On the usefulness of deliberate (but bounded) randomness in decision making

Description

Tweet

An introduction

In many spheres of human activity, relevant information may be hard to find, and it may be of variable quality. Human capacities to objectively assess that information may also be limited and variable. Extreme cases may be easy to assess e.g projects or research that is definitely worth/not worth funding or papers that are definitely worth/not worth publishing. But in between these extremes there may be substantial uncertainty and thus room for tacit assumptions and unrecognised biases to influence judgements. In some fields the size of this zone of uncertainty may be quite big (see Adam, 2019 below), so the consequences at stake can be substantial. This is the territory where a number of recent papers have argued that an explicitly random decision making process may be the best approach to take.

After you have scanned the references below, continue on to some musings about implications for how we think about complexity

The literature (a sample)

- Nesta (2020) Why randomise funding? How randomisation can improve the diversity of ideas
- Osterloh, M., & Frey, B. S. (2020, March 9). **To ensure the quality of peer reviewed research introduce randomness**. *Impact of Social Sciences*. https://blogs.lse.ac.uk/impactofsocialsciences/2020/03/09/to-ensure-the-quality-of-peer-reviewed-research-introduce-randomness/
  - *Why random selection of contributions to which the referees do not agree? This procedure reduces the â??conservative biasâ?•, i.e. the bias against unconventional ideas. Where there is uncertainty over the quality of a contribution, referees have little evidence to draw on in order to make accurate evaluations. However, unconventional ideas may well yield high returns in the future. Under these circumstances a randomised choice among the unorthodox contributions is advantageous.*
  - *â?¦two [possible] types of error: type I errors (â??reject errorsâ?•) implying that a correct hypothesis is rejected, and type 2 errors implying that a false hypothesis is accepted (â??accept errorsâ?•). The former matters more than the latter. â??Reject errorsâ?• stop promising new ideas, sometimes for a long time, while â??accept errorsâ?• lead to a waste of money, but may be detected soon once published. This is the reason why it is more difficult to identify â??reject errorsâ?• than â??accept errorsâ?•. Through randomisation the risks of â??reject errorsâ?• are diversified.*

- Osterloh, M., & Frey, B. S. (2020). **How to avoid borrowed plumes in academia**. *Research Policy*, *49*(1), 103831. https://doi.org/10.1016/j.respol.2019.103831 Abstract: Publications in top journals today have a powerful influence on ac

- Liu, M., Choy, V., Clarke, P., Barnett, A., Blakely, T., & Pomeroy, L. (2020). **The acceptability of using a lottery to allocate research funding: A survey of applicants**. *Research Integrity and Peer Review*, *5*(1), 3. https://doi.org/10.1186/s41073-019-0089-z
    - ***Background****: The Health Research Council of New Zealand is the first major government funding agency to use a lottery to allocate research funding for their Explorer Grant scheme. â?¦ the Health Research Council of New Zealand wanted to hear from applicants about the acceptability of the randomisation process and anonymity of applicants.* ***â?¦*** *The survey asked about the acceptability of using a lottery and if the lottery meant researchers took a different approach to their application.* ***Results****:â?¦ There was agreement that randomisation is an acceptable method for allocating Explorer Grant funds with 63% (n = 79) in favour and 25% (n = 32) against. There was less support for allocating funds randomly for other grant types with only 40% (n = 50) in favour and 37% (n = 46) against. Support for a lottery was higher amongst those that had won funding. Multiple respondents stated that they supported a lottery when ineligible applications had been excluded and outstanding applications funded, so that the remaining applications were truly equal. Most applicants reported that the lottery did not change the time they spent preparing their application.* ***Conclusions:*** *The Health Research Councilâ??s experience through the Explorer Grant scheme supports further uptake of a modified lottery.*

- Roumbanis, L. (2019). **Peer Review or Lottery? A Critical Analysis of Two Different Forms of Decision-making Mechanisms for Allocation of Research Grant**s. *Science, Technology, & Human Values*, *44*(6), 994â??1019. https://doi.org/10.1177/0162243918822744

- Adam, D. (2019). **Science funders gamble on grant lotteries**.A growing number of research agencies are assigning money randomly. *Nature*, *575*(7784), 574â??575. https://doi.org/10.1038/d41586-019-03572-7
    - *â?¦.says that existing selection processes are inefficient. Scientists have to prepare lengthy applications, many of which are never funded, and assessment panels spend most of their time sorting out the specific order in which to place mid-ranking ideas. LowÂ and highÂ quality applications are easy to rank, she says. â??But most applications are in the midfield, which is very big*
    - *The fund tells applicants how far they got in the process, and feedback from them has been positive, he says. â??Those that got into the ballot and miss out donâ??t feel as disappointed. They know they were good enough to get funded and take it as the luck of the draw.â?•*

    - Fang, F. C., & Casadevall, A. (2016). **Research Funding: The Case for a Modified Lottery**. *MBio*, *7*(2).
        - *ABSTRACT The time-honored mechanism of allocating funds based on ranking of proposals by scienti?c peer review is no longer effective, because review panels cannot accurately stratify proposals to identify the most meritorious ones. Bias has a*

major in?uence on funding decisions, and the impact of reviewer bias is magni?ed by low funding paylines. Despite more than a decade of funding crisis, there has been no fundamental reform in the mechanism for funding research. This essay explores the idea of awarding research funds on the basis of a modi?ed lottery in which peer review is used to identify the most meritorious proposals, from which funded applications are selected by lottery. We suggest that a modi?ed lottery for research fund allocation would have many advantages over the current system, including reducing bias and improving grantee diversity with regard to seniority, race, and gender.

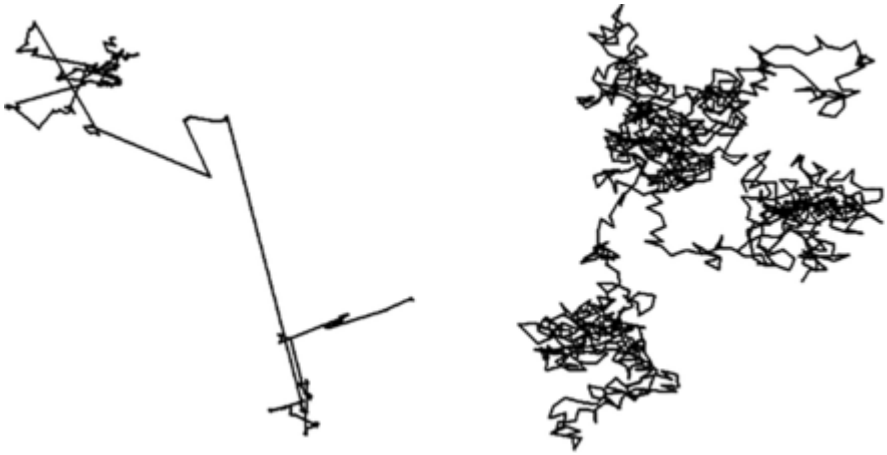
- Avin, S (2015) Breaking the grant cycle: on the rational allocation of public resources to scientific research projects
    - Abstract: The thesis presents a reformative criticism of science funding by peer review. The criticism is based on epistemological scepticism, regarding the ability of scientific peers, or any other agent, to have access to sufficient information regarding the potential of proposed projects at the time of funding. The scepticism is based on the complexity of factors contributing to the merit of scientific projects, and the rate at which the parameters of this complex system change their values. By constructing models of different science funding mechanisms, a construction supported by historical evidence, computational simulations show that in a significant subset of cases it would be better to select research projects by a lottery mechanism than by selection based on peer review. This last result is used to create a template for an alternative funding mechanism that combines the merits of peer review with the benefits of random allocation, while noting that this alternative is not so far removed from current practice as may first appear.
- Schulson, M. (2014). **If you canâ??t choose wisely, choose randomly.** Aeon. A quick review of known instances of the use of randomness across different cultures, nationalities and periods of history
- Casadevall, F. C. F. A. (2014, April 14). Taking the Powerball Approach to Funding Medical Research. *Wall Street Journal*.

- Stone, P. (2011). The Luck of the Draw: The Role of Lotteries in Decision Making. In *The Luck of the Draw: The Role of Lotteries in Decision Making*.
    - *From the earliest times, people have used lotteries to make decisionsâ??by drawing straws, tossing coins, picking names out of hats, and so on. We use lotteries to place citizens on juries, draft men into armies, assign students to schools, and even on very rare occasions, select lifeboat survivors to be eaten. Lotteries make a great deal of sense in all of these cases, and yet there is something absurd about them. Largely, this is because lottery-based decisions are not based upon reasons. In fact, lotteries actively prevent reason from playing a role in decision making at all. Over the years, people have devoted considerable effort to solving this paradox and thinking about the legitimacy of lotteries as a whole. However, these scholars have mainly focused on lotteries on a case-by-case basis, not as a part of a comprehensive political theory of lotteries. In The Luck of the Draw, Peter Stone surveys the variety of arguments proffered for and against lotteries and argues that they only have one true effect relevant to decision making: the â??sanitizing effectâ?• of preventing decisions from being made on the basis of reasons. While this rationale might sound strange to us, Stone contends that in many instances, it is vital that decisions be made without the use of*

reasons. By developing innovative principles for the use of lottery-based decision making, Stone lays a foundation for understanding when it isâ??and when it is notâ??appropriate to draw lots when making political decisions both large and small

Randomness in other species

- Drew, L. (2020). *Random Search Wired Into Animals May Help Them Hunt*. Quanta Magazine. Retrieved 2 February 2021, from https://www.quantamagazine.org/random-search-wired-into-animals-may-help-them-hunt-20200611/
  - *Of special interest here is the description of Levy walks, a variety of randomised movement where the frequency distribution of distances moved has one long tail. Levy walks have been the subject of exploration across multiple disciples, as seen inâ?¦*
- Reynolds, A. M. (2018). Current status and future directions of LÃ©vy walk research. *Biology Open*, *7*(1). https://doi.org/10.1242/bio.030106
  - *Levy walks are specialised forms of random walks composed of clusters of multiple short steps with longer steps between themâ?¦. They are particularly advantageous when searching in uncertain or dynamic environments where the spatial scales of searching patterns cannot be tuned to target distributionsâ?¦Nature repeatedly reveals the limits of our imagination. LÃ©vy walks once thought to be the preserve of probabilistic foragers have now been identified in the movement patterns of human hunter-gatherers*



Levy walk random versus Brownian motion random movement

Implications for thinking about complexity

Uncertainty of future states is a common characteristic of many complex systems, though not unique to these. One strategy that human organisations can use to deal with uncertainty is to build up capital

reserves, thus enhancing longer term resilience albeit at the cost of more immediate efficiencies. From the first set of papers referenced above, it seems like the deliberate and bounded use of randomness could provide a useful second option. The work being done on Levy walks also suggests that there are interesting variations on randomisation that should be explored. It is already the case the designers of search/opitimisation algorithms have headed this way. If you are interested, you can read further on the subject of what are called â??Levy Flight â?• algorithms.

On a more light hearted note, I would be interested to hear from the Cynefin school on how comfortable they would be marketing this approach to â??managingâ?• uncertainty to the managers and leaders they seem keen to engage with.

Another thoughtâ?¦years ago I did an analysis of data that had been collected on development projects that had been funded by the then DFIDâ??s funded Civil Society Challenge Fund. This included data on project proposals, proposal assessments, and project outcomes. I used Rapid Miner Studioâ??s Decision Tree module to develop predictive models of achievement ratings of the funded projects. Somewhat disappointingly, I failed to identify any attributes of project proposals, or how they had been initially assessed, which were good predictors of the subsequent performance of those projects. There are number of possible reasons why this might so. One of which may be the scale of the uncertainty gap between the evident likely failures and the evident likely successes. Various biases may have skewed judgements within this zone in a way that undermined the longer term predictive use of the proposal screening and approval process. Somewhat paradoxically, if instead a lottery mechanism had been used for selecting fundable proposals in the uncertainty zone this may well have led to the approval process being a better predictor eventual project performance.

Postscript: Subsequent findsâ?¦

- **The Powerball Revolution.** By Malcom Gladwell (n.d.). *Revisionist History Season 5 Episode 3*. Retrieved 7 April 2021, from http://revisionisthistory.com/episodes/44-the-powerball-revolution
    - On school student council lotteries in Bolivia
        - â??Running for an officeâ?• and â??Running an officeâ?• can be two very different things. Lotteries diminish the former and put the focus on the latter
        - â??Its a more diverse groupâ?• that end up on the council, compared to those selected via election
        - â??Nobody knows anythingâ?• -initial impressions of capacity are often not good predictors of leadership capacity. Contra assumption that voters can be good predictors of capacity in office.
    - Medical research grant review and selection
        - Review scores of proposals are poor predictors of influential and innovative research (based on citation analysis), but has been in use for decades.
    - A boarding school in New Jersey

Category

1. Uncategorized

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