



Thinking Fast and Slow

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What is thinking?



Thinking going on here?





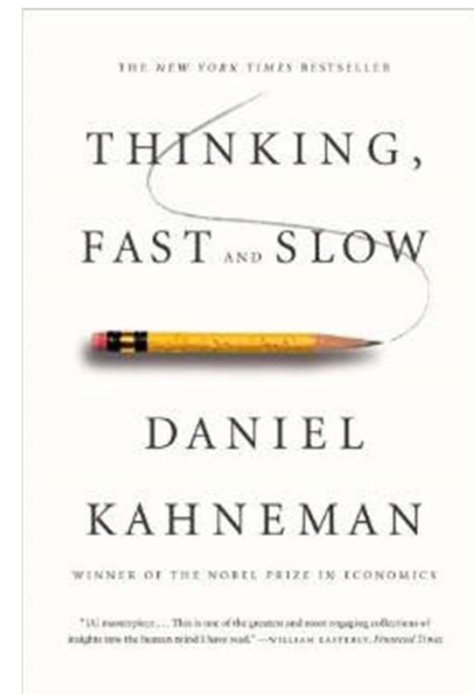
Commonalities

- **Staring, focused, concentrated attention**
- **Pressure to produce, decide as quickly as possible**
- **Don't stop or take a break – that would mean you're not really working**
- **This is what passes for thinking**

Behavioral economics

Psychologist Daniel Kahneman won the Nobel Prize for “Economic Sciences” in 2002.

Kahneman & Tversky changed the way we think about thinking.





My goal: useful tips

Cognitive science is fast growing, uses controlled experiments, on-going re-testing, produces an explosion in results

Our field is slow growing, few controlled experiments, mostly anecdotal, case studies

We should pay attention. It might help us work better 😊!



Which System?

System 1

Unconscious (runs 24/7)
Older
Multiple modules
Fast
Intuitive
Can multi-task
Remembers everything ****
11 million bits/sec
BUT inaccessible

Our gut feeling

System 2

Conscious (on-line when awake)
Newer
Single module
Slow
Rational
Linear
Forgetful
40 bits/sec
Chatters constantly while awake

We identify with it



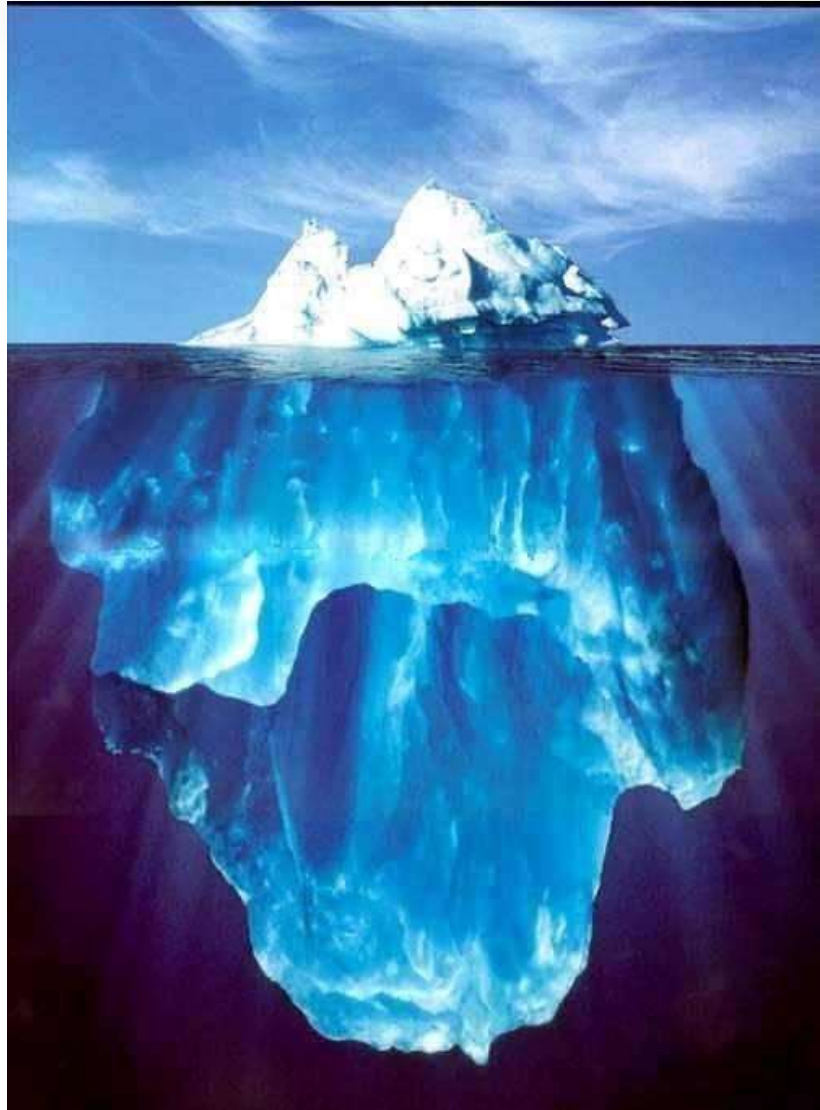
Abstract Capabilities

System 1

- Here and now
- Automatic
- Pattern detector
- Rigid
- Becomes more and more capable

System 2

- The long view
- Controlled
- Fact checker
- Flexible
- Limited





More on System 1

- **Heuristics, expertise, automatic mental activities of perception and memory**
- **Associative memory continually creates a story interpreting what is going on -- your personal story where you are the star of the show**



The worst heuristics

Confirmation bias: tend to search for, interpret, favor, recall (it affects memory) information to confirm our beliefs. We seek confirmation, not information.


Cognitive dissonance: struggle to hold two disconfirming ideas at the same time

Naïve realism: we believe we are rational and those who disagree with us just need “the facts” to see our side



Any help for cognitive bias?

- **Hardwired**
- **Difficult to overcome on a personal level**
- **Sooooo easy to see in others**
- **In group, diverse views, if heard, can help, a “cultural immune system”**



I'm considered one of the worst offenders on many of these errors. I'm overconfident, when I preach against that. I make extreme predictions, when I preach against that. Some people read *Thinking, Fast And Slow* hoping it will improve their minds. I wrote it and it didn't improve my mind. Those things are deep and powerful and hard to change.

Daniel Kahneman



System 2

- **Allocates attention to effortful mental activities.**
- **Associated with action, choice, concentration.**
- **When fully engaged can only focus for 50 minutes (max).**



How we learn

- **New skills acquired by System 2.**
- **With practice/experience, we can move them to System 1 as they become automatic and we acquire expertise.**
- **Examples: walking, driving, playing a musical instrument, sports.**
- **When we “overthink” in a domain where we have skill we can inhibit our expertise.**

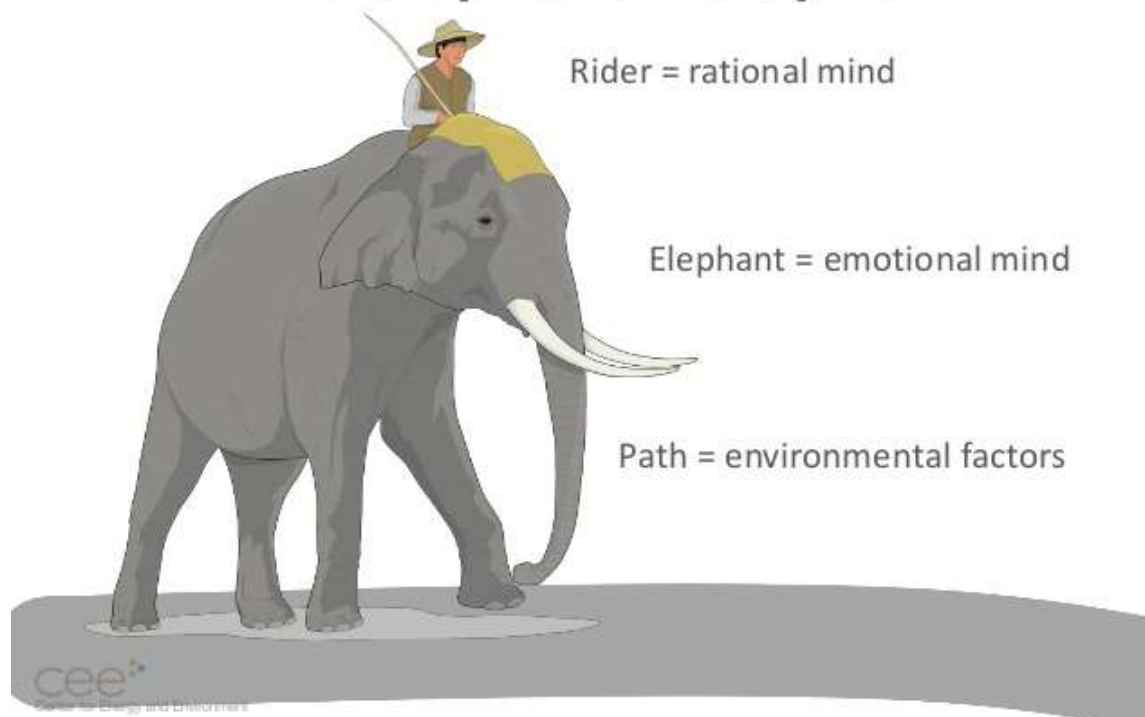



Models are not reality


- **Kahneman's model is an abstraction**
- **All models are wrong but some are useful.**
George Box, statistician
- **Kahneman made no effort to map Systems to brain regions.**
- **Except for well-known areas of the brain involved in sensory and motor functions, almost every part of the brain is involved in almost everything the brain does.**

Jonathan Haidt & Heath Brothers

The elephant metaphor



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- When communicating with someone who disagrees with you: **talk to the elephant!**
 - To influence people: **make the path (the environment, the context) as easy as possible. Make your choice the default.** In Fearless Change, this is the pattern “Easier Path.”



The rider trails the parade, cleaning up after the elephant, following, fixing, and occasionally stepping in the conclusions that the elephant seems so naturally to produce.

Dan Gilbert [my paraphrase]



System 2 takes energy

- **Conscious decision-making (slow System 2) takes time and energy (about 25%).**
- **Difficult cognitive reasoning or self-control causes drop in blood glucose.**
- **“Pay attention” means there is a cost for System 2.**
- **It’s an illusion that System 2 = thinking.**
- **Don’t waste conscious effort.**



Limitations of System 2

- **Our pool of “mental energy” is limited.**
- **Thus, System 2 cannot multi-task.**
- **Thus, we make bad decisions when we are tired or hungry.**
- **Thus, we need to take breaks.**



Rule #1- don't do it

- **If possible—don't spend time on it!**
- **OR hand it off to System 1**
- **Professionals spend an average of 9 minutes choosing their office attire.**
OfficeTeam survey of 2015 workers in North America.
- **System 2 is a limited resource, do not waste it.**



My problem-solving approach

Define problem. Say it out loud. Write it down.

Enough data?


Invest minimal effort solving it – 10 min. max

LEAVE IT:

- work on another task (the more different, the better)**
- stand up/sit down, stretch**
- take a break**
- talk out loud**
- do nothing, daydream**

If solution not forthcoming, repeat steps.

System 1 is not always “right.” System 2 can override.



You may have more knowledge, data, information than you realize. It's better to go ahead with what you have than to wait for a complete understanding, which may never come and might not be necessary.

Note: System 1 is already working on it.



System 1 is creative

- **The solutions System 1 produces are not binary (should I do this or not) but can be complex, innovative approaches.**
- **Songs, novels, scientific discoveries have been produced this way.**

Trust the Pie (see MIB III)





When to use System 2

- **Complex tasks, e.g. income tax reports**
- **Reading. Taking notes.**
- **Practicing anything.**
- **Meetings, lectures, podcasts.**
- **Anytime you have to “pay attention.”**




Do “Nothing”

The areas of the brain involved in (prospect) thinking about the future – insight – occurs during idle time – are the same areas of the brain involved in thinking about what others are thinking.

Right temporoparietal junction RTPJ, one of the areas that’s most different in our brains.

It takes a long time to develop ~age 5.

We need to take time off, let the mind wander, listen to others, take another point of view.



I insist on a lot of time being spent, almost every day, to just sit and think. That is very uncommon in American business. I read and think. So I do more reading and thinking and make less impulsive decisions than most people in business.

Warren Buffett



The Ultimatum Game

In pairs of subjects, Player A is given money (e.g. \$10) and makes an offer to Player B. If B accepts offer, both keep the money. If B rejects offer, both get nothing.

Typically, low offers (e.g. \$2) are rejected.

Research shows that if players take a 10-min break, low offers are accepted, so TAKE TEN!



System 1 vs System 2 Decisions

**For a straightforward, simple decision,
use System 2.**

**For a complex decision with many
variables, use System 1.**

See research by Ap Dijksterhuis.




The Power of Algorithms?

- **Is an ulcer malignant?**
- **Simple algorithm – 7 equally weighted variables predicted cancer well**
- **Algorithm compared with expert diagnosis of x-rays**
- **Physicians' diagnoses all over the place, inconsistent on hidden repeats (errors 20% of the time), little agreement**



Algorithms win

- **The same inputs generate the same outputs.**
- **They don't get distracted.**
- **They don't get bored.**
- **They don't get mad.**
- **They don't have off days.**
- **They don't fall prey to biases humans do (although humans can encode their biases into the algorithms).**
- **Don't have to be complex. Simple rules work well.**



The surprising success of equal-weighting schemes has an important practical implication: it is possible to develop useful algorithms without prior statistical research. Simple equally weighted formulas based on existing statistics or common sense are often good predictors of significant outcomes.

Daniel Kahneman



Better Meetings



Better Meetings

- **Water, tea, coffee available**
- **Standing, moving should be OK**
- **Very small groups use walking meetings**
- **Limit continuous meeting time to 45 min**
- **Longer meetings take a different seat after breaks**
- **Always, always, always take a 10-minute break before important decisions**



Brainstorming

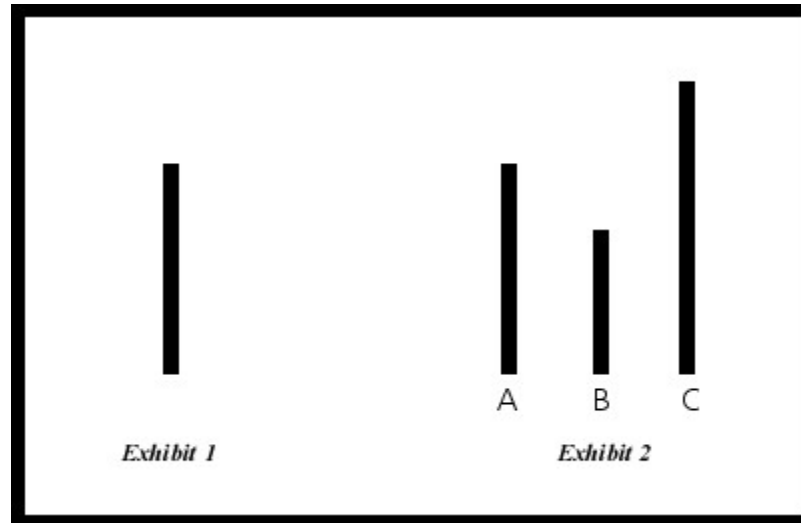
Brainstorming “invented” in the 1940s—intuitively appealing—we all get together and follow some simple rules to generate innovative ideas


Research shows that individuals working on their own produce a higher quantity/quality of ideas than groups and avoids “social loafing” and “groupthink.”

Stressed people tend to conform more to social opinion.

“Groupthink: the brainstorming myth,” The New Yorker, Jonah Lehrer.

Solomon Asch Experiment



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- **Subjects in Asch's experiment did not know the shills but were still influenced by them.**
 - **75% of the subjects agreed with the group. We still don't know why the remaining 25% did not.**



More effective than brainstorming

**Individual quiet storming – primarily using
System 1 – at least overnight**

Independence is a requirement

**Alternate convergence and divergence – work
separately, then meet together – repeat if it's a
tough problem.**

**Instead of a three-day System 2 brainstorming
marathon, spread the work over three days in
tiny sprints.**



Brainstorming Process

- **Email problem statement. Answer any questions.**
- **Individual quiet storming (using System 1) overnight is best. Collect all ideas.**
- **Send out all ideas (anonymous). Repeat quiet storming. Collect all ideas.**
- **Hold a meeting. Discuss. Add new ideas. Prioritize.**
- **Individuals diverge. Groups converge. Going back and forth produces the best ideas.**



Small Steps

We have a sense that large, complex problems require large, complex solutions.

Organizations and software are complex adaptive systems where the impact of any change is difficult to predict.

The often-overlooked approach of Small Steps is a better road to success where the result of each small experiment can be seen before the next step is taken.



Continuous experiments

Ask System 1 questions and leave it.

The answer may not be definitive but can suggest a small experiment that leads to more questions and more experiments.

This process never ends.

Thanks for listening!



References

- *Brain Rules*, John Medina, brainrules.net
- *The Art of Changing the Brain*, James Zull
- Any book by Dan Ariely
- <http://youarenotsosmart.com/podcast/>
- *Thinking Fast and Slow*, Daniel Kahneman