Housekeeping notes

- Participant cameras and audio are switched off, this is to ensure the presenters do not have any disruptions
- If you have issues with the audio or visual of the presentation please contact the moderator via the Q&A section in the bottom right hand corner of your screen
- Q&A for the presenters will be live throughout the session, please submit your questions via the Q&A section. Questions will be moderated and will be answered verbally at the end of the session.
- A post event survey will automatically pop up at the conclusion of the webinar, your feedback will be greatly appreciated.
- A Certificate of Attendance will be sent automatically if you complete the post event survey.
- The views or opinions expressed by our guest speakers are solely their own and do not necessarily represent the views or opinions of the Risk Engineering Society.

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Acknowledgement of Country

Engineers Australia acknowledges the traditional custodians of the country throughout Australia and recognises their continuing connection to land, waters and community.

We pay our respects to them and their cultures; and to elders both past and present and emerging.

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The presentation will start soon

While you're waiting:

- Test your sound
- Locate the questions tab in your control panel and the 'hands up' icon
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- Email **Rebok@engineersaustralia.org.au** with your name and membership number
- You will receive an email with the webinar link a prior to each webinar
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Seeking presenters

It's YOUR community. Please share what you know about:

- **Risk Engineering**
- **Functional applications**
- Overviews of risk engineering in an **industry**

These can take the form of case studies, research studies or 101 introductions to the subject. Recommend others or deliver yourself. All presentation to be primarily educational in nature.

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1. Search LinkedIn Groups for **Risk Engineering Society (RES)** or go to: **https://www.linkedin.com/groups/3751665/**
2. Apply to join the group and we will approve you
3. We encourage you to:
    a. Share industry news
    b. Post thought leadership articles
4. We will send preview articles of webinars

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ENGINEERS AUSTRALIA AWARDS

ENGINEER OF THE YEAR AWARDS 2020

CELEBRATE THE INNOVATORS THANK THE PROBLEM SOLVERS

NOMINATIONS CLOSE 7 JUNE 2020

Nominate an outstanding engineer

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Coronavirus – Lessons in Risk, Resilience & Complex Systems

Warren Black

Principal of the Complexus Research Project

19 May 2020

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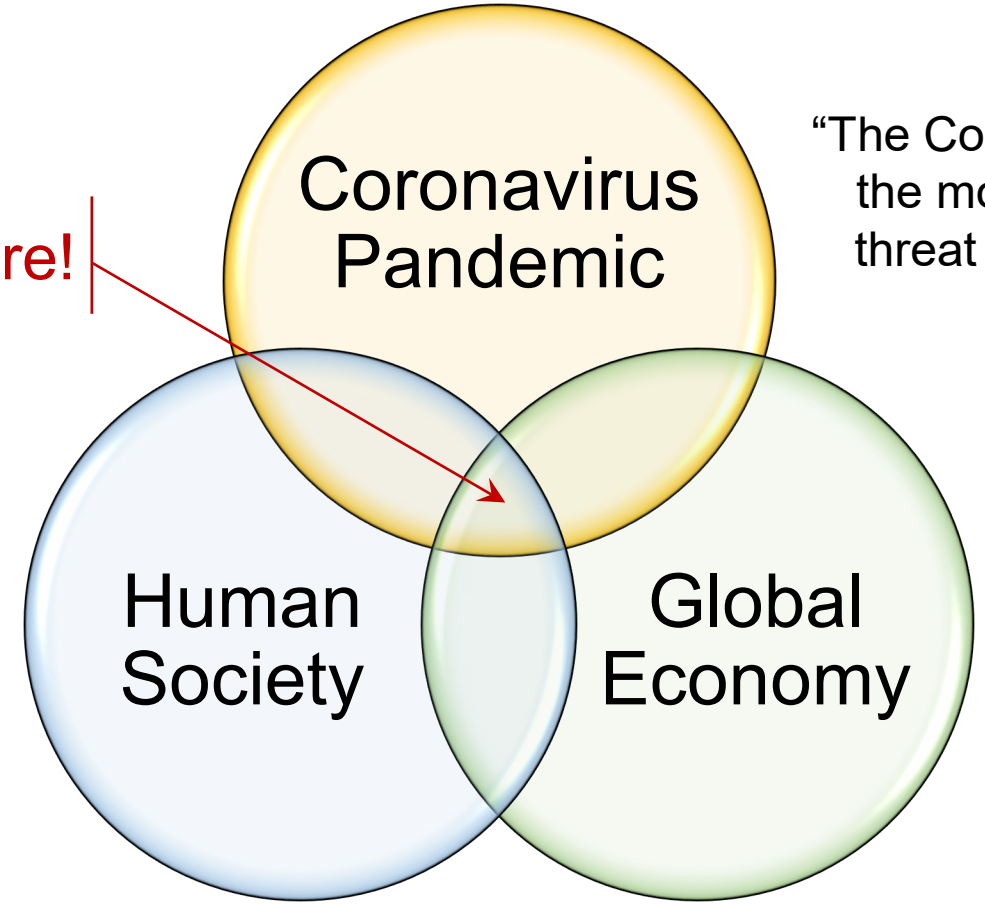
Context

The 2020 Coronavirus pandemic is being called the most significant global threat since World War II

It has led to significant numbers of deaths, mass social disruption, widespread fear, supply shortages and global economic instability

Coronavirus has become our generation’s greatest stress test

In 2020, three extremely powerful Complex Systems collided…



We are here!

"The Coronavirus pandemic is the most significant global threat since World War II "

"Enforced lockdowns has seen more than one third of the world's population being put under house arrest"

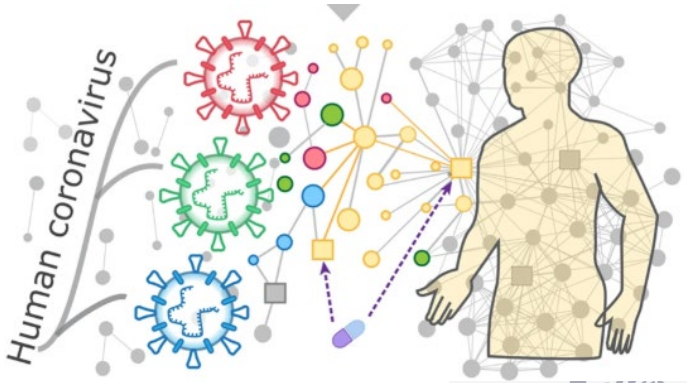
"The World is now facing the worst recession since the Great Depression"

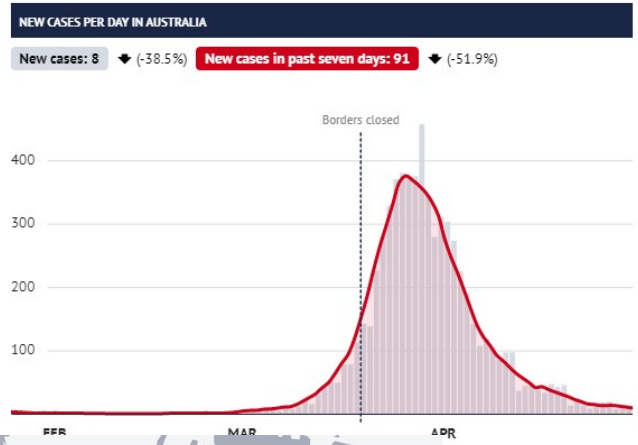
Coronavirus - the ultimate case example of risk management within complex situations

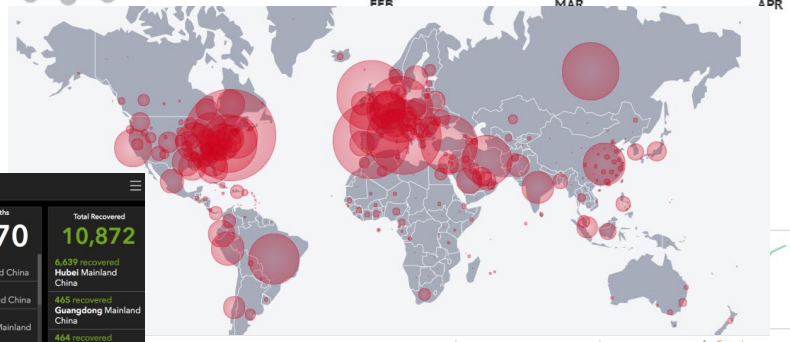
The Coronavirus crisis has already demonstrated that modern risk management is not a simple-state game…

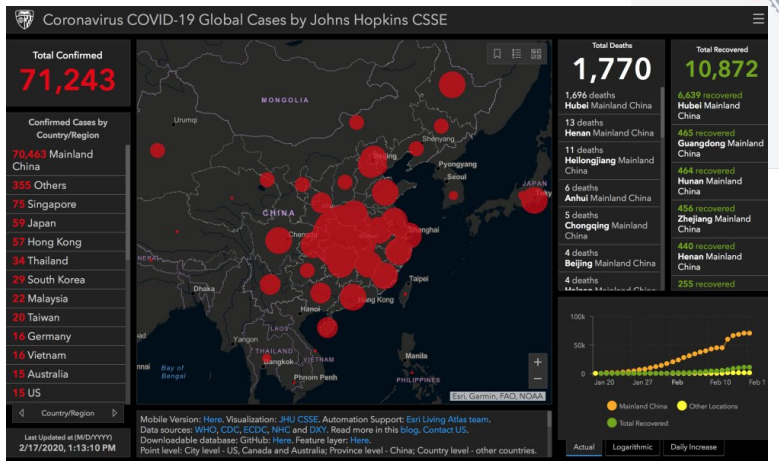
It is in fact a highly technical discipline that requires a valid understanding of;

- Disruption
- Uncertainty management
- Probabilistic modeling
- Data analytics
- Complexity management
- Natural systemic resilience
- Complex systems theory









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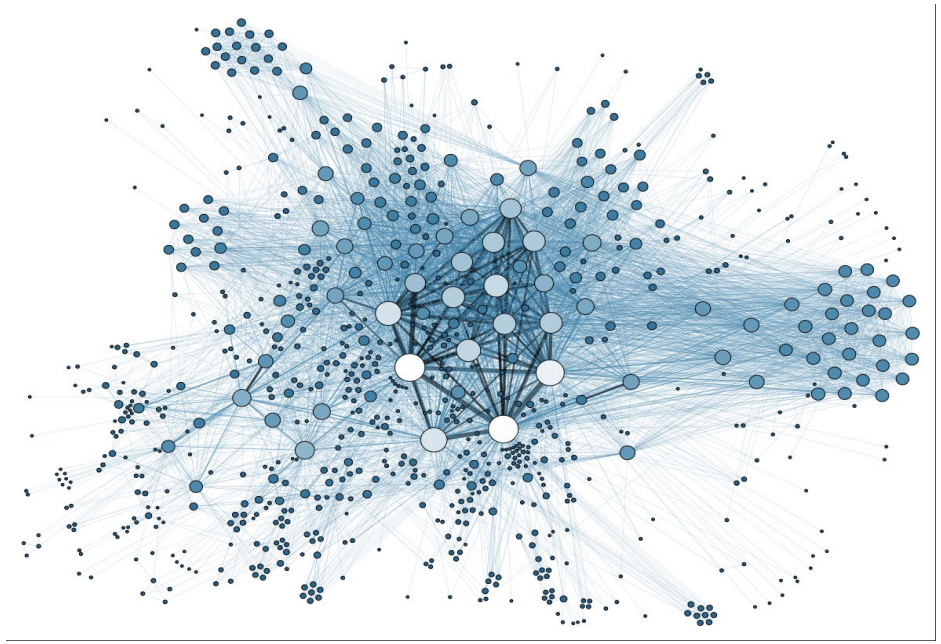
A *brief* introduction to Complex Systems?

Complexus
Intelligent Risk Thinking

What are Complex Systems?



A highly energised body comprising of an advanced number of interconnected and co-dependant parts

Natural Systems

- The Weather
- A Rainforest
- A Food Chain
- The Human Brain
- An Immune System

Man-made Systems

- Human Society
- The Internet
- An Economy
- Large Organisations
- Major Projects

Types of Complex Systems

Complex Physical Systems

Stable, Linear, Standardised
(Controllable)

Complex Adaptive Systems

Dynamic, Random, Unique
(Potentially Chaotic)

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Practical lessons from the Coronavirus Pandemic

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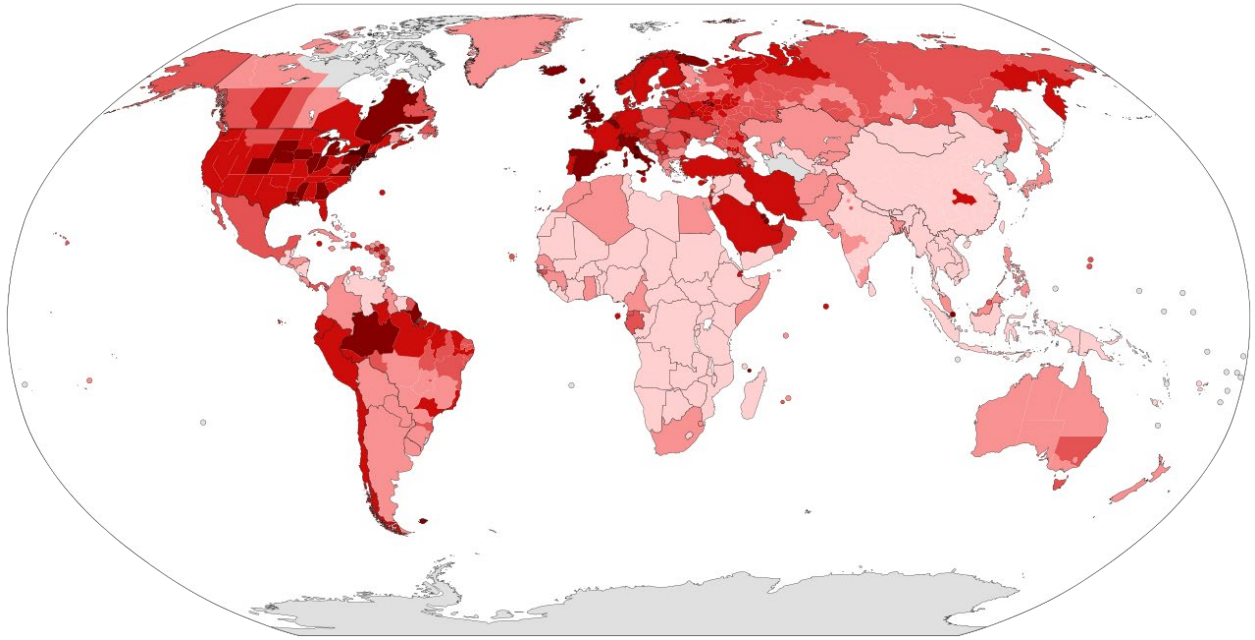
Lorenz’s Butterfly Effect



The wonder of unlimited, interconnected relationships

A seemingly insignificant change in one area of a complex system can ripple and compound through all the system’s other relationships to create momentous impacts elsewhere within the system

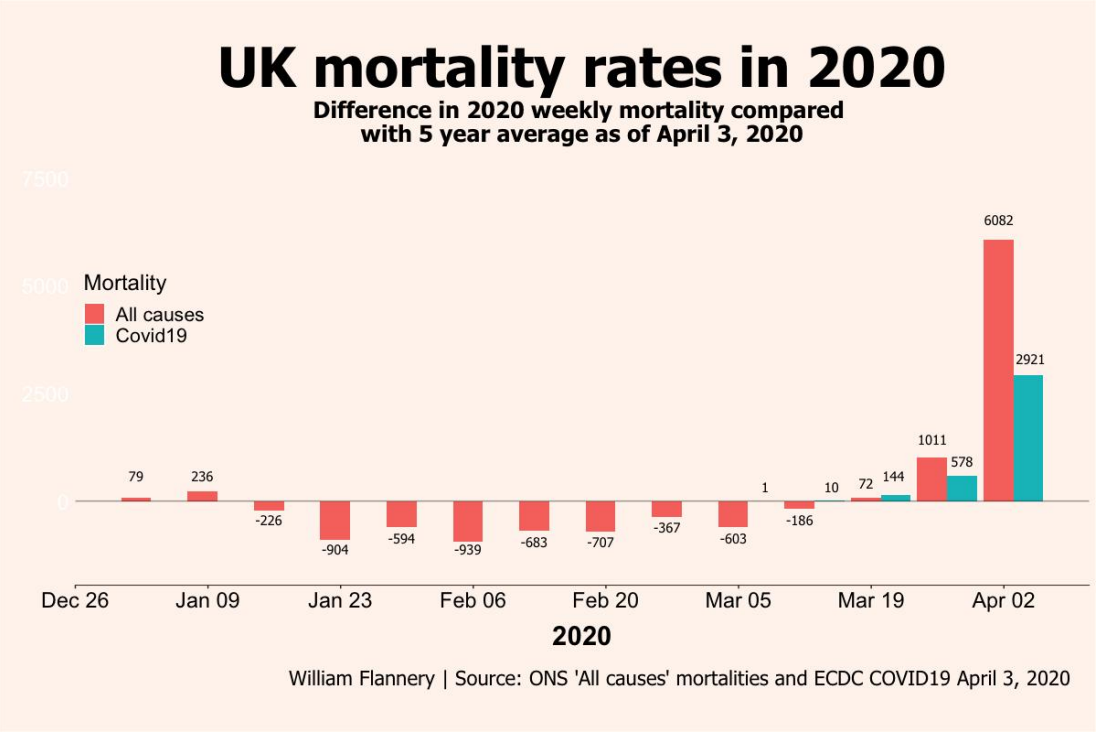
Non-Linearity, Fractal Relationships and Strange Attractors

The illogicality of complex systems

The Coronavirus panic lead to an almost immediate shortage of toilet paper, but never of tinned goods nor bottled water?

Such irrational, dynamic systems can not be controlled by rational-linear processes

Emergence



Unintended side effects

A highly energised, continually transforming complex system will create new emergent behaviours, properties and challenges that are not an outcome of the intended design

Emergence occurs when there is a shift in systemic relationships

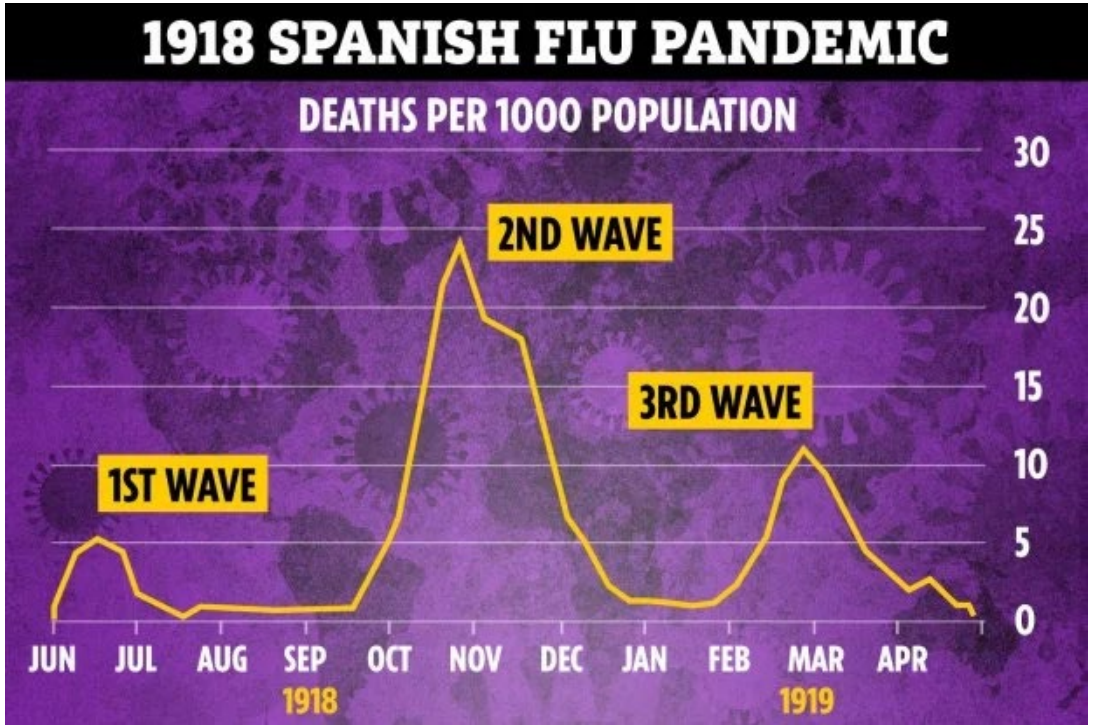
The Edge of Chaos

Waiting for an excuse to unleash

A complex system is a highly volatile entity, which at all times is no more than a transition or two away from descending into wild disorder (chaos)

Complex systems should thus be considered to be inherently chaotic, whereby every change has the potential to edge the system closer to chaos

Wicked Problems

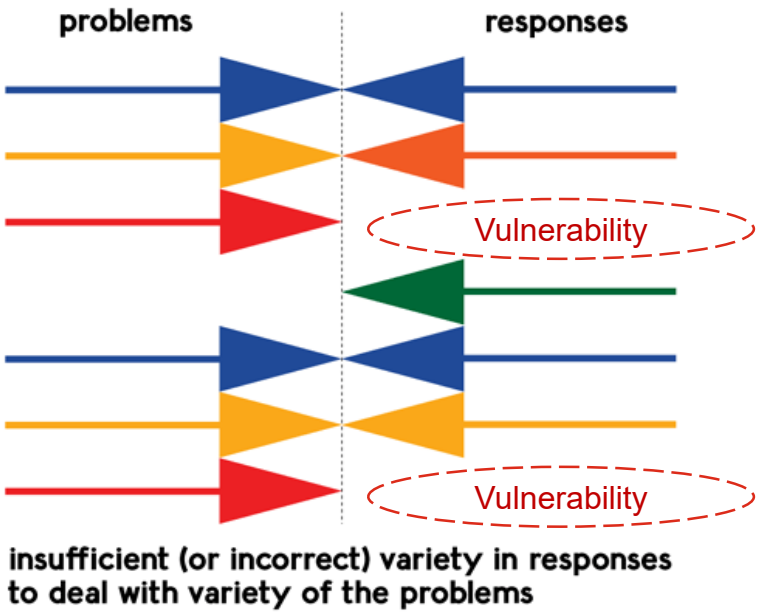


“Wicked" denotes a state of continued resistance to resolution

Wicked problems can not be stopped by standardised control approaches

As each selected solution is engaged, the host system simply adapts and transforms

Ashby's Law of Requisite Variety

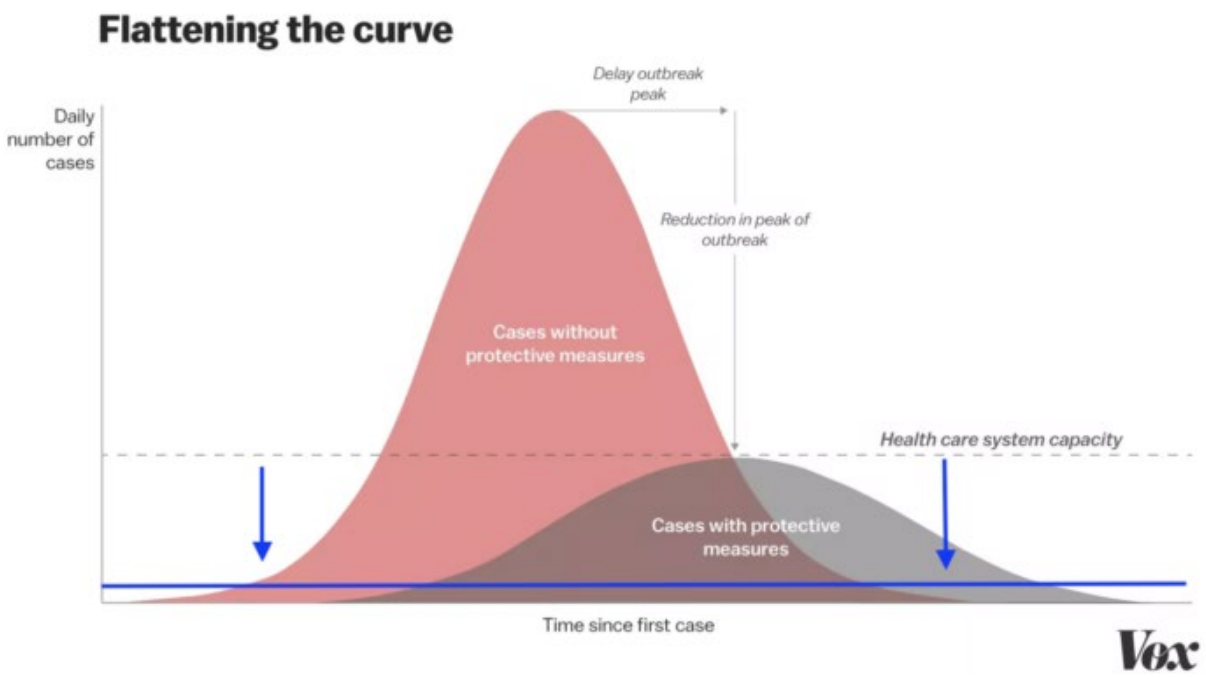


Variety is the key to control

Ashby's Law argues that any proposed solution must offer a broad enough variety of control options, to counter match the variety of challenges offered by the system

Limited control approaches offer insufficient variety to validate specific effectiveness

Fat Tail vs Long Tail Threats

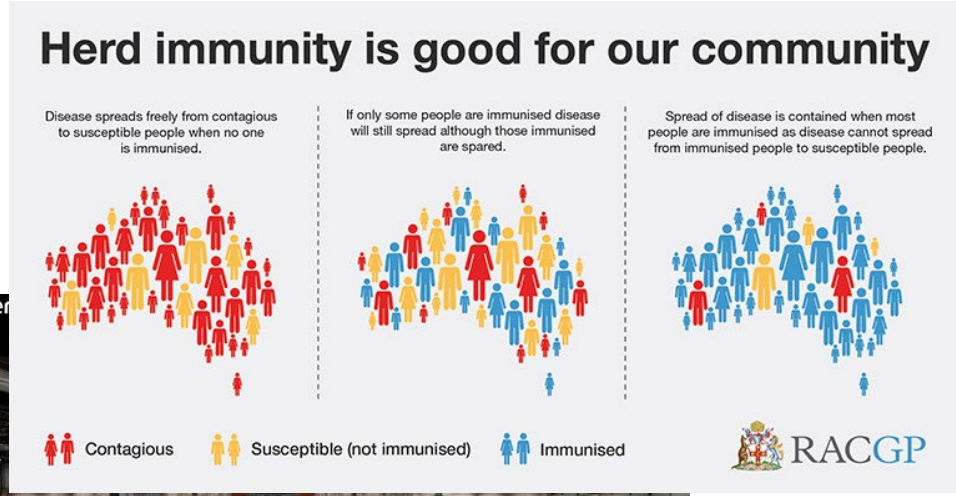


Going all in…

A Fat Tail is an emerging threat with a relatively high probability of an extreme outcome

Proponents of Fat Tails argue for a “rapid, all in” approach to addressing Fat Tails as "failing to do so will eventually cost us everything"

Herd Immunity



COMMENT & OPINION

Here's Why Herd Immunity Won't Save Us From The COVID-19 Pandemic

GIDEON MEYEROWITZ-KATZ 30 MARCH 2020

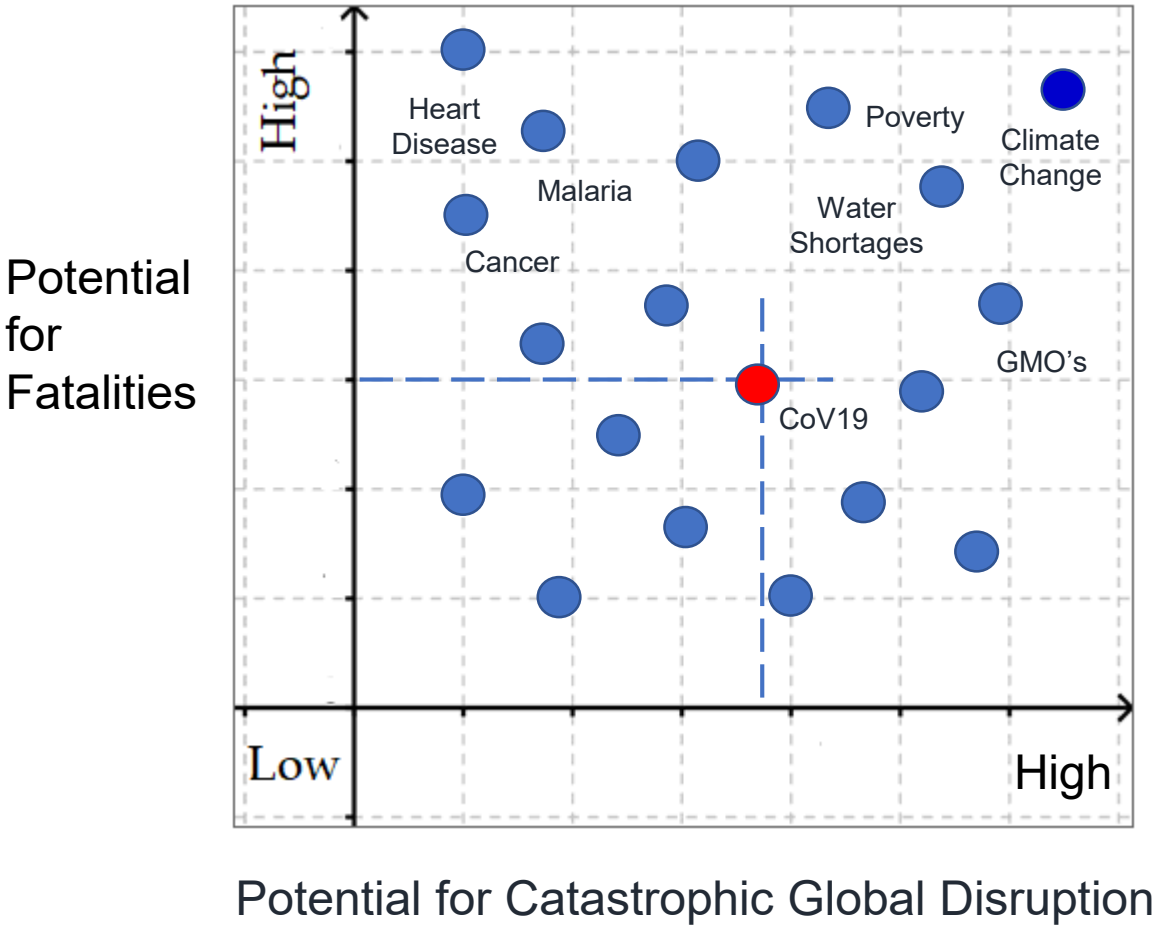
It's hard to predict things in a pandemic. The situation changes so much on a daily basis that everything you thought you knew last week is wrong by the end of the day. Things are changing so fast that even the solid certainties that

Eliminating systemic vulnerabilities

Herd Immunity occurs when a large enough percentage of the population has been infected (and survived) a virus

It's a brutal form of natural selection, but in the absence of a vaccine, it is the only means to building up a natural, system-wide resilience to the virus

Establishing our Risk Appetite



What were the specific criteria for prioritising CoV19 over all the other comparable risks?

Projected deaths from poverty, heart disease, cancer, HIV, malaria, road accidents, diabetes (and the like) far exceed CoV19

Equally… climate change, fresh water shortages, increasing wealth disparity and genetically modified organisms have far greater potential for catastrophic global disruption

The Economy as an Eco-System

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Coronavirus: 'World faces worst recession since Great Depression'

By Szu Ping Chan
Business reporter, BBC News

The Economy sustains life

Our economy is the complex, global, super eco-system upon which 7.5 billion people are dependant on for their continued health and security

Throughout history more lives have been lost due to bad economics than all the major pandemics put together

The New Normal

From Chaos springs new life

Evolutionary growth spurts are often born from catastrophic disruption

The Great Asteroid, the Black Plague, the Dark Ages, the Great Depression and World War II - all did their bit to accelerate our existence, by forcing us to acknowledge our vulnerabilities and evolve to a higher state

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Close

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Intelligent Risk Thinking

Closing Thought

Despite decades of repeated institutional warnings of the inevitability of a catastrophic global pandemic, as well as numerous dry runs and near misses; when Covid19 did eventually come along, the only mitigation we had ready was to place billions of people under house arrest, destabilise the economy and put our children's futures at risk

Considering the above, how confident are we now in our readiness to tackle Climate Change?

Q&A

Warren Black - Biography

Warren is an Engineer, Risk Professional and Complex Systems' Advisor who has particular interest in understanding how the complexity sciences may offer a better means to controlling emergent risks within highly complex, operating systems.

Warren consults to industry on how to improve Governance, Risk & Assurance practices so that they may reflect not only the degree of investment at risk, but also the specific complexities in play.

Warren is currently engaged in a higher degree in research (PHD) program, whereby he is *Investigating a Complex Systems Approach To Controlling Risk within Complex Organisations*, at the Queensland University of Technology.

www.complexus.com.au

Geoff Hurst - Biography

Geoff is a well qualified OHS and Risk Engineering professional with expertise in the development of safety and risk management frameworks, embedding & developing effective Health & Safety Management Systems, workplace wellness programs, and implementing workplace cultural change in a variety of settings.

Geoff leads the ENGENEOHS Alliance to deliver on safety and risk related projects specific to client needs in the key areas of Engineering, Enterprise, Environment, Or Health & Safety. He is the President - Risk Engineering Society.

Geoff delivers the Risk & Due diligence module at Swinburne University and Risk and Hazard Management topics at Federation University (VIOSH) and has a special interest area in dealing with Complex Socio Technical systems.

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Upcoming Webinars

- **30 June:** Introduction To The Resilience Potentials
- **28 July:** ISO31K
- **25 August:** Strategic Risk Policy

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Thank you

Today's presenter:

Warren Black – warrenblack@complexus.com.au

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