WELCOME TO ENGINEER 4A03

WEEK 3 Lecture

McMaster University

ENGINEERING

Ethics, Equity and Law in Engineering FA24

Today's Agenda

01 **Recap + Housekeeping**

Technology, Society and Responsibility

02 **Developing Technology**

Hoe does technology develop?

03 **Innovation**

04 **UNSDG MMP**

–let's answer this...

How are you feeling today?

01
Recap + Housekeeping

Addressing the Engineer's Concern?

1. Separatism – I will do my job.
2. Technocracy – I will be the governing expert.

Separatism

Scientists and engineers apply technical inputs, **but** appropriate management and political organs make the value decisions

Illustrated by the Tripartite model

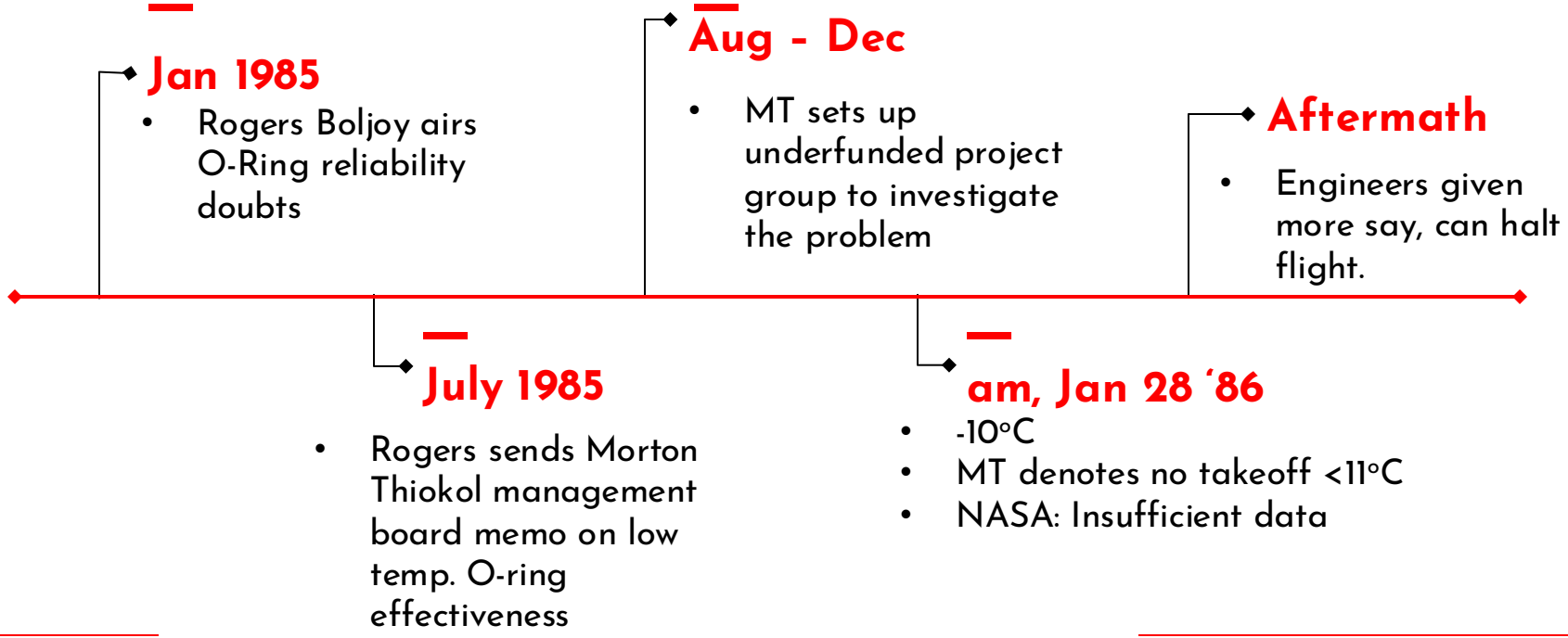
Technocracy

Engineers should take over the role of managers in the governance of companies

Leads to a situation: Government by experts

???what unique expertise do engineers possess for legitimacy?

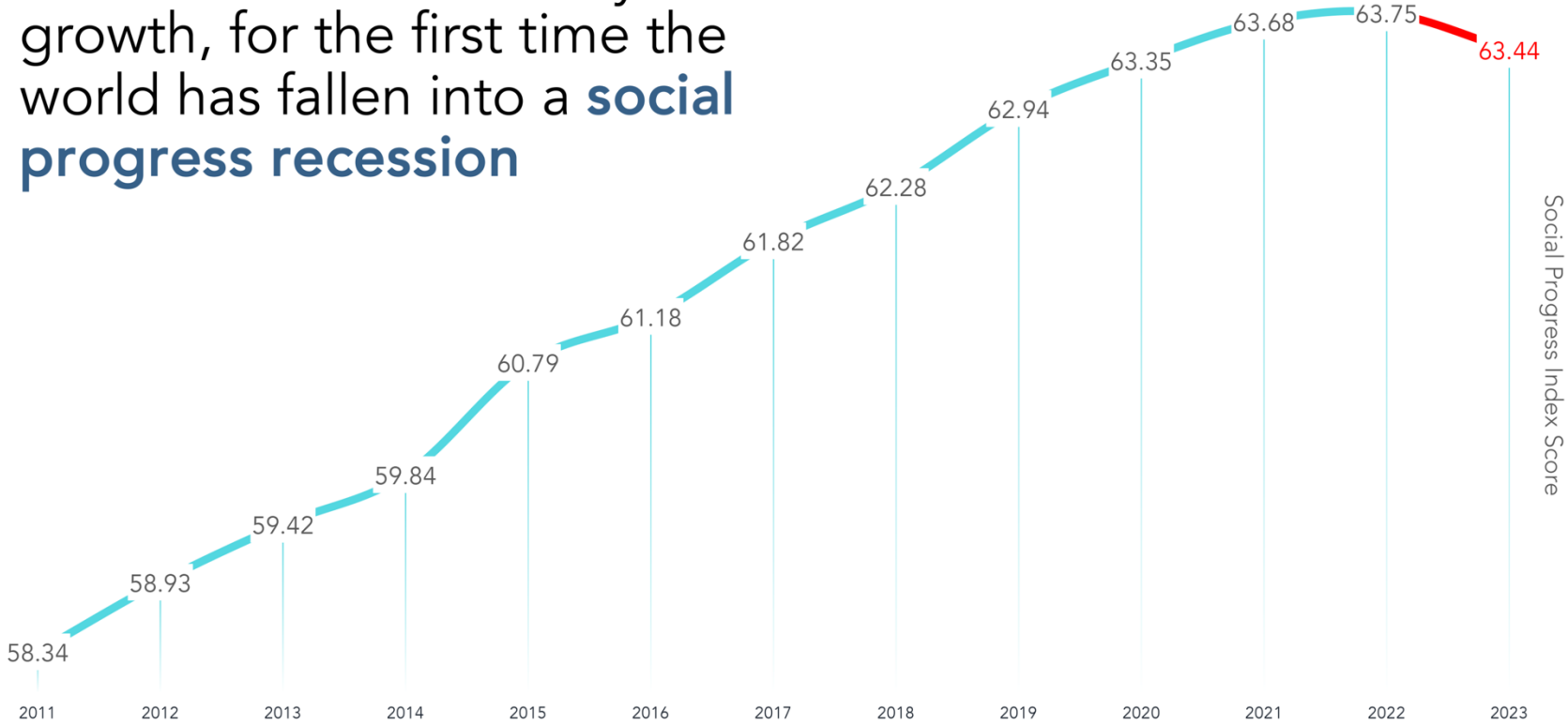
Challenger Disaster – the cost of putting a civilian in space



McGinn, R. (2018). *The ethical engineer: Contemporary concepts and cases*. Princeton University Press.


SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

After a decade of steady growth, for the first time the world has fallen into a **social progress recession**

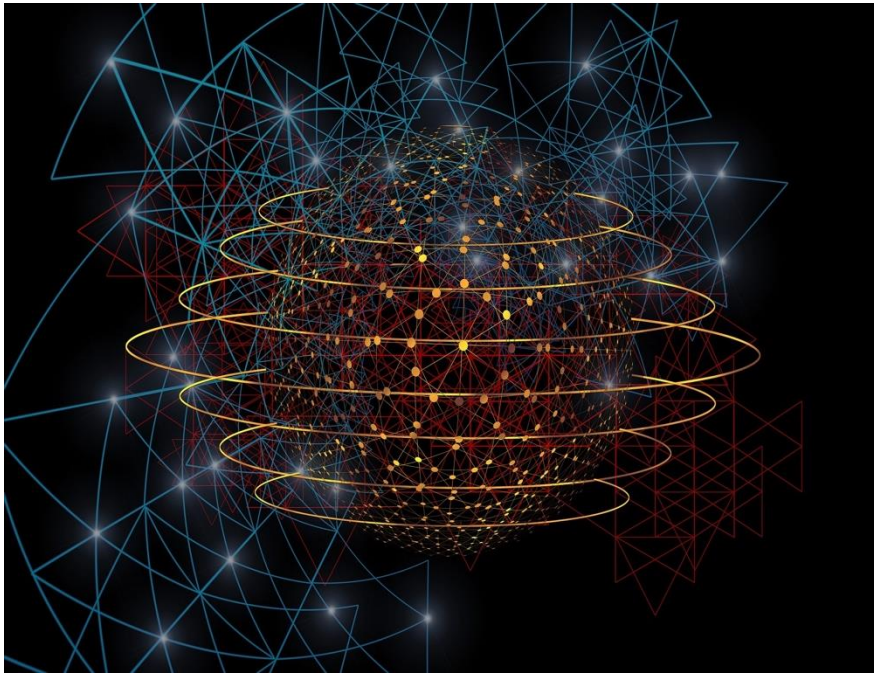


SOCIAL PROGRESS IMPERATIVE
socialprogress.org

https://www.socialprogress.org/social-progress-index

02

Developing Technology



Technology is

"…all the things people make and do to their natural environment in order to get the things they want and need."

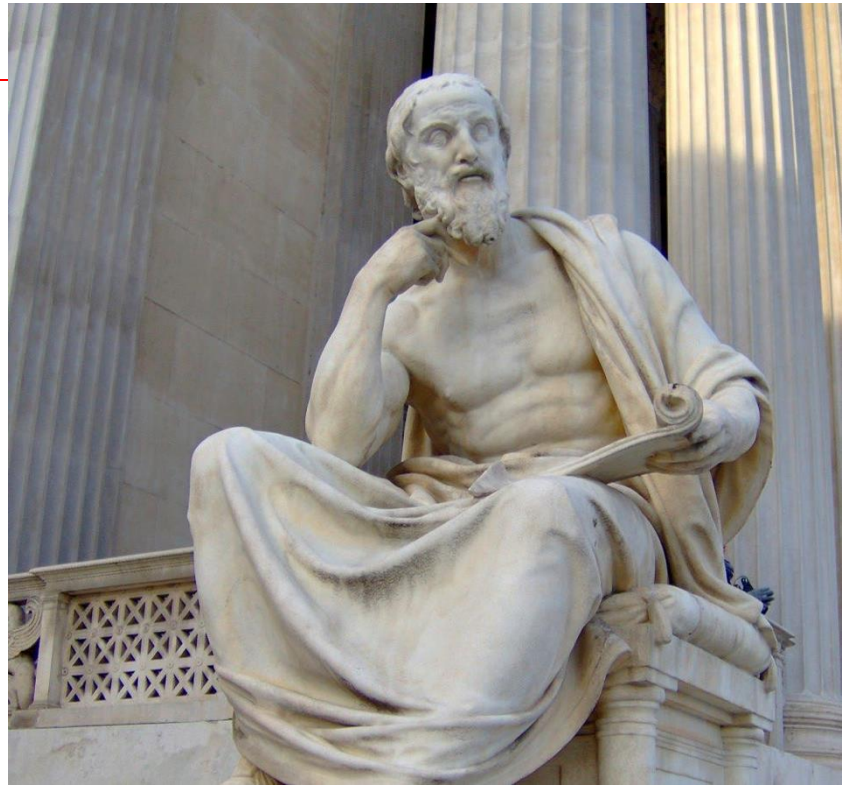
(Sharon A. Brusic, Technology Education for Children Council,2000)

What drives technology?

1. Determinism?
   - Future = past + present
2. Materialism?
   - Everything = physical
3. Curiosity?
   - Why?

Herodotus, 424 BC

"Nothing stays the same, and, if you don't want to grow, you will soon be passed by those who do! If we don't keep the future alive with realistic planning, then the alternative looks awfully grim"



…Speed!

A constant acceleration in the appearance and evolution of complex systems witnessed

- Sharp edges, fire, wheel –long, long ago
- By 1000 AD big changes took 2 centuries
- 19thcentury more growth than the previous 18
- First 20 years of the 20thcentury eclipsed 19th
- WWW is more than a decade old!
- 21stCentury expect 200 centuries of progress! (according to Ray Kurtzweil)

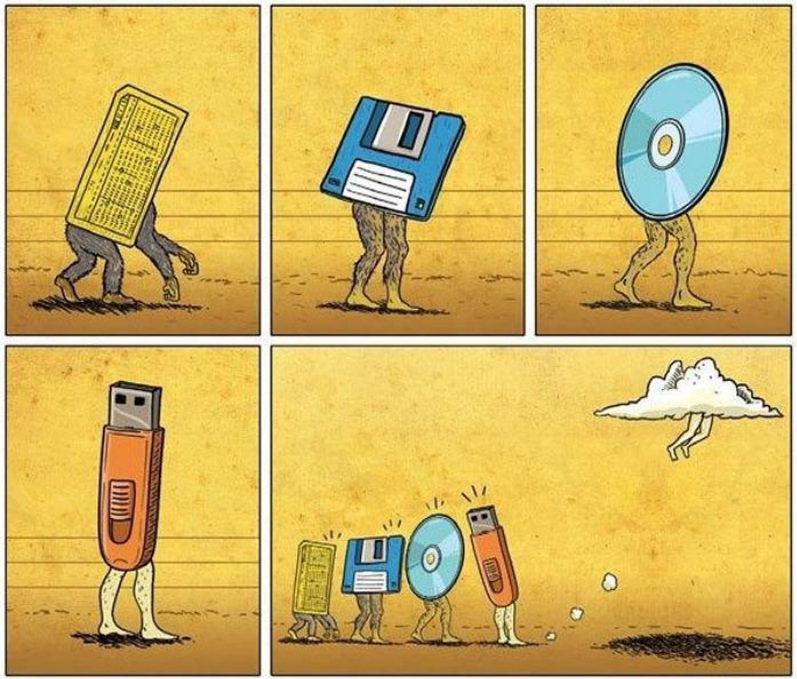
It's only getting faster...

1993

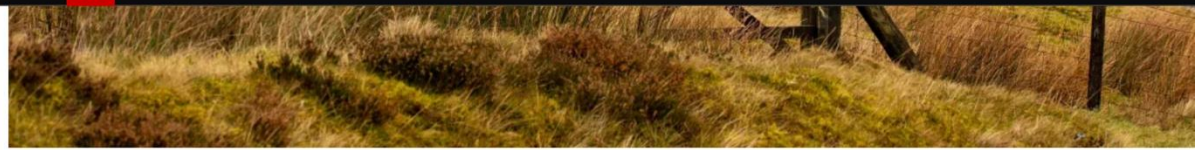
- 150 calls in 1 optical fiber strand
- 10 Megabyte drive cost $200
- High end portable cd player $250

2021

- Over 60000 calls in one optical fiber strand
- $75 = 2 Terabyte
- Smartphones have access to every song imaginable $0-15.00



Complexity: Old TV knocks out internet:



Villagers in Aberhosan, Powys, Wales, had broadband problems for 18 months. Ian Jones/Alamy Stock Photo

(CNN) — For 18 months, residents of a village in Wales have been mystified as to why their broadband internet crashed every morning.

Now engineers have finally identified the reason: A second-hand television that emitted a signal that interfered with the connection.

A crack team of engineers-turned-detectives have become heroes in the village of Aberhosan after finally finding the source of the problem, according to a press release from Openreach, the company that runs the UK's digital network, published Tuesday.

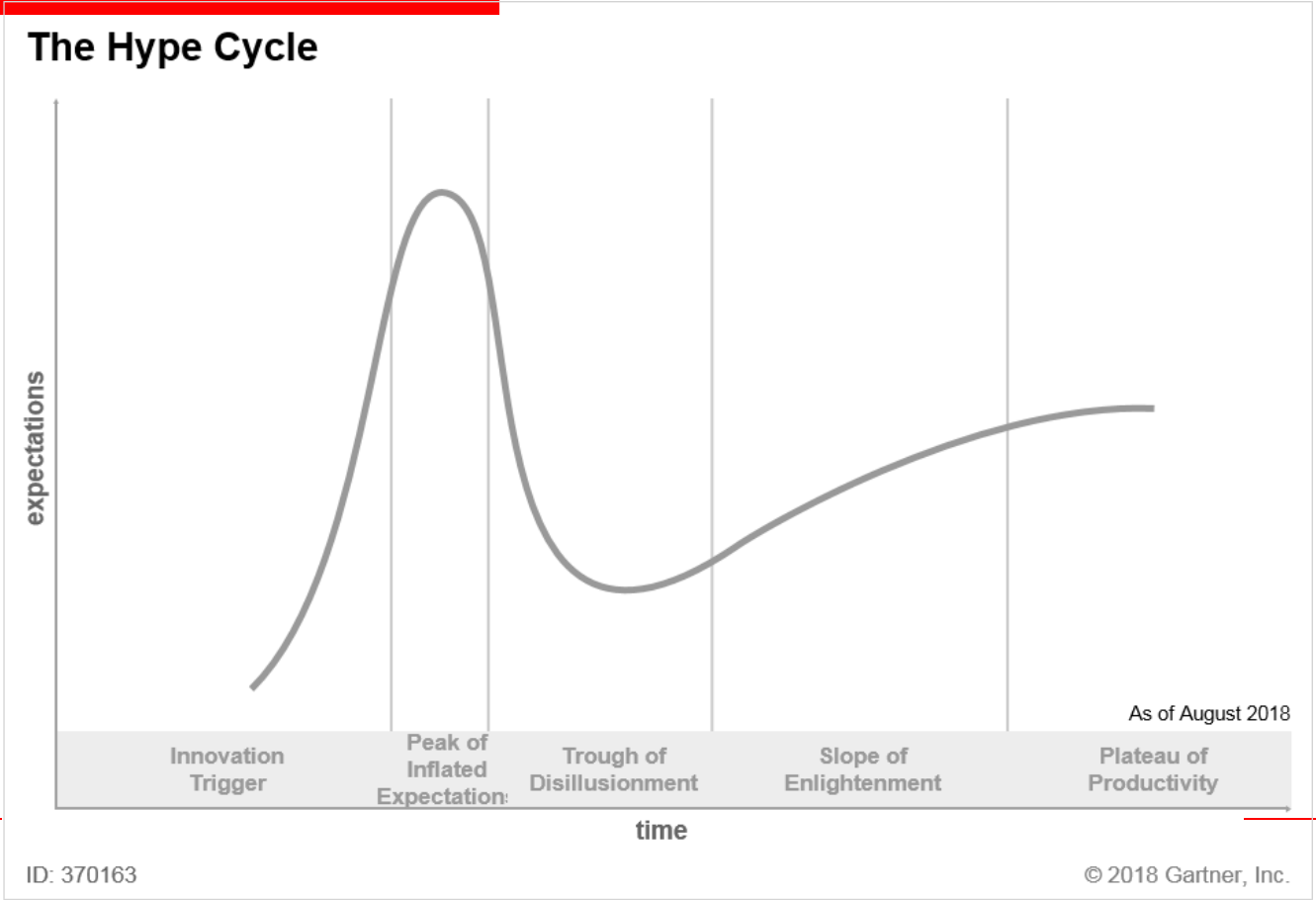
Staff had visited the village repeatedly and found no fault with the network. They even replaced cables in the area to try and solve the problem, but to no avail.

Then local engineer Michael Jones called in assistance from experts at the Openreach chief engineer team.

After carrying out a plethora of tests, engineers had a theory that the problem could be caused by a phenomenon

https://edition.cnn.com/2020/09/22/uk/old-tv-breaks-broadband-village-scli-intl-gbr/index.html

Technical Evolution



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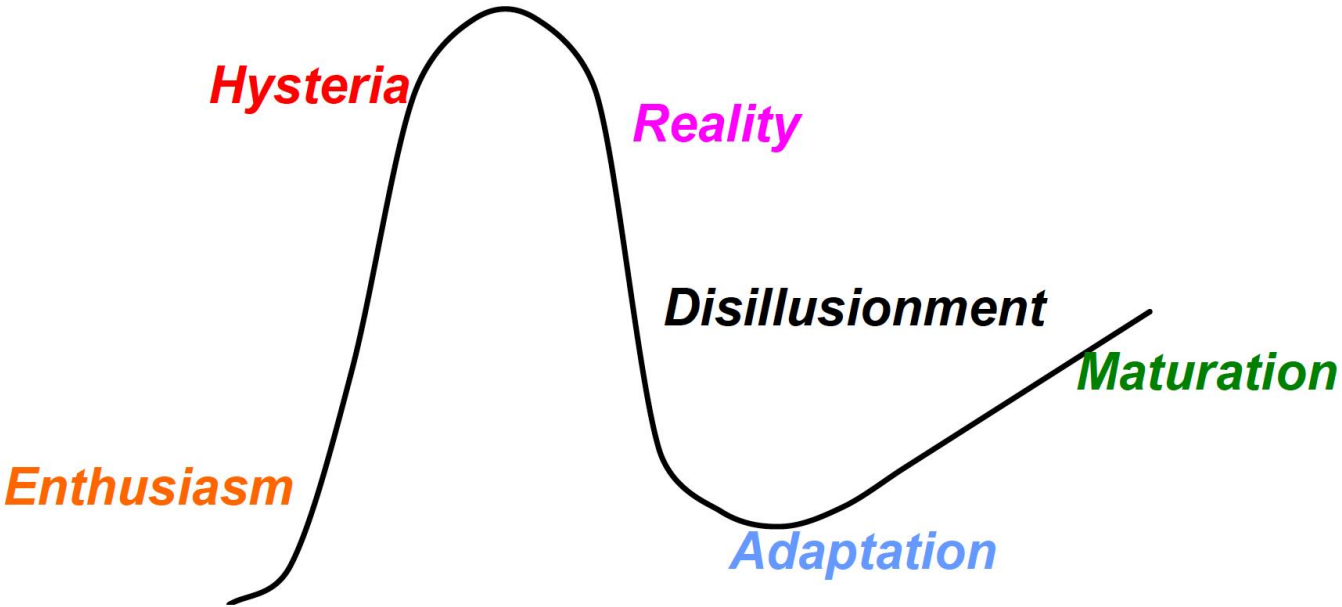
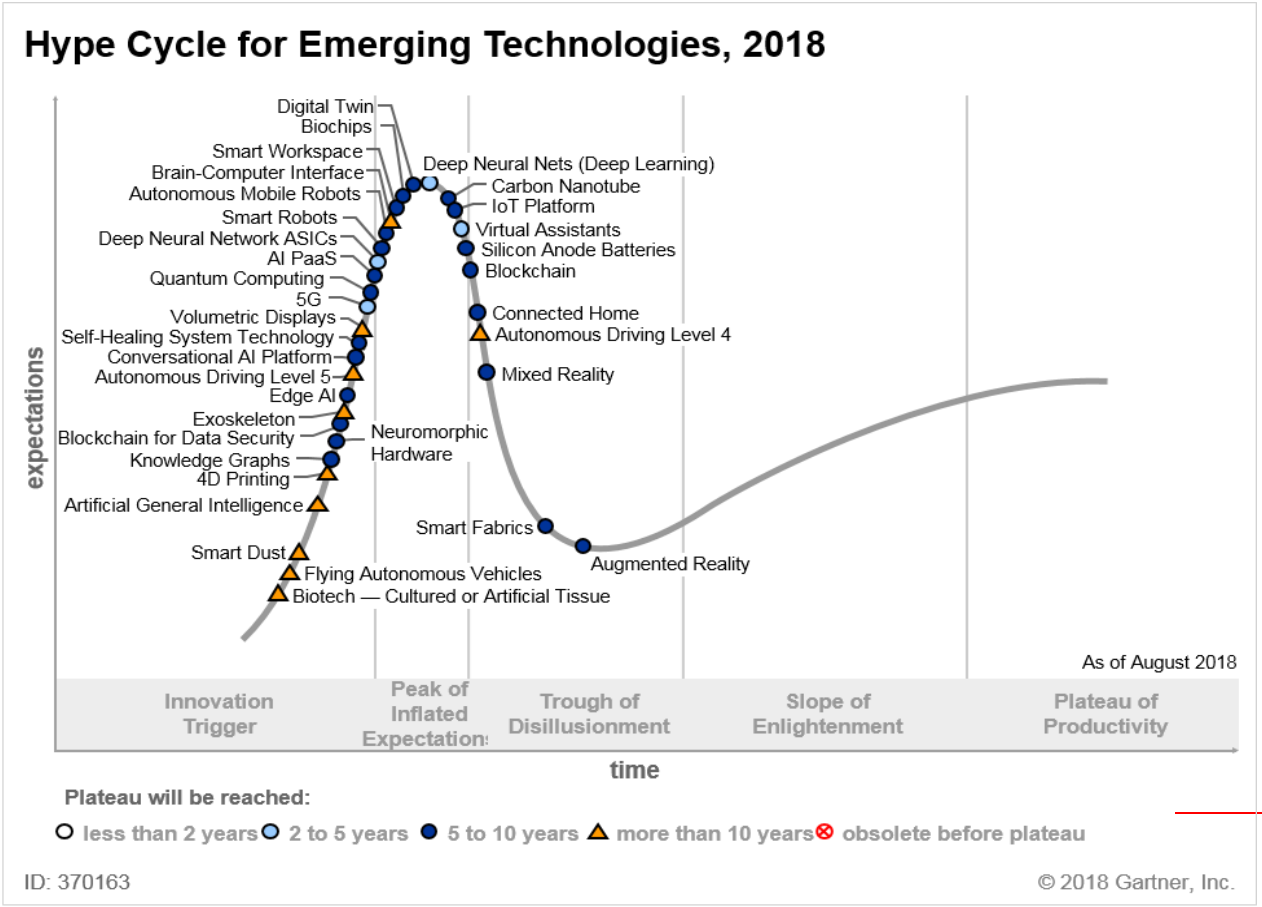
Technical Evolution



Expectations vs Time

Technical Evolution



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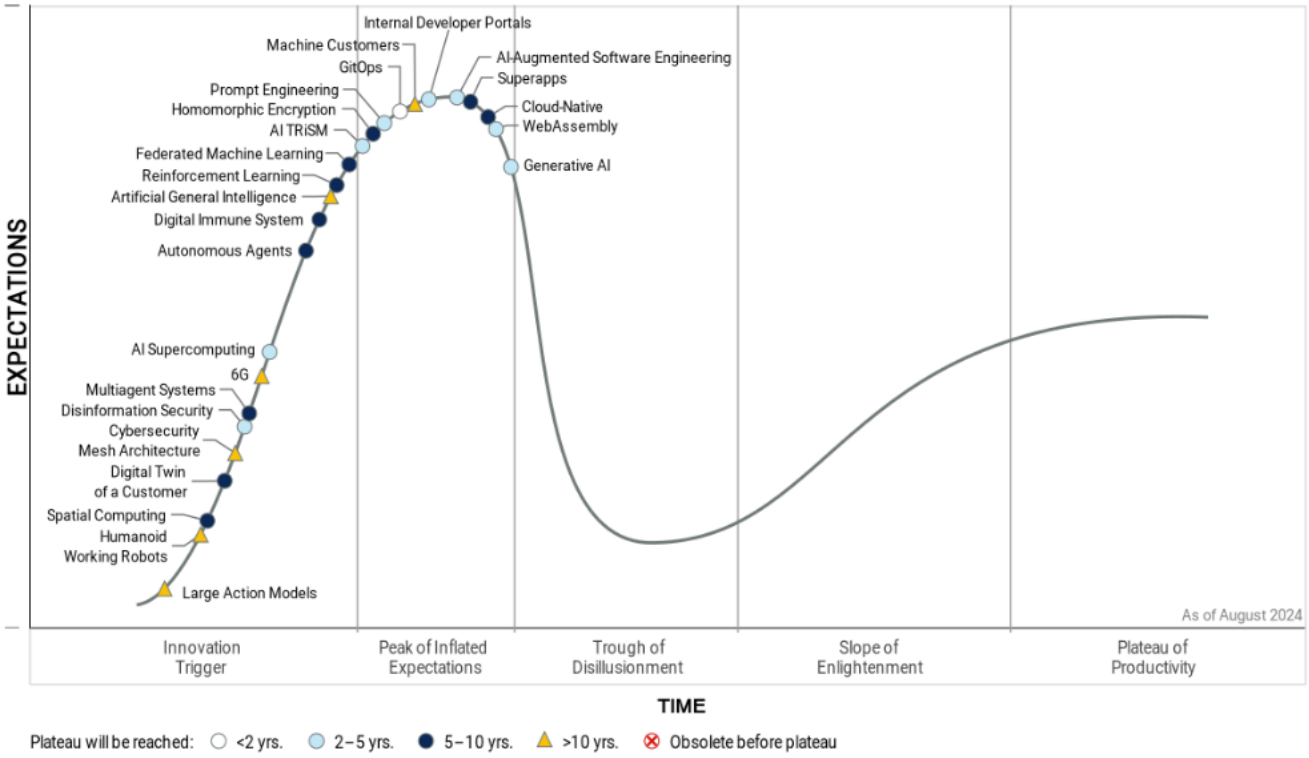
Technical Evolution (Hype Cycle 8/24)



Gartner

https://www.gartner.com/

Good Scenario

Our Mistake

We overestimate the impact of new technologies over a 2 year time span

- Web retail expectations
- Ebooks
- Wireless adoption

Because…

- Ignore implementation details
- Sellersneed to sell!
- Buyersneed to buy!

Our Mistake

We undersestimate long term changes due to technology (10+ years)

- Planes, automobiles
- PC, internet
- Biotech, nanotechnology

Because…

- We think linearly about progress

If it Can happen, It will!

- Is it physically possible ?
- Does it fulfill a basic human need/want?
- Is there money to be made from it?

It will happen…

"It will take over 100 years before we decode the entire human genome" *Bottstein, MIT 1975*

"It will take us another 3 or 4 decades before we finish the whole thing" *Ridley, CIT & MIT 1992*

"Done" *J. CraigVenter, Celera Genomics & Francis Collins. Human Genome Proiect June 2000*

How does technology develop?

cumulatively

rather than
in isolated
heroic acts

invention then use

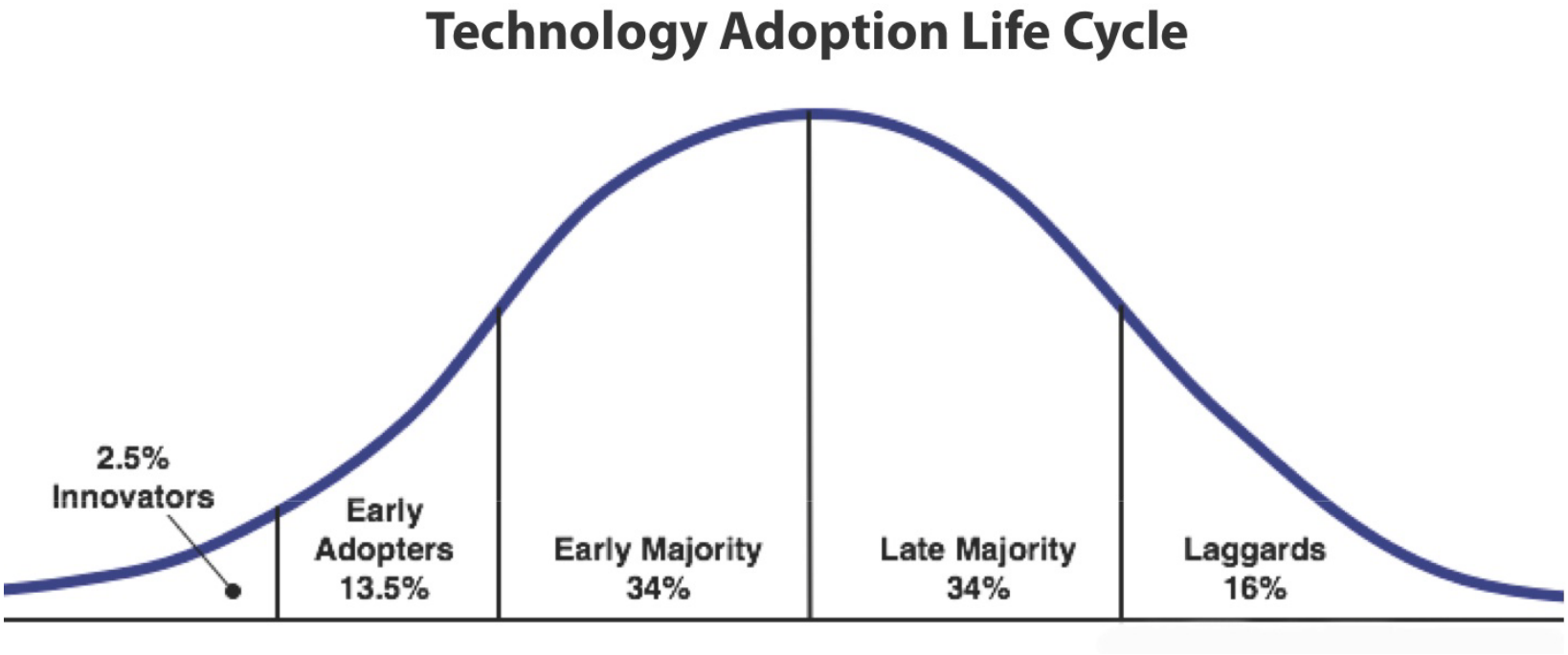
rather than being invented to meet a foreseen need

inventor persuasion

will the society adopt it?

Factors influencing technology acceptance

1. Relative economic advantage compared with existing technology
2. Social value and prestige, which can override economic benefit
3. Compatibility with vested interests
4. Ease with which their advantages can be observed



Adapted from E.M. Rogers, Diffusion of Innovations (2003)

Innovators

- willing to take risks,
- typically are youngest in age,
- have great financial liquidity,
-

- Risk tolerance has them adopting technologies which may ultimately fail. (Rogers 2003)

Early Adopters

- have the highest degree of opinion leadership among the other adopter categories.
- typically younger in age,
- have a higher social status,
- have more financial lucidity,
- advanced education,
- are more socially forward than late adopters.
- More discrete in adoption choices than innovators

Early Majority

- adopt an innovation after a varying degree of time (Critical mass).
- This time of adoption is significantly longer than the innovators and early adopters.
- slower in the adoption process,
- have above average social status,
- contact with early adopters,
- seldom hold positions of opinion leadership in a system

Late Majority

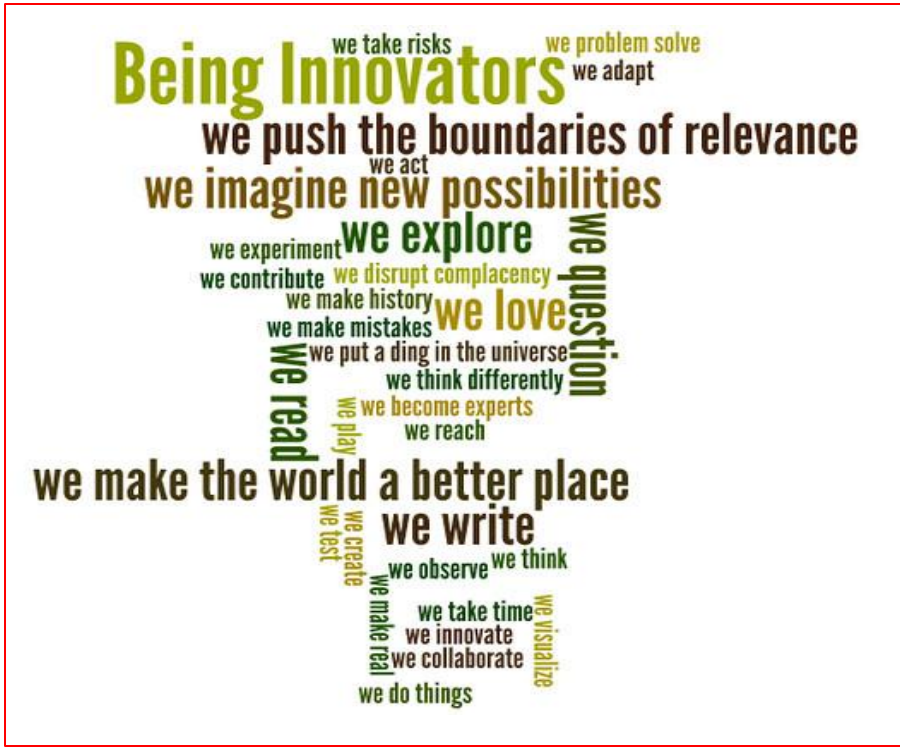
- will adopt an innovation after the average member of the society.
- skeptical about an innovation,
- have below average social status,
- very little financial lucidity,
- in contact with others in late majority and early majority,
- very little opinion leadership.

Laggards

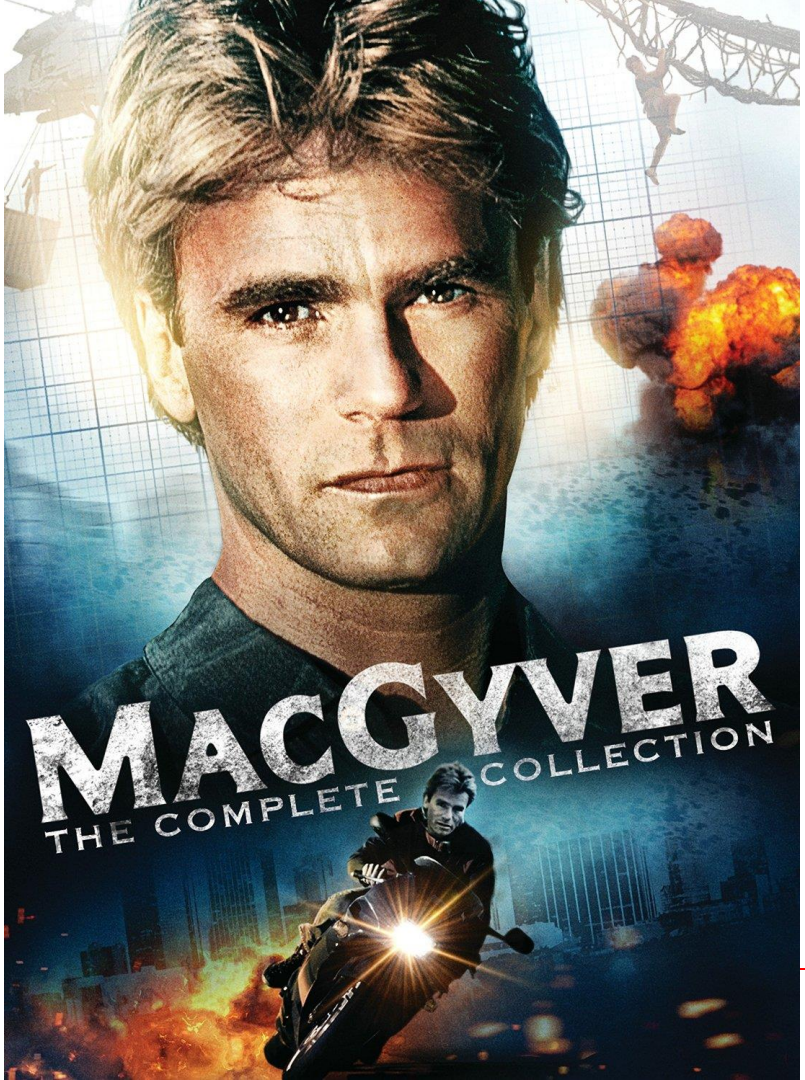
- Individuals in this category are the last to adopt an innovation.
- show little to no opinion leadership.
- have an aversion to change and tend to be advanced in age.
- tend to be focused on "traditions",
- likely to have lowest social status,
- lowest financial fluidity,
- be oldest of all other adopters,
- in contact with only family and close friends.

03

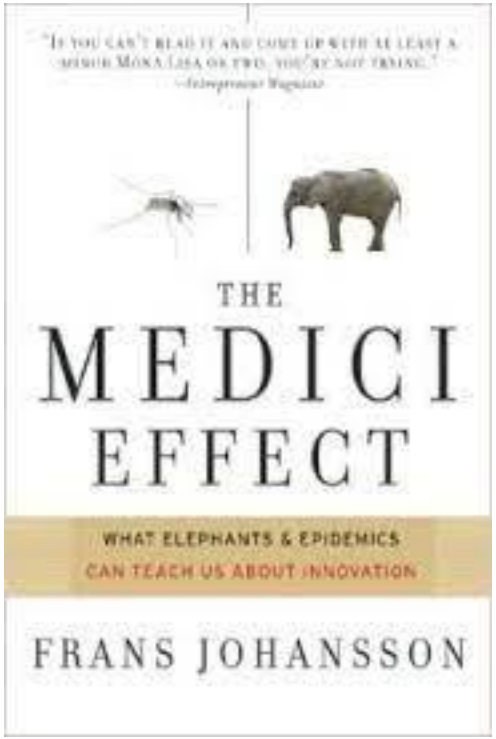
Becoming a Great Innovator



Have you watched this?



"When you step into an intersection of fields, disciplines, or cultures, you can combine existing concepts into a large number of extraordinary new ideas."



THE MEDICI FAMILY

Banking family in Florence

Patrons who funded creators from a wide range of disciplines (e.g.Leonardo da Vinci)

Sculptors, scientists, poets, philosophers, financiers, painters, and architects converged

Broke down barriers between disciplines and cultures

Society changed based on resultant new ideas

The Intersection

Term used by Johannson to describe where different fields meet .

- What is the intersection?

point where ideas from different disciplines meet and combine

- Stepping into the intersection creates **the medici effect**

creativity thrives when different perspectives intersect.

Types of Ideas

Directional

- We know where we are going
- Often build on existing ideas

Intersectional

- Surprising and fascinating
- Take leaps in new directions
- Open up entirely new fields
- Can affect the world in unprecedented ways

Associative Barriers

- Associations-
  - By hearing a word or seeing an image the mind unlocks a string of connected ideas.

- The mind follows the simplest path

Chef

Writer

HOW DO ASSOCIATIVE BARRIERS HELP AND HINDER US?

Help

- Efficient (quick analysis to action)
- Order / Group concepts
- Structure in the environment

Hinder

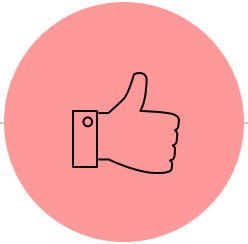
- Inhibit broad thinking
- Prevent assumption questioning
- Create barriers to alternate thinking
- Inhibit creativity

How can we destroy these barriers?

- Reverse assumptions
- View multiple perspectives
- Diversifying occupations
- Go intersection hunting
- Futuring

PRACTICE INNOVATIVE THINKING

- Go on thought walks
- Be observant
- Always ask why?
- Participate in a hackathon
- Check this out: https://makezine.com/tag/makeshift/



Thanks!

Let's end here today

In the Coming Week:

- **Assignment 1 posted on A2L**
- **Quiz 2 Due Next week**