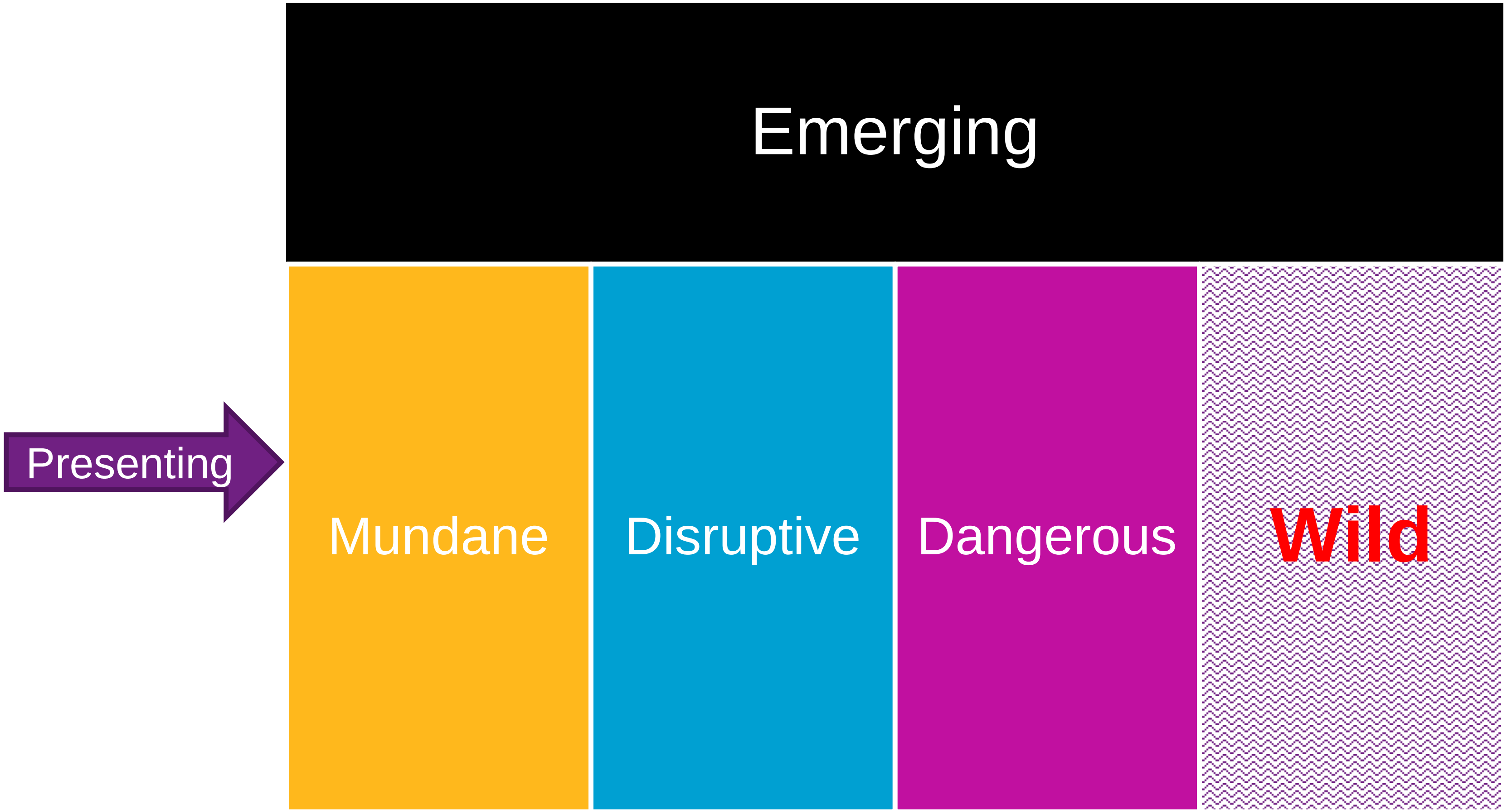
Just Dangerous and Totally Wild

Degrees of Randomness (Mandelbrot)

1. Proper mild randomness (the normal distribution)
2. Borderline mild randomness: (the exponential distribution with $\lambda=1$)
3. Slow randomness with finite and delocalized moments
4. Slow randomness with finite and localized moments (such as the lognormal distribution)
5. Pre-wild randomness (Pareto distribution with $\alpha=2$ - 3)
6. **Wild randomness**: infinite second moment (Variance is infinite. Pareto distribution with $\alpha=1$ - 2)
7. **Extreme randomness**: (Mean is infinite. Pareto distribution with $\alpha<=1$)

Five Types of Risks



Mundane Risks

Mundane

- Risks that might create losses that at worst would mean a bad quarter
  - Frequency from low to moderate
  - High frequency losses are just bad management
- Most operational risks of insurers
- Very small lines of business
- Very secure investment classes
- Small investment positions

- These are presenting risks – i.e. they might cause losses this coming year

Disruptive Risks

Disruptive

- Risks that might result in a loss that wipes out a full year's profits
  - But unlikely that the loss will result in a significant reduction of Surplus
  - In a well diversified insurer, many risks might fall into this category
    - If management is conscious of their risk profile, it might be a strategy to limit exposures so that this happens
    - If management is not conscious of their risk profile, it might happen that concentrations develop and exposures drift to the high end of this category and beyond
- One approach would be to have a rule that no risk would be allowed to surpass this level without approval by the board
  - Requiring that management be conscious of their risk profile

- These are presenting risks – i.e. they might cause losses this coming year

Dangerous Risks

Dangerous

- Risks that might result in losses that could mean a significant reduction of surplus in adverse conditions
  - This requires either or both of a large concentration of risk and a fat tail of the loss distribution (i.e. high losses are more likely)
  - Concentration happens when an insurer’s strategy is focused on a narrow range of risk taking
    - Or when just one part of strategy works much better than the rest
  - Taking too much fat tailed risk might happen because remote loss potential is misunderestimated
    - Common Stock Risk prior to Dot Com and Financial Crisis
    - Multiple medium Tor/Hail storms
    - Max loss from a Hurricane (Katrina, Maria)
    - May be acerbated by failure of mitigation approach
- When you have both problems, insolvency can result

- These are presenting risks – i.e. they might cause losses this coming year

Wild Risks

- Risks that can **<u>change the world</u>**
  - We tend to discount these completely, but many of them pass the test that they have actually happened before
  - Ultra low frequency and/or long latency period
    - Pandemic
    - Major Earthquake
    - Meteor strike
    - Climate Change
    - Ocean pollution
  - If they happen, they are total game changers

- Some of these are presenting risks – i.e. they might happen this coming year
  - Long latency risks are often contingent upon the continuation of some trend

Emerging Risks

Emerging

- Risks that are not expected to create any losses this year
- Usually we do not actually know the likelihood of losses from these risks
  - As far as severity goes, we have our imagination
- As Max in covering this topic in detail, I will not spend any more time on it.
- Instead, I will focus on Disruptive, Dangerous and Wild Presenting risks

Dangerous Risks Survey

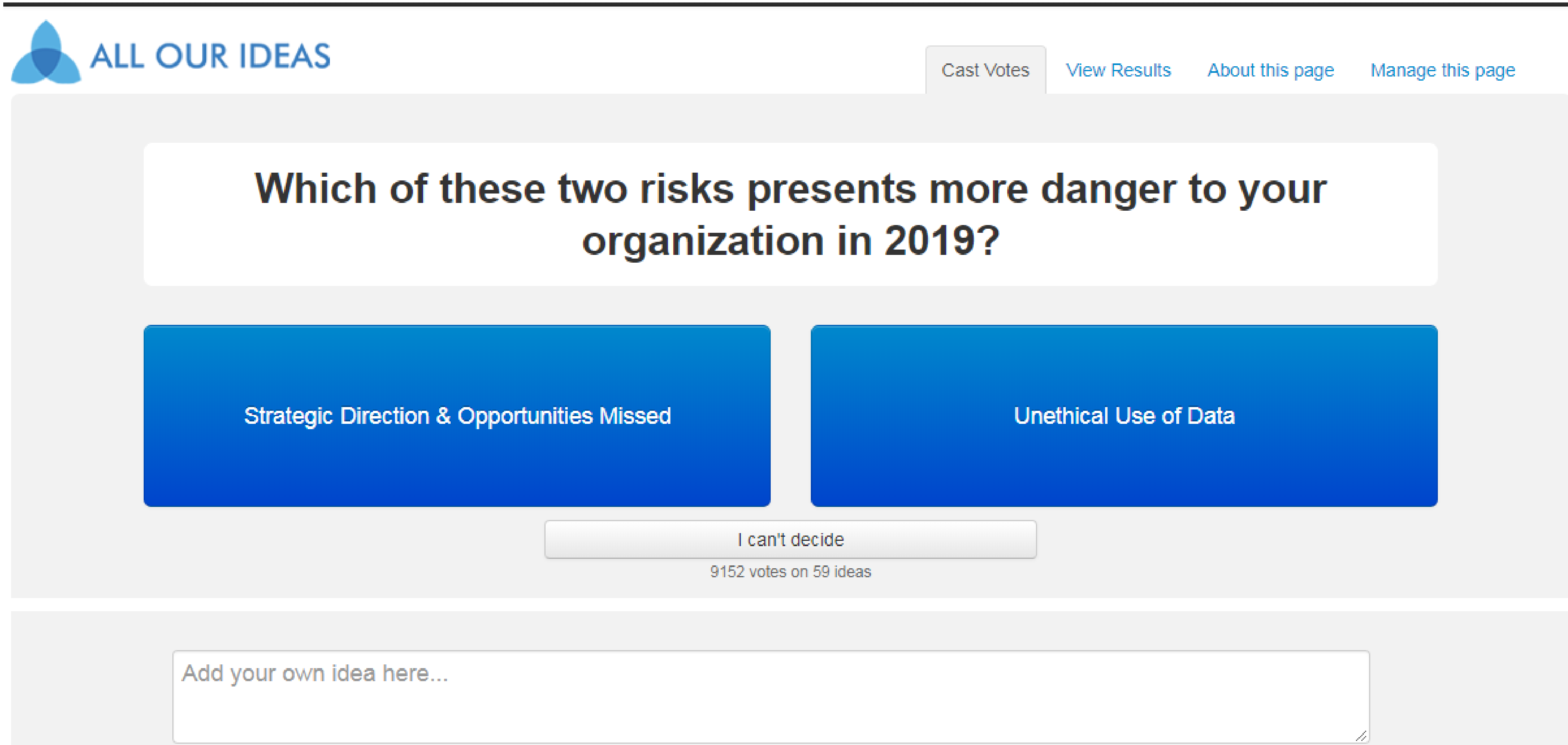
- In late 2016, we reached out to over 1000 insurance professionals. Mostly Willis Re North America clients, analytical staff and brokers
- We asked one simple question:

  "Which risk of these two risks presents the most danger to your organization in the coming year?"

- We used the wiki survey platform

- We started with a list of about 60 risks
  - We got them from combining the top 20 risks of 10 insurers that we work with (and eliminating duplicates)

The Survey Page



Resulting Article on Willis Towers Watson Wire

Dangerous Risks

2019 Rank	Risks	2018 Rank	Risks	2017 Rank	Risks
1	Strategic Direction & Opportunities Missed	1	Cyber	1	Cyber
2	Cyber	2	IT	2	Pricing / Product Line Profit
3	Pricing / Product Line Profit	3	Strategic Direction	3	IT
4	IT	4	Pricing / Product Line Profit	4	Competition
5	Competition	5	Runaway Claims	5	Underwriting

Dangerous Risks

2019 Rank	Risks	2018 Rank	Risks	2017 Rank	Risks
6	Legislative & Regulatory	6	Disruptive Technology	6	Legislative & Regulatory
7	Talent and employee	7	Customer needs not served	7	Investment Market Risk
8	Reputation / Rating	8	Emerging Risks	8	Strategic Direction
9	Business Operations Failure	9	Competition	9	Natural Catastrophe
10	Customer needs not served	10	Underwriting	10	Emerging Risks

2019 Dangerous Risks - Commentary

1. Strategic direction and opportunities missed

(up from number three in 2018)

- The crystal ball is cloudy. It seems that many firmly agree that a change in direction is coming for the industry, but it is unclear what that new direction will be. Few felt confident in their own ability or their management's ability to make all the right choices for their companies' future directions.

2. Cybersecurity and cybercrime

(down from number one in both 2017 and 2018)

- Cyber remains a top risk, though it lost its number one ranking this year. Perhaps this reflects the growing availability of internal skills and external insurance options. Or perhaps it is a mark of unrealistic optimism. One respondent notably mentioned that the overemphasis on cyber risk at the expense of other risks was a new danger.

3. Pricing and product-line profit

(up from number four in 2018)

- Swiss Re estimated global catastrophe losses in 2018 to be less than half the level of 2017. However, pricing and product-line profit is still seen as a major danger to insurers for 2019.

What use is this?

Context for Max's discussion of Emerging Risks

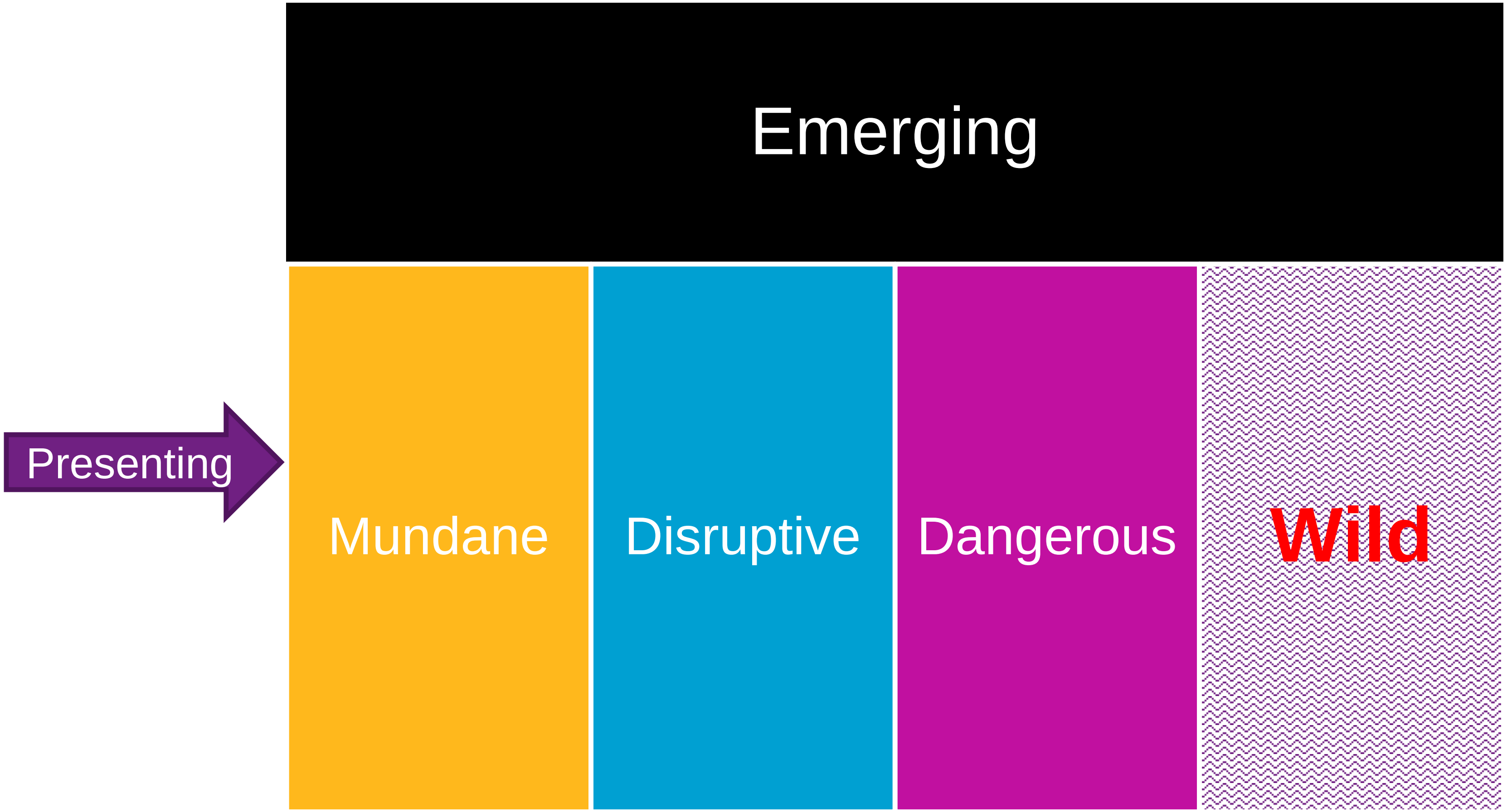
- These are the presenting risks
- Max will now talk about Emerging

A standard to look at when you are updating your risk register

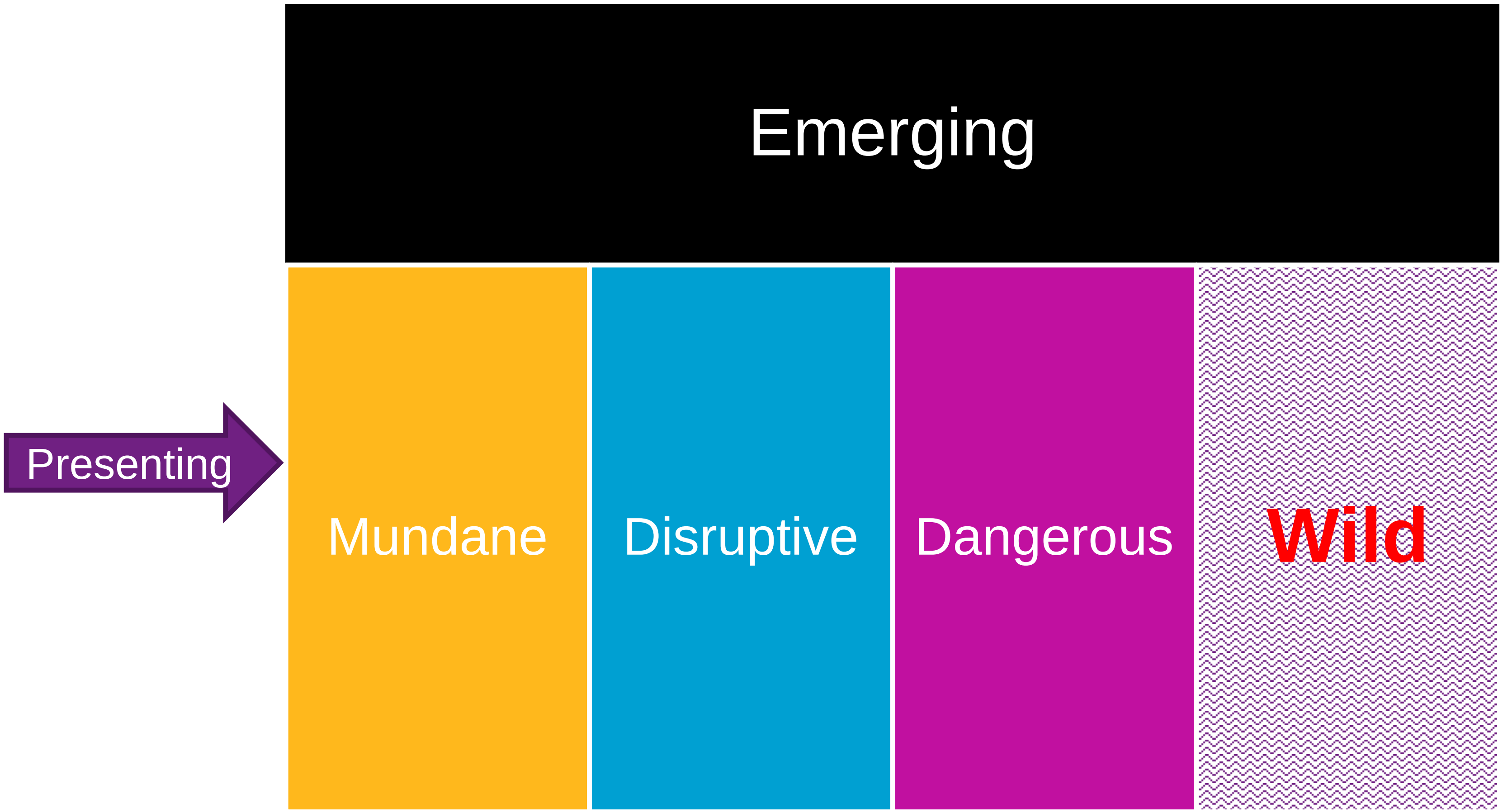
- If your top risks are different from the poll results can you justify the difference?
- Are there any risks on this list that you should consider adding to your list?

- And to be clear, I am not recommending that you change your priorities or the risks on your list
  - I am suggesting that this Dangerous Risks list can be used as a challenge to your thinking
  - I would expect that you would make few if any changes, but occasional challenge is healthy

Five Types of Risks



Five Types of Risks



Wild Risks

Extreme Climate Change

Nuclear War

Global Pandemic

Ecological Catastrophe

Global System Collapse

Major Asteroid Impact

Source: 12 Risks that threaten human civilization, Cambridge

Wild Risks

Super-volcano

Synthetic Biology

Nanotechnology

Artificial Intelligence

Unknown Consequences

Future Bad Global Governance

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