



Why Innovation Fails

A risk management problem



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Valorizing natural gas

Gas is available in areas where it's not useful and, thus, not valuable. Moving it to other regions is hard. What to do?

LNG or gas to liquids?

Around 2001, Qatar began to incentivize GTL projects

Shell

1993: Started SMDS in Bintulu

2004: FEED study Pearl GTL

2006: FID Pearl GTL

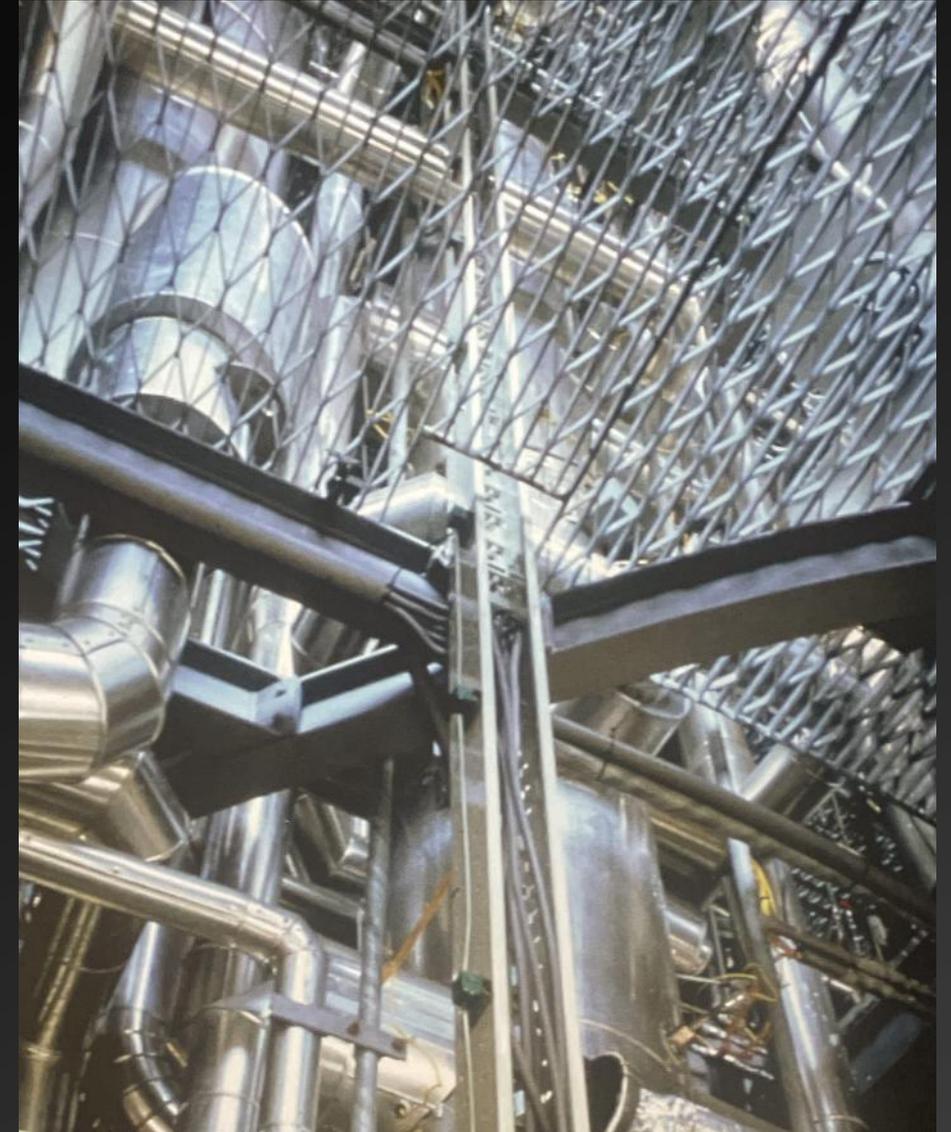
2007: Pearl GTL breaks ground

2011: First production

ExxonMobil

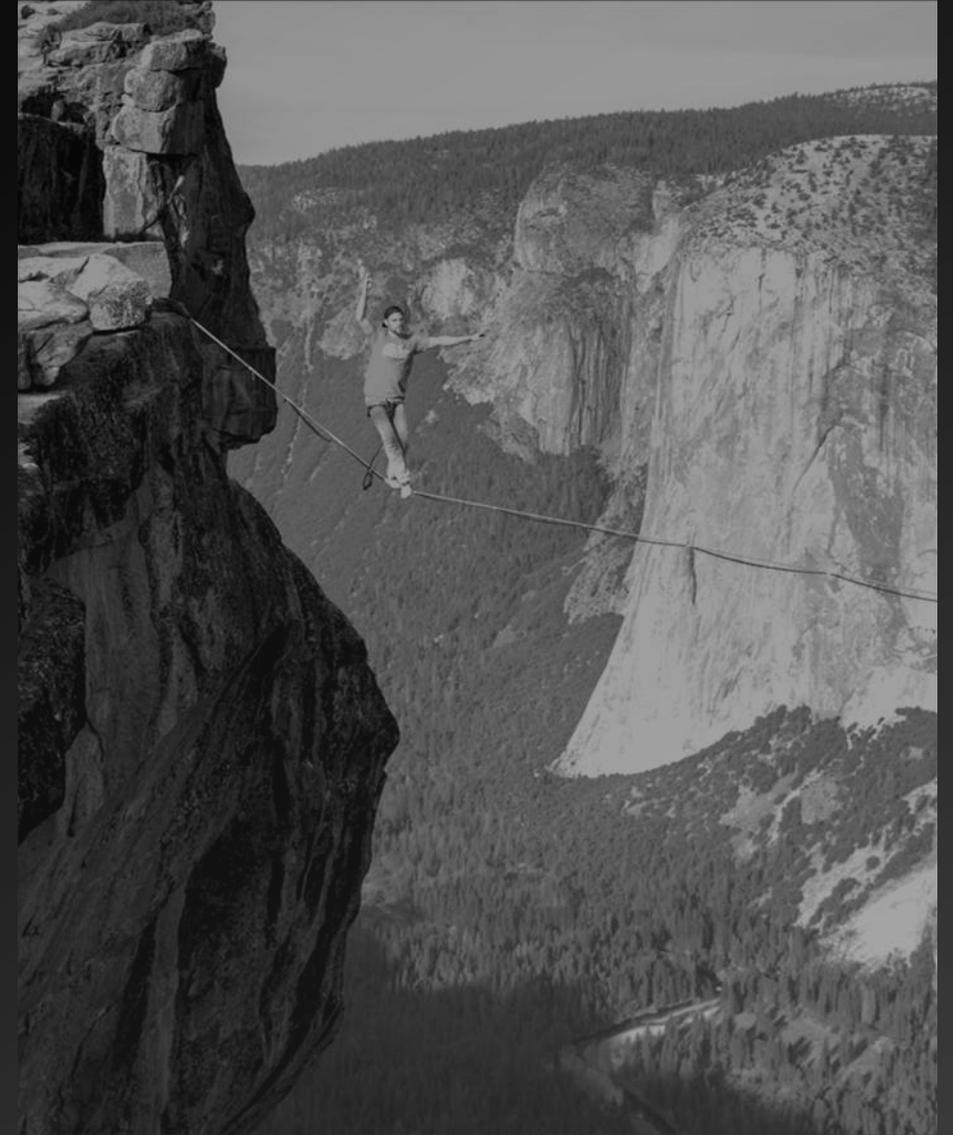
2004: Term sheet PALM GTL

2007: PALM GTL canceled



Walking the tightrope today

- 01 | The rise of innovation risks
- 02 | Managing risks
- 03 | The risk nobody mentions
- 04 | Turning risk into opportunity

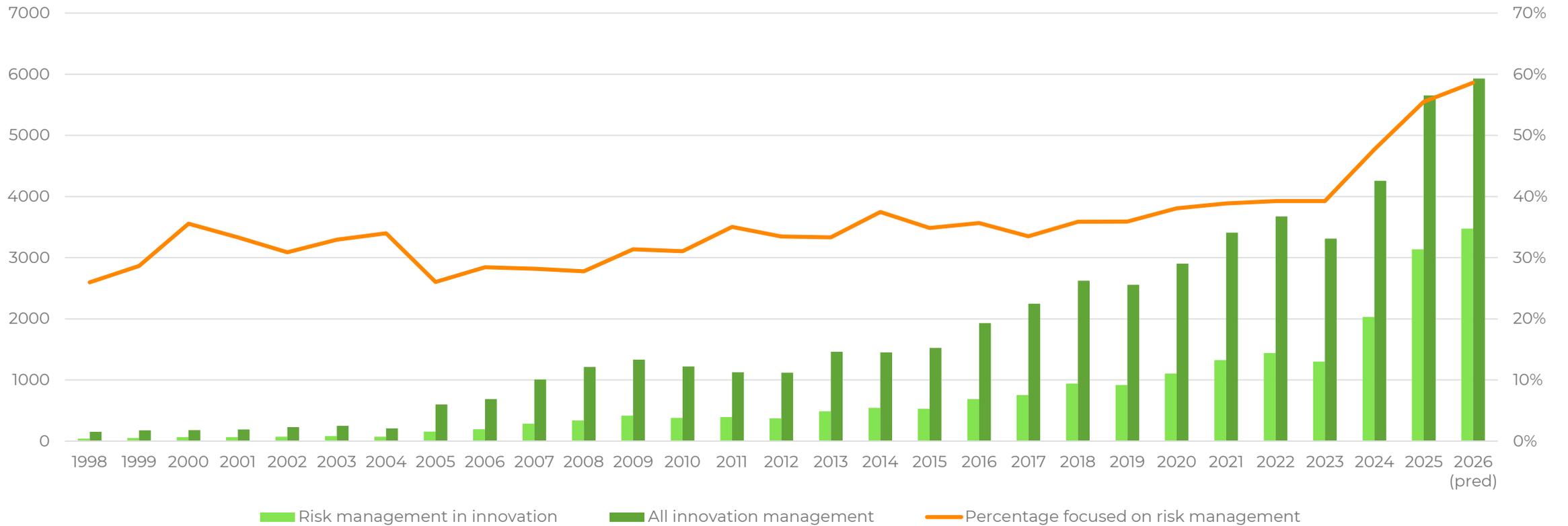




**Innovation is driven by risk perception
rather than business cases.**

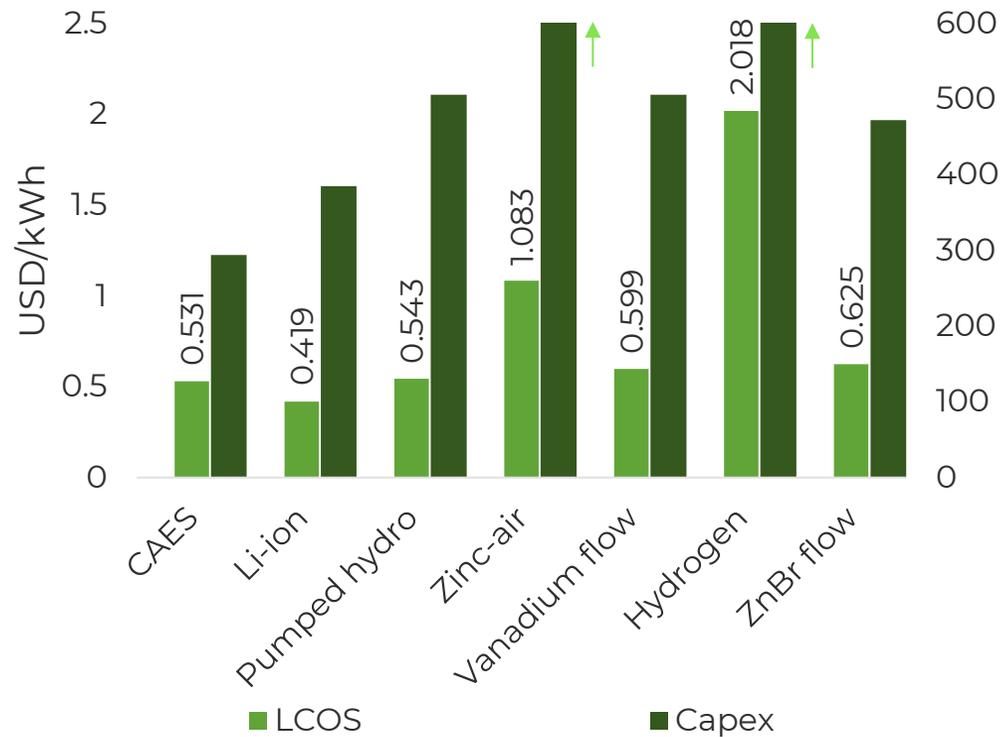
Innovation leaders' attention is turning to risk

Innovation Management Research (publications)

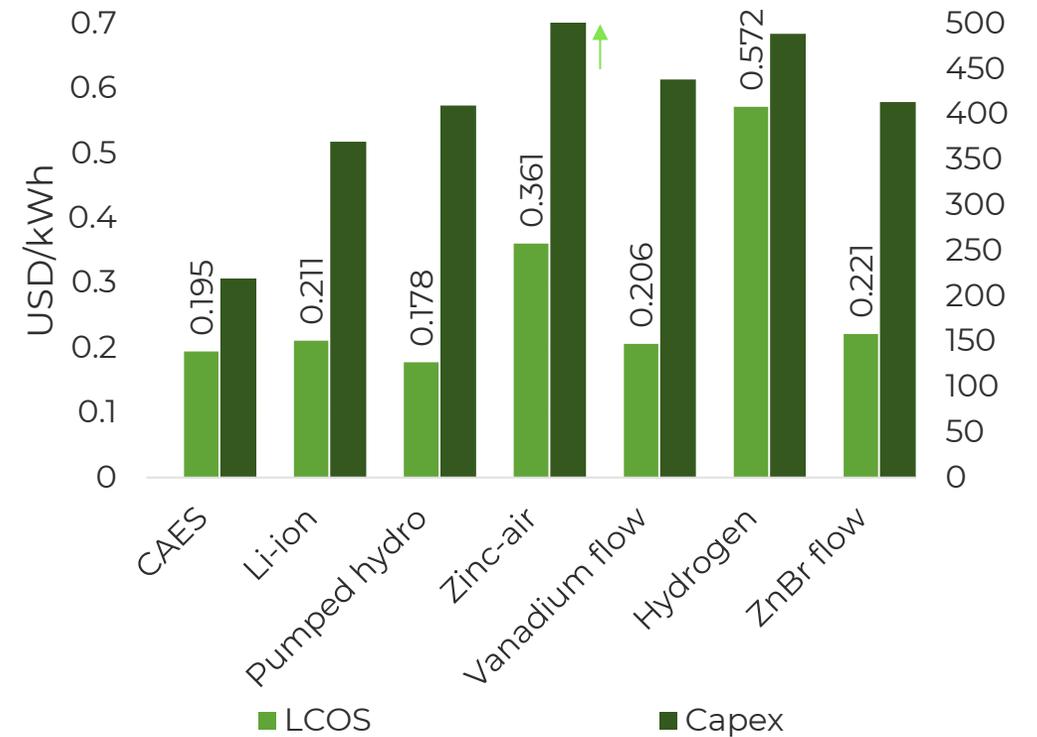


Assumptions drive the business case

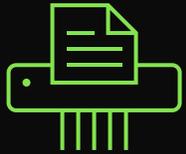
100-MW, 4-h discharge,
120 cycles/y



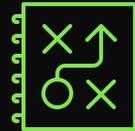
100-MW, 6-h discharge,
365 cycles/y



What businesses fear when innovating



**Betting on
the wrong
technology**



**Having the
wrong GTM
strategy**



**Missing the
right timing
in the
marketplace**



**Misallocating
precious R&D
capacity**



**Backing
ecosystems
that won't form**

Risks cannot be separated cleanly



Societal risk



Environmental risk



Financial risk



Technology risk

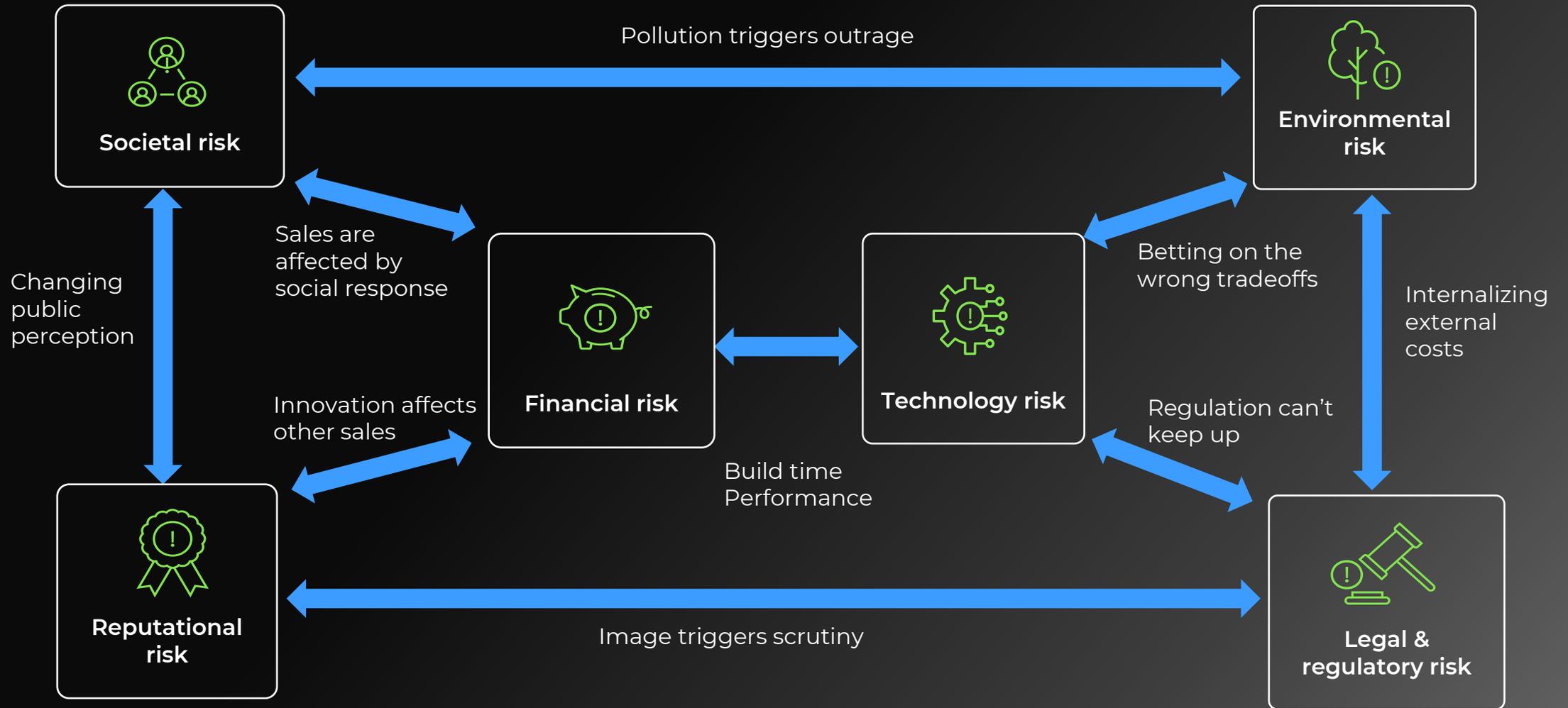


Reputational risk



Legal & regulatory risk

Risks cannot be separated cleanly



Not all risks are equal

Quantifiable



Financial risk

- Interest rates
- Capex
- Raw material costs
- Market size
- Product price
-

- Liability
- External costs
-



Legal & regulatory risk

- Regulation
- Access
-

- Backlash
- Unintended consequences
- Movements
-



Societal risk



Technology risk

- Yield
- Specifications
- Capex
- Supply chain
- R&D costs
-

- Emissions cost
- Sunk costs
-



Environmental risk

- Pollution
- Resilience
-

- Credibility
- Spillover
- License to operate
- Partners
-



Reputational risk



Managing risks is not limited to the business case; it requires a broad view on your entire business context.

At least two types of risk management

QUANTIFIABLE

Risk = Probability × Impact

- **Stage gating:** Reduce probability while increasing exposure (impact)
- **Monte Carlo simulations:** Estimate real probability × impact number
- **Real options valuation:** Weigh the quantifiable risk against potential return to determine investment

NOT QUANTIFIABLE

Derisk = Options × Agility

- **Scenarios:** Helping you prepare options and know when to switch
- **(Consumer) trends:** Shape messaging and anticipate backlash
- **First principles:** If an issue is inherent, it will surface, so prepare for it

Picking the risk you know

Metallocene catalysts allow more precise synthesis of polyolefins. However, they are more expensive and potentially incompatible with existing assets.

Dow took the leap

Late 1980s: Licensed the catalyst technology from ExxonMobil

1993: Launched INSITE technology

1990s: Strong growth of ELITE (picture) and AFFINITY products

1997: UNIPOL joint venture between Dow and ExxonMobil to license the technology



Biding your time (Monte Carlo)

Boeing considered composites for the fuselage of the 777 when starting development in 1988.

While the business case was clear (better payload), the variability in the business was very high, driven by:

- Engineering uncertainty (how much material is needed)
- Manufacturing uncertainty (no large-scale manufacturing had been done)

In 2003, developing the 787 Dreamliner, the uncertainty had shrunk.



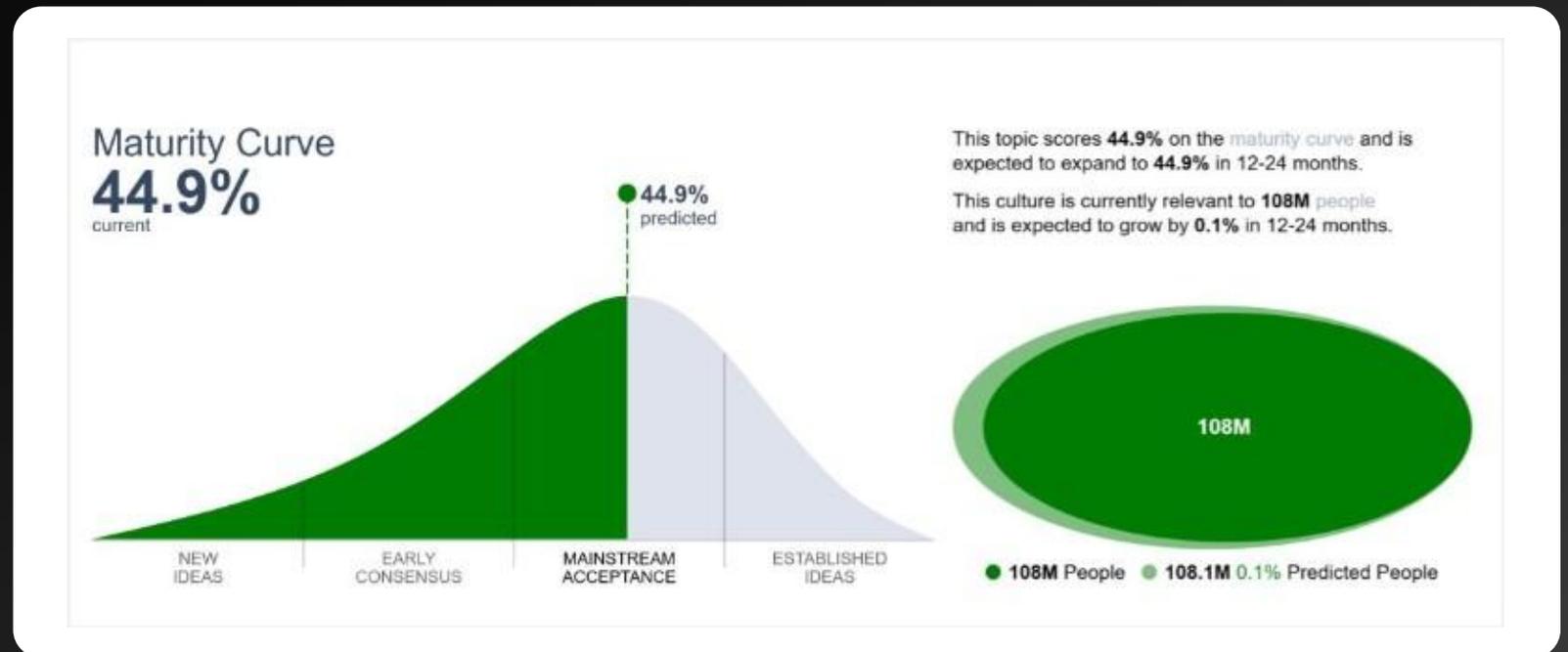
The rolling PFAS crisis

- Food



The rolling PFAS crisis

- Food
- Cooking and household goods



The rolling PFAS crisis

- Food
- Cooking and household goods
- Cleaning products



The rolling PFAS crisis

- Food
- Cooking and household goods
- Cleaning products
- The health contradiction of sports equipment
-



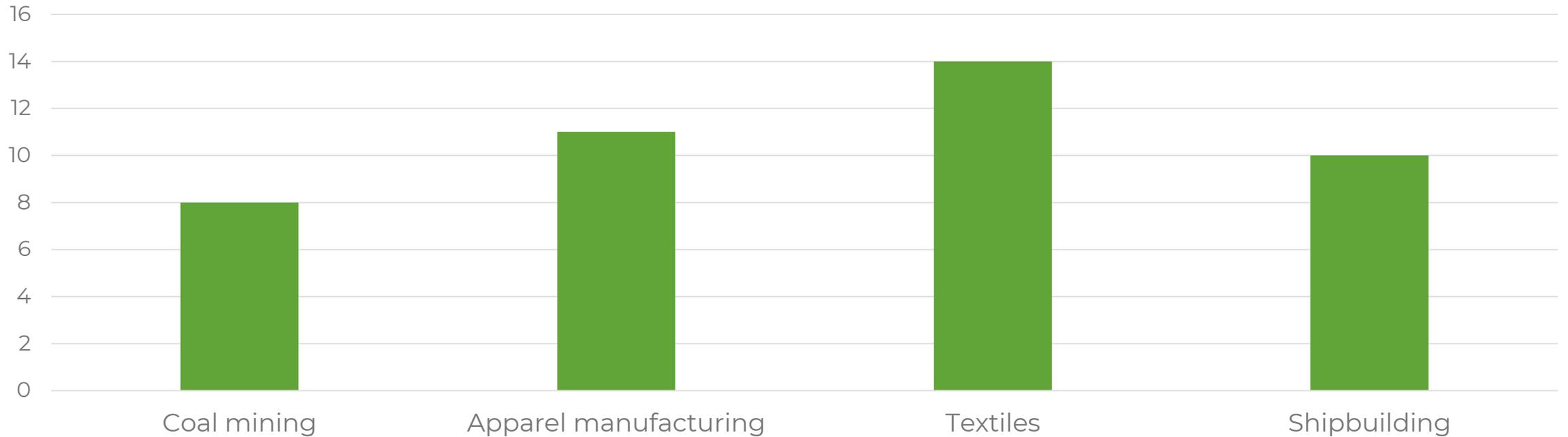


**If you think innovating is risky, try not
innovating.**

This is the risk nobody mentions.

Industry half-life

Industry Half-Life (years)



Data for the U.S. measured by reduction of employment in the segment after the peak

Sticking with the telegraph

Bell offered to sell the telephone patent to Western Union in 1876.

The company refused, citing:

- Inferior technology
- Questionable demand
- Cannibalization of existing business

Around 1900, Bell Telephone equaled Western Union's revenue.





**A structural risk always materializes and
you can use that fact.**

Humans don't process nonlinearity and scaling

Risk = Probability × Impact

At first: Probability is high; impact is low. There is no risk until it scales.

At first: Impact is limited. There is no risk, until your innovation changes the game.



Refrigerants: Innovation enabled regulation

DuPont recognized how chlorofluorocarbons (CFCs) would eventually be untenable and developed hydrofluorocarbons (HFCs). This enabled regulation to ban CFCs.

Later, Chemours recognized how HFCs also became untenable and developed Hydrofluoroolefins, enabling regulation to ban HFCs.



Key Takeaways

1

Business cases can be tweaked; risks cannot.

Risk perception governs innovation as the risk perception determines whether your business case is deemed credible.

Managing risk and the perception of risk is the key to success in innovation.

2

Innovation lets you take control; the status quo won't.

Doing nothing also has risks. It is important to weigh the innovation risks against the alternative (no innovation).

Within innovation, you can manage risk and pick the best options. In the status quo, you have no control.

3

Key, inherent, vulnerabilities will materialize to your benefit.

If there is key vulnerability in a product or technology, it will materialize when the technology scales enough. At that moment, you can benefit by enabling regulation.



Thank You



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The “Lux Take” is trusted by innovation leaders around the world, many of whom seek our advice directly before placing a bet on a startup or partner — our clients rely on Lux insights to make decisions that generate fantastic business outcomes. We pride ourselves on taking a rigorous, scientific approach to avoid the hype and generate unique perspectives and insights that innovation leaders can't live without.

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