Using data and AI to accelerate innovation in Pharma

BioTechX

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About Elsevier - a global leader in scientific, technical medical information and analytics

ELSEVIER

9,500 employees; ~30% in technology

~20% share of global research output

Comprehensive R&D solutions across article abstracts, biomedicine, chemistry, health

Partnering with **100%** of top pharma

A RELX Group Company FTSE 100, #5 in terms of market cap
Global provider of information-based analytics and decision tools for B2B segments
Employing 36,000 people with $12B revenues. Annual tech investment is $1.7 billion

Our Mission

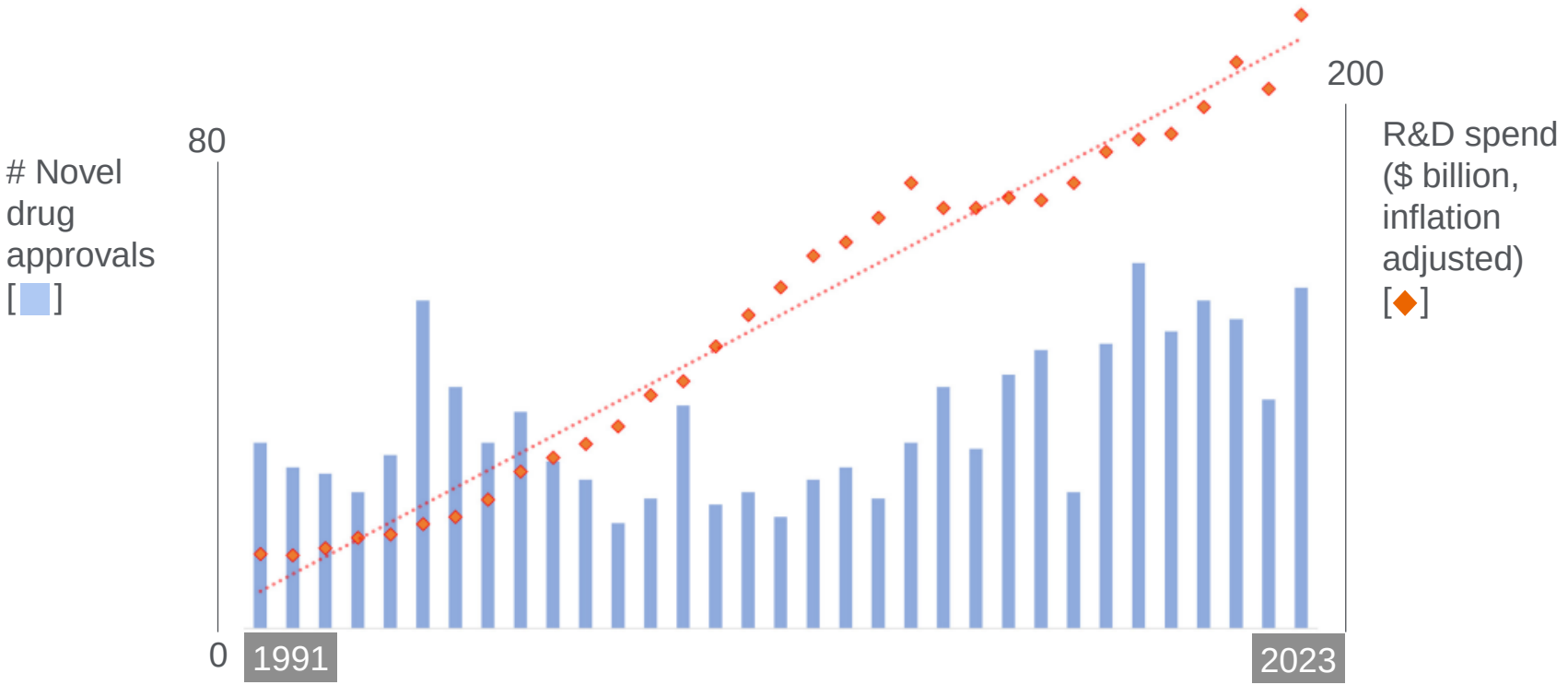
Help researchers and healthcare professionals to advance science and improve health outcomes for the benefit of society

Why are we here?

Our industry has an efficiency problem…

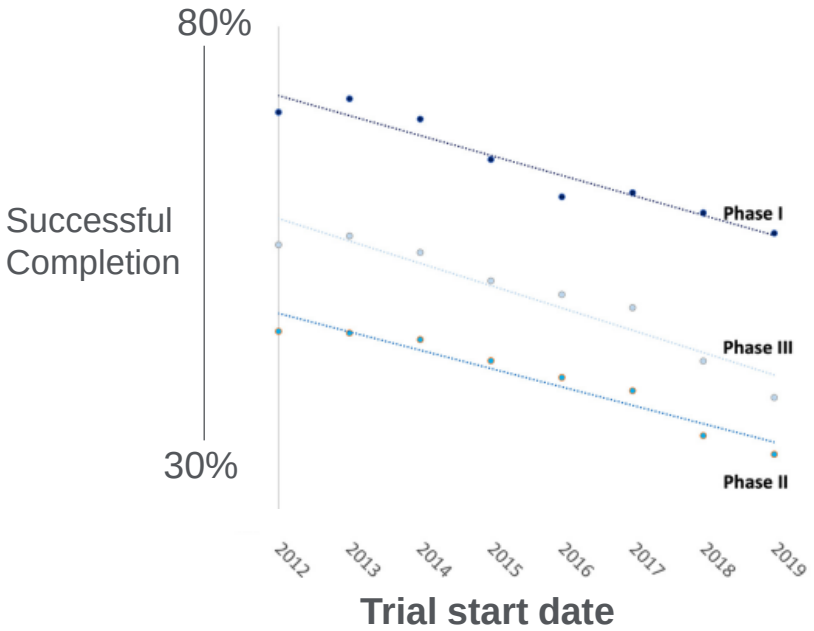
The pharmaceutical productivity gap – decline in R&D efficiency

Drug Discovery Today, Sept 2024

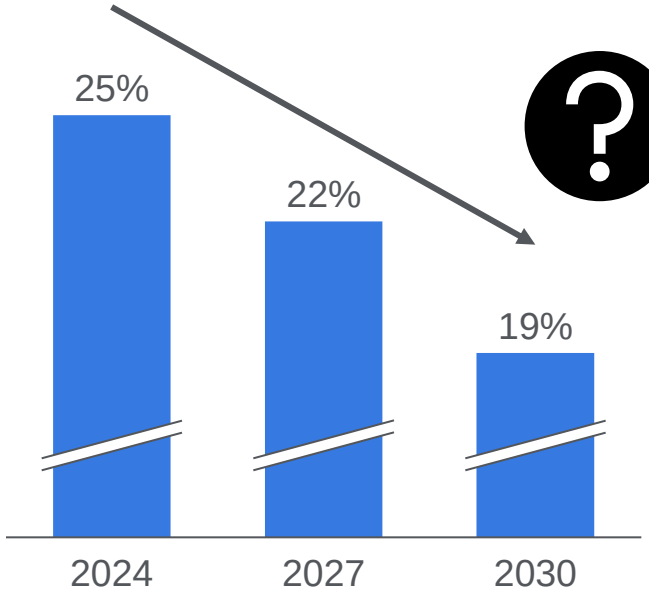


…failure rates are increasing, whilst the industry expects to generate more revenue from less investment

Clinical trial success per phase
(within 4 years, trials starting 2012-2019)



Pharma R&D spend as % of sales



How will we achieve this?

Sources: Drug Discovery Today, Sept 2024; Evaluate Pharma forecast

We need to do things differently

> *“The universe of molecules that could be turned into potentially life-saving drugs is mind-boggling in size: researchers estimate the number at around **10 to the power of 60**.*
>
> *That’s more than all the atoms in the solar system, offering virtually unlimited chemical possibilities – If only chemists could find the worthwhile ones.”*

David Rotman, Editor, MIT Technology Review, April 2020

AI is becoming an imperative for our industry if we are to improve productivity and ROI

AI is key for improving R&D productivity, but concerns remain

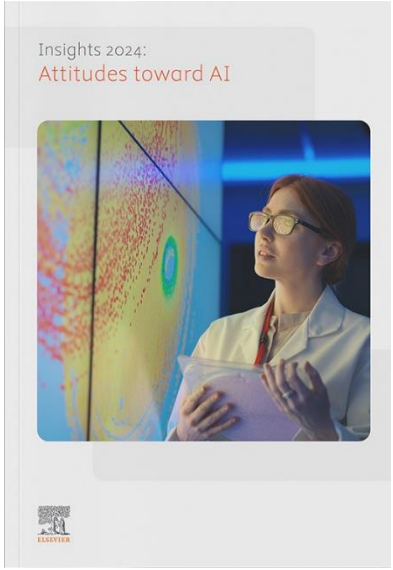
How researchers and clinicians are feeling about AI:

95% Believe AI will **accelerate knowledge discovery**

72% Believe AI will have a **transformative or significant impact** on their area of work

96% Believe AI **could be used for misinformation**

84% Believe AI **may cause critical errors**

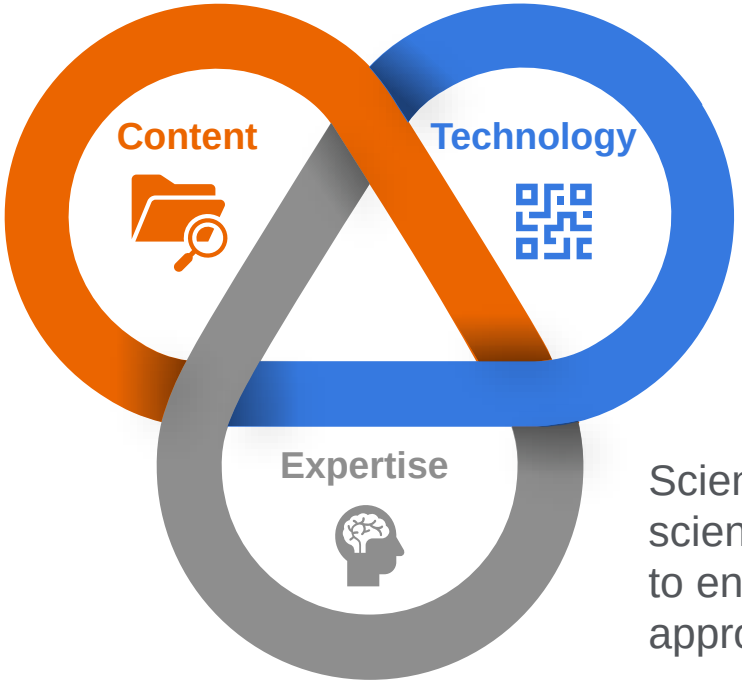


Online survey
Dec 2023 - Feb 2024

Respondents: 2,999 researchers & clinicians from 123 countries

Three key components for AI to be trusted

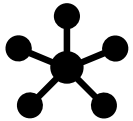
Data used in models has to be robust & trustworthy



Powerful technology with accurate models

Scientific and data science expertise to ensure approach is correct

At Elsevier, we use a range of AI / advanced technologies to help answer the most challenging R&D questions

Disease understanding	Compound development	Regulatory filing	Pharmaco-vigilance
			
Biology knowledge graph	**Multiple predictive tools**	**GenAI for regulatory insights** *[beta]*	**Comprehensive, high accuracy indexing**

Data foundations

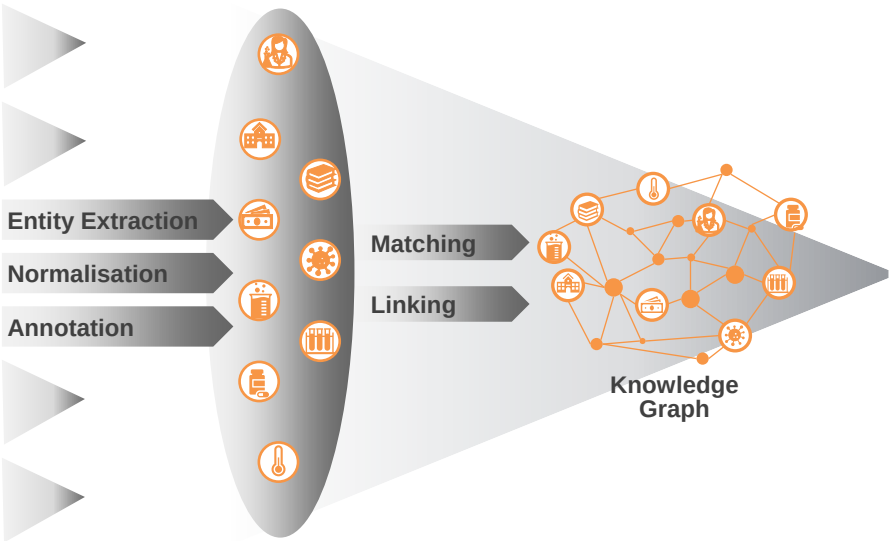
Life sciences taxonomies & ontologies	**AI extraction, excerption, relationship identification**	**GenAI / RAG scientific search**	**AI-ready APIs / datasets**

Our approach to data and AI

Data Sources

- Full text journal articles
- Book Chapters
- Clinical trials data
- FDA documents
- Drug databases
- Biomedical data
- Patents

Data Extraction, Enrichment, Linking



Sample Insights

- Relationships between biological entities
- Potential adverse events
- Biomarker discovery
- Relationships between chemical structures and biological effects
- Toxicology models
- AI predictions (multiple use cases)

But remember, when innovating - start with the problem, not the solution

When you fall in love with the solution….

One potential solution

When you fall in love with the problem….

Many potential solutions

Example: Disease understanding

Finding ‘buried’ biological connections via knowledge graph

Researcher need: Discovering connections between biological entities and how they connect to disease progression to make critical R&D decisions

- Which targets to pursue?
- Which drugs to prioritise in the development pipeline?

Biomedical Content
(36M publications + other texts)

(with option to map additional data to expand insights / use cases)

Extractive & Enrichment AI

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Biology Knowledge Graph

Multiple delivery options

UI designed for biologists

Enriched dataset

Key learnings from working with AI

1. **Start with a use case**, not a technology
2. **Make an honest evaluation of the fit of AI to this problem.** Is it truly superior to existing approaches (speed, accuracy etc.)? Is it cost effective?
3. **Be open and collaborate**, acknowledge your own bench strengths and seek partners where it makes sense
4. **Adopt responsible AI principles from outset:** Human in the loop, explainability, privacy and data governance, consider model bias
5. **Ensure the data used is robust**, comprehensive, high-quality, accurate
6. **Platform level thinking** will be needed at some stage, be ready for this

What excites me for the future

- Seamless exploration across content sources - Elsevier, customer, third party
- Continuing to put AI and advanced technologies to work where it helps customers solve a problem
- Working with the industry – development partners, technology partners etc.


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