



# Beyond the horizon

What may the world of research look like 10 years from now?

A foresight study.



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[www.elsevier.com/connect/elsevier-research-futures-report](http://www.elsevier.com/connect/elsevier-research-futures-report)



# Why did we do the study ?



**Political uncertainty**

Population shifts

**Advances in technology**

**Funding pressures**

Societal challenges in a global scale

- The ability of the research community to thrive in the new world
- Understand the opportunities and challenges these changes imply
- Steps needed to be taken in the future

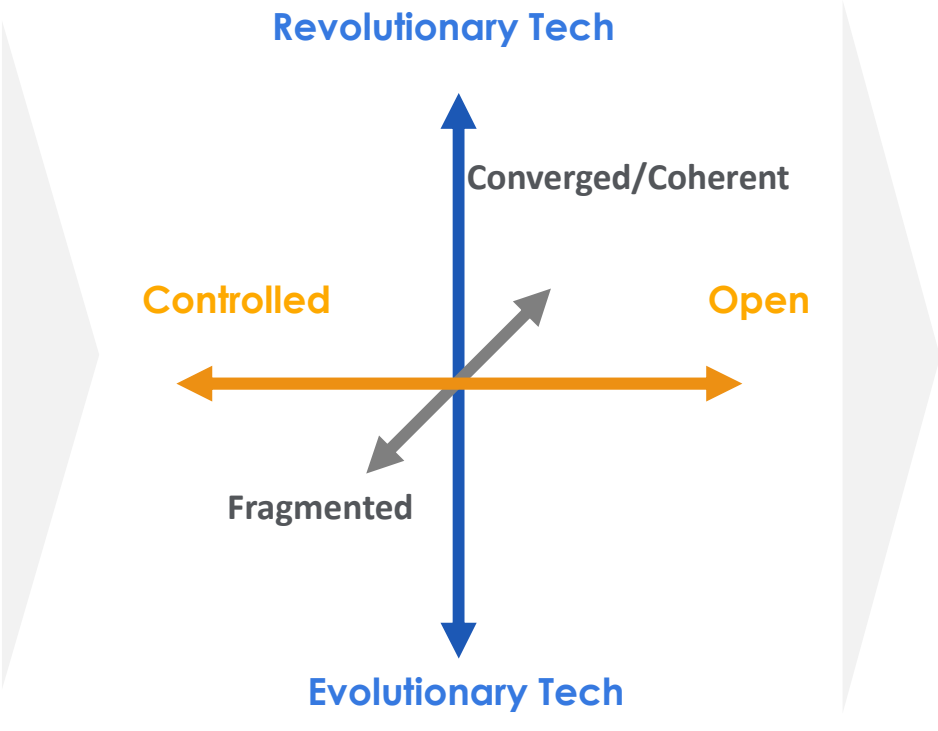
# Overview of approach

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|----------|--------------------------------|--|--------------------------------|
| <b>1</b> | <b>LITERATURE REVIEW</b>       | Understand current system, agents and trends                                       | <b>January 2018</b>            |
| <b>2</b> | <b>INTERVIEWS WITH EXPERTS</b> | 58, hour interviews with experts to explore and refine trends, drivers, decisions. | <b>February to May</b>         |
| <b>3</b> | <b>SURVEY OF RESEARCHERS</b>   | Map motivations, perceptions and likely behaviours around changing trends          | <b>March to April</b>          |
| <b>4</b> | <b>DEVELOP SCENARIOS</b>       | 3 workshops to build and refine scenarios  | <b>April to July</b>           |
| <b>5</b> | <b>WRITE FULL REPORT</b>       | Bring together all the findings for public release                                 | <b>August to December 2018</b> |
| <b>6</b> | <b>LAUNCHED REPORT</b>         | Presented and discussed findings at the AAAAS in Washington                        | <b>February 2019</b>           |

# Scenarios constructed along three different dimensions

- SIX THEMES**
- Funding in the future
  - Pathways to open science
  - How researchers work: change ahead
  - Technology: revolution or evolution
  - Building the future research info. System
  - The academy and beyond



**THREE SCENARIOS**



# Visualizing the future through scenarios

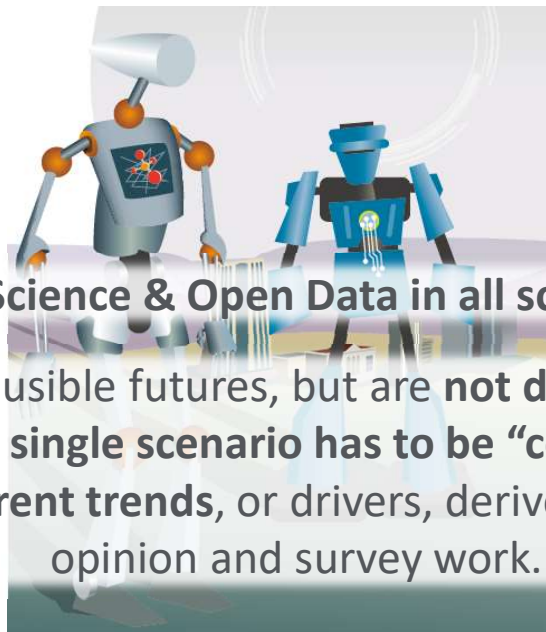
## Brave open world

Open Science becomes the norm



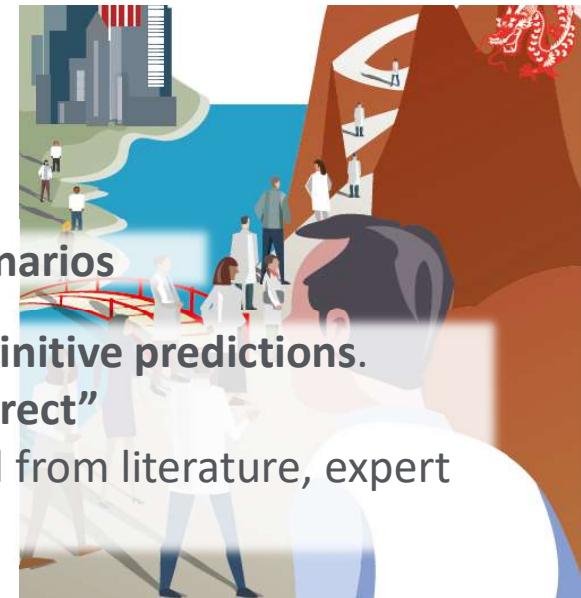
## Tech Titans

Tech giants use AI to change science



## Eastern ascendance

Asia, notably China is the science power-house



### Open Science & Open Data in all scenarios

- Scenarios are plausible futures, but are **not definitive predictions**.
- **No single scenario has to be “correct”**
- They are built on **current trends**, or drivers, derived from literature, expert opinion and survey work.

## Brave Open World

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*"I'm working on a pancreatic cancer vaccine program that is really international. Funders have pooled resources so I'm working with colleagues in Portugal, the US, China, Chile and Denmark."*

*"The team is not only diverse in terms of geography, the disciplines and skills vary too, from bench science to coding. Sharing the information within the team in a way that everyone can understand is a challenge for us."*



*"We are focused on publishing our latest findings right now, we have to publish everything pretty much straight away on our funders' open platform. It takes time to prepare content for open publication, we explain our findings in a way that makes them accessible to everyone."*



## Scenario one **Brave open world**

- State funders and philanthropic organizations create open platforms
- Open access (OA) is the norm, but the form of OA varies by region
- Preprints thrive and are linked to the final article versions, which are still recognized as the authoritative version.
- Researchers benefit from access to data in a variety of ways
- AI provides new methods of generating and communicating results.
- Journal publication plays a diminishing role in determining a researcher's career progress.



## Tech Titans

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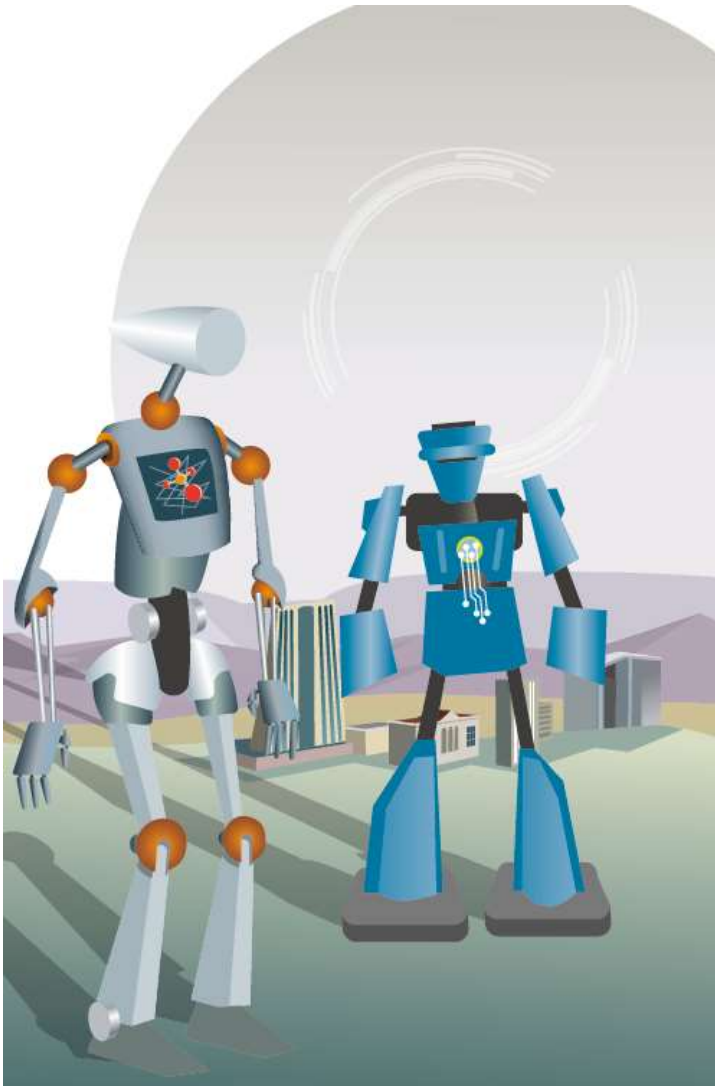
*“The department here is growing; the scope of the research projects is a little more limited, but at least they are well-funded. And I’m still involved in Next GenAvionics, the international project I was working on.”*

*“I just read my first fully AI-generated article that was also AI peer-reviewed. I was a little skeptical, but to be honest, I wouldn’t have known if it didn’t say it on the paper. I still worry that AI-powered peer review is not discerning enough to reject flawed papers.”*

*“It’s unbelievable the tools we’ve got access to. If I need to meet with aeronautics colleagues in Japan at the start of their day, I can be onsite to run a diagnostic – virtually, of course – within seconds of logging on”.*







## Scenario two **Tech titans - “Big tech” in charge**

- Industry and philanthropic foundations are the principal research funders.
- Significant advances in machine learning with sophisticated artificial intelligence (AI) products driving innovation
- Leading countries are leveraging machine learning in their work to address their own priorities and challenges.
- Large technology and data analytics companies become the curators and distributors of knowledge.
- “science-as-a-service” is emerging as barriers to entry are reduced.

## A POSSIBLE ASIAN FUTURE ..

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*"I expected Chinese institutes to focus on the application of research, in other words, commercialization, but that doesn't seem to be the case, especially with this program."*

*"China offers more opportunity. I can't believe how many jobs there are, or how well paid they are! What's really attractive is that they have technology that my current lab can't afford."*



*"I've heard that the government requires results to be published in an approved list of journals and I'm not sure how I feel about that. Plus, I won't be able to share the research data we generate with US colleagues – even though it would benefit them."*



### Scenario three

## **Eastern ascendance - A multi-polar world**

- China's transform into a knowledge-based economy has led to heavy public investment in research and development (R&D).
- The volume of investment in Asia, has made the East a magnet for international researchers.
- Open science adopted in some countries and regions, but not all.
- Lack of global alignment on grand challenges has resulted in inefficiencies in the international research system.
- Governments, industry and other research funders compete for scientific advantage through the controlled distribution and trading of data.

# Online resources

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***Research Futures: drivers and scenarios for the next decade* is freely available:**

- The [summary report](#) (including scenarios)
- The [full report](#) (including the scenarios and essays)
- The [monitoring framework](#)

**Elements of the underlying study data are also freely available:**

- Visit [Mendeley](#) to view the list of references used for the literature review
- View [the full results and chart for the researcher survey](#)
- Find [the results of the researcher survey on Mendeley Data](#)

