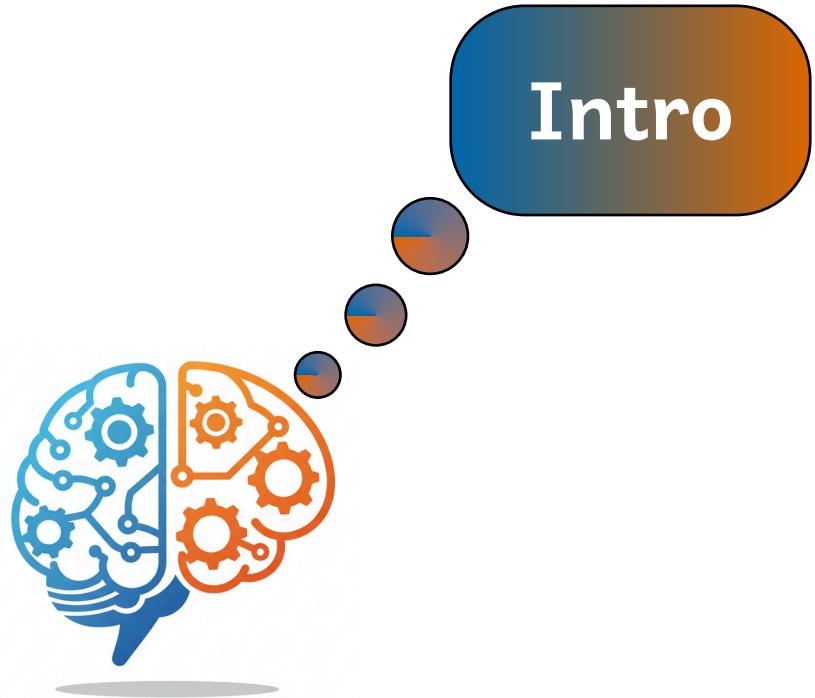




Psychology in Software Development

Chris Pahl | 2025



Intro Poem

- I have read a cool book.
-
-
-

Intro Poem

- I have read a cool book.
- And you should too!
-
-

Intro Poem

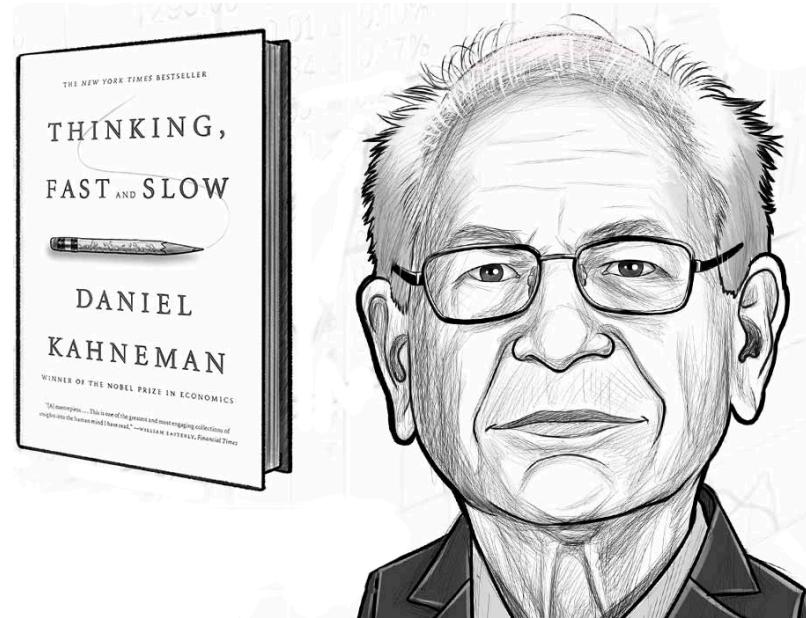
- I have read a cool book.
- And you should too!
- It showed me: My brain is stupid.
-

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- And so are you!

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Cognitive biases



- Our brain was not made to write software.
-
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-
-

Cognitive biases



- Our brain was not made to write software.
- We tend to think of our brain as reliable logical processor.
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Cognitive biases

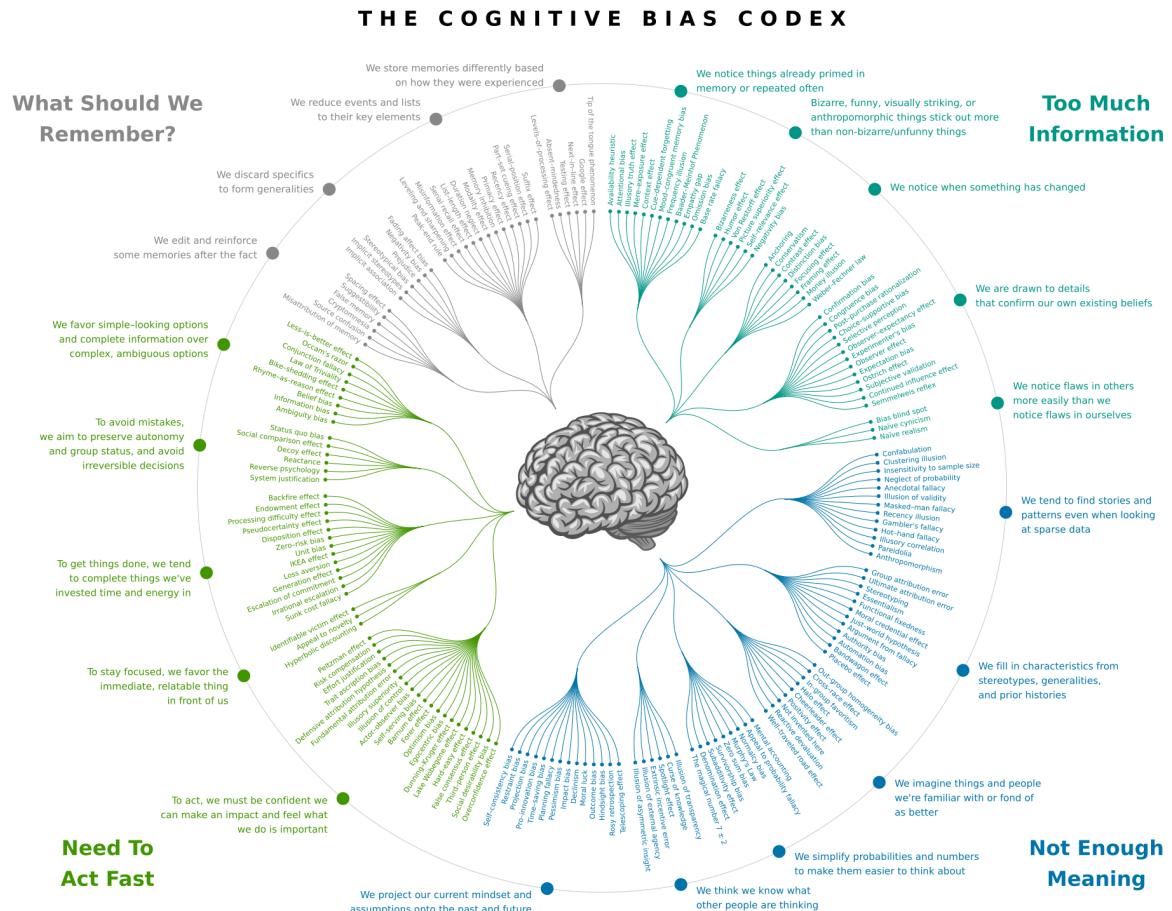


- Our brain was not made to write software.
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- We focus on how our brain fails while writing good software.
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Cognitive biases



- Our brain was not made to write software.
- We tend to think of our brain as reliable logical processor.
- Our brain has bugs, which are called *cognitive bias*.
- We focus on how our brain fails while writing good software.
- I'm qualified for this talk because I do software and have a brain.



Don't believe me?



Don't believe me?

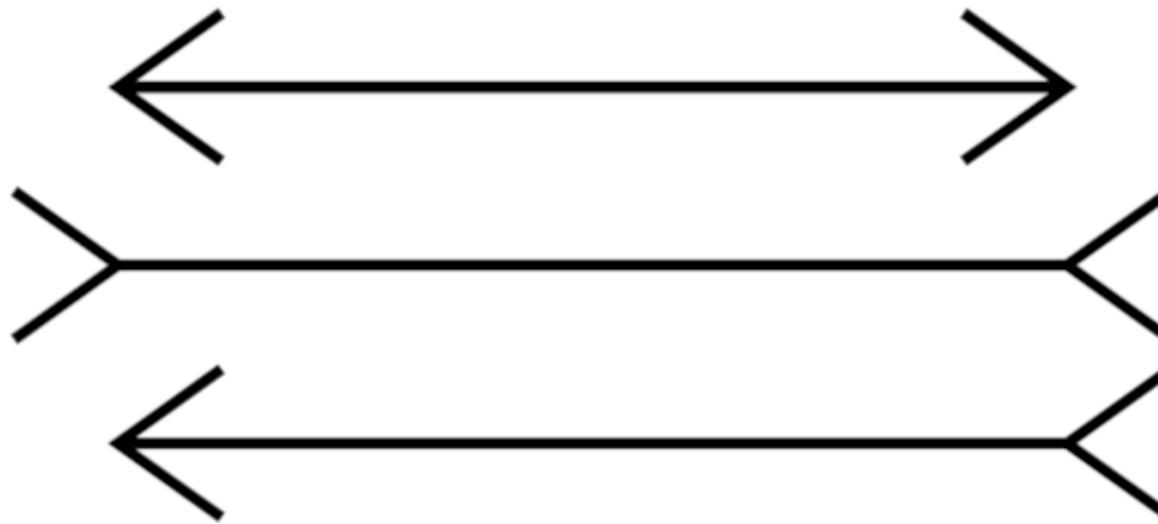


Watch your thoughts:

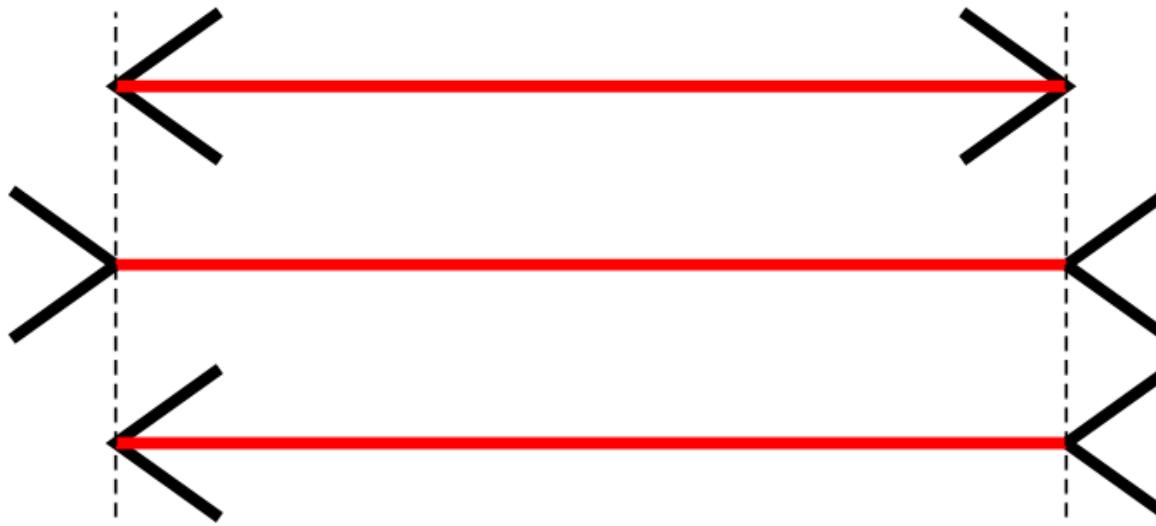
Watch your thoughts:



Which is the longest line?

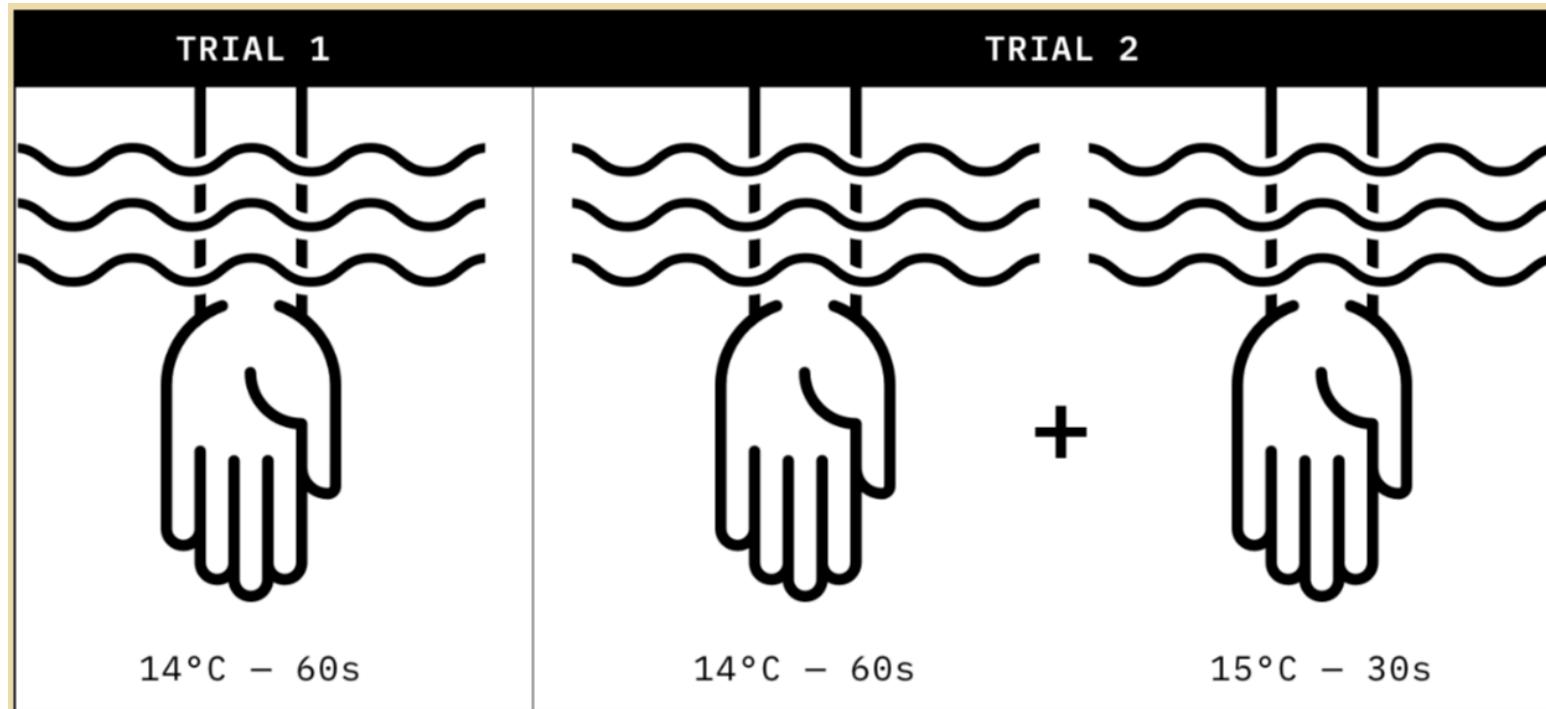


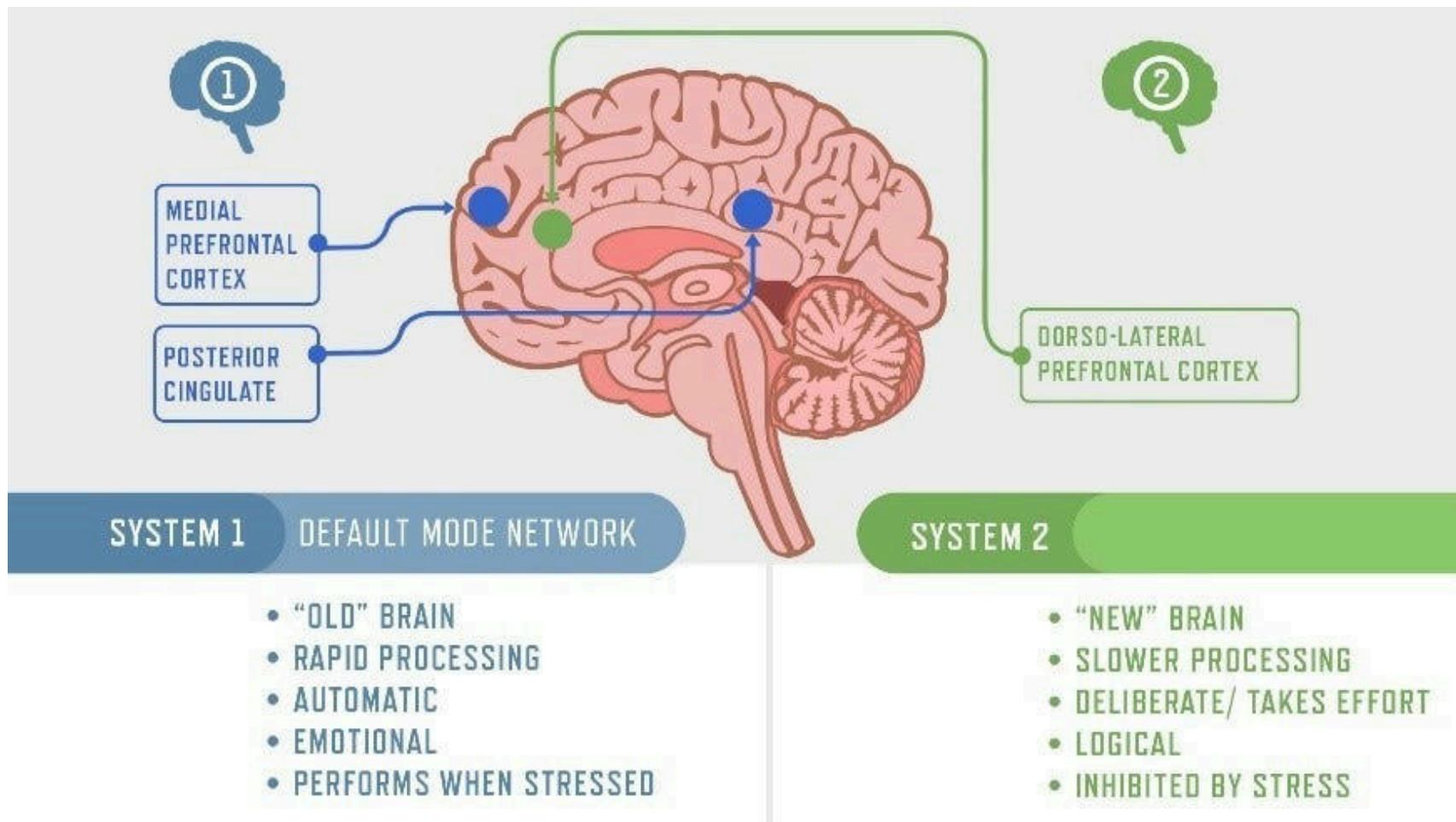
Which is the longest line?



THE CAT

Peak-End-Rule





Math

- $2 + 2$
-
-
-

Math

- $2 + 2$
- $21 \cdot 13$
-
-

Math

- $2 + 2$
- $21 \cdot 13$
- $77 + 33$
-

Math

- $2 + 2$
- $21 \cdot 13$
- $77 + 33$
- $23 \cdot 42$

Cognitive Load

You can hold roughly **four¹** different “chunks” you can keep in your mind.²

¹Exact number does not matter: <https://pubmed.ncbi.nlm.nih.gov/11515286/>

²Very good intro: <https://minds.md/zakirullin/cognitive>

Cognitive Load

You can hold roughly **four**³ different “chunks” you can keep in your mind.⁴

```
// 🧠 +  
if val > someConstant  
    // 🧠 +++, prev cond should be true,  
    // one of c2 or c3 has be true  
    && (condition2 || condition3)  
    // 😱, we are messed up by this point  
    && (condition4 && !condition5) {  
    ...  
}
```

³Exact number does not matter: <https://pubmed.ncbi.nlm.nih.gov/11515286/>

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Cognitive Load

You can hold roughly **four⁵** different “chunks” you can keep in your mind.⁶

```
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    && (condition2 || condition3)  
    // 😱, we are messed up by this point  
    && (condition4 & !condition5) {  
        ...  
    }
```

```
isValid = val > someConstant  
isAllowed = condition2 || condition3  
isSecure = condition4 && !condition5  
// 🧠, we don't need to remember the  
conditions, there are descriptive  
variables  
if isValid & isAllowed & isSecure {  
    ...  
}
```

⁵Exact number does not matter: <https://pubmed.ncbi.nlm.nih.gov/11515286/>

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Intelligence vs Rationality

“Linda is 31 years old, single, outspoken and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in antinuclear demonstrations.”

Intelligence vs Rationality

“Linda is 31 years old, single, outspoken and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in antinuclear demonstrations.”

You have 5 seconds. Which is more likely?

Raise left hand for 1, right for 2.

Intelligence vs Rationality

“Linda is 31 years old, single, outspoken and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in antinuclear demonstrations.”

1. Linda is a bank teller.
2. Linda is a bank teller and is active in the feminist movement.

Framing

The way of presentation of information influences how it is perceived.

Imagine a patient with psychological issues called “Jon”:

- Patients like Jon commit crimes with a probability of 10%.
-

Framing

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- Out of 100 patients like Jon 10 will commit crimes.

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Imagine a patient with psychological issues called “Jon”:

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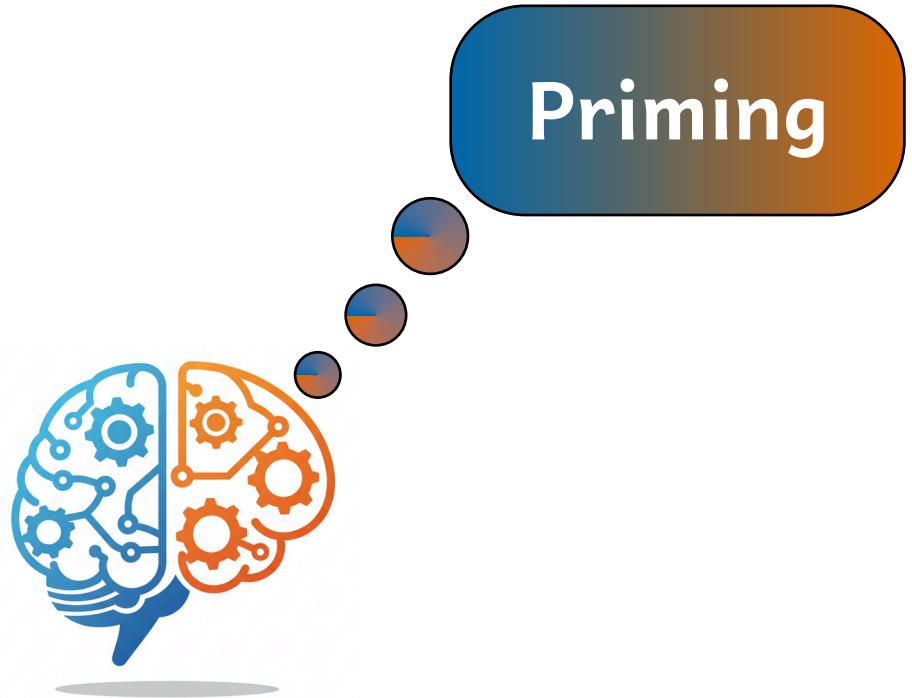
Option 2 was considered way more dangerous by psychological practitioners.



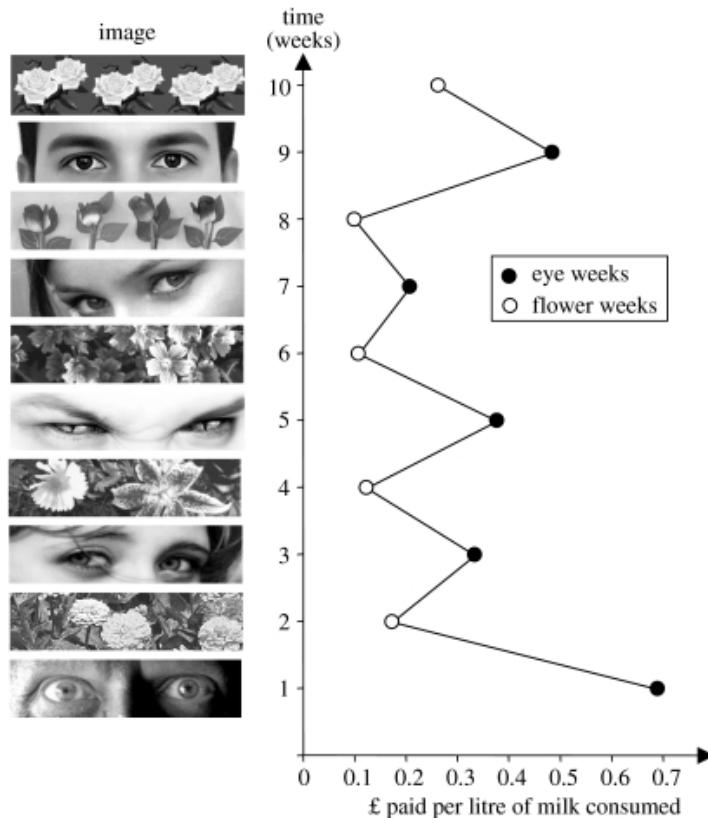
1. Intro
2. Agenda
3. Priming
4. "Autocomplete Bias"
5. Cargo Cult
6. Shiny Object Syndrome
7. Anchoring
8. Broken Window Theory
9. Overconfidence
10. IKEA effect
11. Sunken Cost Fallacy
12. Curse of knowledge
13. Bikeshedding
14. The "antisocial" biases
15. Optimism bias
16. Halo effect
17. Outro

3 slides per cognitive bias:

- Experiment (Quiz, Story time, ...)
- Explanation (Why?)
- Effect & Workaround
- Discussion welcome after each bias.

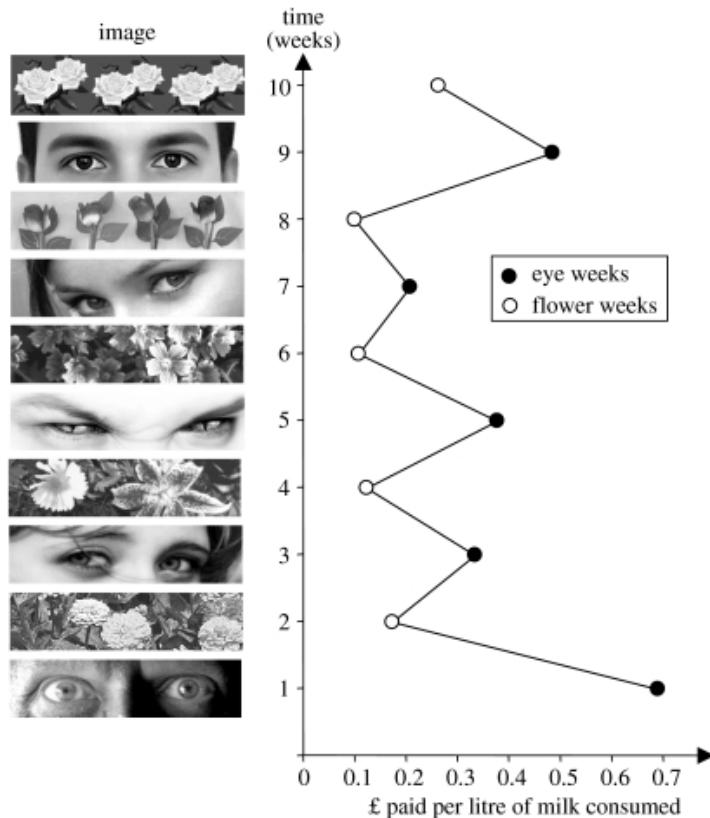


Experiment



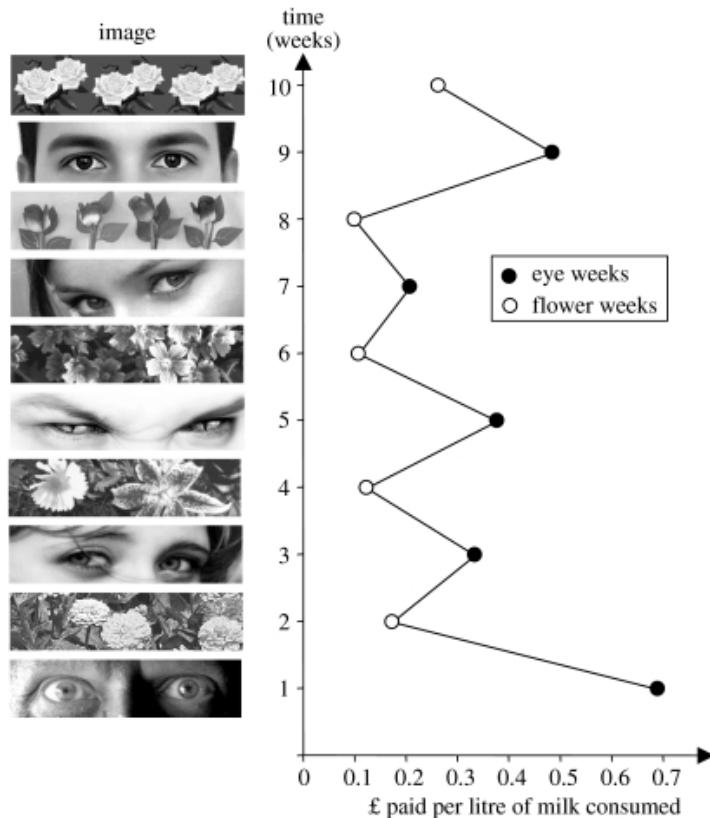
- A trust fund (“Bierkasse”) for coffee milk in office.
-
-
-

Experiment



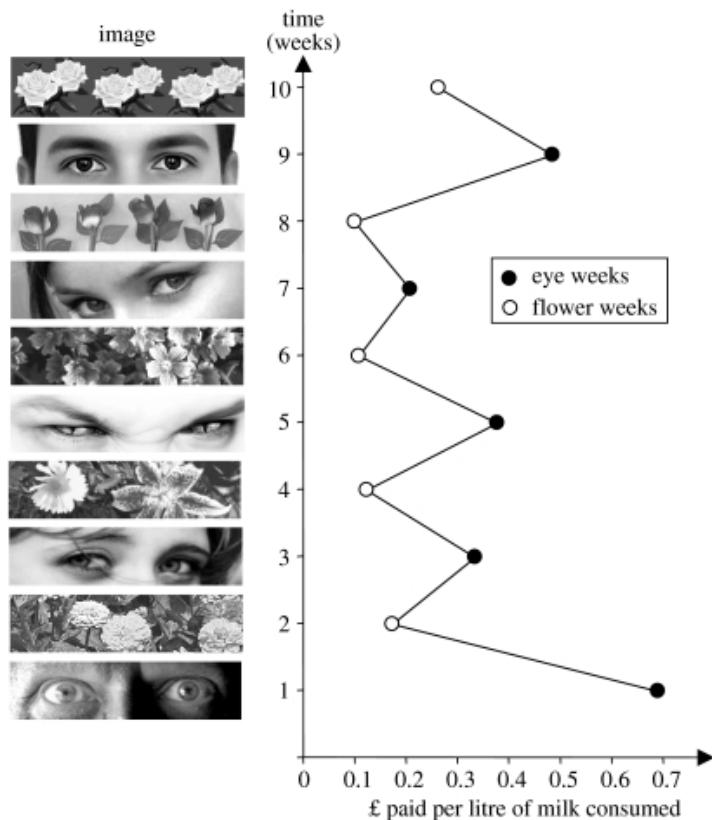
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Experiment



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- Images on the left was put above the £ box & changed weekly.
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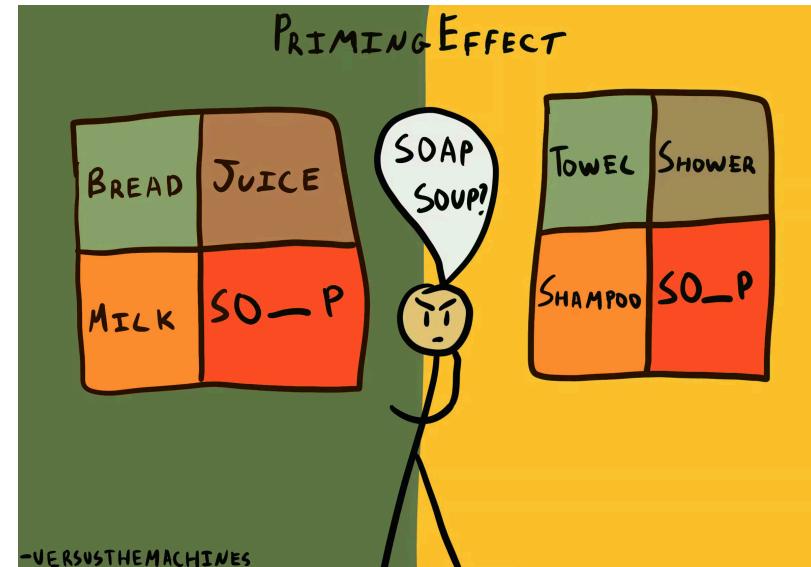
Experiment



- A trust fund (“Bierkasse”) for coffee milk in office.
- Amount of £ was based on trust.
- Images on the left was put above the £ box & changed weekly.
- Face images yielded a much higher cash flow.

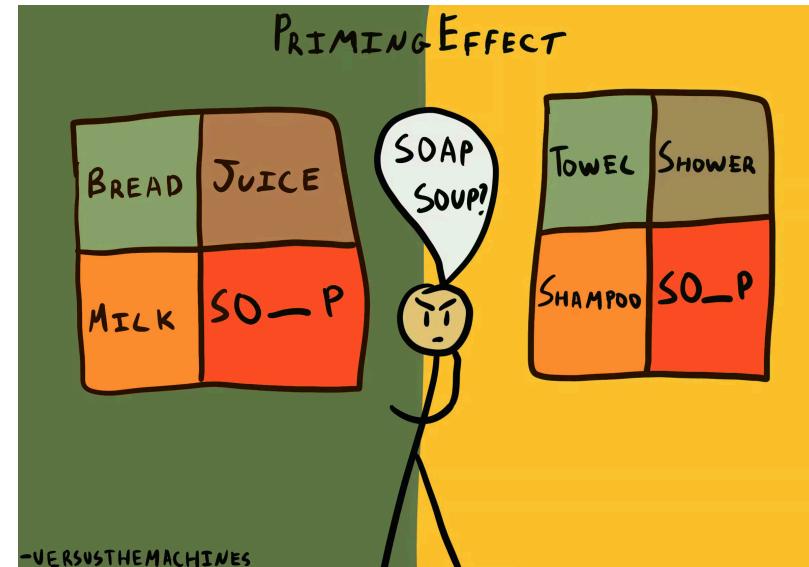
Explanation

- Feeling watched changes our behavior to more cautious.
-
-
-



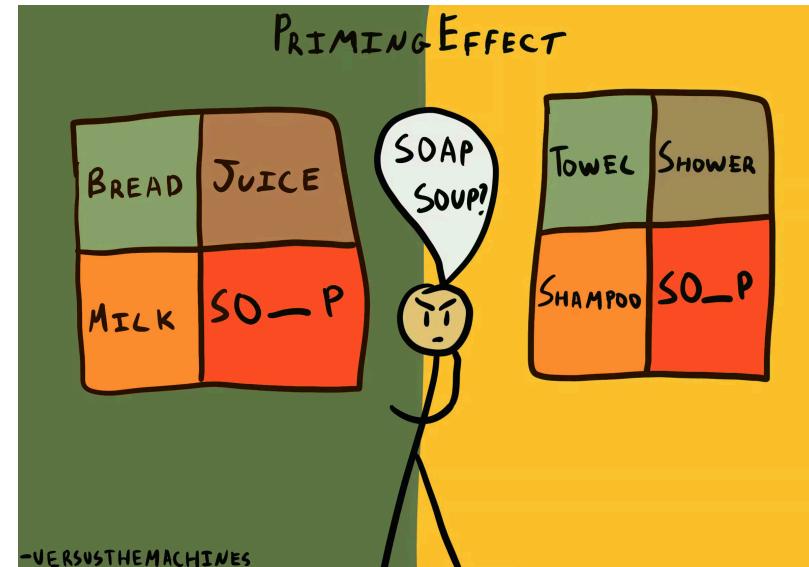
Explanation

- Feeling watched changes our behavior to more cautious.
- Thinking of happy moments improves our mood and makes us more gullible.
-
-



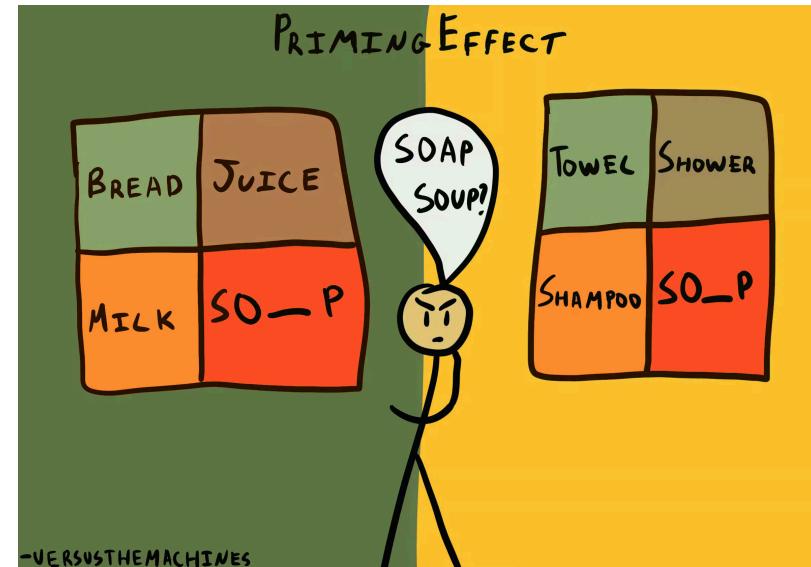
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- Feeling watched changes our behavior to more cautious.
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- Thinking of bad memories makes us more analytical (and sad).
-



Explanation

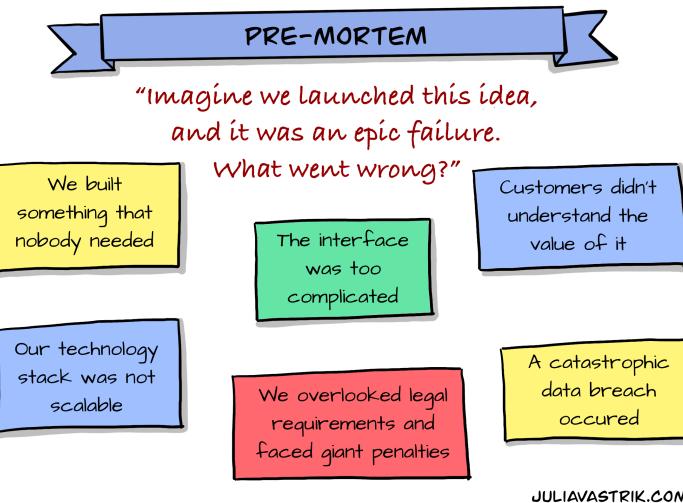
- Feeling watched changes our behavior to more cautious.
- Thinking of happy moments improves our mood and makes us more gullible.
- Thinking of bad memories makes us more analytical (and sad).
- Thinking of money makes us more greedy.



Effect & Workaround

None. If it happens it happens. But:

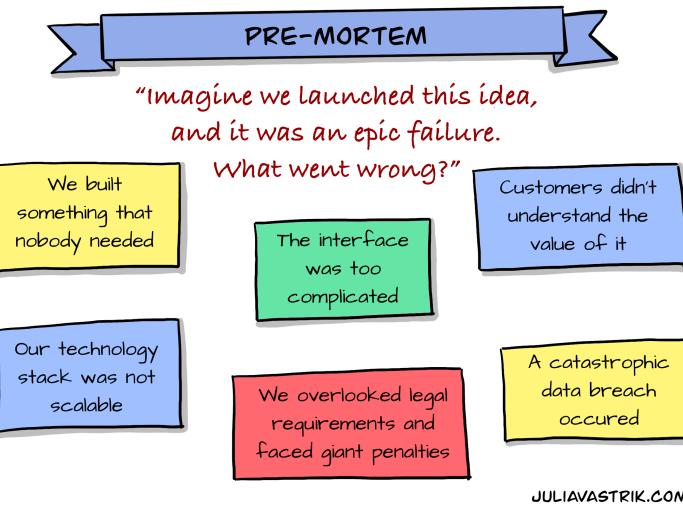
- **Pre-Mortem:** Prime yourself to think about possible mistakes.
-
-



Effect & Workaround

None. If it happens it happens. But:

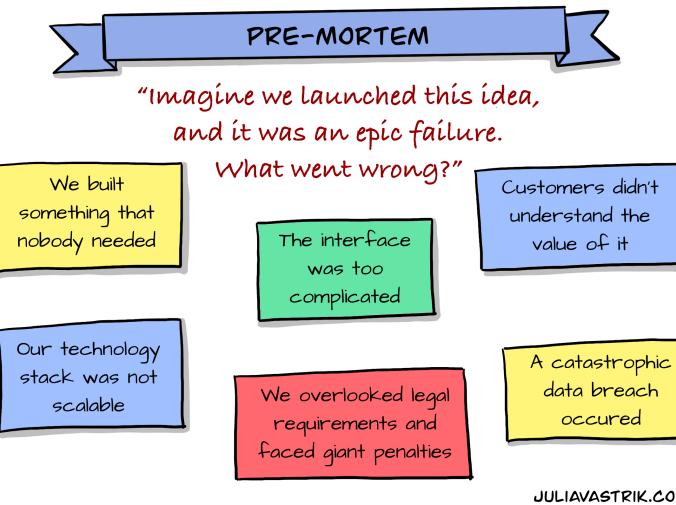
- **Pre-Mortem:** Prime yourself to think about possible mistakes.
- **Asking advice:** Do not mix explanation with opinions.
-

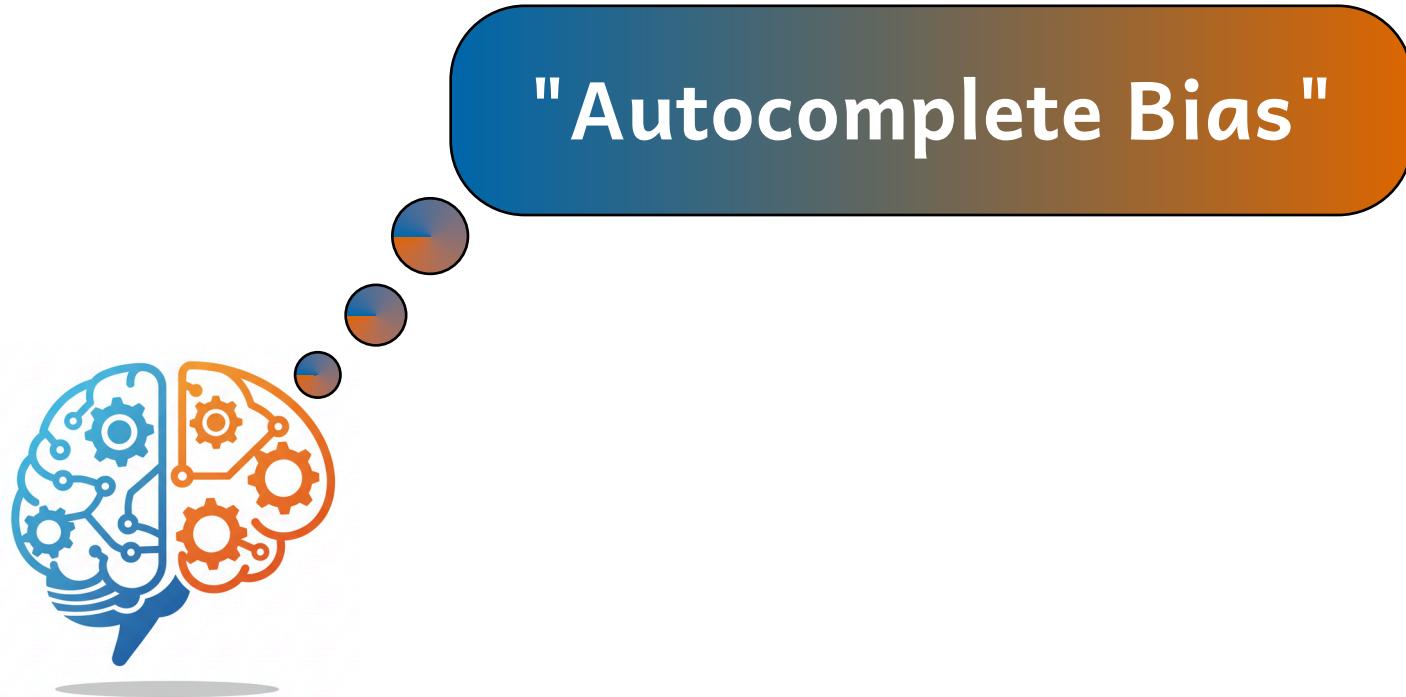


Effect & Workaround

None. If it happens it happens. But:

- **Pre-Mortem:** Prime yourself to think about possible mistakes.
- **Asking advice:** Do not mix explanation with opinions.
- **Take time:** Priming wears off over time. Sleep over it.





Experiment

```
from Crypto.Cipher import AES

# A piece of AI generated code:
# Anything wrong here?
def encrypt(msg, key):
    """
    Encrypt the data in `msg` with `key`,
    return the encrypted bytes.
    """
    cipher = AES.new(key, AES.MODE_ECB)
    return cipher.encrypt(msg)
```

Explanation

Suggestibility

Explanation

Suggestibility

+

Illusion of explanatory depth

Explanation

Suggestibility

+

Illusion of explanatory depth

+

Availability heuristic

Explanation

Suggestibility

+

Illusion of explanatory depth

+

Availability heuristic

=



Effect & Workaround

- Do not auto-complete/generate big chunks of code.
-
-
-

Effect & Workaround

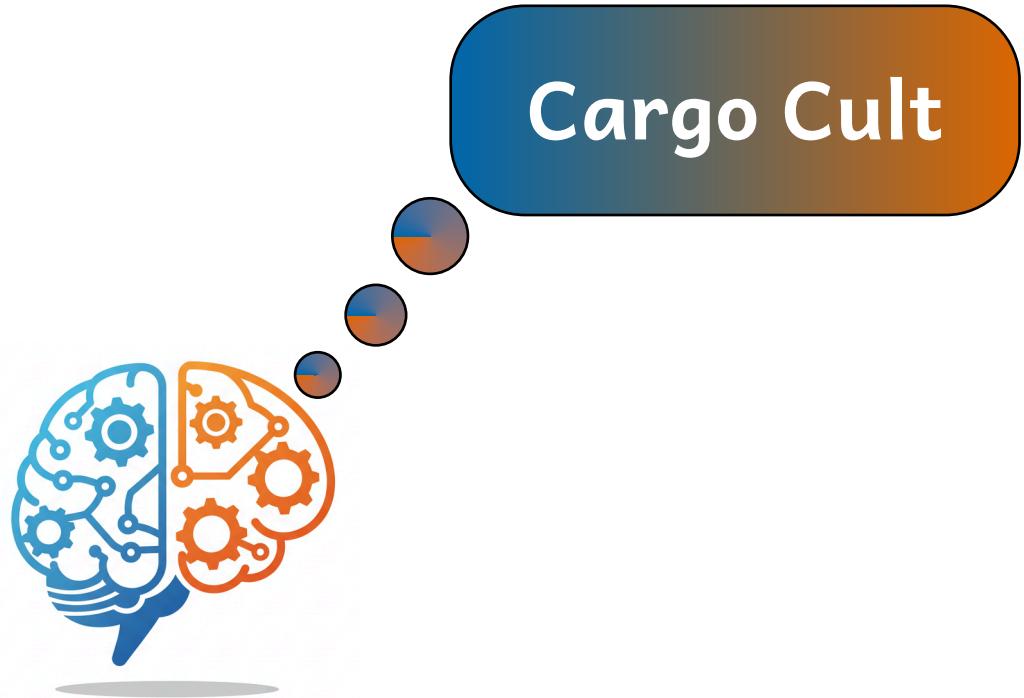
- Do not auto-complete/generate big chunks of code.
- If you learned something, try to explain it (to yourself).
-
-

Effect & Workaround

- Do not auto-complete/generate big chunks of code.
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- Codegen does not replace RTFM.
-

Effect & Workaround

- Do not auto-complete/generate big chunks of code.
- If you learned something, try to explain it (to yourself).
- Codegen does not replace RTFM.
- Review is crucial to find unknown unknowns.



Cargo Cult

Story



Explanation

- Doing rituals in the hope of gaining a benefit, without understanding what leads to the benefit.
-
-
-

Explanation

- Doing rituals in the hope of gaining a benefit, without understanding what leads to the benefit.
- For Software: Usually emulate successful software houses.
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- Examples: k8s, AI, Blockchain, ...
-

Explanation

- Doing rituals in the hope of gaining a benefit, without understanding what leads to the benefit.
- For Software: Usually emulate successful software houses.
- Examples: k8s, AI, Blockchain, ...
- We simply tend to copy behaviors of others, without thinking twice.



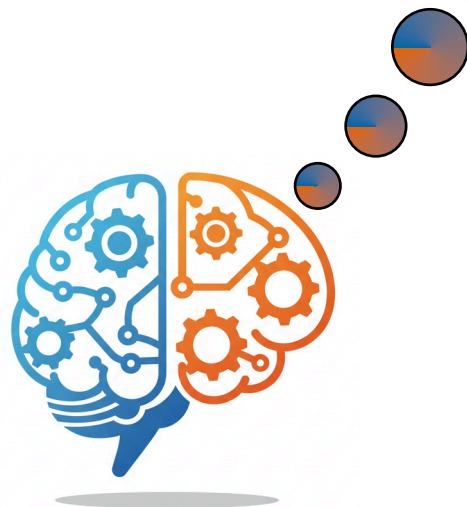
Effect & Workaround

Ask: Do I understand it and do I need it?

Do not:

- Copy & Paste solutions that worked elsewhere without understanding.
- Fixing applications by *Shotgun debugging*.
- Deploying tools like k8s - just because Google uses it.
- Applying patterns (e.g. GoF) without limit.
- ...

Shiny Object Syndrome



Experiment



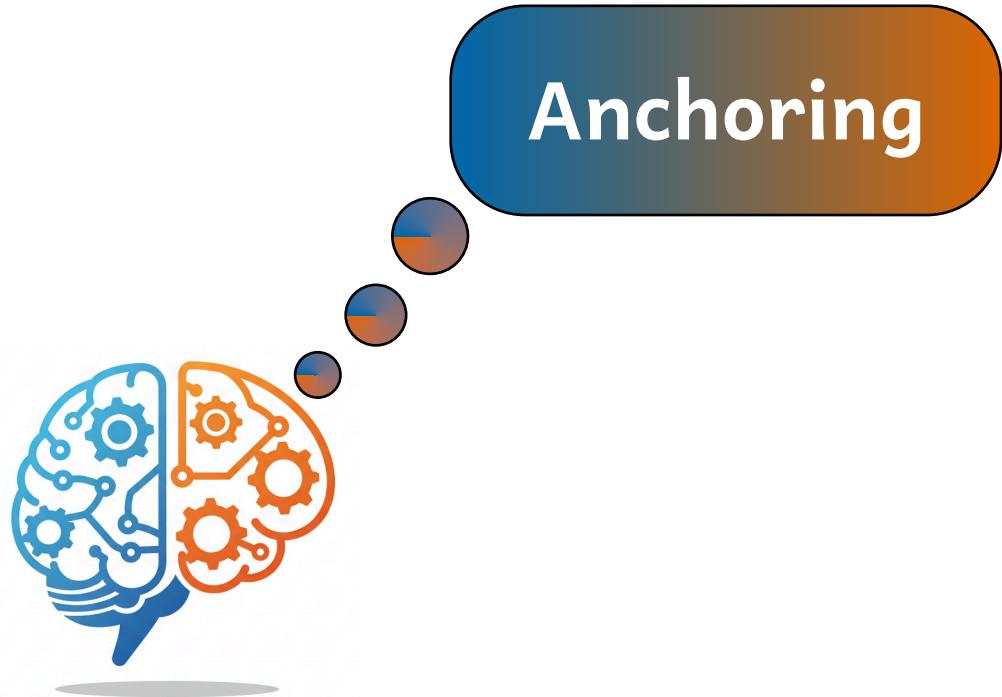
Explanation

- New and exciting things release Dopamine.
- Applies to...
 - ▶ ...choosing new technology.
 - ▶ ...distractions in projects.
 - ▶ ...trends.



Effect & Workaround

- Use well-tested & renowned software.
- Strategy first and then stick to it.
- Get used to be skeptic about new technology:
 - ▶ Does it solve an actual problem?
 - ▶ Can the technology improve software quality and reduce complexity?
 - ▶ Can I understand the new technology?
 - ▶ Do not ask: *Does it make my life easier?* or *Is it cool?*
- **Opposite:** Status Quo Bias.
- **Bonus:** Zero risk bias



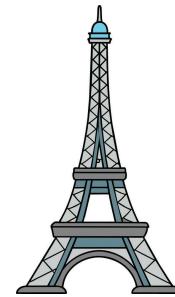
Experiment

- Divide in two groups!
- Answer the question **silently** below and note on a piece of paper.
- If it is not your turn, close your eyes.

Experiment

- Divide in two groups!
- Answer the question **silently** below and note on a piece of paper.
- If it is not your turn, close your eyes.

How high is the Eiffel tower? Is it higher than 1000m?



Experiment

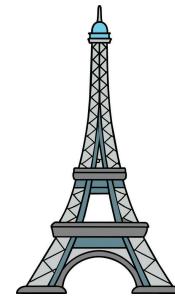
- Divide in two groups!
- Answer the question **silently** below and note on a piece of paper.
- If it is not your turn, close your eyes.

Now the other group!

Experiment

- Divide in two groups!
- Answer the question **silently** below and note on a piece of paper.
- If it is not your turn, close your eyes.

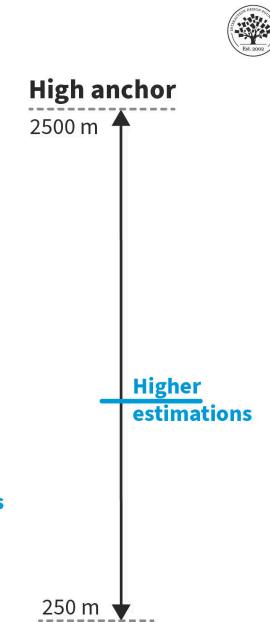
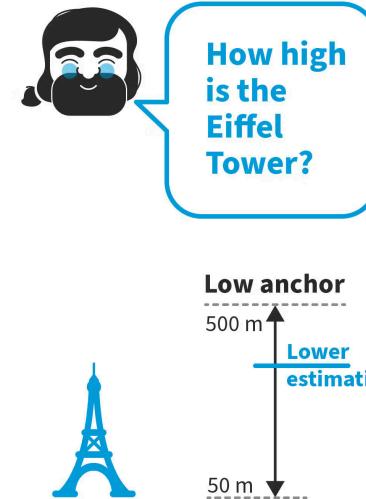
How high is the Eiffel tower? Is it higher than 100m?



Explanation

- We initially imagine something.
- The initial image is the anchor.
- We iterate until we feel happy about our guess.

Anchoring Effect



Interaction Design Foundation
interaction-design.org

Effect & Workaround

Anchoring happens with...

- ...effort estimations.
- ...fixation on initial ideas.
- ...consumers due to dark patterns.

Mention the effect!



Broken Window Theory



Story



7

⁷<https://blog.codinghorror.com/the-broken-window-theory>

Explanation

- Shows people that breaking the rules has no downsides.
-
-
-

Explanation

- Shows people that breaking the rules has no downsides.
- Enables “Just driving the excavator.”-Mentality.
-
-

Explanation

- Shows people that breaking the rules has no downsides.
- Enables “Just driving the excavator.”-Mentality.
- Negative, self-enhancing feedback loop.
-

Explanation

- Shows people that breaking the rules has no downsides.
- Enables “Just driving the excavator.”-Mentality.
- Negative, self-enhancing feedback loop.
- Feeling suffocated by things that need to be fixed.

Effect & Workaround

Repair bad decisions, design and poor code early.

Well, at least try to.

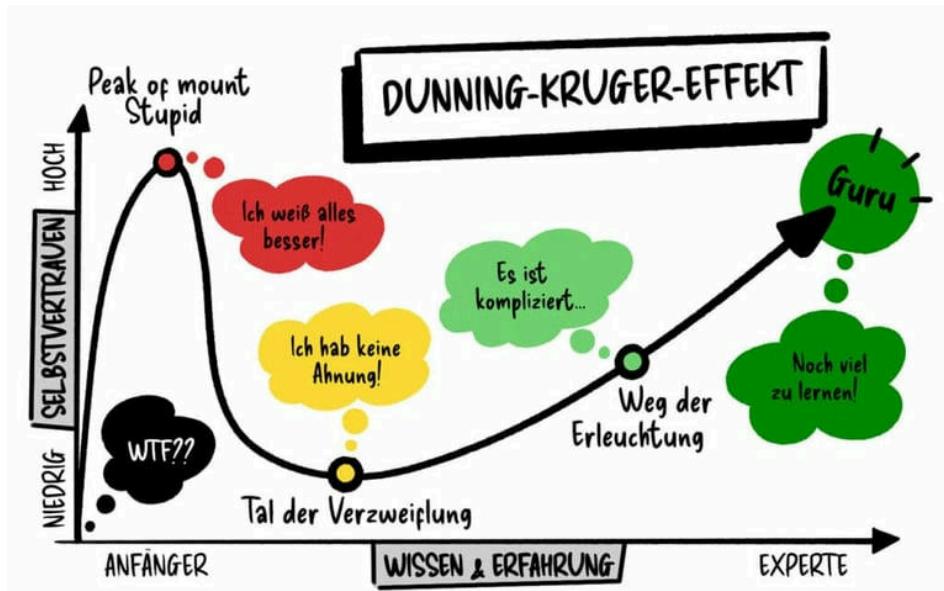


Story

80% of swedish drivers claim they are better than the average driver.

How can this be?

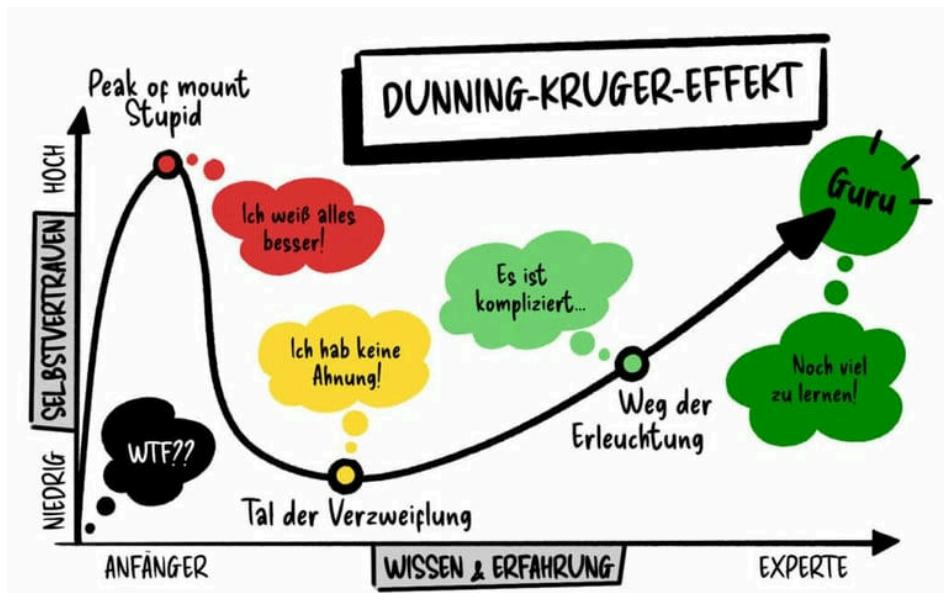
Explanation



- People with the required skill do not have the ability to judge a skill.

-
-
-

Explanation

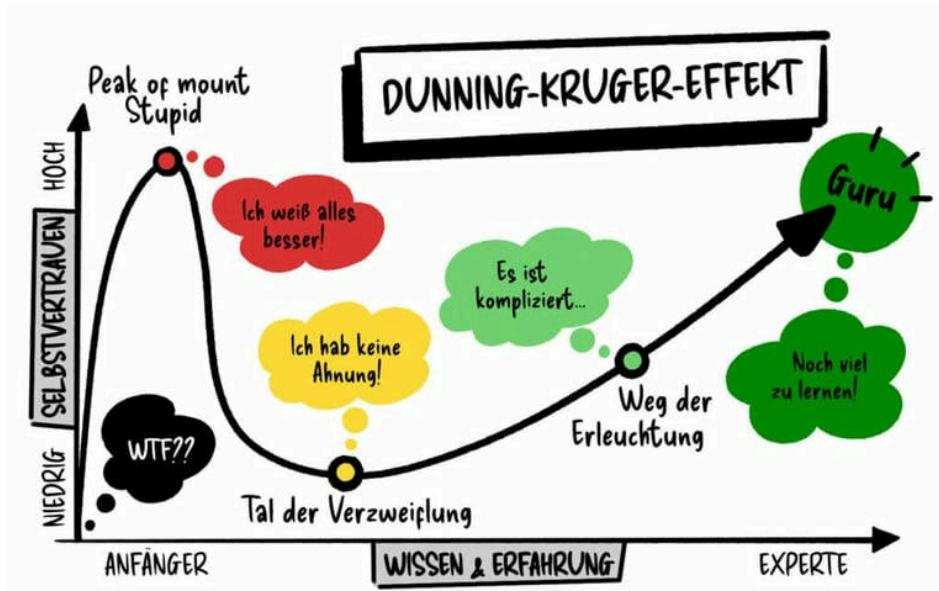


- People with the required skill do not have the ability to judge a skill.
- The value of a skill is often not recognized to be useful.

•

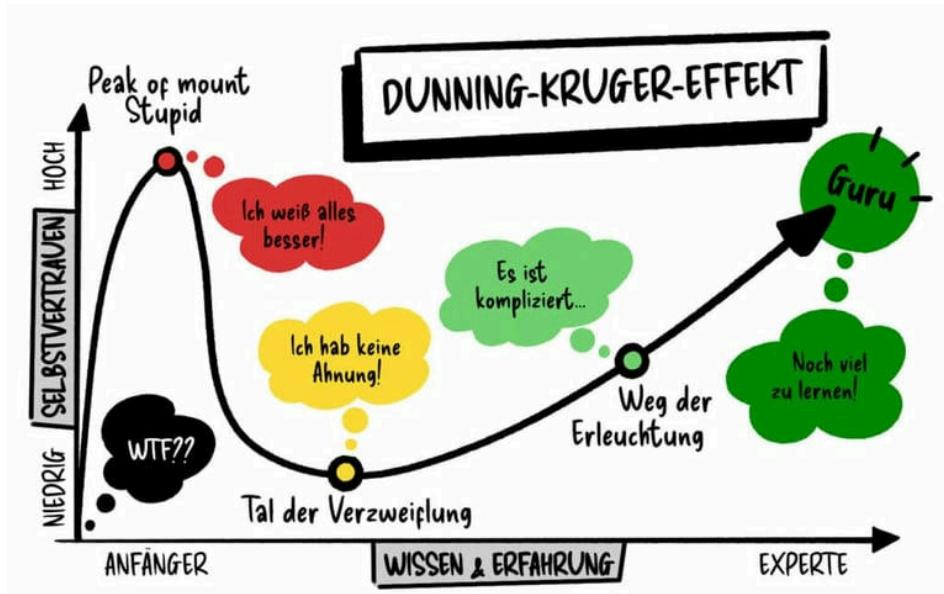
•

Explanation



- People with the required skill do not have the ability to judge a skill.
- The value of a skill is often not recognized to be useful.
- A positive self-image has positive effects on the own mental health.
-

Explanation



- People with the required skill do not have the ability to judge a skill.
- The value of a skill is often not recognized to be useful.
- A positive self-image has positive effects on the own mental health.
- The unknown unknowns are ignored as usual.

Effect & Workaround

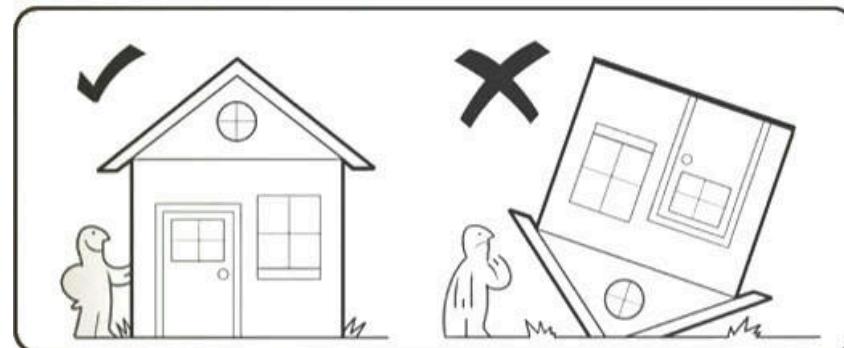
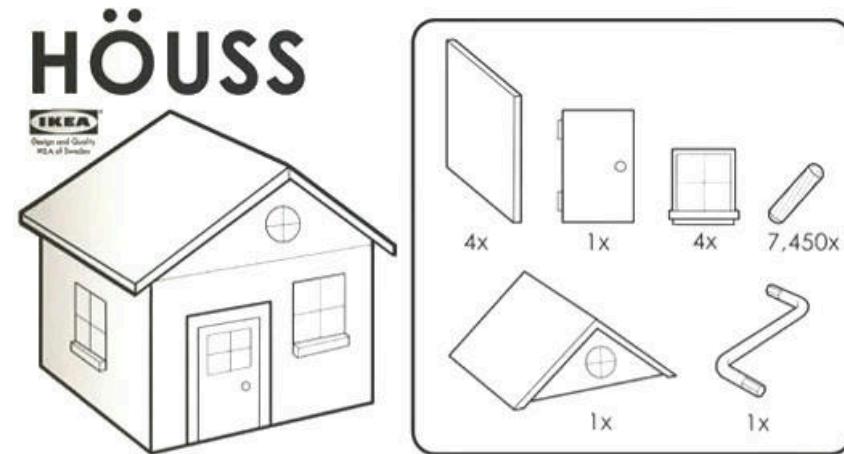


- If you feel like you are lacking, it might be a good sign!
- Be open for feedback and ask where you're lacking.
- Force overconfident people to explain themselves.
- Foster a feedback culture as a corrective.



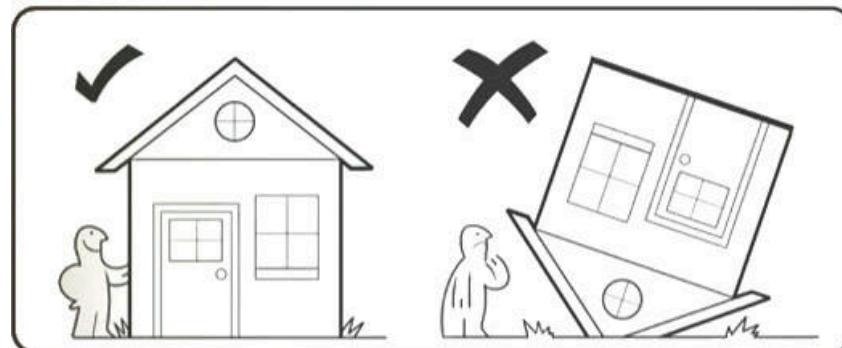
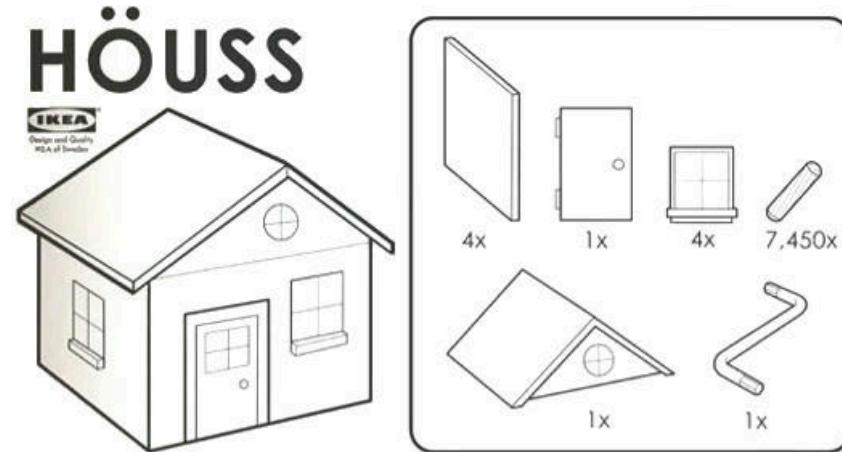
Story

- Items/Projects are more valued when self-build.
-
-



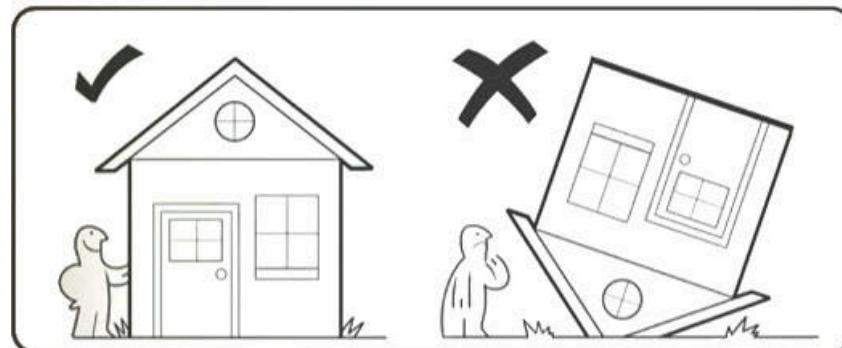
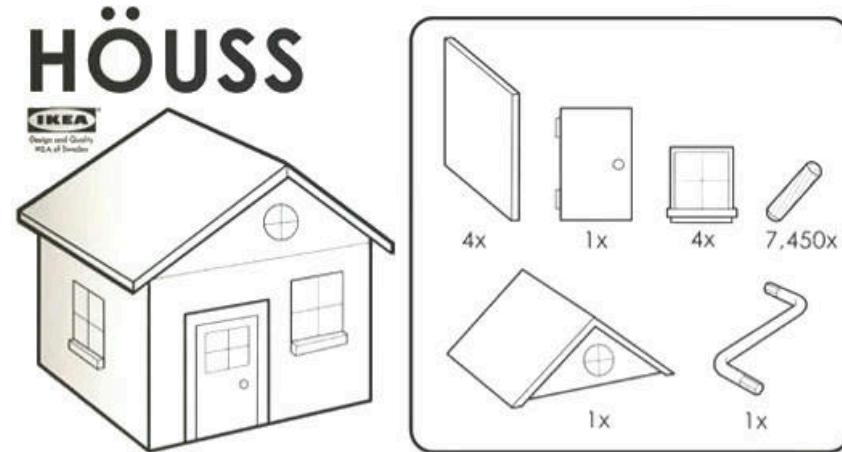
Story

- Items/Projects are more valued when self-build.
- Even if you did a small part only.
-



Story

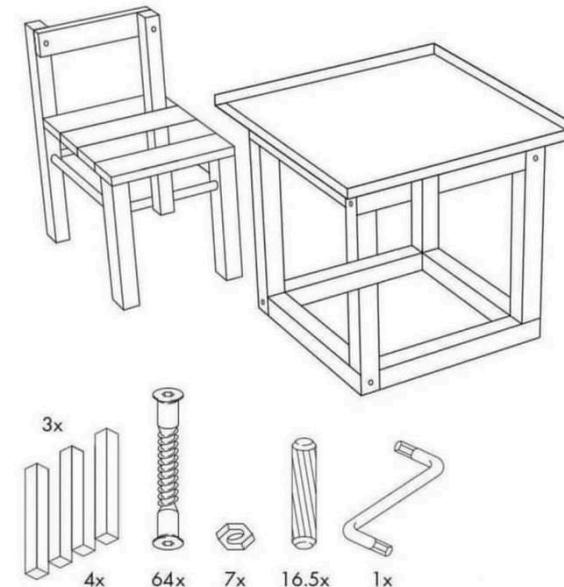
- Items/Projects are more valued when self-build.
- Even if you did a small part only.
- Even if done very poorly!



Explanation

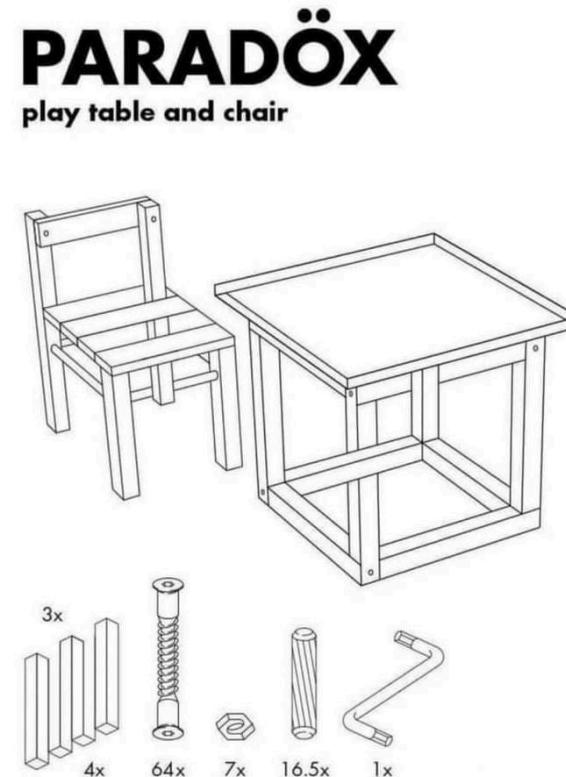
- Building something makes us feel confident about our skills.
-
-

PARADÖX
play table and chair



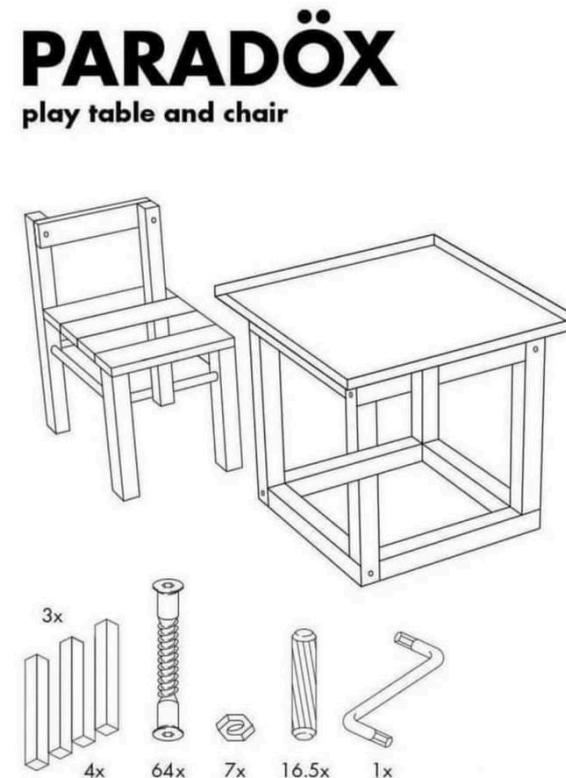
Explanation

- Building something makes us feel confident about our skills.
- Elevates users to “co-creators”.
-



Explanation

- Building something makes us feel confident about our skills.
- Elevates users to “co-creators”.
- The more effort the more positive we see the product.



Effect & Workaround

Negative:

- The primary cause for *Not-Invented-Here-Syndrom*.
- Tools we researched ourselves are more appealing.

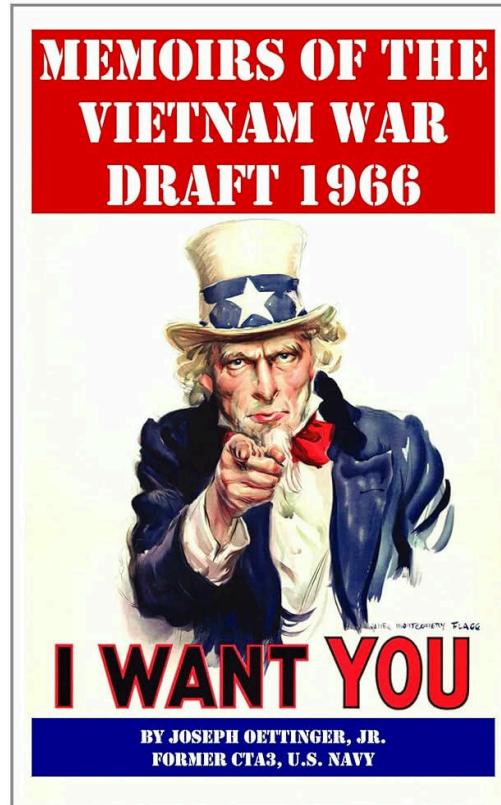
Positive:

- Open Source: Increases contribution.
- If users can adjust something, they love it more (dashboards, profiles)

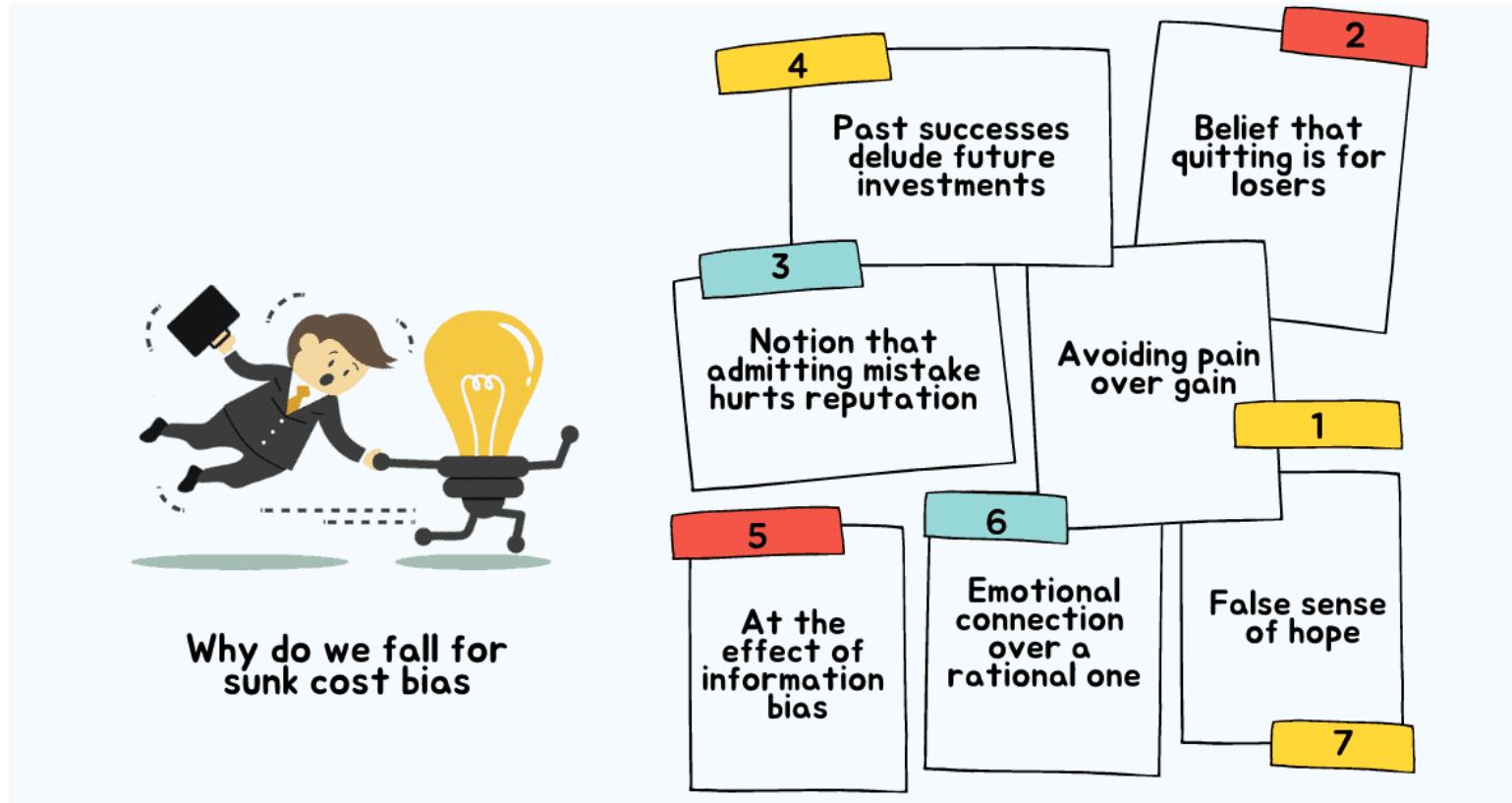
Sunken Cost Fallacy



Story



Explanation



Effect & Workaround

- If you ride a dead horse, get off.
-
-
-
-



Effect & Workaround

- If you ride a dead horse, get off.
- Evaluate choices like you'd start freshly on a green field.
-
-
-



Effect & Workaround

- If you ride a dead horse, get off.
- Evaluate choices like you'd start freshly on a green field.
- Have a good error culture.
-
-



Effect & Workaround

- If you ride a dead horse, get off.
- Evaluate choices like you'd start freshly on a green field.
- Have a good error culture.
- Get used to abandoning old stuff.
-



Effect & Workaround

- If you ride a dead horse, get off.
- Evaluate choices like you'd start freshly on a green field.
- Have a good error culture.
- Get used to abandoning old stuff.
- IKEA effect contributes here.





Curse of knowledge

Experiment

Explain to your seating neighbor a specific detail you assume they have no idea about. For example from a hobby of yours.

What do you notice?

Explanation

- We implicitly assume everyone else has the same knowledge as we do.

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Explanation

- We implicitly assume everyone else has the same knowledge as we do.
- This can apply also to future selves
No comments in code, anyone?
- UI design also suffers from CoS: We assume the user knows.
- Often not called out.



Effect & Workaround

- Knowing about it helps. Feel free to interrupt your peer.
- Try to see the world from your peer's perspective.
- Ask questions to see if your peer understood.
- Be patient as explainer.



Story & Experiment



The Bikeshed Effect

The amount of time spent discussing an issue in an organization is inversely correlated to its actual importance in the scheme of things.

Discuss: What trivial detail did you did give disproportional detail?

Explanation

- We tend to decide quickly on things we do not know much about.
-
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- Focusing illusion shifts priorities.
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- If we know much about a subject we tend to over discuss it.
- We see opportunity to demonstrate our skills.
- We forget about the greater goal.
- Can lead to Analysis Paralysis.

Effect & Workaround

Hard to fix, since it often masquerades as useful discussion.

- Have frameworks like OKR for common goals.
-
-
-

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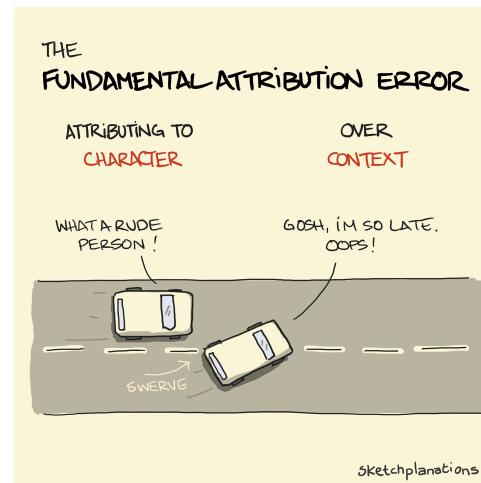
- Have frameworks like OKR for common goals.
- Time-box meetings and give priorities.
- Leaders should actively discussions gone wild.
- Explain Bikeshedding to peers.

The "antisocial" biases

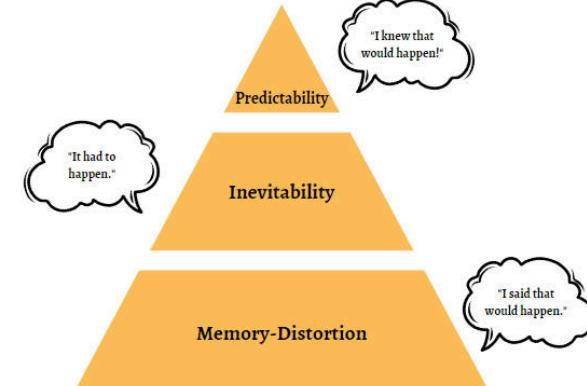


Story & Experiment

CONFIRMATION BIAS



Hindsight Bias



Explanation

Confirmation bias:

- Desire to be right & self esteem.
- We like to confirm more than to refute. Being wrong feels bad.
- Mental shortcut.

Hindsight bias:

- Desire for control.
- Reducing regret by sugarcoating.

The Fundamental Attribution Error:

	Reason for my action	Reason for other person's action
Positive outcome	Personal character	The situation
Negative outcome	The situation	Personal character

Example:

	Reason for the time I arrived	Reason for the time the other person arrived
On time for work	I take my job seriously	It's their job
Late for work	Heavy traffic	They are disrespectful

Effect & Workaround

- Tends to create echo chambers.
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Effect & Workaround

- Tends to create echo chambers.
- Testing: Positive tests > Negative tests.
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- Re-use of old solutions for new problems.
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Effect & Workaround

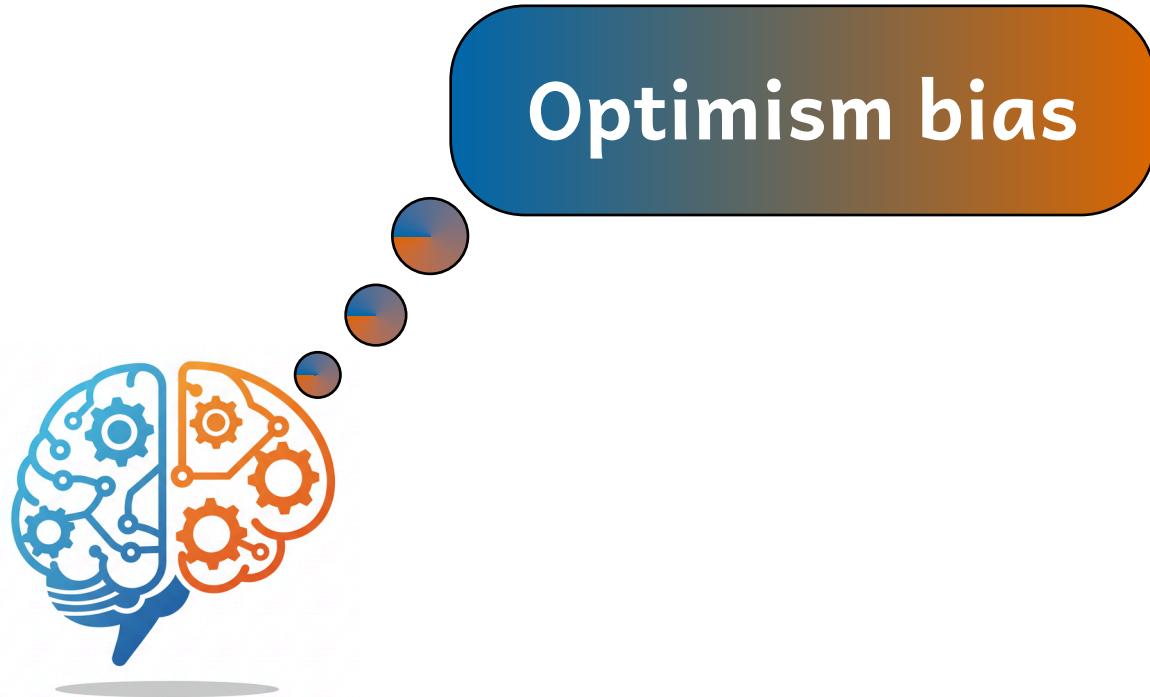
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- Colleague X is such an idiot, I would have it done so much better!
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No solution here. Humans are weird.

Effect & Workaround

- Tends to create echo chambers.
- Testing: Positive tests > Negative tests.
- Re-use of old solutions for new problems.
- When Deployment goes wrong: I had a bad feeling!
- Colleague X is such an idiot, I would have it done so much better!
- I don't like Chris, his ideas are no good.

No solution here. Humans are weird.



Optimism bias

Common sayings amongst developers

It's not that hard to add 2 database columns...

I smoke way less than others

That solution will be fast enough!

Loosing all backups is really unlikely

That deadline will be no issue.

That new framework/tool/whatever will fix it all.

Hackers target only big companies!

Explanation

- Representativeness heuristic.
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Explanation

- Representativeness heuristic.
- People want to feel good.
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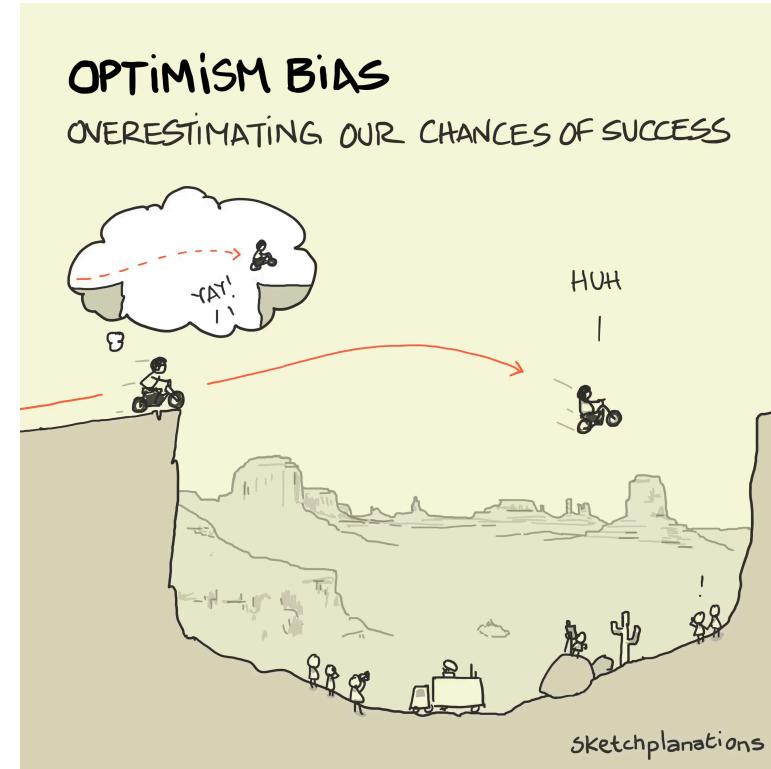
Explanation

- Representativeness heuristic.
- People want to feel good.
- Focus on desired end states.
-
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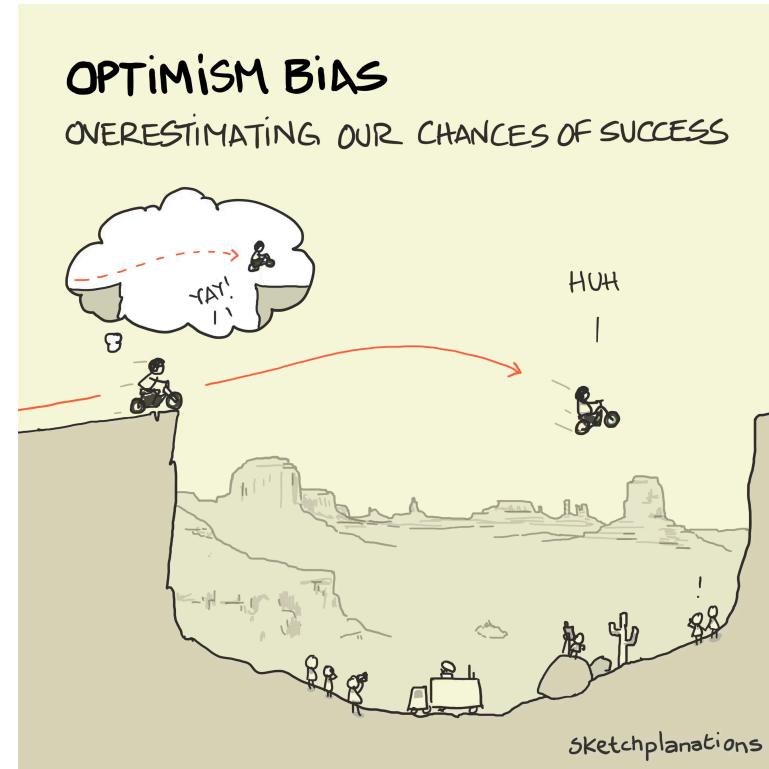
Explanation

- Representativeness heuristic.
- People want to feel good.
- Focus on desired end states.
- Missing painful experiences.
-



Explanation

- Representativeness heuristic.
- People want to feel good.
- Focus on desired end states.
- Missing painful experiences.
- Good mood makes us optimistic.



Effect & Workaround

- **Very hard to fully eliminate.**
-
-
-

Effect & Workaround

- **Very hard to fully eliminate.**
- There is no glory in prevention.
-
-

Effect & Workaround

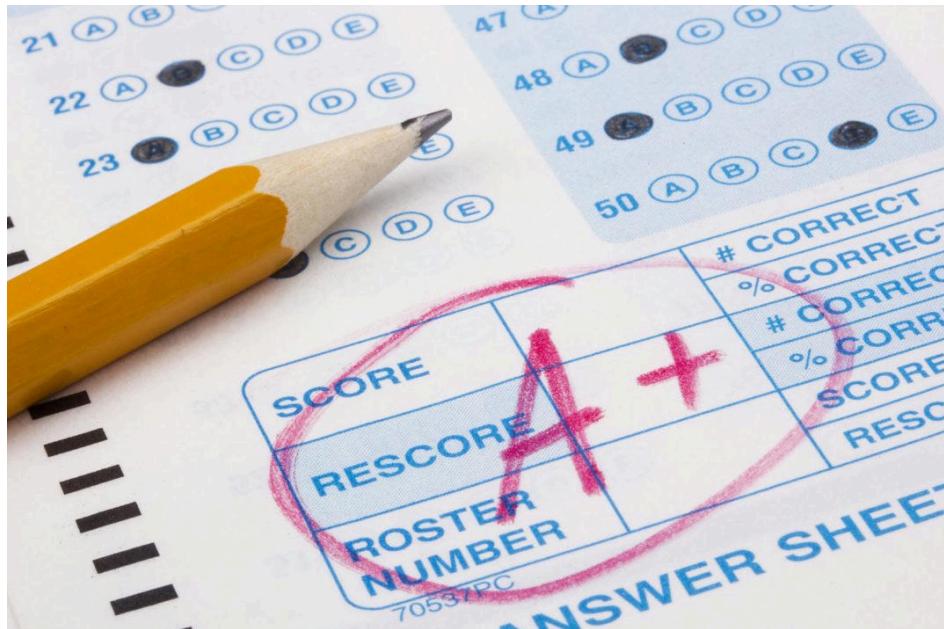
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- Base rates (i.e. look at other projects).
-

Effect & Workaround

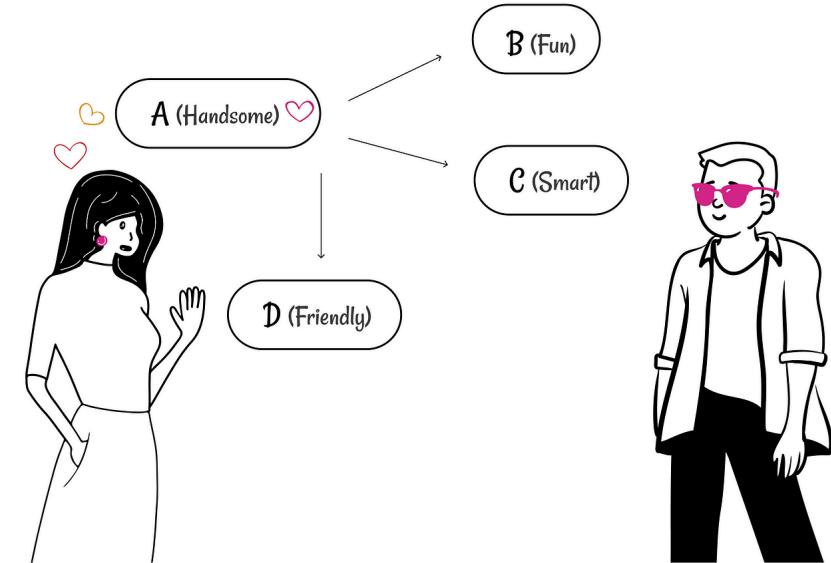
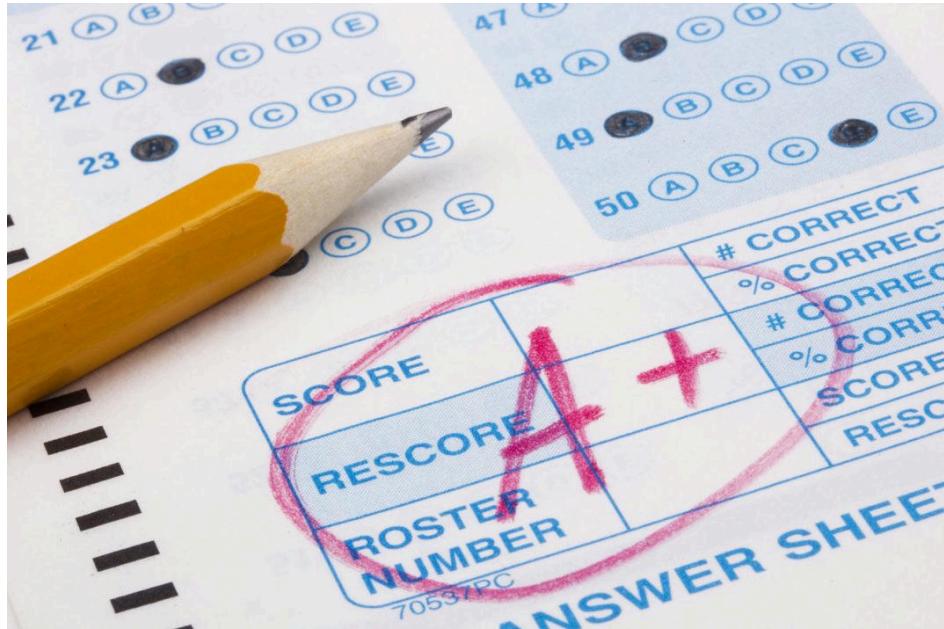
- **Very hard to fully eliminate.**
- There is no glory in prevention.
- Base rates (i.e. look at other projects).
- Use pre-mortem.



Story



Story



Explanation

The Impact of the Halo Effect on Daily Life



Effect & Workaround

- We tend to overvalue *Rockstar* developers.
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Effect & Workaround

- We tend to overvalue *Rockstar* developers.
- Each of us have a technology they love. Be aware.
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Effect & Workaround

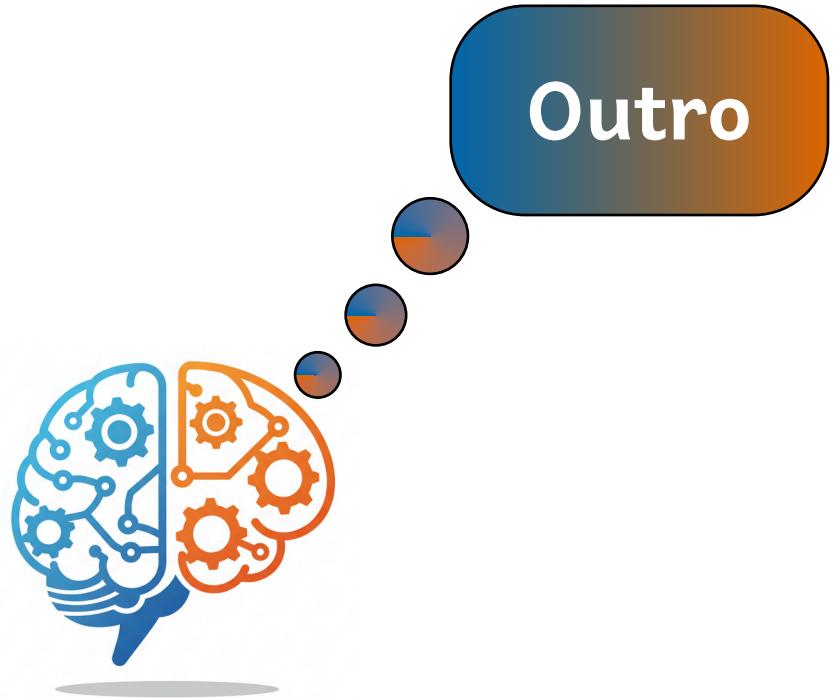
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Effect & Workaround

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- Mind this effect as a manager.
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Effect & Workaround

- We tend to overvalue *Rockstar* developers.
- Each of us have a technology they love. Be aware.
- Do not use *exciting* software, but boring one.
- Mind this effect as a manager.
- Accept all software sucks. 😊



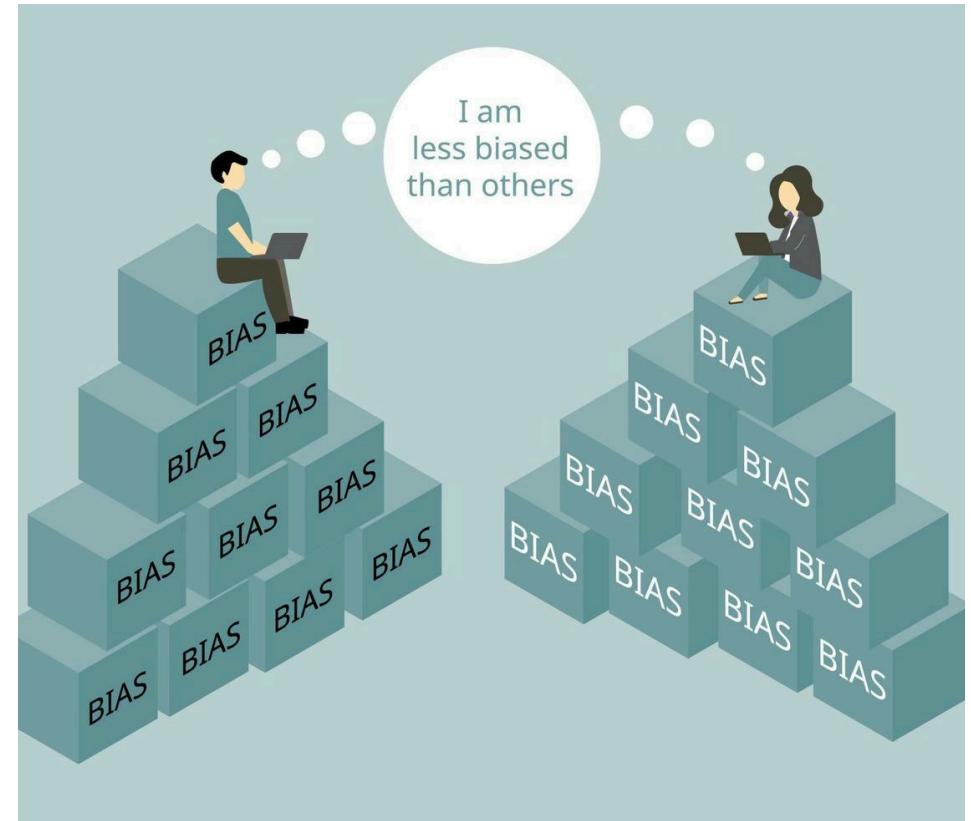


Hegel Borg™ ✅
@xxclusionary

I have a mental illness that makes me think that people will change their minds if I present the correct arguments with the appropriate facts and data.

Summary

- Even if we know about biases, our brain will still experience them.
- Now we can at least debug our past behavior.
- Make it a habit watching your mind.
- Take time for important decisions.
- Build intuition through experience to use System1.
- This talk was not complete (e.g. Dark Patterns in UI/UX)



Doubt yourself!

(and me)

Sources

- <https://thedecisionlab.com/biases>
- https://en.wikipedia.org/wiki/Cognitive_bias
- <https://github.com/zakirullin/cognitive-load>
- <https://thevaluable.dev/cognitive-bias-software-development>
- [...]