Supporting the Decision Making Process

Pawel Ziemianski, Ph.D.

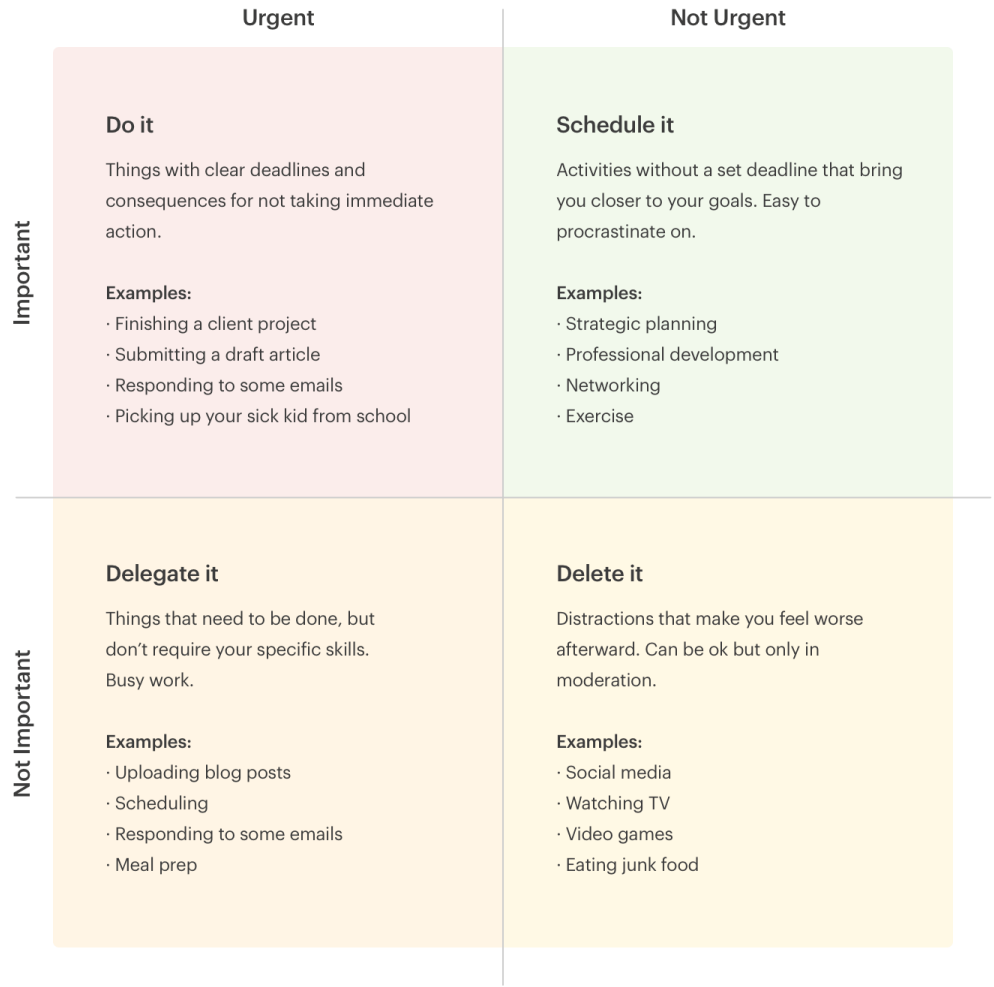
4 parts of today's class

1. Examples of methods enhancing human decision making
2. An example of computer science's possible contribution to decision making
3. Should we trust algorithms?
4. Aversion to algorithms

1. Examples of methods enhancing human decision making

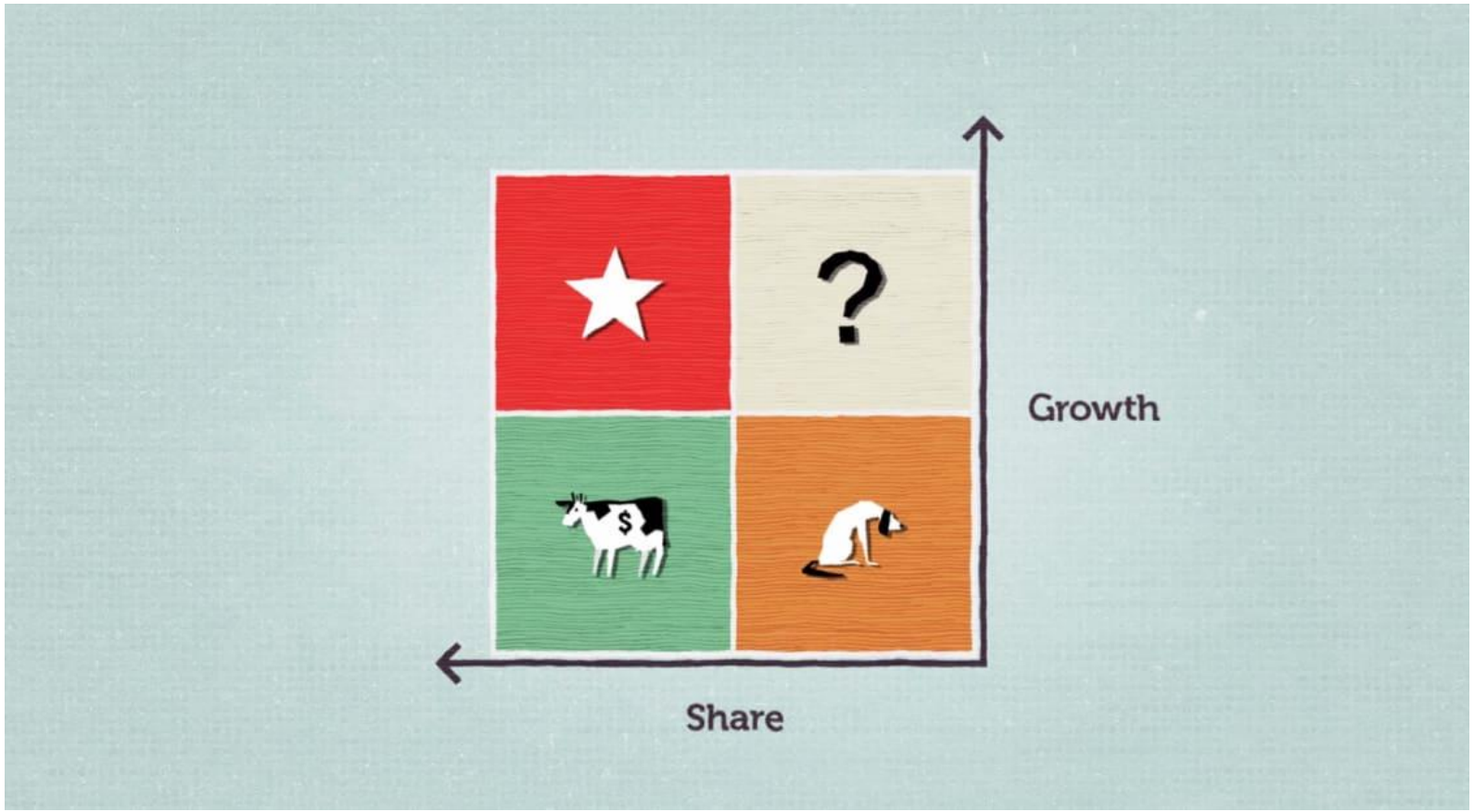
- People have been developing heuristic methods to help them solve important life dilemmas for centuries
- Consider the methods used for detecting liars or frauds (Vicianova, 2015):
    - the Chinese method involving rice – described ca 1000 BC
    - the European method involving water trials
- These methods led to decisions with severe consequences – sometimes including the life sentence

1. Examples of methods enhancing human decision making – Tasks Management



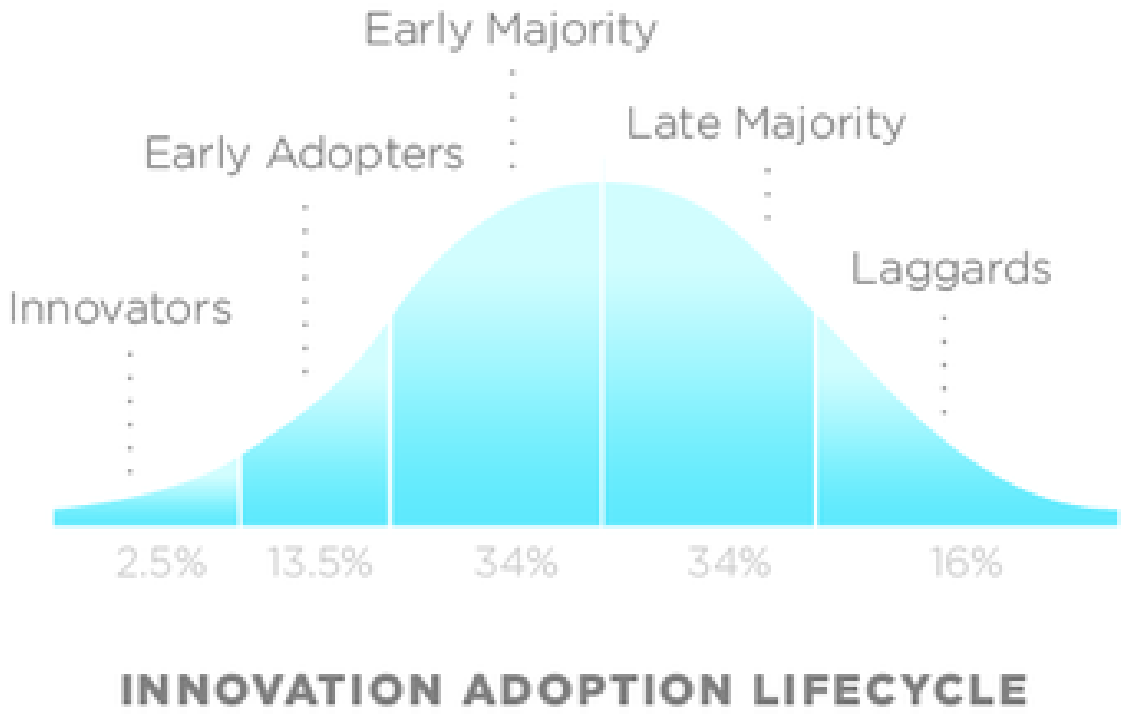
https://get.todoist.help/hc/en-us/articles/210762449-Eisenhower-Matrix-with-Todoist

1. Examples of methods enhancing human decision making - Customers' Segmentation



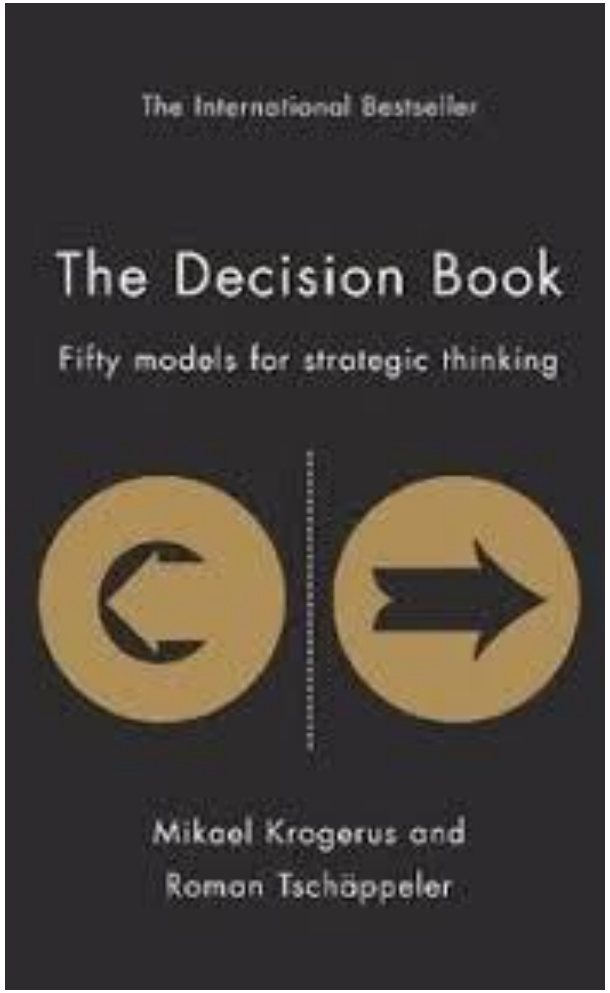
Source: https://www.bcg.com/pl-pl/publications/2014/growth-share-matrix-bcg-classics-revisited.aspx

1. Examples of methods enhancing human decision making – Diffusion of innovation

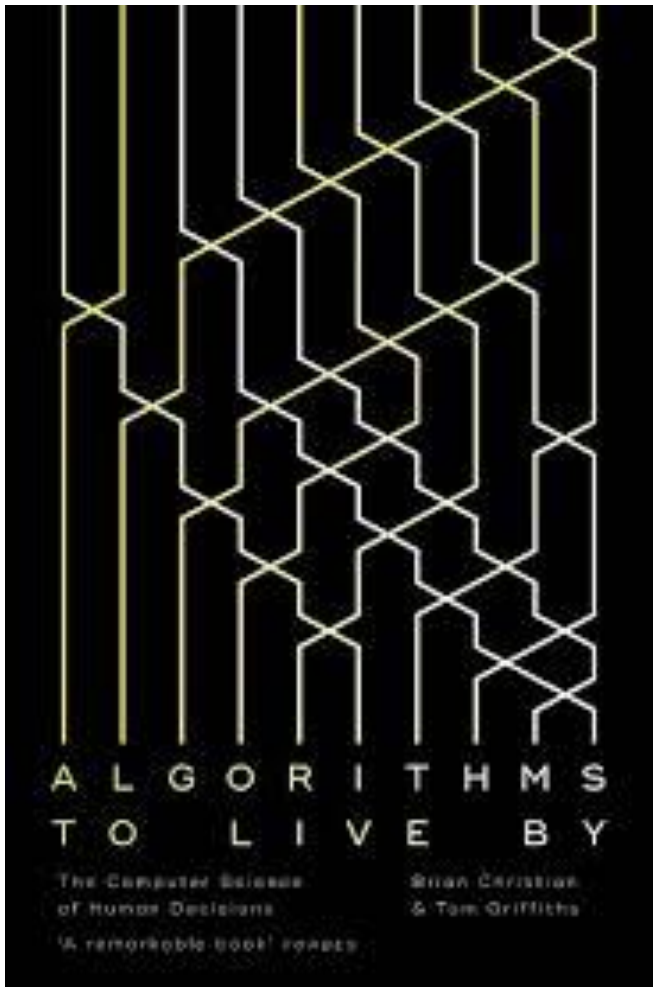


Source: https://en.wikipedia.org/wiki/Early_adopter

1. Examples of methods enhancing human decision making – Diffusion of innovation



2. An example of computer science's contribution to decision making



2. An example of computer science's contribution to decision making – Book Chapter 5 - Scheduling

- Humans need to solve the problem of scheduling tasks
- This is in fact a single machine scheduling problem

We can use different solutions to decide on scheduling tasks:

- Earliest Due Date
- Shortest Processing Time (including a weighted version)

Is procrastination better than procrastination?

2. An example of computer science's contribution to decision making – Book Chapter 5 - Scheduling

- The cost of context switching when changing from one task to another is real for both computers and humans.

- Thrashing in the case of human activity – when there is so much to do that a person starts to think about making a list to establish order, but cannot do it because there is much to do.

- Responsiveness vs. Throughput and the story of Donald Knuth

A summary of one 2019 survey results (n=1640 students)

- About having a robot as friend, 41% responded favorably, and 71% did not consider robots a threat. About trusting robots in various situations, almost 50% would trust them to perform surgery, pilot a plane, and tutor students. In other scenarios, the percentages are more varied: 56% would trust a robot as cook, 57% as personal trainer, 61% in a military capacity, 69% as taxi driver, 91% as street cleaner, and 93% as house cleaner. Conversely, the majority of respondents would not trust a robot to look after the safety of a city (62%) or care for their own grandparent (70%). Likewise, they would not trust a robot in the role of teacher (72%) or in positions of command (90%).
- Source: Campanozzi, L. L., Guglielmelli, E., Cella, E., Ghilardi, G., Michilli, M., Molina, A., ... & Tambone, V. (2019). Building Trust in Social Robotics: A Pilot Survey. *IEEE Technology and Society Magazine*, *38*(4), 45-54.

3. Should we trust algorithms?

- We know that humans err
- We know that algorithms can suggest wrong decisions
- But what if algorithms tend to be more accurate, even though they make mistakes?
- Jennifer Logg asserts that algorithms outperform experts, and it should be acknowledged that, for example, *People get tired and distracted. Algorithms do not.*

https://hbr.org/2019/08/using-algorithms-to-understand-the-biases-in-your-organization

3. Can algorithms be biased?

Of course they can…

Why it's totally unsurprising that Amazon's recruitment AI was biased against women

https://www.businessinsider.com/amazon-ai-biased-against-women-no-surprise-sandra-wachter-2018-10?IR=T

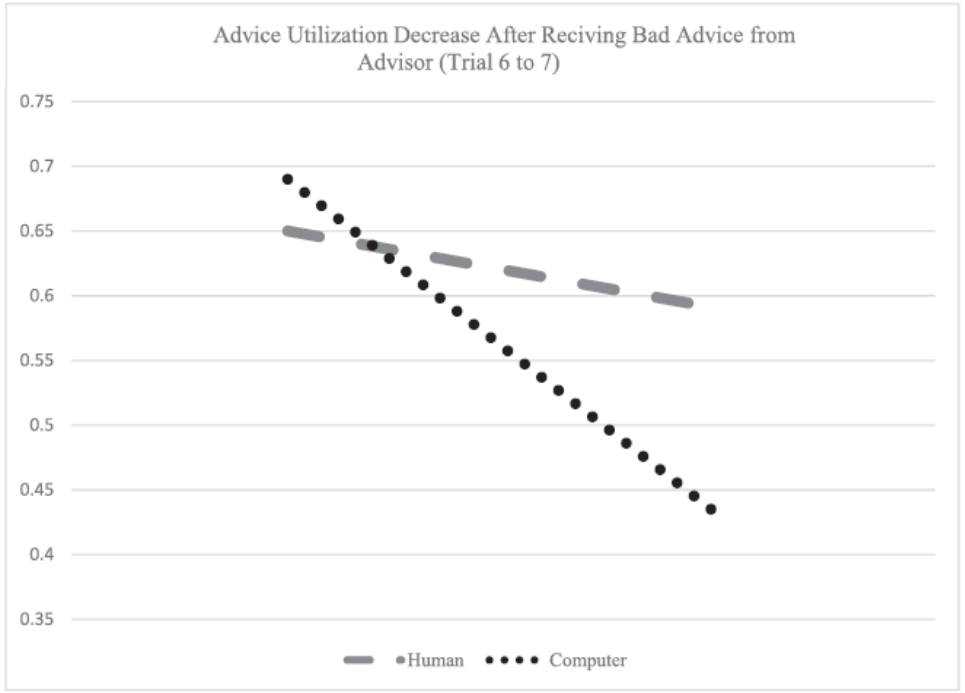
But perhaps…

Amazon's sexist hiring algorithm could still be better than a human

https://phys.org/news/2018-11-amazon-sexist-hiring-algorithm-human.html

4. Algorithm aversion

- People seem to avoid algorithms and prefer to stick to human advice, in particular they do not forgive algorithm's mistakes (Dietvorst et al., 2015)



Source: Prahl, van Swol (2016)

Sources and recommended readings

- Campanozzi, L. L., Guglielmelli, E., Cella, E., Ghilardi, G., Michilli, M., Molina, A., ... & Tambone, V. (2019). Building Trust in Social Robotics: A Pilot Survey. *IEEE Technology and Society Magazine*, *38*(4), 45-54.
- Dawes, R. M. (1979). The robust beauty of improper linear models in decision making. *American Psychologist, 34*(7), 571–582. https://doi.org/10.1037/0003-066X.34.7.571
- Dietvorst, B. J., Simmons, J. P., & Massey, C. (2015). Algorithm aversion: People erroneously avoid algorithms after seeing them err. *Journal of Experimental Psychology: General*, *144*(1), 114.
- Prahl, A., & Van Swol, L. (2017). Understanding algorithm aversion: When is advice from automation discounted?. *Journal of Forecasting*, *36*(6), 691-702.
- Vicianova, M. (2015). Historical techniques of lie detection. *Europe's journal of psychology*, *11*(3), 522.
- Zou, J., & Schiebinger, L. (2018). AI can be sexist and racist—it's time to make it fair.