Making rational decisions in software projects: moving beyond biases

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Why decisions?

> Decision making is crucial

> Poor decision making a problem

> Many failures are due to:
  - *Poor decisions*
  - *Untimely decisions*
  - *Absence of decisions*

Outline: decision making, bias, professional

➢ **The link between decision making and bias**

➢ **Challenges in decision making**

➢ **Are you susceptible to biases?**

➢ **Framing questions**

➢ **Dealing with uncertainty**

➢ **Implications**

➢ **Decision making manifesto**

➢ **The way forward**

➢ **Professional decision making?**

What is bias?

➢ According to the Oxford Dictionary: A bias is a predisposition or prejudice.

➢ According to my son's English book it is **a strong opinion for or against an idea.**

➢ But are we susceptible to biases?

Would you buy this house?

This charming and unusual country cottage enjoys a quiet position at the end of an idyllic country lane. Its period features and unashamed old world style make it ideal for restoration by a loving owner. The property benefits from many original characteristics which could be further enhanced to suit your personal taste.

The 'house' stands in a very isolated position up a rough and unmade farm track. It is sadly neglected – the roof tiles are broken, the walls and ceiling crumbling and there is an urgent need for essential repairs. Inside most of the rooms there is evidence of rising damp. The whole property requires an urgent overhaul.
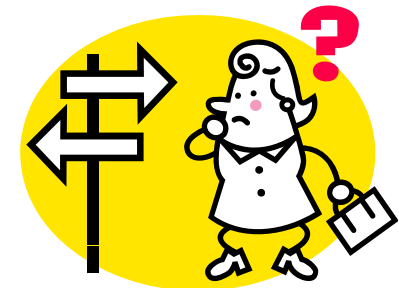
The starting point

Most of us do not make great decisions, and a few of us are aware of this fact.

- Hoch & Kunreuther

Today we are going to explore this area.

Challenges in decision making

> ➢ Information overload
> ➢ Galloping rate of change
> ➢ Rising uncertainty
> ➢ Few historical precedents
> ➢ More frequent decisions
> ➢ More important decisions
> ➢ Conflicting goals
> ➢ More opportunities for miscommunication
> ➢ Fewer opportunities to correct mistakes
> ➢ Higher stakes

(after Russo & Schemaker)

Add to that…

- ➢ Multiple objectives
- ➢ Multiple stakeholders
- ➢ Multiple perspectives
- ➢ Multiple value sets
- ➢ Complexity
- ➢ Ambiguity
- ➢ Ignorance

Making decisions

➢ New play by Andrew Lloyd Webber, **Rats**

➢ You just bought a ticket for £50, seats not marked. You lost your ticket. Would you buy another?

➢ Situation 2: Going to see a play. Open wallet – lost £50 note. Would you still pay?

➢ Typically 62% buy ticket again (having made effort)
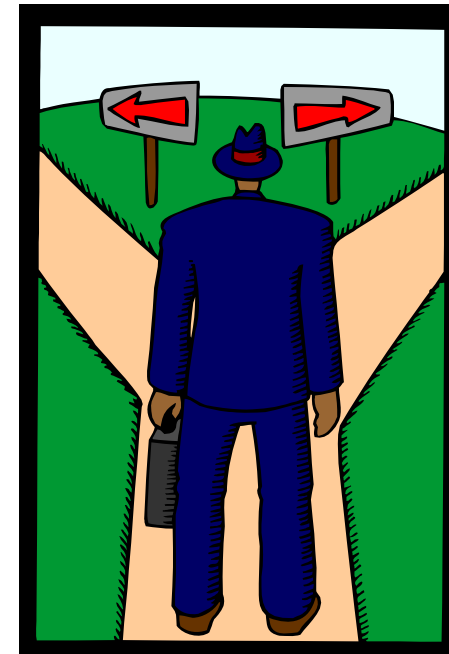
➢ 85% pay cash

Gamble

1% chance of winning £10,000

50% chance of winning £400

Which option would you select?

Expected Value

0.01 * £10,000 = £100

0.50 * £400 = £200

Bias

➢ Many decisions deviate from the 'optimal, rational' result.

➢ The flaws are **repeatable** and can be attributed to consistent mistakes.

➢ These cognitive **biases reduce** the effectiveness of the decision maker affecting the acquisition, analysis and interpretation phases.

➢ This in turn affects the **quality** (and relevance) of the decision itself.

What treatment would you prefer?

Of 100 people having surgery, 10 will die during surgery, 32 will have died within one year and 66 will die within five years. Of 100 people having radiation therapy, none will die during treatment, 23 will die within one year, and 78 will die within five years.

Of 100 people having surgery, 90 will survive the surgery, 68 will survive past one year, and 34 will survive through five years. Of 100 people having radiation therapy, all will survive the treatment, 77 will survive one year, and 22 will survive past five years.

Can we trust professionals?

New England Journal of Medicine

➢ Group of 369 boys were examined for possible tonsillectomy

➢ Step 1: Panel of doctors examined all boys

Decision: 45% required tonsillectomy

➢ Step 2: New panel of doctors examined remaining boys (214)

Decision: 46% needed tonsillectomy

➢ Step 3: New panel of doctors examined 116 doubly healthy boys

Decision: 44% needed tonsillectomy

Availability

➢ The decision maker uses only easily available information and ignores not easily available sources of significant information.

➢ **Are there more seven letter words in the English language:**

- - - - - n -

- - - - i n g

➢ **Consider a group of ten people:**

How many different committees of two?

How many different committees of eight?

Availability again

> ➤ **Are there more words in the English language**
>   **a. that begin with the letter 'R' ?**
>   **b. for which 'R' is the third letter ?**

> ➤ Most of us can recall words that begin with 'R'. However, thinking of words that have R as the third letter is more difficult.

Anchoring & adjustment

➢ Selecting an initial value as a starting point (could be average) and then adjusting the value improperly in order to accommodate the rest of the data.

➢ Provide a rapid guesstimate for:
1 * 2 * 3 * 4 * 5 * 6 * 7 * 8 =
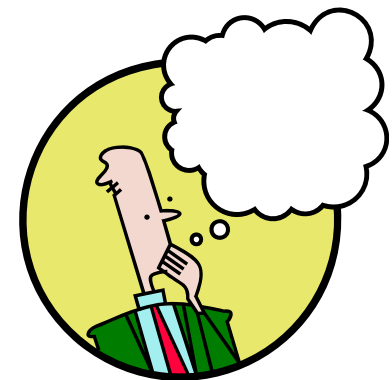8 * 7 * 6 * 5 * 4 * 3 * 2 * 1 =

Medians typically are 512 and 2,250
Answer: 40,320

Hiring a new engineer

➢ A newly hired engineer for a computer firm in the City of London area has four years experience and excellent qualifications. When asked to estimate the starting salary for this employee, my secretary (knowing very little about the profession or industry) guessed an annual salary of £23,000.

➢ What is your estimate of the salary?

Hiring a new engineer II

➢ A newly hired engineer for a computer firm in the City of London area has four years experience and excellent qualifications. When asked to estimate the starting salary for this employee, my secretary (knowing very little about the profession or industry) guessed an annual salary of £85,000.

➢ What is your estimate of the salary?
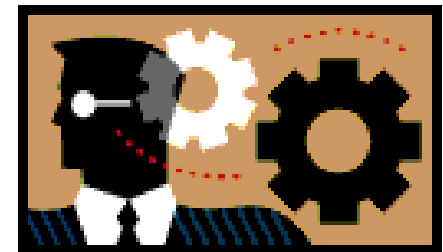
Some more unrelated anchoring

➢ What are the last three digits of your home phone number?

➢ Add 400 to the number above.

➢ In what year would you guess Attila the Hun was actually defeated?

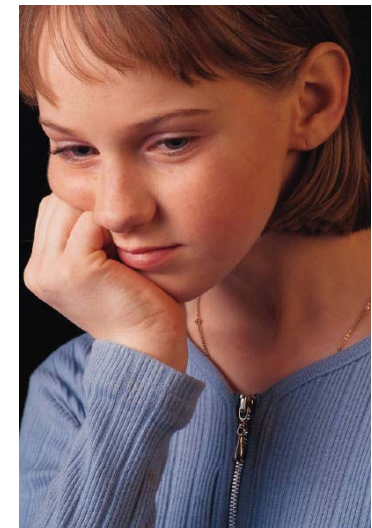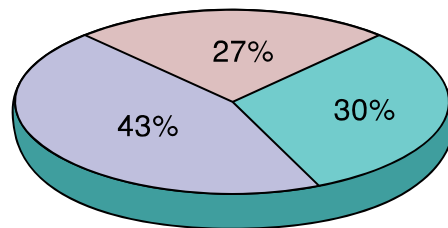| Range (number + 400)	Mean
400 to 599	629
600 to 799	680
800 to 999	789
1000 to 1199	885
1200 to 1399	988

Data Presentation

➢ The impact of summarised data and facts

➢ Would you undertake an action that will produce a 30% increase in the annual mortality risk?

➢ Would you undertake an action increasing your annual chances of death from 1 in 10,000 to 1.3 in 10,000?

Buying a new item – adding features

- ➤ You are about to buy a new car for £22,134.56 and have just been tempted to add a new radio which will bring the total price to £22,428.41. (feeling that the difference is trifling)
- ➤ Is this a rational decision?

- ➤ Upon reflection you can see that you are about to be charged £293.85 for a radio, which may be a touch excessive…

Conservatism

➢ Failure to revise estimates (by as much as they should be) in light of new and significant information.

Habit

> ➢ Familiarity with a particular rule, method or approach may often lead to re-utilisation of the same procedure or the selection of a similar alternative when faced with a seemingly identical problem.

Hindsight

➢ People are often unable to think objectively if they receive information that an outcome has occurred and they are told to ignore this information. With hindsight outcomes that have occurred seem inevitable. Relationships and links are easier to form and predictions are often altered to reflect what we know occurred.

➢ Football results
➢ Lost in traffic?
➢ New employee in interview
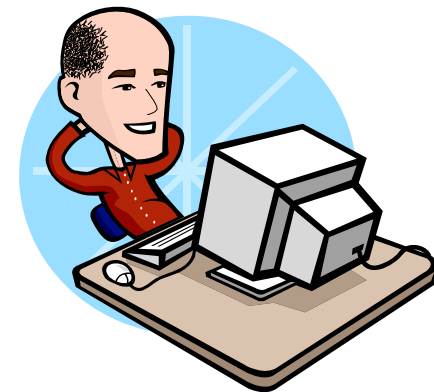
Using hindsight to sell

> ➢ Storer Cable Communication sent the following notice to subscribers in Louisville, Kentucky.

> ➢ "It's not often you get good news instead of a bill, but we have got some for you. If you've heard all the rumours about your basic cable rate going up $10 or more a month, you can relax: *It's not going to happen!* The great news is ... the rate for basic cable is increasing only $2 a month"

How consistent are you?

➢ You are in a shop about to buy a new watch which will cost £70. As you wait to pay, a friend walks past and tells you that an identical watch is available in another shop 10 minutes away for £40. You know that the service and reliability of the other shop are just as good as this one. Will you travel 10 minutes to save £30?
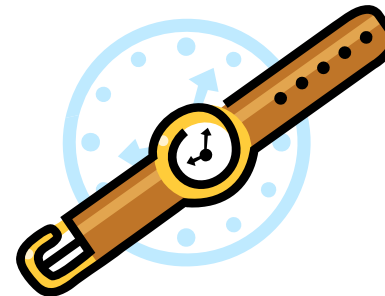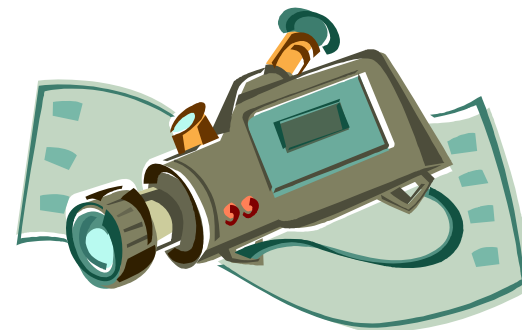
How consistent are you?

> You are in a shop about to buy a new video camera which will cost £800. As you wait to pay, a friend walks past and tells you that an identical video camera is available in another shop 10 minutes away for £770. You know that the service and reliability of the other shop are just as good as this one. Will you travel 10 minutes to save £30?

Framing questions - obtaining information

➢ Do you get headaches frequently, and if so how often?   2.2 / week

➢ Do you get headaches occasionally, and if so how often?   0.7 / week

➢ How many headache products have you tried? 1? 5? 10?   5.2 products

➢ How many headache products have you tried? 1? 2? 3?   3.3 products

- After Loftus (1975)

Framing questions – changing facts?

➤ How long was the film?   130 minutes

➤ How short was the film?   100 minutes

➤ How tall was the player?   79 inches

➤ How short was the player?   69 inches

- After Harris (1973)
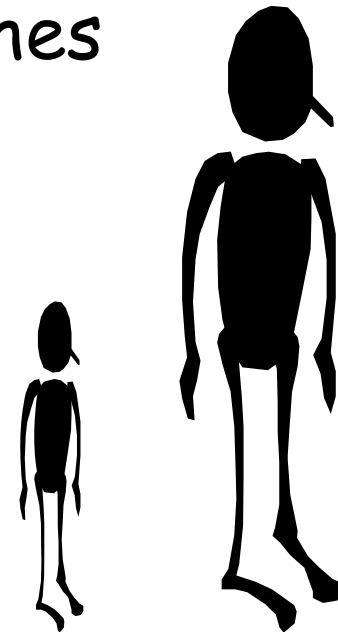
Insurance/ Gamble and uncertainty

Insurance Formulation

Situation A: You stand a one out of a thousand chance of losing £1000.

Situation B: You can buy insurance for £10 to protect you from this loss.

Gamble Formulation

Situation A: You stand a one out of a thousand chance of losing £1000.

Situation B: You will lose £10 with certainty.

Winning or losing?

Imagine I have just given you £200. I now offer you more, in the form of one of two options:

Option 1. I will give you an additional £100

Option 2. I will toss a fair coin. If it lands heads, I will give you an additional £200; if it lands tails, I will give you no additional money.

Option 1. You must give me back £100

Option 2. I will toss a fair coin. If it lands heads, you must give me back £200; if it lands tails, you may keep all the money I gave you.

Assigning values

> Imagine the UK is preparing for an outbreak of an unusual disease that is expected to kill 600 people. Two programmes to combat the disease have been proposed.

A. If prog. 1 is adopted 200 people will be saved.

B. If prog. 2 is adopted, there is a one-third probability that 600 people will be saved, and a two-thirds probability that no people will be saved.

A'. If prog, 1 is adopted 400 people will die.

B'. If prog. 2 is adopted, there is a one-third probability that nobody will die, and a two-thirds probability that 600 people will die.

A partial model of decision making

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┌─────────────────────────────────────────────────────────────────────────┐
│                                                                           │
│  ┌──────────────────┐        ┌──────────────────┐      ┌──────────────────┐  │
│  │ Cognitive limits │        │ Simplistic       │      │ Savings in decision│ │
│  │  on rationality  │   ──►  │ decision strategies│ ──► │ making resources │  │
│  │                  │        │                  │      │                  │  │
│  │ Situational limits│       │ Inadequate       │      │ Decreases in     │  │
│  │  on rationality  │        │ decision models  │      │  decision quality│  │
│  └──────────────────┘        └──────────────────┘      └──────────────────┘  │
│             ▲                                                              │
│  ┌──────────────────┐                                                     │
│  │ Few decision     │                                                     │
│  │ resources        │                                                     │
│  │                  │                                                     │
│  │ High levels of   │                                                     │
│  │  stress          │                                                     │
│  └──────────────────┘                                                     │
│                                                  (After [Huber, 1980])    │
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Cognitive limits on rationality

Situational limits on rationality

Simplistic decision strategies

Inadequate decision models

Savings in decision making resources

Decreases in decision quality

Few decision resources

High levels of stress

(After [Huber, 1980])

Levels of bounded rationality

Imperfect
Information

Time & Cost
Constraints

Cognitive

Rational
Decision
Making

Limitations

(After [Harrison, 1987])
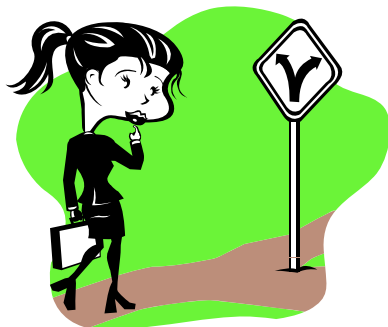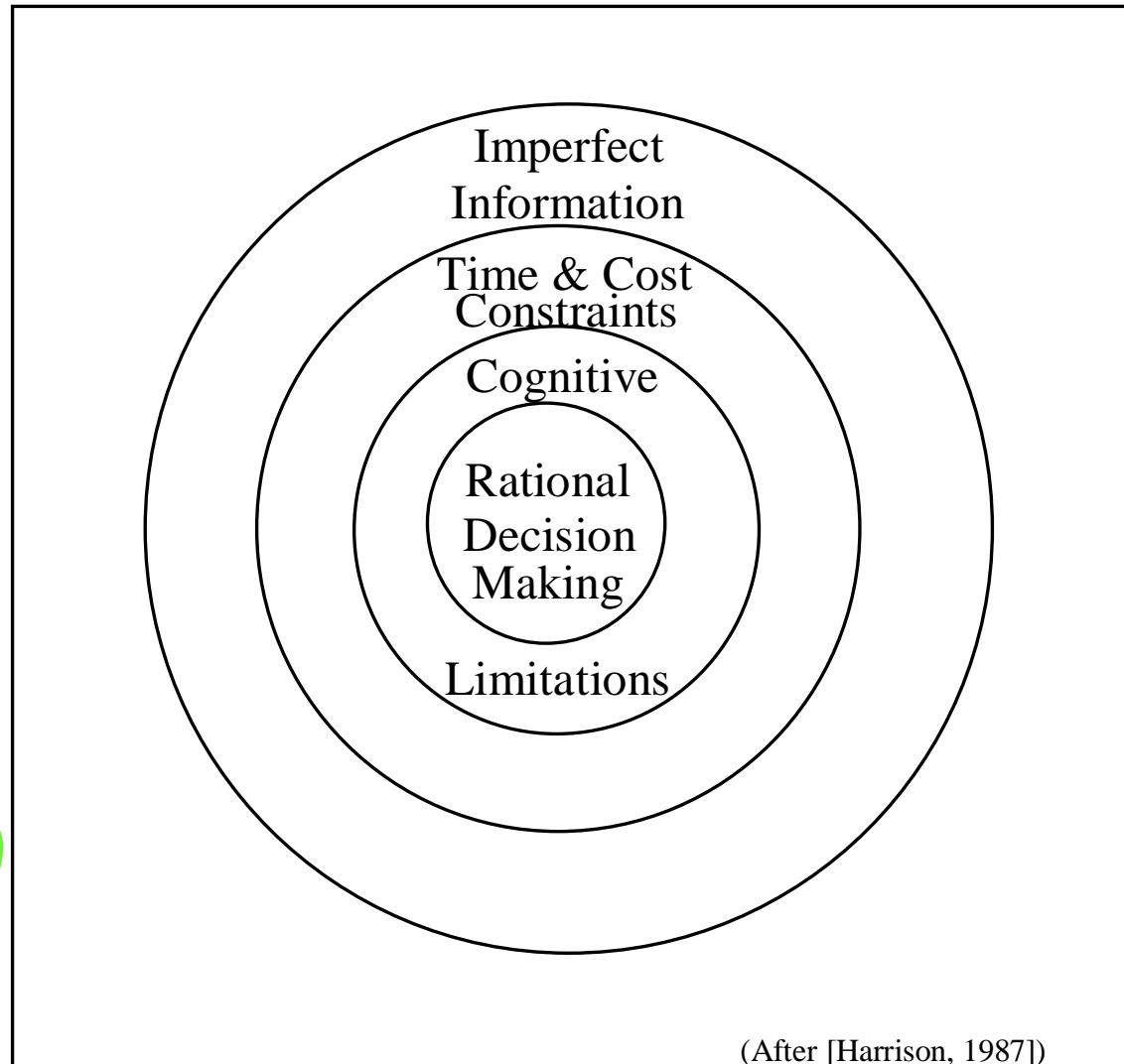
About biases

"Get your facts first, and then you can distort them as much as you please"
— Mark Twain
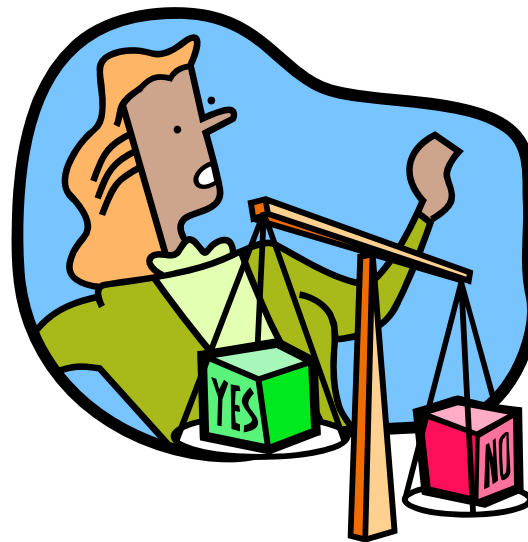
Implications for our profession

- ➢ Technical BoK not enough
- ➢ Need to know about decision making?
- ➢ Decision Making a key competence?
- ➢ Licensing Professionals
- ➢ Responsibility and liability of project managers
- ➢ Do we need to teach decision making?
- ➢ Ethical issue – Objective DM?
- ➢ CPD in DM?
- ➢ Researchers:
  implications on how we ask questions?
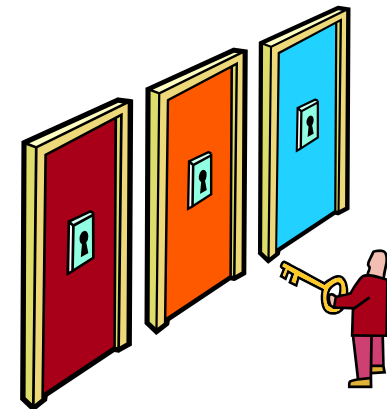
The decision making manifesto

Decisions are crucial to our performance.

What it takes to improve:

➢ Good enough decisions
➢ Transparent decisions
➢ Correctable decisions
➢ Human decisions

The way forward

- ➤ Think what is outside your view (assumptions)
- ➤ Be aware of anchoring
- ➤ View decisions from multiple perspectives
- ➤ Work with multiple sources of information
- ➤ Look at the complementary side
- ➤ Provide a range, not an isolated value
- ➤ Challenge your views and values
- ➤ Remain open to new (& conflicting) information
- ➤ Know the limits of your information (beyond facts) – confidence levels
- ➤ Remember we are all human!
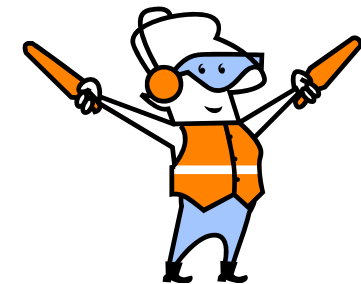
Summary

- ➢ The good
- ➢ The bad
- ➢ And the professional