is rejected about half of the time, and rejection rates increase as the proposal falls to 10% and below

Incompetent decision makers?

- Are incompetent decision makers to blame for bad decisions?
- We would then expect different ‘bad’ or ‘irrational’ decisions (‘biases’)…but instead they are repeated…
- Bad decisions are notoriously predictable
- We require a unique ‘model’ of decision making

Thinking, fast and slow

Two modes of thinking

- *System 1: effortlessly originating impressions*
  - *main sources of explicit beliefs and deliberate choices*
- *System 2: conscious, reasoning self that has beliefs, makes choices,*
  - *decides what to think about and what to do*

Two fictionary heroes…

Two ways to think

System 1

- *operates automatically and quickly*
- *little or no effort*
- *no sense of voluntary control*

System 2

- *limited resources*
- *allocates attention to the effortful mental activities that demand it, including complex computations*
- *associated with the subjective experience of agency, choice, and concentration*

System 1

- automatic operations of System 1 generate surprisingly complex patterns of ideas
- reduced reaction time and required energy

Auto-pilot

System 1 (examples)

- 2+2=;
- orient to the source of a sudden sound
- detect hostility in a voice
- make a “disgust face” when shown a horrible picture
- detect that one object is more distant than another
- understand simple sentences
- drive a car on an empty road

System 2

- Logical thinking and focus; requires

attention

strong effort

self control

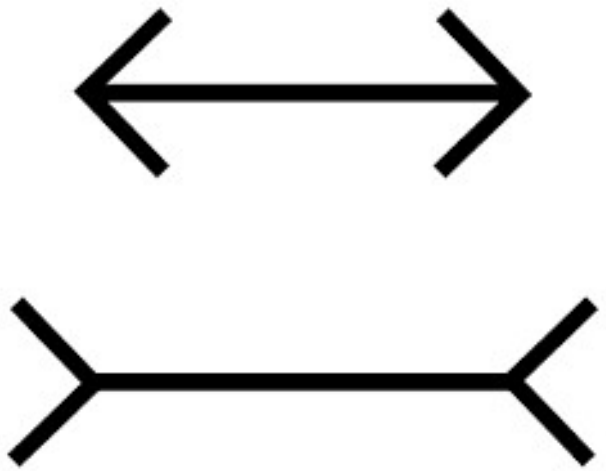
- We often react based on intuition and impulses of System 1

The lazy controller

System 2 (examples)

- brace for the starter gun in a race
- focus on the voice of a particular person in a crowded and noisy room
- count the occurrences of the letter *a* in a page of text
- park in a narrow space (garage attendants excluded)
- compare two washing machines for overall value
- fill out a tax form
- check the validity of a complex logical argument

Muller-Lyer illusion



- System 1 says that the upper line is shorter
- System 2 is needed to correct illusion

Ego depletion

- *If you have had to force yourself to do something, you are less willing or less able to exert self-control when the next challenge comes around*
- High demands on System 2 require self-control, which is depleting
  - when actively involved in difficult cognitive reasoning or engaged in a task that requires self-control, your blood glucose level drops
  - like a runner drawing down glucose stored in her muscles during a sprint
  - we cannot overcome an intuitive response to get the correct answer

Depleted by chess

- Top chess players burn 6000 calories per day during tournaments (R. Sapolsky, Stanford Prof. of Neurology and Neurosurgery)
- Increased heart rate and oxygen intake
- «*You'd run into this depletion effect where you can't sustain the same level of cognitive performance*» (M. Raichle, Prof. of Medicine, Washington University School of Medicine in St. Louis

https://www.cnbc.com/2019/09/22/chess-grandmasters-lose-weight-burn-calories-during-games.html

The depletion of judgement

- Danziger et al. (2011): parole judges in Israel
  - random order
  - ~6 minutes to review applications for parole
  - default: denial
  - ~35% approval rate
  - Decision time is recorded
- after each food break, ~65% of applications are granted, yet the rate drops steadily
- right before next break: ~0% approval

Tired and hungry judges tend to fall back on the easier default position of denying requests for parole

Characteristics of System 1

- impressions, feelings, inclinations ⇒ System 2 ⇒ beliefs, attitudes, and intentions
- operates automatically and quickly, with little or no effort, and no sense of voluntary control
- can be programmed by System 2 to mobilize attention when a particular pattern is detected (search)
- executes skilled responses and generates skilled intuitions, after adequate training
- creates a coherent pattern of activated ideas in associative memory

Characteristics of System 1

- links a sense of cognitive ease to illusions of truth, pleasant feelings, and reduced vigilance
- distinguishes the surprising from the normal
- infers and invents causes and intentions
- neglects ambiguity and suppresses doubt
- is biased to believe and confirm

Characteristics of System 1

- exaggerates emotional consistency (halo effect)
- focuses on existing evidence and ignores absent evidence
- generates a limited set of basic assessments
- represents sets by norms and prototypes, does not integrate
- computes more than intended (mental shotgun)

Characteristics of System 1

- sometimes substitutes an easier question for a difficult one (heuristics)
- is more sensitive to changes than to states (*prospect theory*)
- outweighs low probabilities
- shows diminishing sensitivity to quantity (psychophysics)
- responds more strongly to losses than to gains (loss aversion)
- frames decision problems narrowly, in isolation from one another

Do the association

Intuitively cohesive pattern

Intuitive activation (System 1)

Ideas trigger new other ideas ⇨ Causal story

⇨ *Replication of reality*

Intuitive answers

"How many animals of each kind did Moses take into the ark?"

- Reply: 'NONE'

Intuitive answers

"How many animals of each kind did Moses take into the ark?"

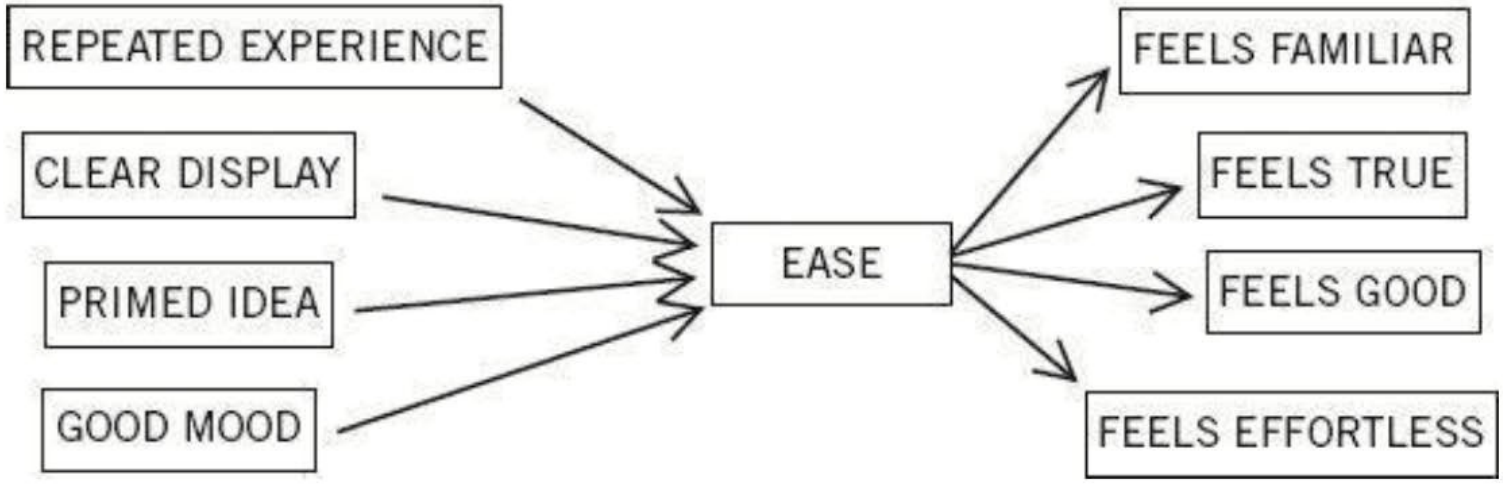
- Reply: 'NONE'
- Noah build the arc

Biblical framing considered Moses as an acceptable argument

An easy way out

Cognitive Ease

Causes and Consequences of Cognitive Ease



(…like in negotiation…)

Norms, Surprises, and Causes

System 1

- maintains and updates a model of our personal world constructed by associations that link ideas of
  - circumstances
  - events
  - actions
  - outcomes

  that co-occur with some regularity
- determines our interpretation of the present and our expectations of the future

When something does not fit into the current context of activated ideas ⇨ *abnormality*

Pros and cons of quick conclusions

Quick conclusions are

efficient when

- likely to be correct
- mistake is affordable
- save time and energy

risky when

- unfamiliar situation
- stakes are high
- no time to collect information

Predictable cognitive illusions

Repetition is more believable (e.g. authoritarian institutions and marketers)

- Frequent repetition supports lies
  - familiarity is not easily distinguished from truth
- The entire statement of a fact or idea does not have to be repeated to make it appear true
- If we cannot remember the source of a statement and have no way to relate it to other things we know, our only option is to go with the sense of cognitive ease

Pass the message

How to write a persuasive message

- Cognitive load works against us
- How to relieve System 2
  - letters that are easily read
  - vivid colors
  - no unnecessary big words
  - memorable text (rhyming if possible)
  - reference to easy names
- Intuitive response by System 1 is rejected
  - the lazy System 2 will adopt the suggestions of System 1 and march on

I got tired

- Inversely, when System 2 is busy, it will accept something more easily
  - System 1 believes easily
  - System 2 disbelieves, but is busy and lazy
- Fatigue makes you accept nonsense
- Improbable claims or events are more easily digested
  - we overestimate the probabilities of catastrophic, yet highly improbable, events

The Halo effect

'The tendency to like (or dislike) everything about a person—including things you have not observed'

The Halo effect in practice

- We attribute the success of a project (or a firm) to a single person/leader
  - "*Steve Jobs created Apple out of nothing*"
- Any behavior of the person is a cause of success
- We end up that imitating his/her practices will lead to the same outcome

We are looking for a 'hero'

Sequence matters

The Halo effect *raises the relative weight of first impression*

- Sometimes to an extent that *any further info is useless*!
- 'Survivorship' bias
- Getting inspiration is fine, but imitating disastrous!

The sequence we observe characteristics is often *random*

- yet *it affects our judgement (…marking an exam based on the first reply)*

What You See is All There is (*WYSIATI*)

Will M. be a good leader?

She's intelligent and strong

- The answer that comes to mind is «YES!»
- What if the next two adjectives were «*corrupt and cruel*?»

System 1…

- got to work on its own from «intelligent» (=> *good*), «intelligent and strong» (=>*very good*); best story that can be constructed from two adjectives
- delivered it with great cognitive ease

BUT

- bias favoring the first impression
- no room for non-available information!

Looking for confirmation

- *We look for reasons to verify, rather than reject, a story*
- *The better the story, the easier it is to accept it*
  - we focus on the story, not the facts
  - we look at the coherence of the story
  - we rule out coincidence
  - more intense when we get to choose the source of information
  - intelligence of the recipient is irrelevant
  - the recipient underestimates the influence

The importance of a good story

- Combined with lazy System 2, this implies that we often adopt view based simply on *intuitive judgments*
- What matters for a good story is coherence, not completeness
  - with little information, we can more easily build a coherent framework
- It's easier to see mistakes of others than our own

What You See Is All There Is

WYSIATI principle

- "What would I need to know before I form an opinion about the quality of leadership?"
- information not retrieved (even unconsciously) from memory might as well not exist
- amount and quality of information are irrelevant
- *Coherence* matters
  - facilitates cohesion and cognitive ease
  - transforms a claim to reality
  - easier to believe a story that supports our view, rather one that rejects it

Guidelines for meetings

In a meeting, the first -and more coherent- views set the agenda and the climate between the members

- members look to confirm, rather than reject the story
- absence of dissent in a team addressing a complex problem should sound an alarm
- secure independence of opinions
  - submit memos before the meeting
  - ensures variety of views
  - strengthens commitment

Biases of judgment and choice

- Overconfidence
  - quality of the story that the individual can tell matters about what she sees
  - even if little is to be seen
- Framing
  - an individual normally sees only one formulation of the story
  - “90% fat-free” is more attractive than “10% fat”
- Base-rate neglect
  - we neglect how often something happens

How judgments happen

System 1

- continuous assessment of the main problems that an organism must solve to survive
- generates ***basic assessments of alternatives (computations of similarity and representativeness, attributions of causality, and evaluations of the availability of associations and exemplars)*** with little or no effort

System 2

- faces or generates questions
- draws attention if necessary and seeks answers with memory

Basic assessments

- System 1 generates continuously basic assessments about our environment

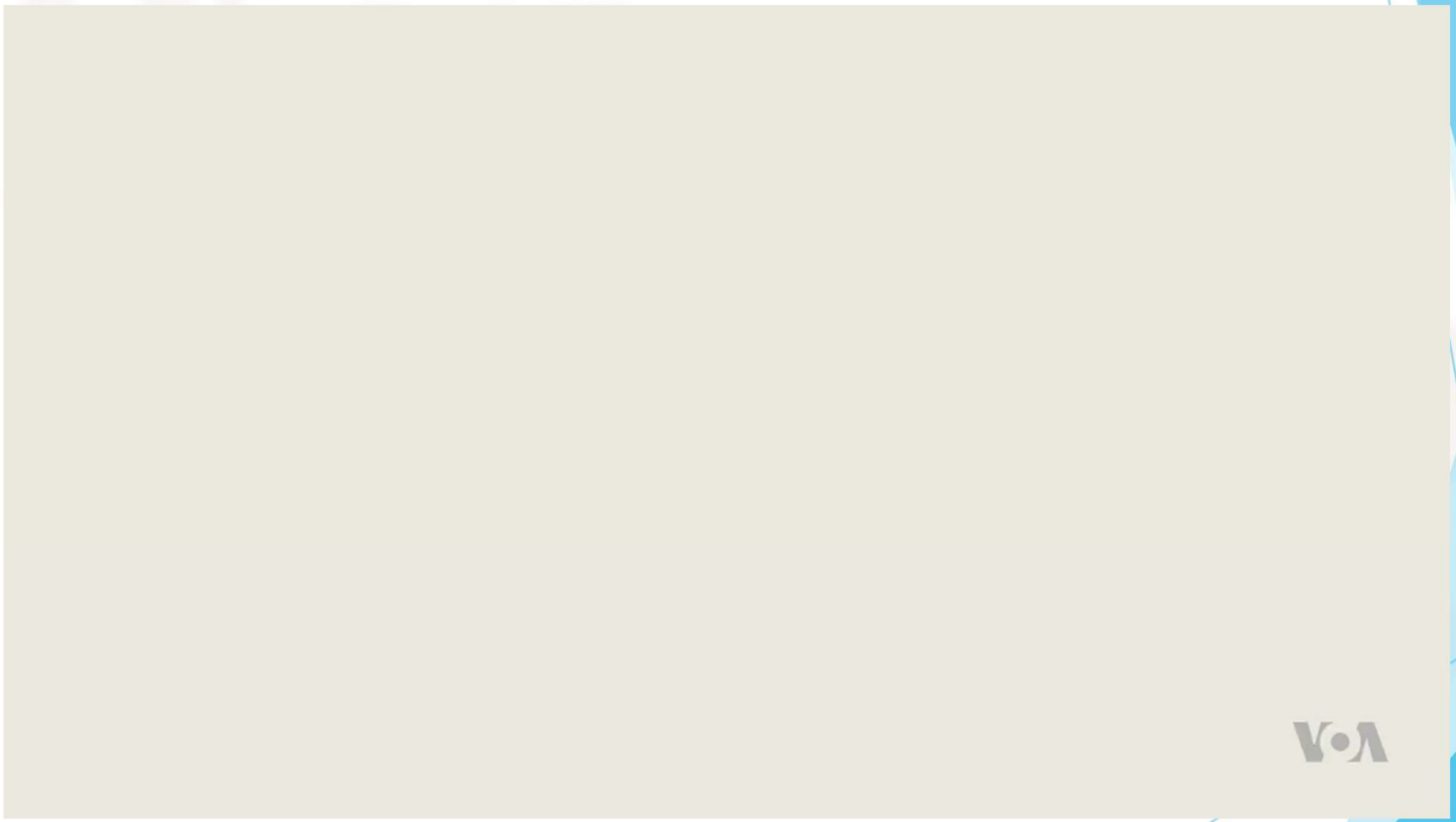
- Example: *rapid judgments* (Todorov)

  by a single glance at a stranger's face, we can evaluate whether he is:

  - *dominant* (ie a threat)
  - *trustworthy*

- ancient mechanism of survival

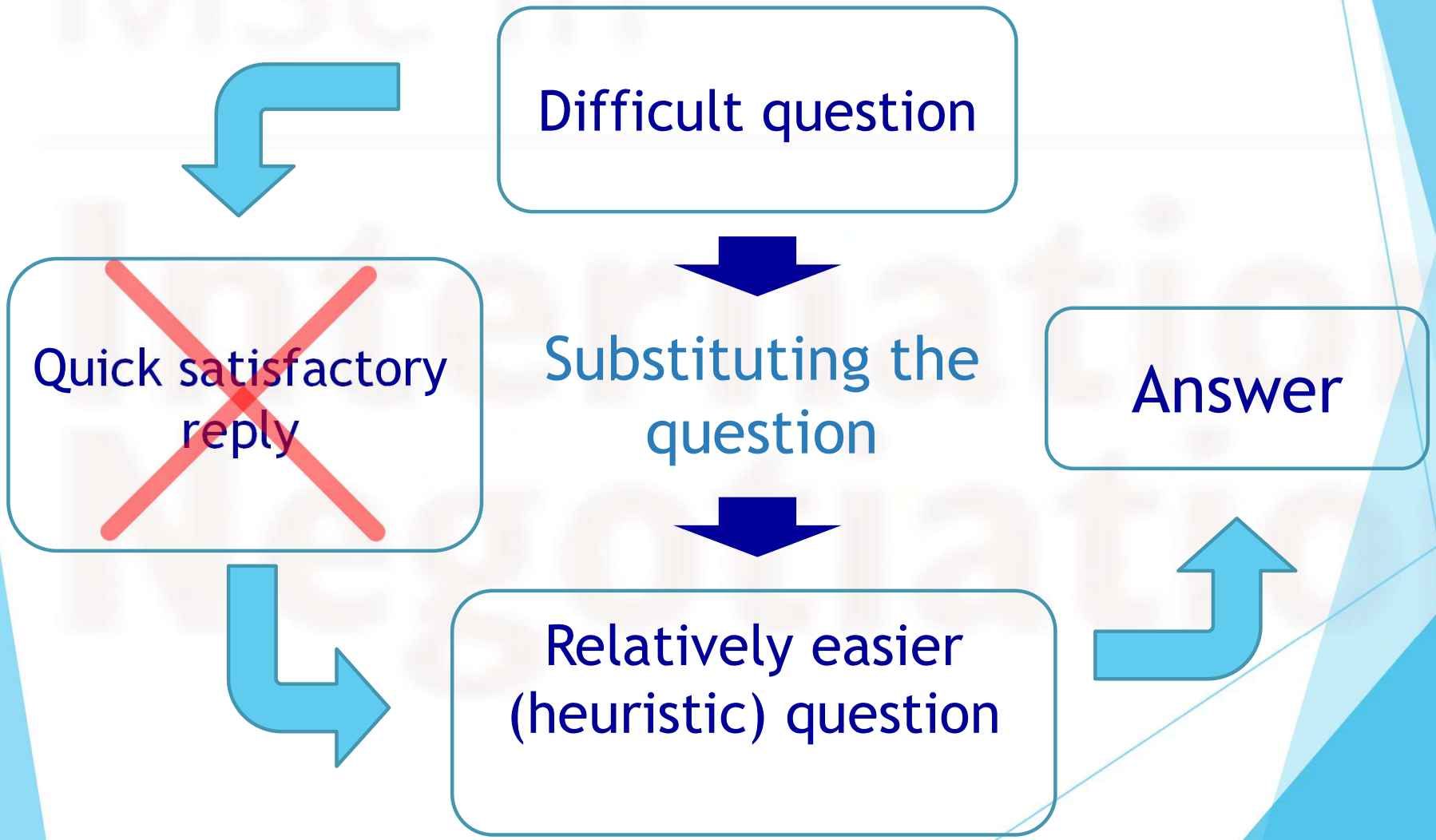
Quick judgement in politics



VOA News (2018, October 8). First Impressions Can Sway Elections, Experts Say, https://www.youtube.com/watch?v=kJylRmdn7NM

Substituting questions

- *System 1 generates intuitive opinions on complex matters*



Substituting questions

If you cannot solve a problem, there is a (relatively) easier problem that you can

Heuristics:

Process that helps finding adequate, but often imperfect, answers to difficult questions

Disadvantage: answers are not chosen

Example

How do you feel these days?

Heuristics: *How do I feel now?*

Heuristics in 3-D

Is the figure on the right larger or not relative to the one on the left?

Heuristics on happiness

2 samples of German students – two questions in sequence

- Sample A
  - How happy are you these days?
  - How many dates did you have this month?

- Zero correlation

- Sample B
  - How many dates did you have this month?
  - How happy are you these days?

- High correlation

Specific answer drives the general answer!

Same pattern

Same evidence when students were asked, *before* the general question on happiness, on their relations with their parents or their finances

WHY?

Standard case of substitution

- Happiness cannot be easily calculated; thought is needed
- **Narrow question specifies the general one**

The ‘Affect’ Heuristic

- Dominance of “conclusions” over “arguments” is most pronounced where emotions are involved
- Likes and dislikes determine the beliefs about the world
- Yet primacy of conclusions does not imply that
  - our mind is completely closed
  - our opinions cannot change

Learning is part of life in all species!

To me she speaks; she moves me for her theme.
What, was I married to her in my dream?
Or sleep I now, and think I hear all this?
What error drives our eyes and ears amiss?
Until I know this sure uncertainty
I'll entertain the offer'd fallacy.

Shakespeare, The Comedy of Errors

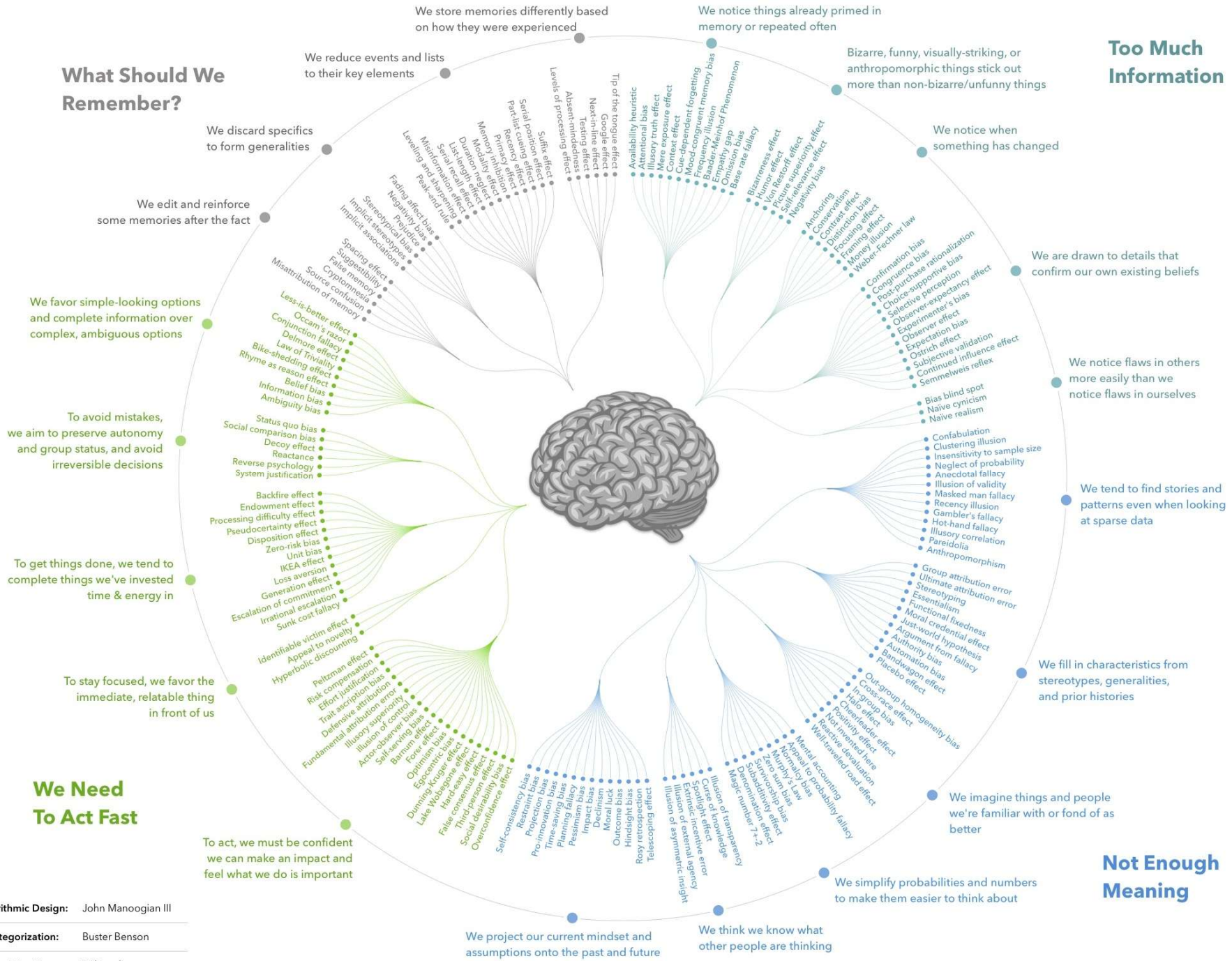
Heuristics and Biases

Sarantis Kalyvitis, AUEB

Short intro

Learn Liberty (2017, Sep 25). What are heuristics?, https://www.youtube.com/watch?v=ReFqFPJHLhA

COGNITIVE BIAS CODEX



Visual & Algorithmic Design:	John Manoogian III
Concept & Categorization:	Buster Benson
List of 188 Cognitive Biases:	Wikipedia

designhacks.co

The Law of Small Numbers

In other words

Law of Large Numbers

- Large samples are more precise than small samples

- Small samples yield extreme results more often than large samples do
  - If I pick balls from a pot, I'll find two same ones more than 3 in small samples

Large samples reduce that risk

- Small samples depend on luck!

‘Law’ of small numbers

- Researchers overlook their sample size as they use their judgement
- Tversky and Kahneman (1971)
  - Research on Researchers
  - Statistical intuition has to be

    a) faced with suspicion

    b) replaced by precise calculations

Psychologists commonly choose samples so small that they exposed themselves to a 50% risk of failing to confirm their true hypotheses

Confidence Bias

In a poll 60% of seniors supports the president

- We focus on the story and not the source

= *seniors support the president*

- Doubt requires bigger effort compared to being certain
- System 1 suppresses ambiguity and spontaneously constructs stories that are as coherent as possible

Pure luck

sex of six babies born in sequence at a hospital

BBBGGG
GGGGGG
BGBBGB

Sequences are random, but our intuition guides us to consider the third one as *more random and more probable*

- We do not expect to see regularity produced by a random process

Causal way of thinking ⇒ Errors in evaluating randomness of truly random events

What are the odds?

- Feynman

"You know, the most amazing thing happened to me tonight. I was coming here, on the way to the lecture, and I came in through the parking lot. And you won't believe what happened. I saw a car with the license plate ARW 357. Can you imagine? Of all the millions of license plates in the state, what was the chance that I would see that particular one tonight? Amazing!"

- The mind *creates* expectations *searching* for evidence and *connects* them with facts to make *decisions*

Logical representation of reality

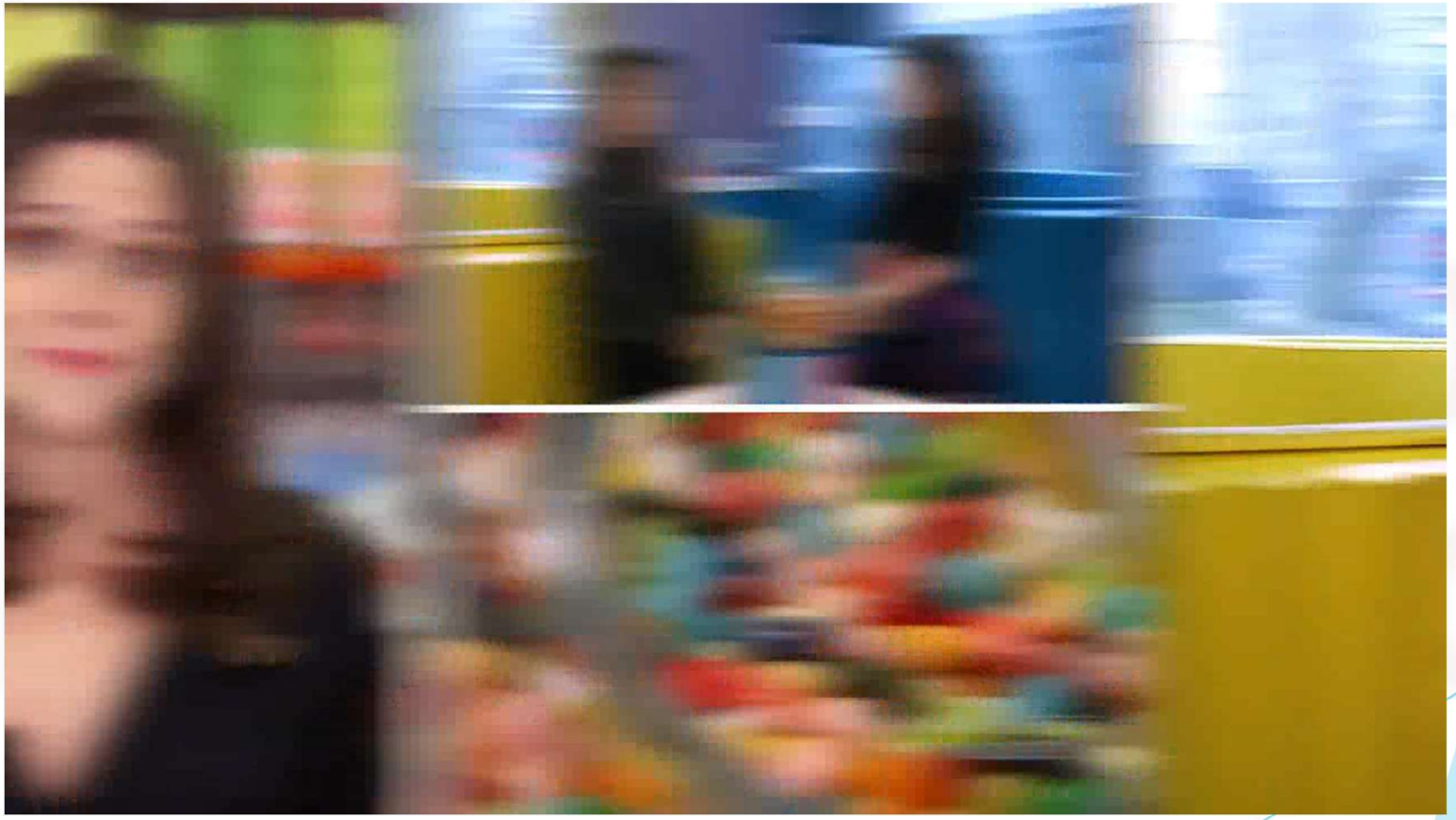
Prone to reliability and coherence

- We pay more attention to the content of messages than to information about their reliability
- We think that small samples look like the population from which they were chosen
- Connection with Halo Effect
- We end up with a view of the world around us that is simpler and more coherent than the data justify
- We act as if the Law of Small Numbers holds

Anchoring

Anchoring Effect

We tend to have a specific value on an unknown quantity, before any actual assessment of the quantity



Business Insider (2018, Oct 23)Anchoring Effect: Guessing How Many Jelly Beans Are In A Jar | Why Are We All So Stupid? https://www.youtube.com/watch?v=igv_0-azRU

Mechanism of Anchoring

- Two mechanisms for the two Systems
  - System 2: intentional adjustment process
    - System 2 works on data retrieved from memory in an automatic and involuntary operation of System 1
  - System 1: preparation effect
    - System 2 susceptible to the biasing influence of anchors that make some information easier to retrieve

Adjustment process

- Estimate uncertain quantity
  - Initial value (*anchoring*)- high or low?
  - Gradual adjustment of initial estimate – distancing from anchor
  - Adjustment typically ends *too soon* due to uncertainty

Preparation

Anchoring occurs when thoughts and behavior are influenced much more than we know or want by the environment of the moment

- When some ‘causes’ us to
  - see
  - hear
  - feel

  by merely bringing it to mind

- Preparation effect that **forces the mind to find compatible evidence**

Examples

- Was Gandhi more or less than 144 years old when he died?
- How old was Gandhi when he died?

We do not believe that Gandhi lived to the age of 144, yet associative machinery generated an impression of a very ancient person

- *We drive quicker when entering from the highway to town, particularly when we chat with someone*

The German judge

- German judges with 15-year experience
- rolled a pair of dice loaded so every roll resulted in either a 3 or a 9
  - on average, those who had rolled a 9 said they would sentence her to 8 months;
  - On average, those who had rolled a 3 said they would sentence her to 5 months
  - the anchoring effect was 50%

System 1 tries its best to construct a world in which the anchor is the true number

Invisible anchors

https://www.youtube.com/watch?v=NFiDdbquWJY

Anchors and planning

- Strategic plans (e.g. budgets) require negotiations
  - status quo sets an anchor and matters
  - anchoring sets unidentifiable limits for parties
- CEOs should allocate funds based on *future* prospects
  - current allocation is supported by managers
  - a reallocation questions last year's process as well
  - firms typically reallocate with a new CEO

Uses and abuses of anchors

- *In negotiations*
  - first-move advantage?
  - we stay closer to the anchor when we are tired
- Resistance to anchoring
  - threat to withdraw following an outrageous offer
  - mobilize yourself (System 2) to combat the effect
  - stay alert and look for arguments against the anchor
    - think the opposite on purpose

Overall on anchoring

- The anchor is a life saver
- Our thoughts and our behavior are influenced, much more than we know or want, by the environment of the moment
- We cannot comprehend how the anchor drives our thoughts and assessments
  - extremely hard to imagine a world in which the anchor would b different -or would not exist at all

Availability and Representativeness

What comes to our mind?

Availability heuristics

*We assess the frequency of events by the availability heuristic: "**the ease with which instances come to mind**"*

- Substitution of questions

  no real assessment of frequency or size

  the ease to think of something matters

  → systematic errors and bias

- Sources of errors

  salient or extreme events, personal experiences etc

Happy marriage

Who takes the garbage out?
(Who causes quarrels?)

- Sum of answers > 100% (< 100%)
- We over(under)-estimate our contribution
- Personal experiences are more readily available

Availability Bias: If I remember something, it must be important!

Psychology of availability

- Schwarz (1990)
  - list six instances in which you behaved assertively
  - evaluate how assertive you are

The evaluation of assertiveness depends on:

- the number of instances retrieved
- the ease with which they come to mind

- *people who listed twelve instances rated themselves as less assertive than people who had listed only six*

What counts more? The fluency of the retrieval!

Say less or more

- Decreasing ease of reporting instances
  - we are less confident in a choice when they are asked to produce more arguments to support it
  - we are less confident that an event was avoidable after listing more ways it could have been avoided
  - we are less impressed by a car after listing many of its advantages
- Content of instances is not important
- Students who list more ways to improve a class rate it higher

Availability and risk

Cycles of disasters, concern, and growing complacency

- The dynamics of memory: bias in overestimating numbers from less likely causes
  - a car in flames brings crashes to mind
  - shortly after catastrophic events: insurances, security and protective measures
  - memories of disasters dim over time, so do worry and diligence

Public perceptions of risks

Table 5.14 Approximate number of deaths in the United States and estimated number of deaths from different causes.

	Actual number	Estimated number	Newspaper inches
Fireworks	6	331	0
Whooping cough	15	171	0
Venomous bite or sting	48	535	0
Tornado	90	688	153.5
Lightning	107	128	0.8
Non-venomous animal	129	298	33.8
Flood	205	863	41.8
Pregnancy, childbirth and abortion	451	1,932	0
Appendicitis	902	880	0
Electrocution	1,025	586	42.2
Train collision	1,517	793	0
Asthma	1,886	769	1.9
Firearm accident	2,255	1,623	28.2
TB	3,690	966	0
Fire and flames	7,380	3,814	320.7
Drowning	7,380	1,989	247
Leukemia	14,555	2,807	14.8
Homicide	18,860	8,441	5,042.9
Accident falls	17,425	2,585	124.8
Breast cancer	31,160	3,607	0
Diabetes	38,950	2,138	0
Motor vehicle accidents	55,350	50,000	1,440.5
Lung cancer	75,580	9,723	35.9
Heart disease	738,000	25,900	303.4

Source: Lichtenstein et al. (1978).

Media coverage

- Estimates of causes of death are warped by media coverage
- Unusual events attract disproportionate attention
  - perceived as less unusual than they really are
- Expectations about the frequency of events are distorted by the prevalence and emotional intensity of the messages to which we are exposed
- The world in our mind is far from the real one

Public vs Experts

PEOPLE

- guided by sentiments, not rationality
- affected by less important details
- are not adequately aware of the differences between small and negligible probabilities

EXPERTS

- more familiar with numbers and quantities
- weaker prejudices
- calculate risk objectively

Public and Experts

- Policy questions involve assumptions about human nature
  - the choices that people may make
  - the consequences of their choices for themselves and for society
- Poor regulation is wasteful of lives and resources
  - both can be measured objectively

Key limitation

- The mind is uncapable of facing the real dimension of small risks
- It ignores them or outweighs them (eg. parents and kids, terrorism etc)
  - *neglecting probabilities*
  - *overrating secondary threats*
- Key question: *What is the alternative use of resources?*

Representativeness: What does X study?

X is a graduate student in our city

- Most students → humanitarian studies
- What does X study? Classify from most to less likely
  - *business administration*
  - *computer science*
  - *engineering*
  - *humanities and education*
  - *law*
  - *medicine*
  - *library science*
  - *physical and life sciences*
  - *social science and social work*

X's field

- Base-rate information
  - Proportion of students in a field: *base rate*
  - X was chosen randomly from the graduate students in this sample (town)
  - There are more students overall in the humanities and education than in in computer science or library science
    - go by the base rates and guess that X is more likely to be enrolled in humanities and education

X's identity

- is highly intelligent, although lacking in true creativity
- has a need for order and clarity, and for neat and tidy systems in which every detail finds its appropriate place
- his writing is rather dull and mechanical
- he seems to have little feel and little sympathy for other people, and does not enjoy interacting with others
- self-centered, he nonetheless has a deep moral sense

What you say now about X's studies?

What do we think that X studies?

Replies (from more to less popular)

1. computer science
2. engineering
3. business administration
4. physical and life sciences
5. library science
6. law
7. medicine
8. humanities and education
9. social science and social work

X's field

- Representativeness
  - Stereotypes on professions
  - Focusing on similarity of description with stereotypes
- Base rates
  - Mostly ignored when available, as also are doubts on the validity of description

Predicting through representativeness

- Participants ranked
  - the big field (humanitarian studies) too low
  - the small specialty (computer science) to high

- Classical case of substitution
  - assessing the probability asked by ranking through representativeness

These predictions are *not statistically optimal*

The sins of representativeness

- Two basic errors
  - Willingness to predict improbable events
  - Lack of sensitivity on the quality of indications
  - What do we do?
  - **Leave probability judgements near the base rate**

Bayesian statistics

- Bayes rule
  - How to combine evidence (here, **base rate**) with evidence
  - Consider events A and B

$$\textit{Probability of A given B} = \frac{\textit{Probability of B given A} \times \textit{Probability of A}}{\textit{Probability of B happening}}$$

Factors of Bayesian approach

- Base rates matter
  - this is often not intuitively obvious
- ***What You See Is All There Is*** and **associative coherence** drive us to believe them
  - our intuitions are often overrated
- We anchor our judgement to the probability of an **obvious base rate**

We do not rely on the validity of indications and stereotypes

About Linda

Tversky και Kahneman

- *Linda is 31 years old, single, outspoken, and very bright*
- *majored in philosophy*
- *as a student, she was deeply concerned with issues of discrimination and social justice*
- *participated in antinuclear demonstrations*

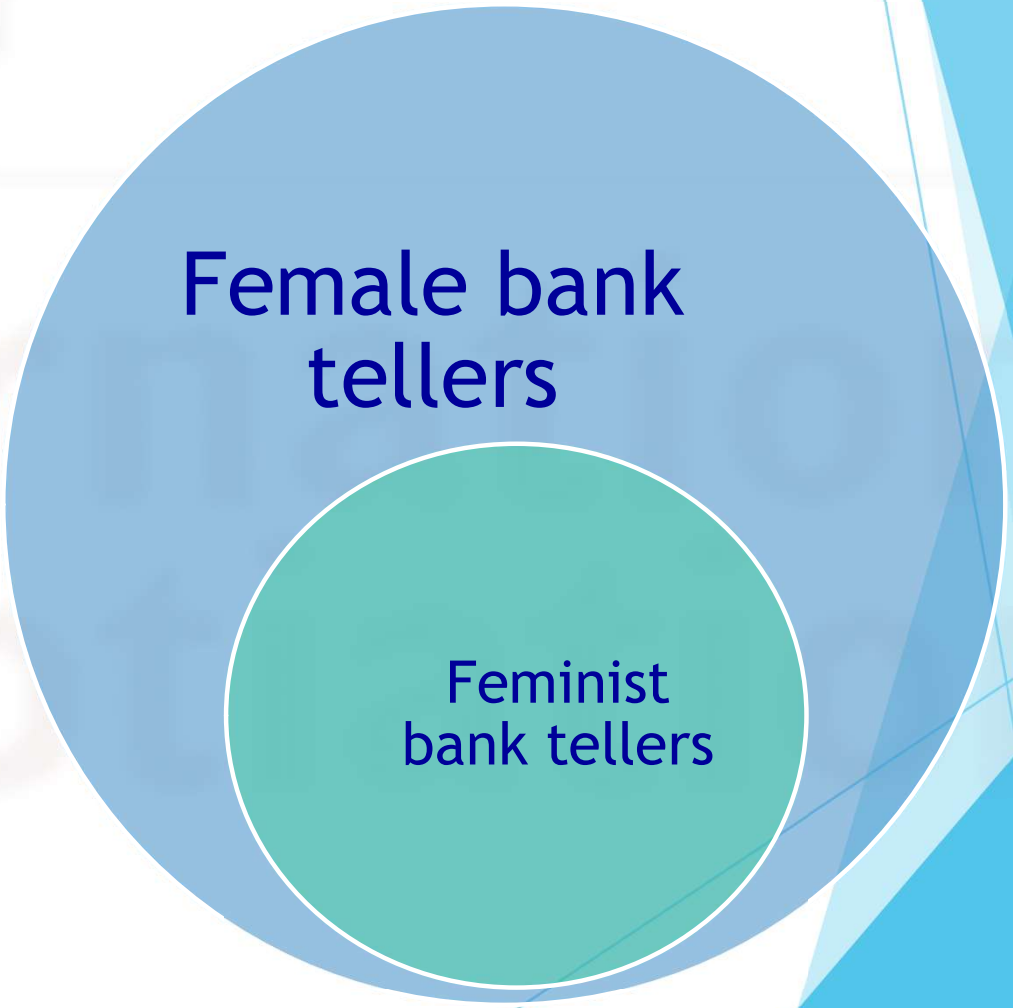
Linda: Less Is More

Linda…

- is a teacher in elementary school
- works in a bookstore and takes yoga classes
- is active in the feminist movement
- is a psychiatric social worker
- is a member of the League of Women Voters
- is a bank teller
- is an insurance salesperson
- is a bank teller and is active in the feminist movement

Bank tellers and feminism

- Feminist bank tellers are a subset of bank tellers



Logic…

The probability {*Linda – feminist bank teller*}

has to be smaller than the probability

{*Linda – bank teller*},

since statistically

$$P(A \cap B) \leq P(A)$$
$$and$$
$$P(A \cap B) \leq P(B)$$

…or representativeness;

- The evidence showed that if subjects with experience in statistics, placed the choice «*feminist – bank teller*» higher than «*bank teller*»
- *Representativeness won!*

Why?

- The most representative outcomes combine with the personality description to produce the most coherent stories
- The most coherent stories are not necessarily the most probable, but they are *plausible*
  - coherence, plausibility, and probability are easily confused by the unwary
- **Adding detail to scenarios makes them more persuasive, but less likely to come true**

Forms of base rates

- Two kinds of base rates
  - Statistical base rates
    Evidence from the population of a specific sample, which are not particular to the sample
  - Causal base rates
    Evidence on the specific sample that affect our judgement

Less is More

- A: How much would you pay for this expensive dinnerware?
- B: How much would you pay for this expensive dinnerware + 2 extra average pieces?
- Suggested price for A was higher

- We think with norms and prototypes
  - System 1 does not add, calculates on average
  - System 2 is not readily available

Think statistically

Subjects' unwillingness to deduce the particular from the general was matched only by their willingness to infer the general from the particular (Nisbett and Borgida)

- Gap between statistics and real incidents in our thinking
  - statistical results with a causal interpretation have a stronger effect on our thinking than noncausal info
- Powerful long-term beliefs rooted in personal experience
- Isolated incidents have a powerful impact
  - effective tool for teaching psychology because the incongruity must be resolved and embedded in a causal story

Mean reversion

Talent or luck?

- Need for causal explanations in random and unavoidable variations leads to wrong interpretations
- Excellent scores are mostly due to luck
  - typically followed by lower ones

Most likely the change would have occurred anyhow

Reversion to the mean

- The more extreme an incident, the larger the expected reversion to the mean
- Effects are visible everywhere
  - a distinction is followed by a ‘slump’
  - it’s not the distinction that caused it, but rather the reversion to the mean

Correlation vs. causality

- Galton (1877)
  - offspring did *not* tend to resemble their parent seeds in size
  - always more mediocre than they— smaller than the parents, if the parents were large; to larger, if they were very small

Regression to mediocracy

Highly intelligent women tend to marry men who are less intelligent than they are

Yes, but…

- The correlation between the intelligence scores of spouses is less than perfect
- Men and women on average do not differ in intelligence
- Mathematically inevitable that highly intelligent women will be married to husbands who are on average less intelligent than they are (and vice versa)

Associative causality

- We are biased towards causal explanations
- Statistical evidence become ‘invisible’ to us
  - Luck is the best explanation for an athlete who performed well, but lacks the causal explanation preferred by the mind
- When we spot something, associative memory searches for a cause in any possible source in which it might have been stored
- Regression to the mean has an explanation, not a cause
  - Unsurprisingly, the best candidates fail to meet our expectations

Intuitive forecasts

Forecasts are the result of

- precise calculations from similar occasions
  - economists forecast inflation
  - chefs estimate the demand for their dishes
- Intuition and System 1
  - skill and expertise acquired by repeated experience
  - heuristics that often substitute an easy question for the harder one

Julie's average

Julie is currently a senior in a state university. She read fluently when she was four years old.

What is her grade point average (GPA)?

1. Causal link; associative memory quickly and automatically constructs the best possible story from the information available
2. The evidence is evaluated in relation to a relevant norm
3. substitution and intensity matching
4. translation, from an impression of Julie's relative academic standing to the GPA that corresponds to it

System 1 does not adapt to weak evidence

Correcting intuitive predictions

The evidence should be evaluated according to their corresponding weight

1. Start with an estimate of average GPA
2. Determine the GPA that matches your impression of the evidence
3. Estimate the correlation between your evidence and GPA
4. If the correlation is .30, move 30% of the distance from the average to the matching GPA

Defense of extreme predictions

- Question our intuition using System 2, if it is not in accordance with the evidence
- A rational person seeks unbiased and moderate predictions
- Intermediate predictions between the baseline and our intuitive response
  - in the default case of no useful evidence, we stay with the baseline
  - a job candidate with impressive CV and moderate interview should be preferred to someone with the opposite virtues (‘law of small numbers’)

Overconfidence

Excessive self-confidence

Our illusion of being more certain about our abilities compared to what is objectively justified

Best of

- 63-70% of people consider themselves above average in terms of intelligence
  - 88% of Americans believe they are in the upper 50% of drivers (60% believer they are in the upper 20%)
  - 90% of students think that their driving skills are above average
- 95% of MBA students believe they are in the upper 50% of their class, even if their grades do not differ
  - 94% of university professors believe that they are the upper 50% in their field

The Others

- In leadership
  - the input of others is essential, but senior executives focus on the abilities and plans
  - the probability of a negative outcome is systematically underrated
- How to avoid overconfidence: distinguish between aspects of the future that we can affect vs. those that we cannot affect
  - when we can, we can create the future; optimism is a necessity
  - when we cannot, we just predict; optimism can prove disastrous

Understanding the world

Nassim Taleb: narrative fallacy

- How do flawed stories of the past shape our
  - views of the world
  - expectations for the future

We focus on a few striking events that happened rather than on the countless events that failed to happen

The simpler the better

- Nice story (eg Google)
  - simple and coherent explanation of actions and intensions
- The Halo effect
  - We fit a person's characteristics into a single one
    - An ugly athlete performs badly
  - We overrate the consistency of evaluations: good (bad) persons do only good (bad) things
    - Hitler was a vegetarian and loved animals
  - When we reduce inconsistencies, we maintain the simplicity and coherency of narratives

because…

- Inconsistencies reduce
  - ease of thought
  - clarity of feelings
- Non-events are not easily accessible
- The lesson from the nice story of Google
  - Bad luck could have jeopardized any right decision and step
  - Halo effect makes us overrate the role of skills

What You See Is All There Is

- We construct the best possible story given the available information
  - If it fits, we believe it
- It's easier to construct a cohesive story when we know *less*
- Intuition bias about the future
- Unlimited ability to ignore our ignorance

I knew it!

- Human mind makes up narratives about the past
- Mind is limited in its ability to reconstruct
  - past states of knowledge
  - beliefs that have changed
- Once we adopt a new view of the world, we lose much of our ability to recall what we used to believe before
- When we attempt to reconstruct former beliefs, we retrieve current ones instead —substitution
- *"I-knew-it-all-along" effect (hindsight bias)*

Cognitive hindsight bias

- Hindsight bias has pernicious effects on the evaluations of decision makers
- The quality of a decision is not assessed by whether the process was sound but by whether its outcome was good or bad
- We are prone to blame decision makers for good decisions that worked out badly and to give them too little credit for successful moves that appear obvious only *after the fact*
  - a low-risk surgical intervention in which an unpredictable accident occurs that causes the patient's death will lead the jury to believe, after the fact, that the operation was risky and that the doctor should have known better
- The more severe the consequences, the more intense our hindsight bias

Nixon to China

- *Fischhoff και Beyth*
  - survey before President Richard Nixon visited China and Russia in 1972
  - respondents assigned probabilities to 15 possible outcomes of Nixon's diplomatic initiatives
    - *Would Mao Zedong agree to meet with Nixon?*
    - *Might the US grant diplomatic recognition to China?*
    - *After decades of enmity, could the United States and the Soviet Union agree on anything significant?*

Nixon after China

- Respondent were asked *after* the trip to recall the probability that they had originally assigned to each of the 15 possible outcomes
  - If an event had actually occurred, people exaggerated the probability that they had assigned to it earlier
  - If not, participants erroneously recalled that they had always considered it unlikely
  - Further experiments showed that people were driven to overstate the accuracy not only of their original predictions but also of those made by others
- The tendency to revise the history of one's beliefs in light of what actually happened produces a robust cognitive illusion

The case of 9/11

«The officials who failed to anticipate it were negligent or blind»

- 10/7/2001: CIA obtains information that al-Qaeda might be planning a major attack against the US
- Director of CIA brings the information not to President Bush but to National Security Adviser Rice
- Executive editor of Washington Post, Ben Bradlee, declares "*It seems to me elementary that if you've got the story that's going to dominate history you might as well go right to the president.*"

But on July 10, no one knew—or could have known—that this intelligence would turn out to dominate history

Insightful leaders

- Leaders who have been lucky are never punished for having taken too much risk
- The sensible people who doubted them are seen in hindsight as mediocre, timid, and weak
- Through System 1 we see the world in a much simpler way than it really is
- Believing that we understand the past leads to erroneously believe that we can predict the future

The role of CEOs

- Do leaders and management practices influence the outcomes of firms?
  - they do, but the effect is much smaller than the business press suggests
- Consumers have a hunger for a clear message about the determinants of success and failure in business
  - they need stories that offer a sense of understanding, however illusory

Halo effect and outcome bias

- The CEO of a successful company is likely to be called flexible, methodical, and decisive
- If after a year things have gone sour, the same CEO is described as confused, rigid, and authoritarian
- Descriptions sound *right at the time*
  - the Halo effect drives us to get the causal relationship backward
  - we tend to believe that the firm fails because its CEO is rigid, when the truth is that the CEO appears to be rigid *because* the firm is failing
  - these stories induce and maintain an *illusion of understanding* with no lessons of value to readers who are all too eager to believe them

Fortune

- Luck plays a large role
  - the quality of leadership and management practices cannot be inferred reliably from observations of success
- Fortune's "Most Admired Companies"
  - over a 20-year period, firms with the worst ratings went on to earn much higher stock returns than the most admired firms
- the human mind needs a simple message of triumph and failure that
  - identifies clear causes
  - ignores determinative power of luck and inevitability of regression

The illusion of validity

- Subjective confidence in a judgment is not a reasoned evaluation of the probability that this judgment is correct
- Confidence is a *feeling*, which reflects
  - the *coherence* of information
  - the *cognitive ease* of processing it
- Declarations of high confidence mainly tell you that an individual has *constructed* a coherent story in his mind
  - the story is not necessarily true

The illusion of skill

The Illusion of Stock-Picking Skill

Most stock buyers and sellers have

- same information
- different opinions
  - buyers think the price is too low and likely to rise
  - sellers think the price is high and likely to drop

A Random Walk Down Wall Street

Burton Malkiel

- A stock's price incorporates all the available knowledge about the value of the company and the best predictions about the future
- If some people believe that the price of a stock will be higher tomorrow, they will buy more of it today and its price rises
- If all assets in a market are correctly priced, no one can expect either to gain or to lose by trading

Is stock trading worth it?

Odean studied 163,000 trades of 10,000 brokerage accounts of individual investors spanning over 7-years

- instances in which an investor sold some of his holdings in one stock and soon afterward bought another stock
- definite idea about the future of the two stocks; the stock chosen to be bought will do better than that chosen to be sold

- results were unequivocally bad; on average, the shares that individual traders sold did better than those they bought
- the most active traders had the poorest results, while the investors who traded the least earned the highest returns!

Losers and winners

- Financial institutions and professional investors are ready to take advantage of the mistakes that individual traders make in choosing a stock to sell and another stock to buy
- The illusion that we understand the past boosts overconfidence

Professional investors

- able to extract a considerable amount of wealth from amateurs
- fail a basic test of skill: persistent achievement
- good results are due to luck

Illusions behind skill and validity

- Cognitive illusions can be more stubborn than visual illusions due to overconfidence
- The most potent psychological cause of the illusion is certainly that the people who pick stocks are exercising high-level skills
  - skill in evaluating the business prospects of a firm is not sufficient for successful stock trading
  - subjective confidence of traders is a feeling, not a judgment
  - cognitive ease and associative coherence
  - illusions of validity and skill are supported by a powerful professional culture

Clinical vs. Statistical Prediction

Paul Meehl

Who predicts better?

(a) trained counselors predicted the grades of freshmen at the end of the school year, or

(b) statistical algorithm used only high school grades and one aptitude test

- the formula was more accurate than 11 of the 14 counselors
- 60% of studies have shown significantly better accuracy for the algorithms and many others a draw
  - Statistical test are less expensive

Wine statistics

- Example: the wine market is a small stock exchange
  - When do we open a bottle of wine;

Orley Ashenfelter

Statistical formula ⇒ price of wine

- average temperature over the summer growing season
- amount of rain at harvest-time
- total rainfall during the previous winter

Experts vs statistics

cling

- The efficiency of the formula questions the skills of the experts
- Wine producers and experts reponse
  - «*Like judging movies without actually seeing them*»

Why do experts often perform worse than algorithms?

Experts try

- to be clever
- think outside the box
- consider complex combinations of features

➡ *reduced validity*

- Humans are incorrigibly inconsistent in making summary judgments of complex information
- When asked to evaluate the same information twice, they frequently give different answers

➡ Experienced radiologists who evaluate chest X-rays as "normal" or "abnormal" contradict themselves 20% of the time when they see the same picture on separate occasions

The context matters

- Widespread inconsistency
- Extreme context dependency of System 1
- To maximize predictive accuracy, final decisions should be left to formulas, especially in low-validity environments
- Can we predict if someone will go to the movies on a particular day?
  - It is proper to disregard the formula if information is received that the individual broke a leg today (Meehl: *Rule of Broken Leg*)

On formulas

A common approach in social sciences: multiple regression

$$\hat{y}_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots. \beta_i X_i$$

optimal formula of weighted factors

However a simple formula

marital stability =

frequency of lovemaking - frequency of quarrels

enough to compete with an optimally weighted formula

Application: Apgar Score

Simple algorithms for infants

Five variables	and	*three values*
✓ heart rate		0
✓ respiration		1
✓ reflex		2
✓ muscle tone		
✓ color		

1' after birth

Score of infant >8: good shape

Score of infant <4: need of immediate intervention

Disbelief by experts

Clinical psychologists

- know their skills, but rarely their limitations
- correct short-run predictions in the context of the therapeutic interview, but skill bias for long-term predictions

Hostility to mechanical algorithms: human failure is more easily acceptable

Pros and cons

- Algorithm aversion
  - We prefer the **natural against the artificial**
- Supporters of algorithms
  - **Immoral** to rely on intuitive judgements, if an available algorithm performs better
    - applications in medicine, professional evaluation, sports

Algorithms and interviews

- Interviews are, mostly, non regular environments
- Blueprint for interviewers
  - Little effort, but disciplined
  - Prerequisites for the job
    - some short, *independent to each other*, dimensions will do
  - Questions about real facts
  - Intuition adds value even in the justly derided selection interview, but *only after disciplined*
    - *collection of objective information*
    - scoring of separate traits
  - Do not trust ‘gut feeling’ or invent ‘broken legs’

Negotiation guidelines

- Experienced negotiators often trust their ‘gut feeling’
- Extensive experience permits ‘feeling’ the other side
  - feeling weakness or fatigue in the other side
  - feeling when to exercise pressure or retreat
- Yet decisions should be based on facts
  - should I bid for this?
  - what is my maximum offer?
  - what should be the pre-requisites?

When do we trust experts' intuition;

Kahneman και Klein, 2009

Conditions for acquiring skills

- sufficiently regular environment to be predictable
  - *strategic decisions are rarely the same*
- opportunity to learn these regularities through prolonged practice

When these conditions are satisfied, intuitions are likely to be skilled

Differences in skills

- Some intuitions can be quickly acquired (emotional learning), but expert skills take time to develop (reading, chess)
- Differences between experts and their skills
  - e.g. firemen versus clinical psychologists
- Short-term and long-term predictions

Illusion of validity

- Failures are often due to uncertainty in some fields (e.g. political scientists)
- Algorithms are superior because they are more likely to
  - identify elements of weak validity
  - maintain a moderate accuracy level using data in a wise way
- Intuition matters after
  - collecting info
  - applying standardized procedures

On skills and confidence

- Expertise does not comprise a single skill
  - collection of skills
  - the same professional may be highly expert in some of the tasks in her domain while remaining a novice in others *(e.g. surgeon, economic analyst)*
- Overconfidence of experts is often due to the ignorance of their limits in their professional skills
  - a judgement answering the wrong question often forges confidence

Assessing the validity of experts

- Do the experts have all the evidence?
- We rarely get to have repeated experiences
- In a less regular, or low-validity, environment, the heuristics of judgment are invoked
- System 1
  - *produces quick answers* to difficult questions through substitution
  - *creates coherence* when it does not exist
  - does *reply to the question at hand*, but gives a quick reply
  - looks rational enough to *bypass the review* of lazy System 2

The outside view

- Kahneman and co-authors
  - need for textbook to teach judgment and decision making in high schools
  - write down an estimate of how long it would take to submit a finished draft of the textbook
    - confidentially collecting each person's judgment
    - estimated time 2 years
  - The base rate (7 years) was ignored
  - 40% of the teams failed to finish the job

Textbook lessons

- Two approaches
  - Internal and external view
- Initial predictions were closer to a best-case scenario than to a realistic assessment
- Irrational persistence

«Facing a choice, we gave up rationality rather than give up the enterprise»

Invoking 'every case is unique' leads to bad judgements

Inside and outside view

Inside

- predict based on existing information
- no room for “unknown unknowns” (D. Ramsfeld)

Outside

base rate $\Rightarrow$ benchmark for prediction
anchor for subsequent changes

Correct baseline

If the baseline prediction is appropriately chosen

- the outside view shows how far is the target
- can indicate that the inside view is not even close

People who have information about an individual case rarely feel the need to know the statistics of the class to which the case belongs

The Planning Fallacy

Overly optimistic forecasts of the outcome of projects are found everywhere

- are unrealistically close to best-case scenarios
- could be improved by consulting the statistics of similar cases

Examples of planning fallacy

Scottish Parliament building (1997)

- June 1999, the budget for the building was £109 mn
- April 2000, legislators imposed a £195 mn “cap on costs”
- November 2001, they demanded an estimate of “final cost,” which was set at £241 mn
- estimated final cost rose twice in 2002, ending the year at £294.6 mn
- rose three times more in 2003, reaching £375.8 mn by June
- finally completed in 2004 at an ultimate cost of £431 mn

American homeowners with remodeled kitchens (2002)

Budget 18658 USD

Final cost 38769 USD

Facing optimism

- Optimism is normal, but some fortunate people are more optimistic than the rest of us
- If you are genetically endowed with an optimistic bias, you hardly need to be told that you are a lucky person—you already feel fortunate
- *Optimists*
  - ✓ *are normally cheerful and happy, and therefore popular*
  - ✓ *are resilient in adapting to failures and hardships*
  - ✓ *their chances of clinical depression are reduced, their immune system is stronger*
  - ✓ *take better care of their health*
  - ✓ *feel healthier than others and are in fact likely to live longer*

Optimists in society

- Optimistic individuals play a disproportionate role in shaping our lives
  - their decisions make a difference
  - they are the inventors, the entrepreneurs, the political and military leaders—not average people
  - got to succeed by seeking challenges and taking risks
  - are talented and have been lucky, almost certainly luckier than they acknowledge
  - their experiences of success have confirmed their faith in their judgment and in their ability to control events
  - their self-confidence is reinforced by the admiration of others

Optimistic bias

- Optimism
  - contributes to dynamism in a capitalist society
  - is based on the coherence of story
- Optimists
  - take more risks than they realize
  - are overconfident
  - neglect competition
  - encourage themselves in surpassing obstacles

The leader's optimism

- Evidence suggests that optimistic bias plays a—sometimes dominant—role whenever individuals or institutions take on significant risks
- The chances that a small business will survive for 5 years in the US are about 35%
  - individuals who open such businesses do not believe that the statistics apply to them
  - their average estimate of the chances of success for "any business like yours" is 60%
- Psychologists have confirmed that most people genuinely believe that they are superior to most others on most desirable traits

Non-innocent mistakes

- We focus on our goal
  - anchor on our plan
  - neglect relevant base rates
  - expose ourselves to the planning fallacy
- We focus on what we want to do and can do
  - neglect the plans and skills of others
- We focus on the causal role of skill in (i) explaining the past and (ii) predicting the future
  - neglect the role of luck (*illusion of control*)
- We focus on what we know
  - neglect what we do not know
  - makes us overly confident in our beliefs

Recipe for optimism

- ***Are you a good driver?***
- ***Are you better than average as a driver?***

The second question is much harder!

- Entrepreneurs naturally focus on what they know best
  - plans and actions
  - most immediate threats and opportunities (eg funding)
- Entrepreneurs know less about competitors
  - find it natural to imagine a future in which the competition plays little part

What we don't know

- Overconfidence is another manifestation of *WYSIATI*
  - when we estimate a quantity, we rely on information that comes to mind
  - construct a coherent story in which the estimate makes sense
  - impossible to allow for the information that does not come to mind —because one never knew it
- We expect high confidence from experts
  - Uncertain doctors look weak
  - President Truman famously asked for a "one-armed economist"; he was sick and tired of economists who kept saying, "On the other hand…"

Look for the outside view before approving a plan

The Premortem

- Gary Klein: A remedy for optimistic bias
- Before a decision or a meeting
  - *Imagine that we are a year into the future*
  - *We implemented the plan as it now exists*
  - *The outcome was a disaster*
  - *Take 5 to 10 minutes to write a brief history of that disaster*

On April 6th, 1912, a day after the Titanic tragedy, Philip A. S. Franklin, vice president of the IMM Company, stated after being told of the sinking:

"I thought her unsinkable, and I based my opinion on the best expert advice available. I do not understand it."

Mitigating the planning fallacy

Forecasting method similar to the practices recommended for overcoming base-rate neglect (Flyvbjerg)

1. *Identify an appropriate reference class from similar projects*
2. *Obtain the statistics of the reference class and use them to generate baseline prediction*
3. *Use specific information about the case to adjust the baseline prediction, if there are particular reasons to expect the optimistic bias to be more or less pronounced in this project*

Choices

Decision making

Expected utility theory

- foundation of the rational-agent model
- logic of choice
- based on fundamental rules (axioms) of rationality

Example

If you prefer an apple to a banana

$\Rightarrow$ you also prefer a 10% chance to win an apple to a 10% chance to win a banana

Making choices

Initial hypothesis: Gambles are assessed by their expected value

- weighted average of possible outcomes, where each outcome is weighted by its probability

a) 80% chance to win $100 and 20% chance to win $10 is $82 (0.8 × 100 + 0.2 × 10)

b) alternative with certainty $80

If the criterion is expected vale,
we will choose *uncertainty*

The theory by Bernoulli

Daniel Bernoulli (1738)

- people do not in fact evaluate gambles in this way
- most people dislike risk (the chance of receiving the lowest possible outcome)
- if a choice is offered between a gamble and an amount equal to its expected value, we will pick the sure thing
  - I'd rather have 49 euros than 100 with 50% probability

Application of utility

- The economics approach: expected utility theory dictates our choices
- People's choices are based not on dollar values but on the psychological values of outcomes, their utilities

Wealth (millions)	1	2	3	4	5	6	7	8	9	10
Utility units	10	30	48	60	70	78	84	90	96	100

- Diminishing marginal utility
- Requires searching all options (foregone utility)
- Having 1 mn and 7 mn with 50% probability is not the same in terms of utility with having 4 mn with 100% probability [(10+84)/2 = 47 < 60]

Failures of the theory

The theory is seriously flawed!

Example A

Today Jack and Jill each have a wealth of 5 mn

Yesterday, Jack had 1 mn and Jill had 9 mn

Are they equally happy? (Do they have the same utility?)

- **Jack and Jill have the same wealth, and the theory therefore asserts that they should be equally happy**
- Their happiness is determined by the recent change in their wealth, relative to the different states of reference wealth (1 mn for Jack, 9 mn for Jill)

Failures of the theory

Example B

Anthony's current wealth is 1 mn €

Betty's current wealth is 4 mn €€€€

They are both offered a choice between
a) equal chances to end up owning 1 mn or 4 mn (uncertainty)
b) own 2 mn for sure (certainty)

- Bernoulli would expect A and B to make the same choice
  - the prediction is incorrect

Failures of the theory

- **Anthony (currently owns 1 mn): "If I choose the sure thing, my wealth will double with certainty. This is very attractive. Alternatively, I can take a gamble with equal chances to quadruple my wealth or to gain nothing."**
- **Betty (currently owns 4 mn): "If I choose the sure thing, I lose half of my wealth with certainty, which is awful. Alternatively, I can take a gamble with equal chances to lose three-quarters of my wealth or to lose nothing."**
- Anthony and Betty are likely to make different choices because *the sure-thing option of owning 2 mn makes Anthony happy and makes Betty miserable*

Bernoulli's model lacks the idea
of a reference point

Failures of the theory

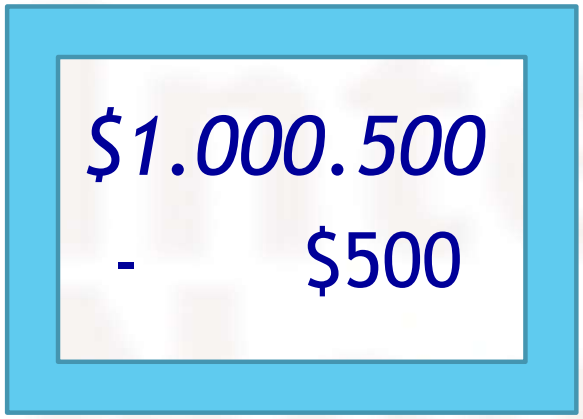
- *Utility theory*
  utility of a gain is assessed by comparing the utilities of two states of wealth

$1.000.000
+ $500

*Utility is the difference between **utilities** from $1.000.500 and $1.000.000*

Failures of the theory

- *Utility theory*
  Disutility is estimated by comparing utilities
  utilities of two states of wealth



the disutility of losing $500 is again the difference between the utilities of the two states of wealth

- no way to represent the fact that the disutility of losing $500 could be greater than the utility of winning the same amount—though of course it is

In summary

- In this setup, utilities from gains or losses differ only in their sign (+ or -)
- **What would you choose in the following**
  - **Problem 1**

    Get $900 for sure OR 90% chance to get $1,000 (and 10% to get nothing)?
  - **Problem 2**

    Lose $900 for sure OR 90% chance to lose $1,000 (and 10% to lose nothing)?
- "Certain" in Problem 1, "Risk' in Problem 2
- The distinction between gains and losses is not supposed to be important!

Prospect theory

- Kahneman και Tversky model
  - descriptive model for decisions in the presence of risk
  - records and explains the violations of rationality in decision making
- Evaluation is relative to a neutral reference point, ("adaptation level)"
  - Jars with cold/hot water
- Principle of diminishing sensitivity
  - effect of same light in dark or illuminated room
- Loss aversion
  - organisms that treat threats as more urgent than opportunities have a better chance to survive and reproduce

Heads and tails

Consider a gamble on the toss of a coin

- tails, you lose $100
- heads, you win $150

Is this gamble attractive?

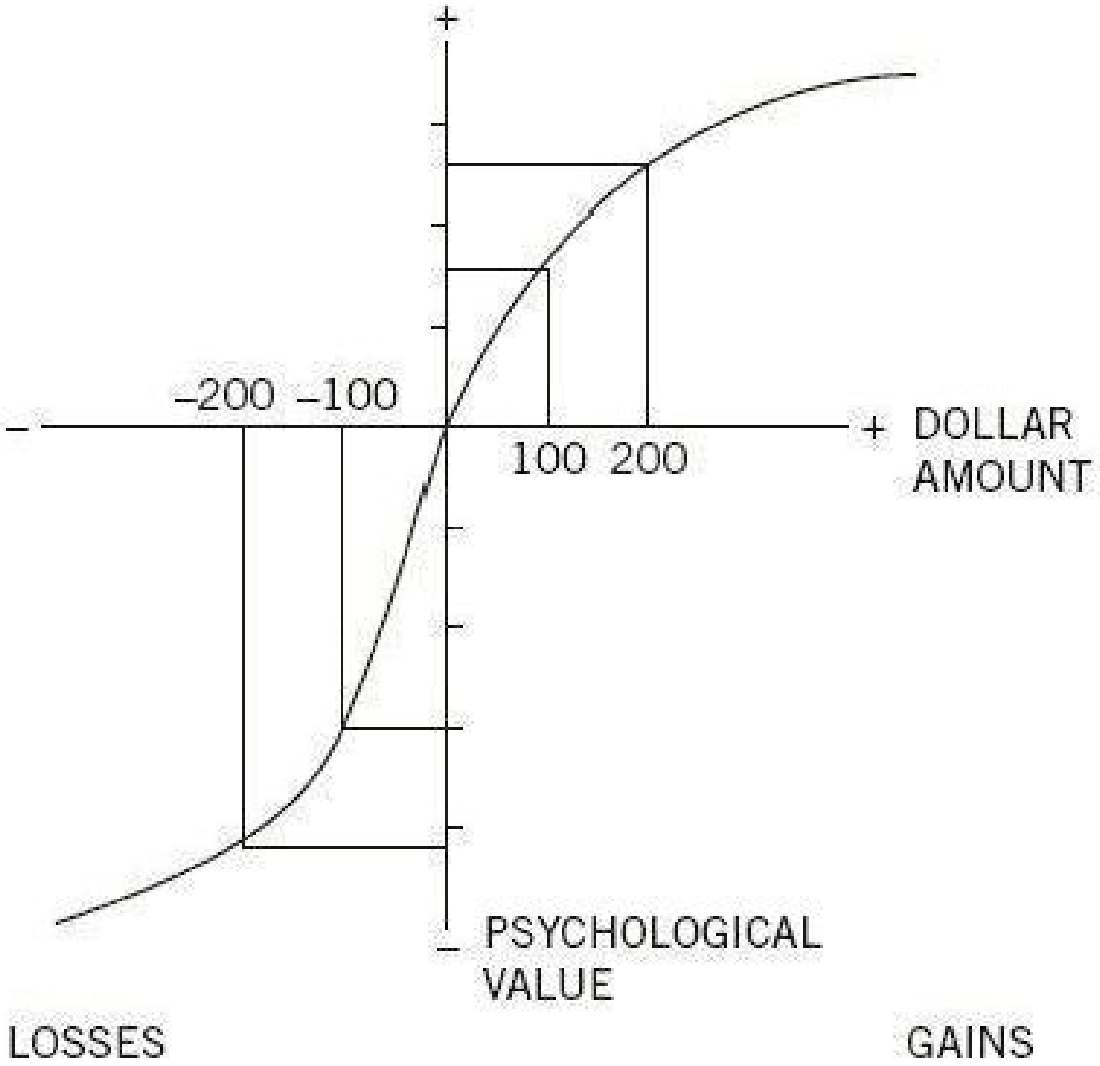
Would you accept it?

Afraid of losses

- For most people, the fear of losing $100 is more intense than the hope of gaining $150
  - “losses loom larger than gains”
  - people are loss averse
- What is the smallest gain that I need to balance an equal chance to lose $100?
- The “loss aversion ratio” has been estimated in several experiments and is usually in the range of 1.5 to 2.5

Prospect theory

For negative amounts, the psychological loss is larger!



How much loss can one stand?

- Consider a 50-50 gamble in which you can lose $10
- What is the smallest gain that makes the gamble attractive?
  - $10 $\Rightarrow$ indifferent to risk
  - < $10 $\Rightarrow$ seek risk
  - > $10 $\Rightarrow$ loss averse
- What about a possible loss of $500 on a coin toss?
  - What possible gain do you require to off set it?
- What about a loss of $2,000?

Risk aversion

- In mixed gambles, where both a gain and a loss are possible, loss aversion causes extremely risk-averse choices
- In bad choices
  - a sure loss is compared to a larger loss that is merely probable
  - diminishing sensitivity causes risk seeking

Prospect theory:

The pain of losing $900 is more than 90% of the pain of losing $1,000

Blind spots of Prospect Theory

- the reference point (status quo) has zero value
  - seems reasonable, but may lead to absurd consequences

Example
A. one chance in a million to win $1 mn
B. 90% chance to win $12 and 10% chance to win nothing
C. 90% chance to win $1 mn and 10% chance to win nothing

Failing to win in scenario C is intensely disappointing..

No regret: other blind spots

- What do you choose

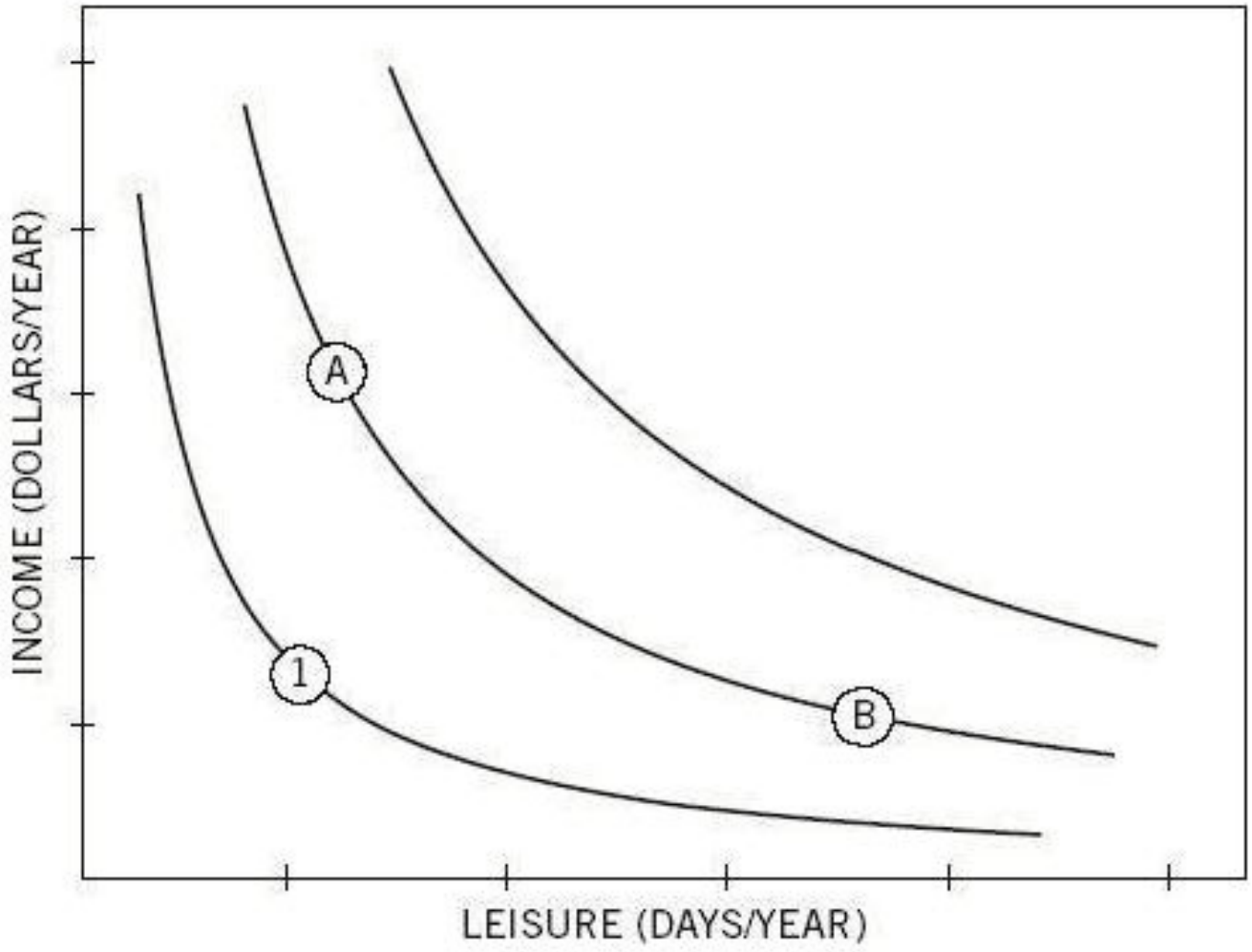
A. *90% chance to win $1 mn OR $50 with certainty?*

B. *90% chance to win $1 mn OR $150,000 with certainty?*

  - failing to win is a disappointment in both
  - the potential pain is larger in B by knowing that if you choose the gamble and lose you will regret the "greedy" decision you made by spurning a sure gift of $150,000
  - the experience of an outcome depends on an option you could have adopted but did not
  - Prospect theory leaves no room for emotions of regret and disappointment

On choices…

Indifference curves



Characteristics

- Curved shape → diminishing marginal utility
- All points on a curve are equally attractive
- No reference point
  (e.g. labor negotiations)

The reference point (baseline) is the current labor contract; any negotiations start from this point

Alternatives matter

- Tastes are not fixed; they vary with the reference point
- Tversky and Shafir (1992): the reference point matters

  A. Conflicting choice: cheap Sony for 99$ vs top-quality Aiwa for 169$ ⇨ people buy both equally

  B. Non-conflicting choice: cheap Sony for 99$ vs low-quality Aiwa for 105$ ⇨ people buy Sony

  C. No alternative: Sony for 99$

More people buy the Sony in B compared to C!

Loss hurts

- The disadvantages of a change loom larger than its advantages, inducing a bias that favors the status quo

- Loss aversion does not imply that you never prefer to change your situation
  - only implies that choices are *strongly biased* in favor of the reference situation
  - generally biased to favor small rather than large changes

Default options

- Status quo bias implies that it is easier *not* to decide rather than make a decision
- The default option is strongly favored when multiple choices arise
  - allocation of savings
  - organ donation
- Our first choice should be to recognize that we do have a choice, yet this rarely happens
- In corporations, annual budgets are not strongly reformed
  - maintaining departments is the first option rather than abolishing them

Ownership and negotiation

QHat(2016, June 7) The Endowment Effect https://www.youtube.com/watch?v=bvjoIAhaIxI

The Endowment Effect

Values between buyers and sellers differ because of loss aversion

part of System 1
(like babies when something is taken from them..)

Wine trade

Professor R.

- bought wine at auctions
  - would never pay more than $35 for a bottle
  - reluctant to sell below $100
  - between $35 and $100, neither bought nor sold
- Standard idea: Professor R had a unique utility for the state of having a particular bottle
- Prospect theory: the willingness to buy or sell the bottle depends on the reference point
- Buying and selling prices should be equal, but owning the good appeared to increase its value ***(ownership effect)***

Loss aversion and ownership

- Giving up a bottle of nice wine is more painful than getting an equally good bottle is pleasurable
  - the most significant contribution of psychology to behavioral economics
  - can be incorporated in the System 1 and System 2 approach
- Biological-psychological approach where negativity dominates positivity

In the bowl

Paul Rozin

a single cockroach will completely wreck the appeal of a bowl of cherries

but

a cherry will do nothing at all for a bowl of cockroaches

- *the negative trumps the positive in many ways*
- *loss aversion is one of many manifestations of negativity dominance*

The dominance of negativity

- The brain reacts automatically
- Priority to bad news
  - the amygdala has a primary role as the "threat center" of the brain
  - an angry face "pops out" of a crowd of happy faces, but a single happy face does not stand out in an angry crowd
  - bad words (*war*, *crime*) attract attention faster than do happy words (*peace*, *love*)

Evil defeats good

- Bad emotions, bad parents, and bad feedback have more impact than good ones
- Bad information is processed more thoroughly than good
- The self is more motivated to avoid bad self-definitions than to pursue good ones
- Bad impressions and bad stereotypes are quicker to form and more resistant to disconfirmation than good ones

Loss aversion and goals

- We are driven more strongly to avoid losses than to achieve gains
- The reference point is sometimes the status quo, but it can also be a goal in the future
- Not achieving a goal is a loss, exceeding the goal is a gain
- The aversion to the failure of not reaching the goal is much stronger than the desire to exceed it

Defending the status quo

- Loss aversion favors the existing situation
- Favors minimum changes from status quo
  - big reforms are bound to fail…
- Helps maintain stability
- Keeps us close to reference point

New York cabs

- Cab drivers in New York have a target income for the month or the year
- Yet the goal that controls their effort is typically a daily target of earnings
  - On rainy days, a cab never remains free for long → the driver quickly achieves his target
  - in pleasant weather cabs often waste time cruising the streets looking for fares

In the cab driver's mind

Economic logic	Logic of loss aversion
Cab drivers	Cab drivers
• work many hours on rainy days	• drivers who have a fixed daily target will work many more hours when the pickings are slim
• treat themselves to some leisure on mild days; "buy" leisure at a lower price	• go home early when rain-drenched customers are begging to be taken somewhere

Negotiations and concessions

- The existing terms define *reference points*
- A change in any aspect of the agreement is viewed as a *concession* that one side makes to the other
  - concessions are my gains, but your losses
- Loss aversion creates an *asymmetry that makes agreements difficult to reach*
- Typical in labor negotiations and in international discussions of trade or arms limitations
- Negotiations over a shrinking pie are especially difficult, because they require an allocation of losses

Good news

In the four examples below, your chances of receiving $1 mn improve by 5%

A. From 0 to 5%
B. From 5% to 10%
C. From 60% to 65%
D. From 95% to 100%

Is the news equally good in each case?

…or better news

- 0 → 5% and 95% → 100% are more impressive than either 5% → 10% or 60% → 65%
  - *qualitative* change!
  - large impact of 0 → 5% illustrates the *possibility effect*
  - *something becomes possible*
  - large impact of 95 → 100% illustrates the *certainty effect*
  - *something becomes certain*

Allais's Paradox

A. 61% chance to win $520,000
OR 63% chance to win $500,000

B. 98% chance to win $520,000
OR 100% chance to win $500,000

- most people prefer the *first option in problem A* and the *second option in problem B*
- logical sin that violates the rules of rational choice

The psychology of worry

Study of the rationality of consumer valuations of health risks addressed to parents (1980)

- **Suppose that you currently use an insect spray that costs you $10 per bottle and results in 15 inhalation poisonings and 15 child poisonings for every 10,000 bottles**
- **A more expensive insecticide reduces each of the risks to 5 for every 10,000 bottles**
- **How much would you be willing to pay for it?**
- The parents were willing to pay an additional $2.38, on average, to reduce the risks by two-thirds from 15 per 10,000 bottles to 5
- They were willing to pay $8.09, more than three times as much, to eliminate it completely

Are we certain?

- Against expected utility theory, the weight placed on outcomes is not equal to their expected probability
- We are reluctant to losses
  - unlikely events are overweighted
  - almost certain events are underweighted
  - the *psychological* difference between a 95% risk of a destruction and the certainty of a destructions looks much bigger
  - the minimum hope that everything will go well looks to big in our eyes and we are willing to pay a lot more to acquire it

The fourfold pattern

	GAINS	LOSSES
HIGH PROBABILITY Certainty Effect	95% chance to win $10,000 Fear of disappointment RISK AVERSE Accept unfavorable settlement	95% chance to lose $10,000 Hope to avoid loss RISK SEEKING Reject favorable settlement
LOW PROBABILITY Possibility Effect	5% chance to win $10,000 Hope of large gain RISK SEEKING Reject favorable settlement	5% chance to lose $10,000 Fear of large loss RISK AVERSE Accept unfavorable settlement

The fourfold pattern

- top left cell: **Bernoulli**
  - people are *averse to risk* when they consider prospects with a substantial chance to achieve a large gain
  - we are willing to accept less than the expected value of a gamble to lock in a sure gain
- bottom left cell: **possibility effect**
  - explains why lotteries are popular
  - without a ticket you cannot win, with a ticket you have a chance; *whether the chance is tiny matters little*
- bottom right cell: **insurance**
  - people are willing to pay much more for insurance than expected value —how insurance companies make their profits
  - people buy more than protection against an unlikely disaster; they *eliminate a worry* and purchase peace of mind

Prospect theory

- The top right cell is a surprise
- Key contribution of prospect theory
- Risk seeking with negative prospects

1. diminishing sensitivity: the reaction to a loss of $900 is more than 90% as intense as the reaction to a loss of $1,000

2. the decision weight that corresponds to a probability of 90% is only about 71%, much lower than the probability

The two key factors

- In a choice between a sure loss and a gamble with a high probability of a larger loss, diminishing sensitivity makes the sure loss more aversive
- The certainty effect reduces the aversiveness of the gamble
- These two factors
  - enhance the attractiveness of the sure thing
  - reduce the attractiveness of the gamble when the outcomes are positive
- We choose disasters instead of manageable failures

In the shadow of the law

- Seeking for negotiation in a trial
  - You have made a claim for a large sum in damages
    - 95% chance to win
    - do you accept a settlement for only 90% of your claim?
    - most likely YES ("*Am I willing to take even a small chance of getting nothing at all?*")
  - Defendant in the same case
    - 95% chance to lose
    - the other side proposes a settlement for 90% of their original claim; Do you settle?
    - most likely NO
    - the temptation to fight on is strong in a weak case

Nasty dilemmas

- Opting for excessive risk
  - low-tech firms

    pointless attempts to cover the gap and break even
  - defeated side in wars

    fights till the end
- Overweighting uncertain events (intuitive decision making) leads to worse outcomes

Rare events

- People overestimate the probabilities of unlikely events
- People overweight unlikely events in their decisions
  - *associative machinery of System 1* → works in usual confirmatory mode, selectively retrieving evidence, instances, and images that would make the statement true
  - interpreting facts and figures is subject to biases
  - explains our overreaction in few rare events that we do not ignore

Psychological mechanisms

- *Suppose that two cities have been warned about the presence of suicide bombers*
- *Residents of one city are told that **two bombers** are ready to strike*
- *Residents of another city are told of a **single bomber**; their risk is lower by half, but do they feel much safer?*

- emotional arousal
  - associative, automatic, and uncontrolled
  - very hard to examine pure facts; instead we focus on the story
- Confirmation bias
- Cognitive ease

How many marbles?

Drawing a marble from one of two urns, in which red marbles win a prize

- Urn A contains 10 marbles, 1 is red (probability 10%)
- Urn B contains 100 marbles, of which 8 are red (probability 8%)

Which urn would you choose?

30%-40% choose urn B with the larger number of winning marbles!

System 1 neglects the denominator

Neglecting the denominator

Explains why different ways of communicating risks vary so much in their effects

- A vaccine that protects children from a fatal disease carries a 0.001% risk of permanent disability → The risk appears small
- One of 100,000 vaccinated children will be permanently disabled

  → the 999,999 safely vaccinated children have faded into the background

Experts are not immune

Professionals evaluated whether it was safe to discharge from the psychiatric hospital a patient with a history of violence

A. *Similar patients are estimated to have a 10% probability of committing an act of violence during the first several months after discharge*

B. *Of every 100 similar patients, 10 are estimated to commit an act of violence during the first several months after discharge*

The professionals who saw the frequency format were almost twice as likely to deny the discharge (41% compared to 21% in the probability format)

The good lawyer

- A good attorney who wishes to cast doubt on DNA evidence will *not* tell the jury that "the chance of a false match is 0.1%"
  - The statement that "a false match occurs in 1 of 1,000 capital cases" is far more likely to pass the threshold of reasonable doubt
- The prosecutor, instead, will favor the more abstract frame—hoping to fill the jurors' minds with decimal points

Don’t focus on description

- Focal attention contributes to the
  - overestimation of unlikely events
  - overweighting of unlikely outcomes
- Focal attention is enhanced by mere mention of an event, by its vividness, and by the format in which probability is described
- *Choice from description* yields a possibility effect
  - rare outcomes are overweighted relative to their probability

Stay immune to the description

- Instead, *choice by experience* is intended to represent many situations in which we are exposed to variable outcomes from the same source, thus revealing inconsistent preferences
  - Never focus on a single scenario because we will overweight its probability (we rarely experience the rare event!)
  - Lay out *alternatives so that probabilities sum to 100%*

Broad or Narrow?

- Ways of constructing decisions
  - **Narrow framing: a sequence of two simple decisions, considered separately**
  - **Broad framing: a single comprehensive decision**

Example: Richard Thaler and top managers

- Consider a risky option in which you could lose a large amount of the capital you control or earn double that amount with 50% probability
- No executive was willing to take such a gamble
- Instead, the CEO answered "*I would like all of them to accept their risks*"

Limitations

- Works when the gambles are genuinely independent of each other
  - does not apply to multiple investments in the same industry, which would all go bad
- Works only when the possible loss does not cause you to worry about your total wealth
  - If the loss implies significant bad news about your economic future, watch it!
- Should not be applied to long shots, where the probability of winning is very small for each bet

Risk policies

- A risk policy is a broad frame that aggregates similar decisions
- Risk policy and outside view of planning problems shift the focus from the specifics of the current situation to the statistics of outcomes in similar situations
- Remedies against exaggerated
  - optimism (planning fallacy)
  - caution induced by loss aversion

Money seeking

- The main motivators of money-seeking are not only economic, but also scores for
  - self-regard
  - achievement
  - social environment
- We refuse to cut losses when doing so would admit failure
- We are biased against actions that could lead to regret

Mental Accounting

- Two sports fans plan to travel 40 miles to see a game
- One paid for his ticket, the other got one free from a friend
- A blizzard is announced for the night of the game

Who is more likely to see the game?

- Both fans set up a *"mental" account* for the game
- Missing the game will close the accounts with a negative balance
- *The closing balance is distinctly more negative for the one who bought a ticket, so he is more likely to go*

Assessing counterfactuals

- Staying home is worse for this individual
  - higher motivation to see the game
- Tacit calculations of emotional balance (System 1)
- To implement a rational behavior, System 2 would have to be aware of the counterfactual possibility
  - "*Would I still drive into this snowstorm if I had gotten the ticket free from a friend?*"
- It takes an active and disciplined mind to raise such a difficult question

Which stock to sell?

You have to sell some stock

- stock A yields $5000 profit if sold today
- stock B yields $5000 less from what you paid for it

Their value is constant recently

Which are we more likely to sell?

- Preference for selling winners rather than losers
- Narrow framing of the investor
  - mental account for each share bought
  - wants to close every account as a gain

Sunk-cost fallacy

- Decision to invest additional resources in a losing account, even when better investments are available
- Escalation of commitment to failing endeavors
- Choice between a sure loss and an unfavorable gamble
  - often unwisely preferred

Corporate choices

- A company has already spent $50 mn on a project that is now behind schedule
- The forecasts of its ultimate returns are less favorable than at the initial planning stage
- Additional investment of $60 mn is required to give the project a chance
- Alternative proposal is to invest the same amount in a new project that currently looks likely to bring higher returns

What will the company do?

CEO choices

- Canceling the project will leave a permanent stain on the CEO's record
- His *personal* interests are best served by gambling further with the organization's resources in the hope of
  - recouping the original investment
  - postpone the day of reckoning
- Sunk costs lead to misalignment between the manager's incentives and the objectives of the firm and its shareholders (agency problem)

Board choices

- Boards of directors often replace a CEO who is encumbered by prior decisions and reluctant to cut losses
- The board may not believe that the new CEO is more competent than the one replaced
  - they do know that she does not carry the same mental accounts and
  - is better able to ignore the sunk costs of past investments in evaluating current opportunities

Happens all the time

- The sunk-cost fallacy keeps us for too long in
  - poor jobs
  - unhappy marriages
  - unpromising research projects
- Constructors know and exploit this pattern

Regret

Regret is accompanied by feelings that one should have known better, thoughts about the opportunities lost, wanting to undo the event

- Triggered by the variety of options during decision making
  - in actions that deviate from the default, we can easily imagine the norm
- Favors risk averse choices
  - people expect to have stronger emotional reactions (including regret) to an outcome that is produced by action than to the same outcome when it is produced by inaction

Reversals

- We make judgment in joint evaluation
  - we consider two scenarios at the same time and make a comparison
  - we lack the counterfactuals that could affect our opinion

- Allows individual choice to depend on the *context* in which the choices are made

'Preference reversals'

The compensation

A man lost the use of his right arm because of a gunshot wound when he walked in on a robbery occurring in a store in his neighborhood

Two stores were located near the victim's home, one of which he frequented more regularly than the other.

Two scenarios:

(i) The burglary happened in the man's regular store

(ii) The man's regular store was closed for a funeral, so he did his shopping in the other store, where he was shot

Should the store in which the man was shot make a difference to his compensation?

Presentation matters

- Presenting the evidence
  - jointly
    - the compensation should be the same
  - separately
    - larger compensation in the case that the victim was shot in a store he rarely visited
- Joint evaluation leaves room for moral principle
  - System 2 is involved
  - System 1 mechanisms of substitution and intensity matching translate the emotional reaction to the story onto a large difference in awards

Emotional framing

- A: "*Would you accept a gamble that offers a 10% chance to win $95 and a 90% chance to lose $5?*"
- B: "*Would you pay $5 to participate in a lottery that offers a 10% chance to win $100 and a 90% chance to win nothing ?*"
- In both problems we must decide whether to accept an uncertain prospect that we will be either richer by $95 or poorer by $5
- Equivalent dilemmas but we prefer B
  - *The bad outcome is a 'non-win', not a 'loss'*
- Framing affects opinions and choices
- Equivalent statements trigger different reactions

Influence and good frames

- Professionals are not immune to framing
- Example: two descriptions of the outcomes of surgery

  A: The one-month survival rate is 90%

  B: There is 10% mortality in the first month

  Even physicians choose surgery in A (84%), but not in B!
- Good frames can drive policies and citizens towards the correct response (Thaler and Sunstein: *Nudge*)
  - organ donation: high-donation countries have an opt out form, whereas low-contribution countries have an opt-in form
  - energy saving

What to avoid

- Stay away from *WYSIATY*
- Do not avoid cognitive effort
- Do not take any decision as if it is ‘unique’
  - never consider a small gamble in isolation or be loss averse for a small gamble
- Consistency and coherence in our preferences
- Never take decisions when problems arise, even if they are closely linked

Loss aversion vs overconfidence

- Can loss aversion co-exist with overconfidence?
- Loss aversion is about *choices*
  - we are conservative when it comes to making a choice
- Overconfidence is about predictions
  - we are excessively optimistic in thinking we can predict the future too accurately
- Companies *reject small projects* because they fear losses but *move on with big projects* (like M&As) by underestimating the difficulties

Put everything together

- The formulation of a choice cannot determine preferences on significant problems
  - challenges the rational agent model
- Individual choices are more likely to be affected by emotions
- Judgment after comparison is more likely to yield consistent outcomes

Overall

- Biases drive us to mistakes, but in a non-random way
  - our folly is systematic and predictable
- We cannot beat our cognitive biases
  - Cooperation and processing are key factors to address them
- We should rather strive for an efficient decision-making process