

Scaling Deep Tech from Lab to Product

What the board must decide — and when — to carry science from TRL 1 to 9.

RESEARCH

DEVELOPMENT

DEPLOYMENT

THE THESIS

The gap is organisational, not scientific.

~80%

of lab technologies stall before reaching the market.

15–20_{yr}

shadow cast by the technology choices you make today.

3x

the cost of fixing the organisation late vs. planning ahead.

The team that invents is rarely the team that scales — for the board, this is a capital and oversight question.

Nine levels, three phases.

1

RESEARCH

TRL 1–3

Is it possible?

2

DEVELOPMENT

TRL 4–6

Is it repeatable?

3

DEPLOYMENT

TRL 7–9

Can it scale?

Prove it works, make it work every time, then deliver it at scale and at a margin.

Research — Proving it is possible

TRL 1–3

ORGANISATIONAL SHAPE

Team

Small, flat group of scientists / founders

Leadership

The inventor or principal researcher

Culture

Curiosity, experimentation, tolerance of failure

WHAT MATTERS MOST

- Optimise for learning speed — many cheap experiments
- Document everything; data and IP feed later stages
- Keep the team deliberately small; size slows discovery
- Define the target application to stay anchored

KEY RISK

Falling in love with the technology instead of validating a genuine market need.

Development — making it work reliably

TRL 4–6

ORGANISATIONAL SHAPE

Team

Cross-functional: engineering, product, quality

Leadership

Founders plus first professional managers

Culture

From “does it work?” to “every time?”

WHAT MATTERS MOST

- Bring in engineering and operations skills
- Introduce lightweight process: reviews, basic QA
- Build and test prototypes in a relevant environment
- Protect the founding team’s knowledge

KEY RISK

The “valley of death” — running out of capital or focus before the product is repeatable.

Deployment — delivering it at scale

TRL 7–9

ORGANISATIONAL SHAPE

Team

Full org: operations, sales, support, supply chain

Leadership

Professional executives; founders advise

Culture

Reliability, quality, customer & cost discipline

WHAT MATTERS MOST

- Shift success to customers, margin and uptime
- Standardise manufacturing, supply chain, support
- Build repeatable go-to-market and after-sales
- Establish governance, quality and risk systems

KEY RISK

Scaling cost and complexity faster than revenue, or losing quality under volume pressure.

Where technologies are made or broken.

The lab proves an idea can work. The market needs a product. The decisive middle is TRL 3 to 6.

80%

of failures occur in this band — not in research or deployment.

2–4x

capital-intensity step-up versus the research phase.

18–36

months

typical time from TRL 3 to a credible TRL 6 demo.

Chade Hydrogen specialises in carrying technologies through exactly this band.

Where it usually goes wrong.

Process too early

Heavy governance in research smothers experimentation.

Process too late

A lab mindset at scale surfaces quality problems in front of customers.

Wrong people, wrong stage

Holding — or replacing — founders at the wrong moment breaks the venture.

Funding the wrong curve

Capital tuned to discovery, not the long climb out of the valley of death.



The science tells you if it can be built.

The organisation decides whether it ever ships.

Scaling from lab to product is a board-level decision. Staged deliberately — capital, hires and oversight ahead of need — it becomes a durable advantage.

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Bring the scale-up question to your board.