COSC345 Software Engineering

Your most important tool

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August 7, 2017

It's your own mind

- So learn how to use it effectively
- Like Terry Pratchett's Tiffany Aching,
  you need First Sight and Second Thoughts.
- See what is really there (not what you expect).
- Think critically about your own thinking.

Biases in our thought

- Familiarise yourself with
  `https://en.wikipedia.org/wiki/List_of_cognitive_biases`
- `https://en.wikipedia.org/wiki/List_of_fallacies`
- `https://www.britannica.com/topic/thought`
- and similar material.

Mental Set

- https://en.wikipedia.org/wiki/Set_(psychology)
- "A *mental set* is a framework for thinking about a problem".
- An appropriate framework helps you.
- An inappropriate framework holds you back.
- If you are banging your head against a brick wall, it's time to stop and approach the problem a different way.

Functional Fixedness

- One particular type of mental set
- Something has one use? Assume *only* that use.
- A hammer can be a paperweight.
- A coin or kitchen knife can be a screwdriver.
- What can a list, an array, a tree do?
- Can you use a list instead of a number?

Functional fixedness, the converse

- If solution X is good for problem Y
- and I do not have problem Y
- then solution X is no use to me

An example

- Water is good if you are dying of thirst.
- I am not dying of thirst.
- Therefore there's no point in me drinking.

Programming example

- TypeScript (or Dart) is useful for large projects (many lines and/or several programmers).
- I do not have a large project.
- Therefore TypeScript (or Dart) has nothing to offer me.
- Half of the 2015 class thought this way.

What you hear is not what they said

- A: "Gay sex is unnatural." B: "I want to do it so it's natural for me, and it occurs in other species."
- What B said is true but irrelevant; that's not what A meant by "unnatural".
- A: "God is omnipotent." B: "Then he can make a stone that's too heavy for him to lift, and lift it."
- What B said misses the point because that's not what "omnipotent" means.

Programming

- What *we* mean by a word may not be what our *client* means by it.
- For example, what is a "character"?
- Is ǔ̀ a "character"? (U+01DC)
- Is an icon of a vampire a "character"? (U+1F9DB)

Focussing on the beginning

- I could choose method X or method Y.
- Method X costs more in phase 1.
- Therefore I should choose method Y to save on whole-project costs.

A real-world instance

- I need to get to Stockholm.
- It is cheaper to take a bus from here to Christchurch than to fly.
- Therefore I should use buses for the whole trip.

Programming instance

- I could use TypeScript (or Dart) or raw JavaScript.
- It will take longer to learn all of TypeScript (or Dart) than all of of JavaScript.
- Therefore I shall use raw JavaScript in order to reduce the **total** project time.
- Also a popular error in 2015.

The illicit **only**

- We read "X is good for Y" as "Y is the **only** thing X is good for."
- We read "it takes longer to learn X than Y" as "learning time is the **only** time that can be affected by the choice."
- Both of these are wrong.

Incomplete comparison

- I have to choose method X or method Y.
- I need a method that is good at T.
- Method X is good at T.
- Therefore I shall use method X.

Example

- I have to choose between Chrome and Firefox.
- I need to save bookmarks.
- Chrome can save bookmarks.
- Therefore I shall use Chrome.
- Also a popular error in project planning.

What's wrong?

- "Method X can do T" is a reason to choose X.
- **only** if Y cannot do T or cannot do it as well.
- To make an **informed** comparison
- you need to find out.

Incomplete task

- I have been asked to do X, Y, and Z.
- I have done X and Y.
- Therefore I have finished.

A mistake, not a fallacy

- We have limited short-term memory (7 ± 2).
- We tend to focus on one thing at a time.
- That is why we use **checklists**.
- A problem for me in real life (so use a diary).
- A common problem in exams.

The greatest treason

- "The last temptation is the greatest treason, to do the right thing for the wrong reason." — T. S. Eliot, *Murder in the Cathedral*.
- Decisions made following these fallacies may or may not be *wrong*, but they will certainly be **unjustified**. Errors of logic are as dangerous as errors of fact.
- Web search engines are useful: *verify* your facts, even the ones you think are true.

Friday

- Guest lecture.
- Phil Newman of Student Health Services
- Usual time, usual place.