



# The End of the Technology Roadmap



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# Your Roadmap for Today

1

Exploring  
the valley

2

Finding  
companions

3

Reaching  
the summit

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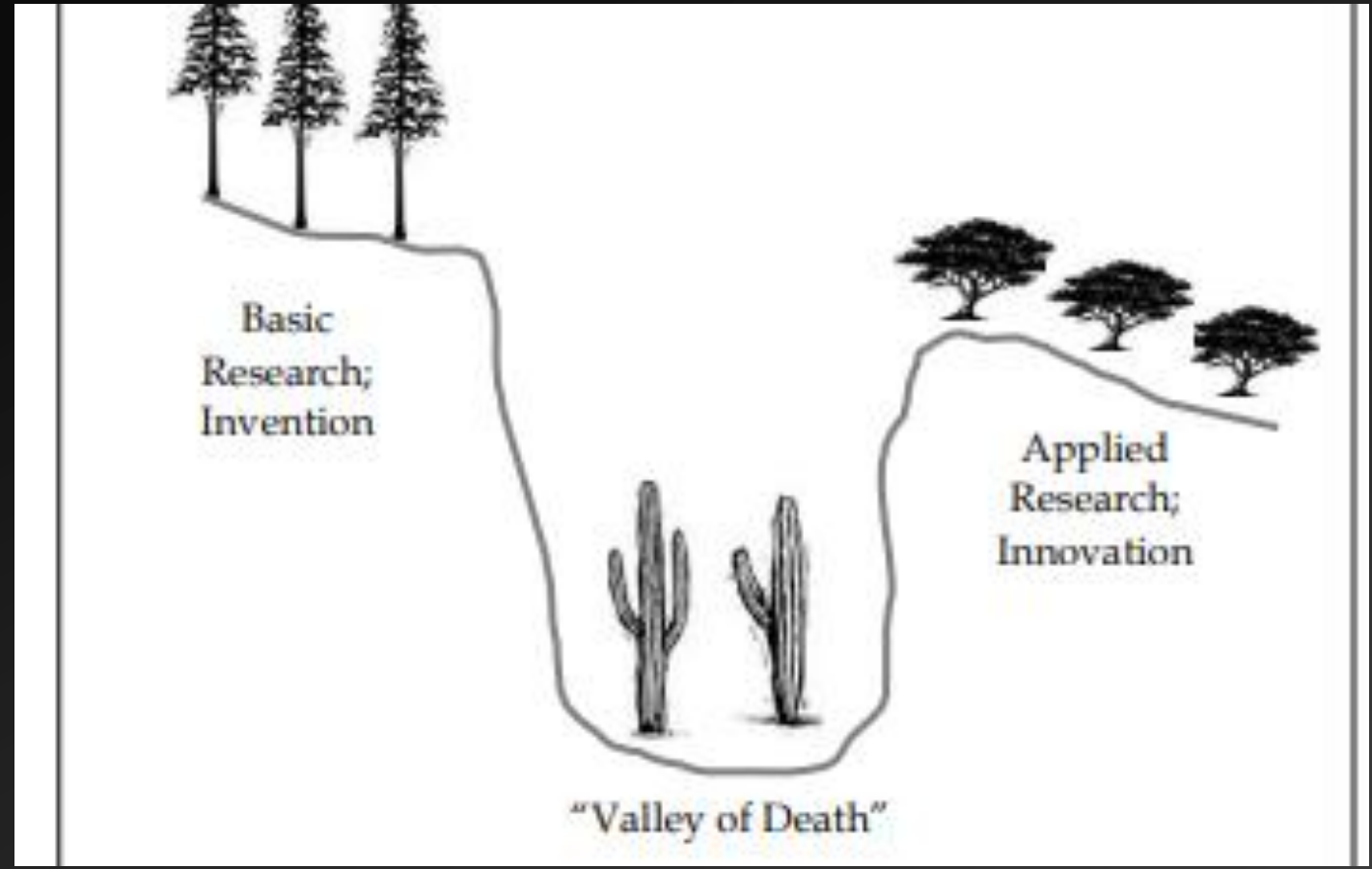


**How do you improve conversion of R&D  
into revenue?**

# The Infamous Funding Gap

Since 2007, we have the notion of the Valley of Death of innovation.

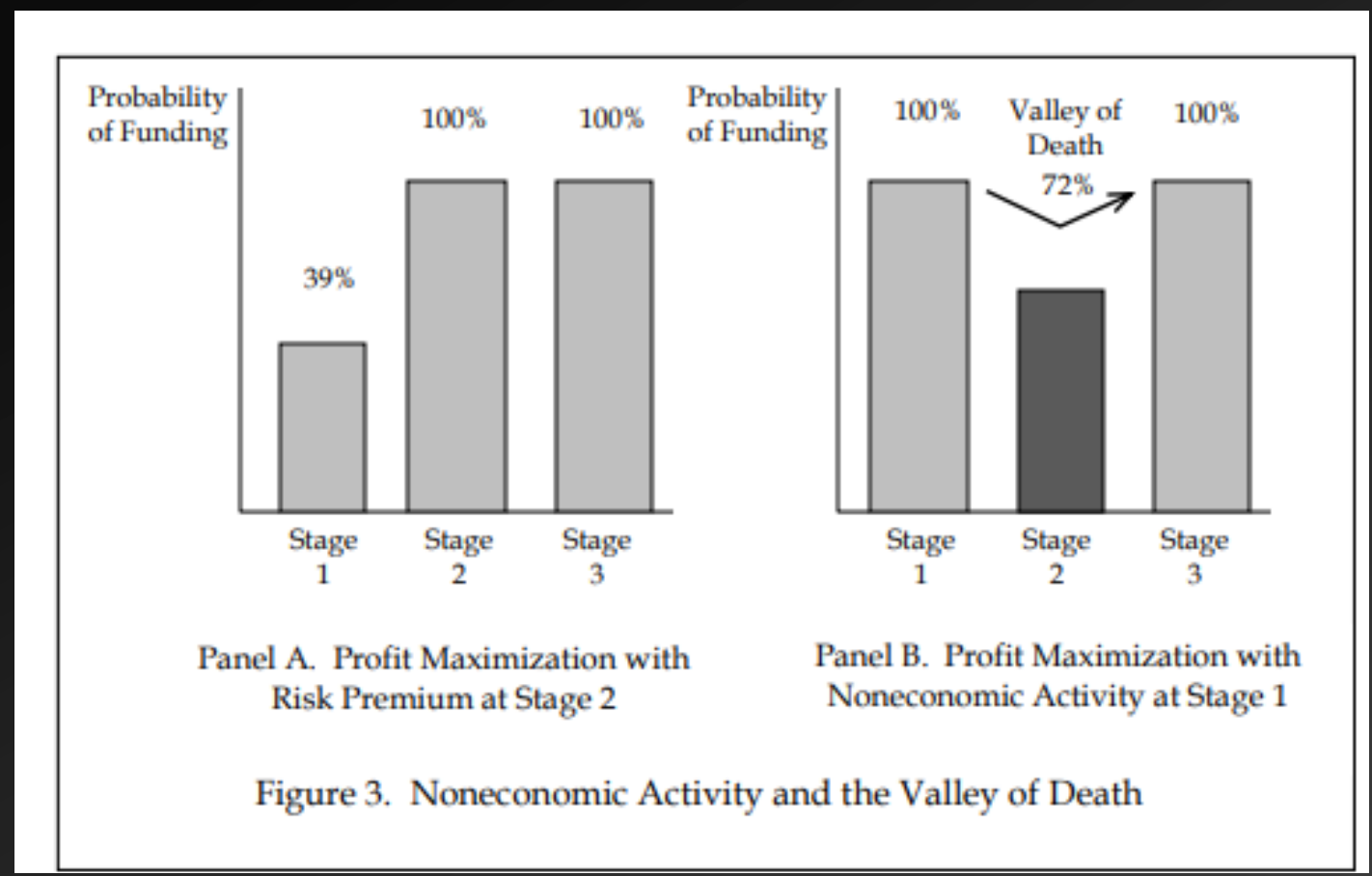
Promising inventions are not funded for further development and deployment.



# The Infamous Funding Gap

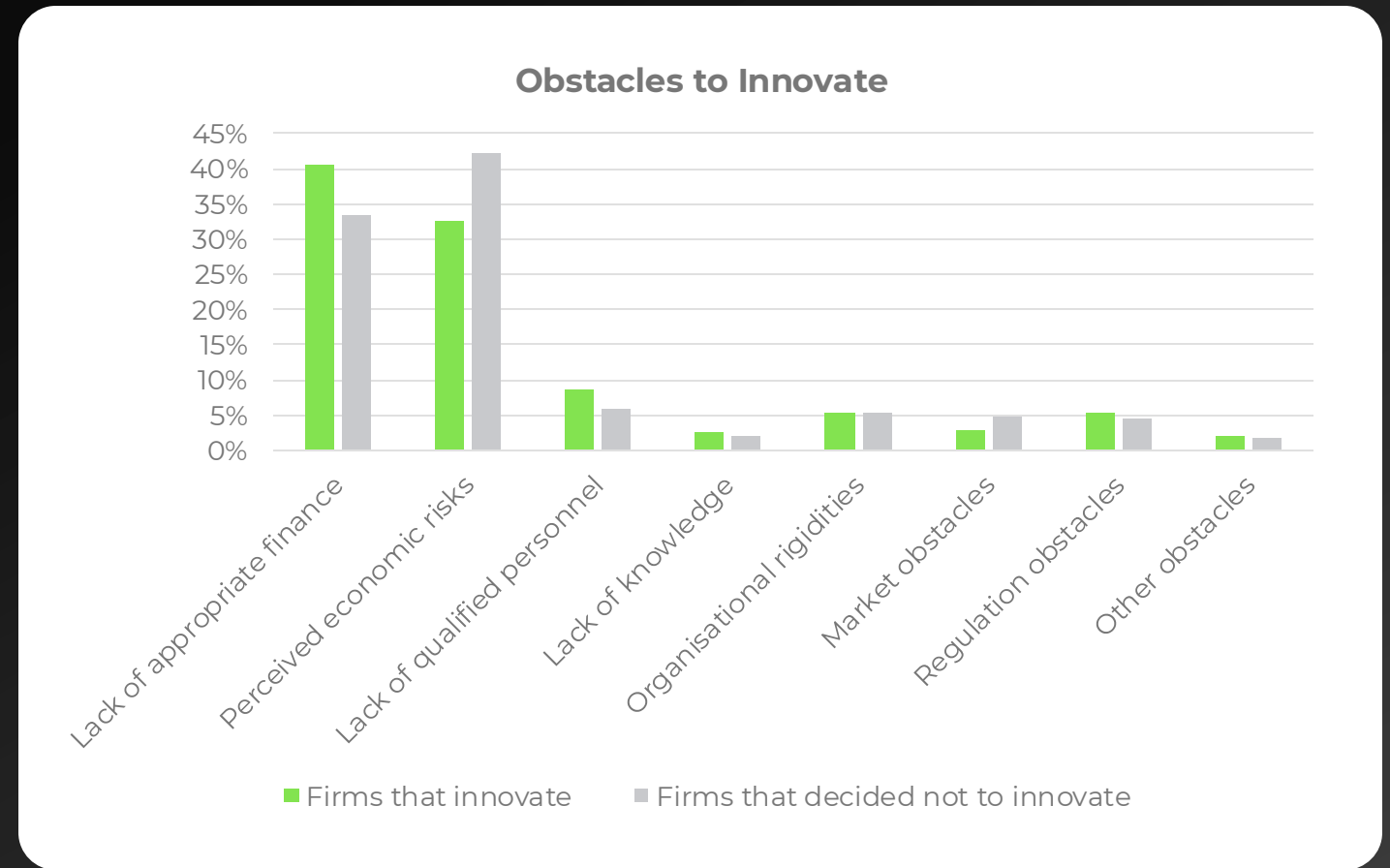
The original study also found the reason: funding noneconomic projects at an early stage.

Note: This is not about technology risks in Stage 1.



# Perception is King

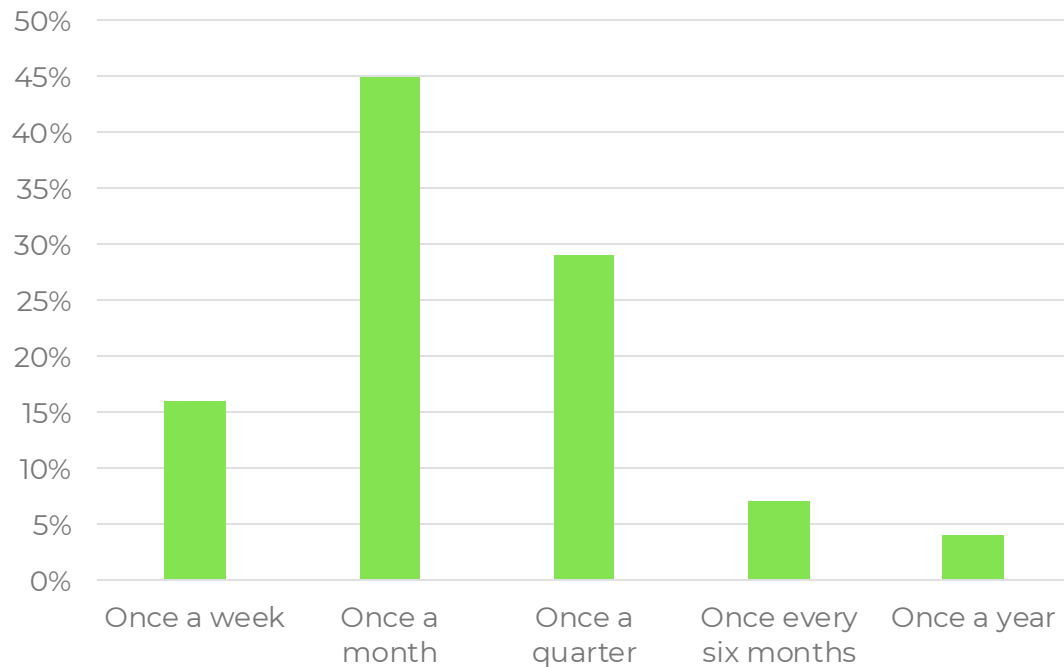
A recent survey of industrial firms shows that risk perception is the main reason not to pursue innovations.



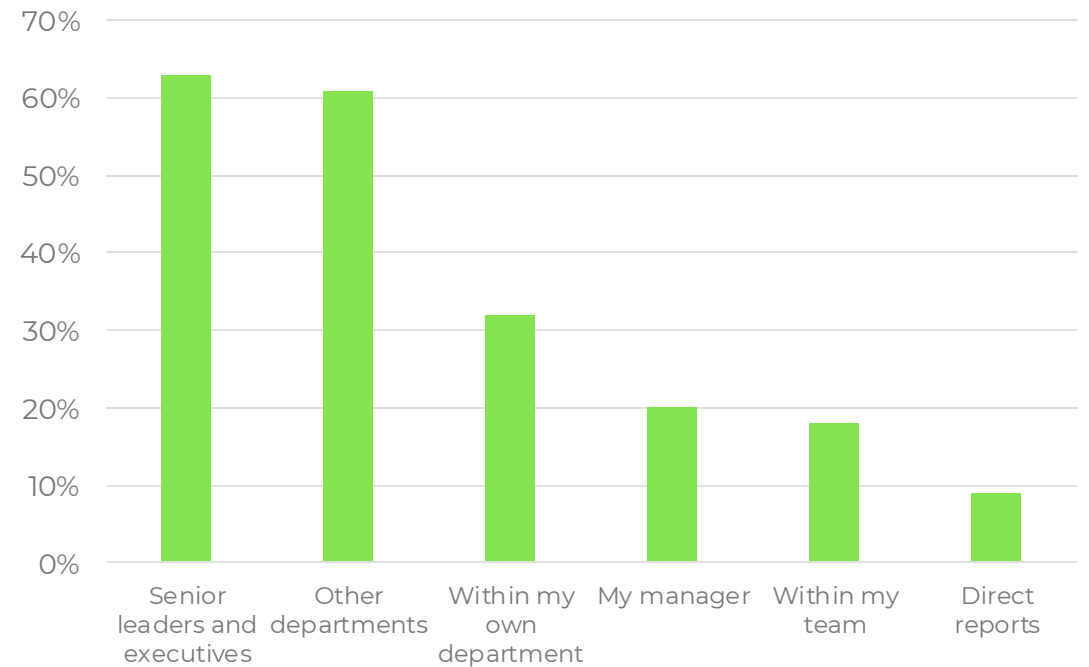
# Communication is Key

Aligning on the goal and value of innovation is a major concern

### Occurrence of Communication Breakdown



### Roles Where Communication Issues Occur



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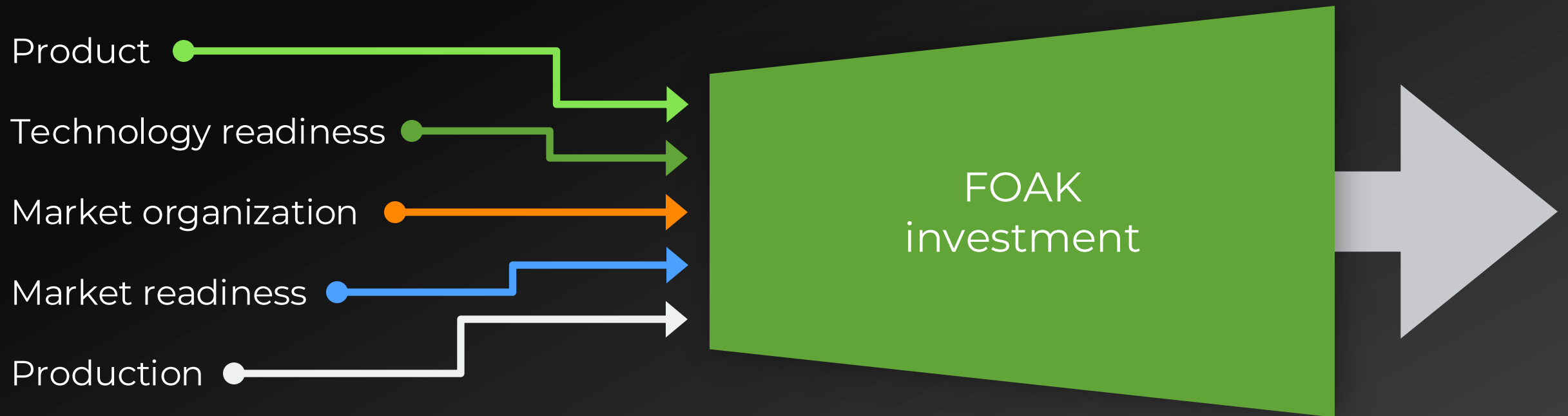
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# More Than Technology

Lux Research's innovation maturity indicator looks at five aspects that must converge to allow the first-of-a-kind (FOAK) investment decision.

TRL is just one of them.



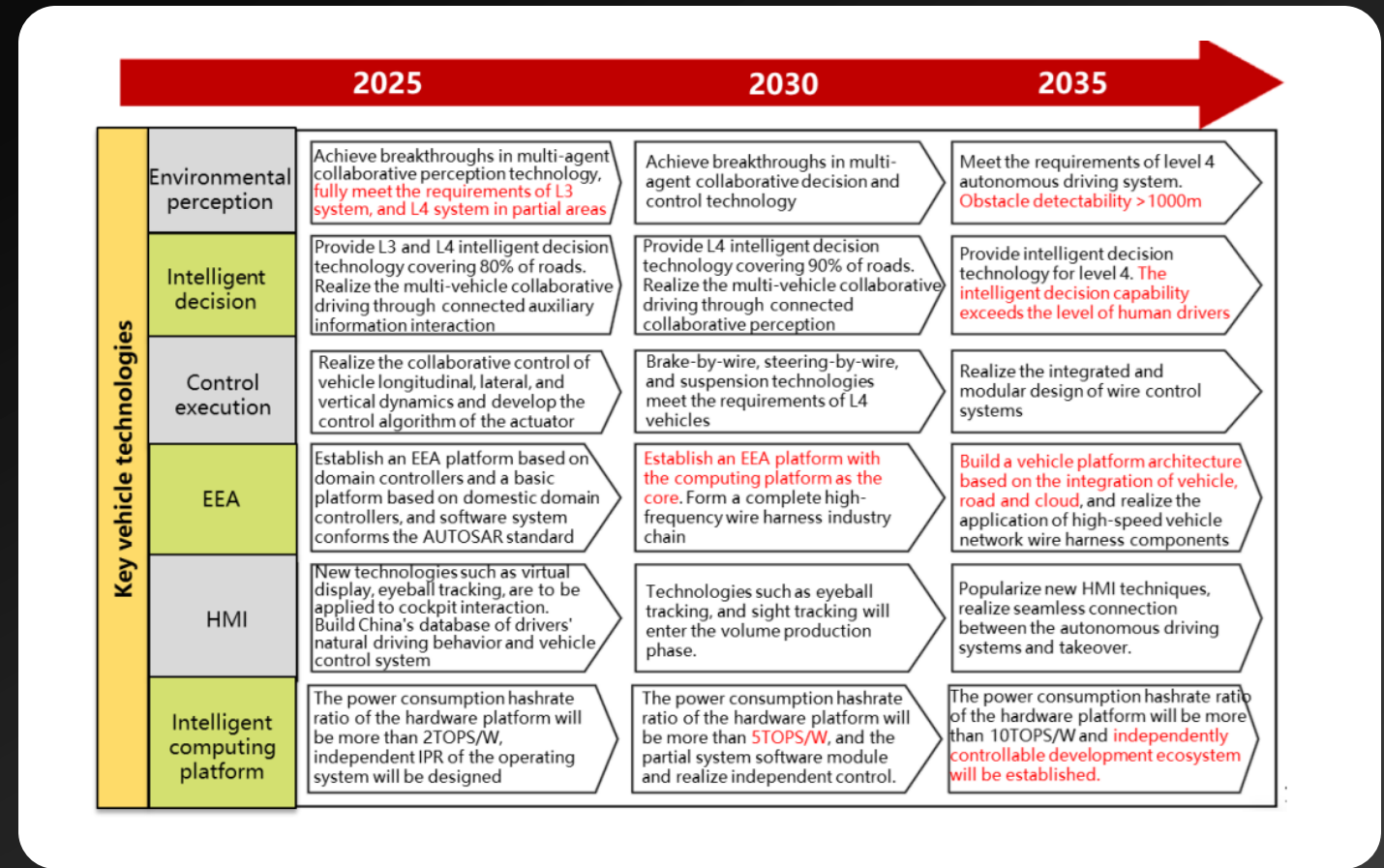
# What's Not There...

**Product:** What need are you trying to fulfill with ICVs and when?

**Market organization:** How do laws and insurance keep up with developments?

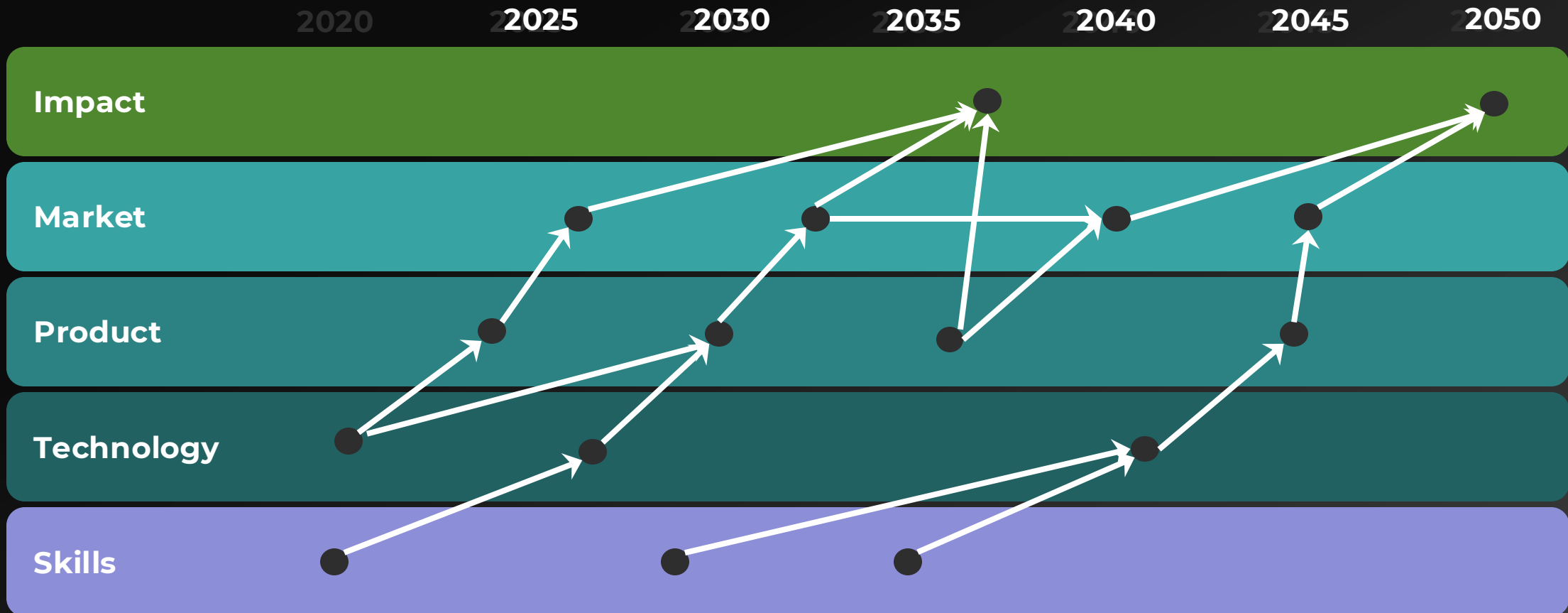
**Market readiness:** Which groups of buyers should you address and when?

**Production:** How will the value chain develop?



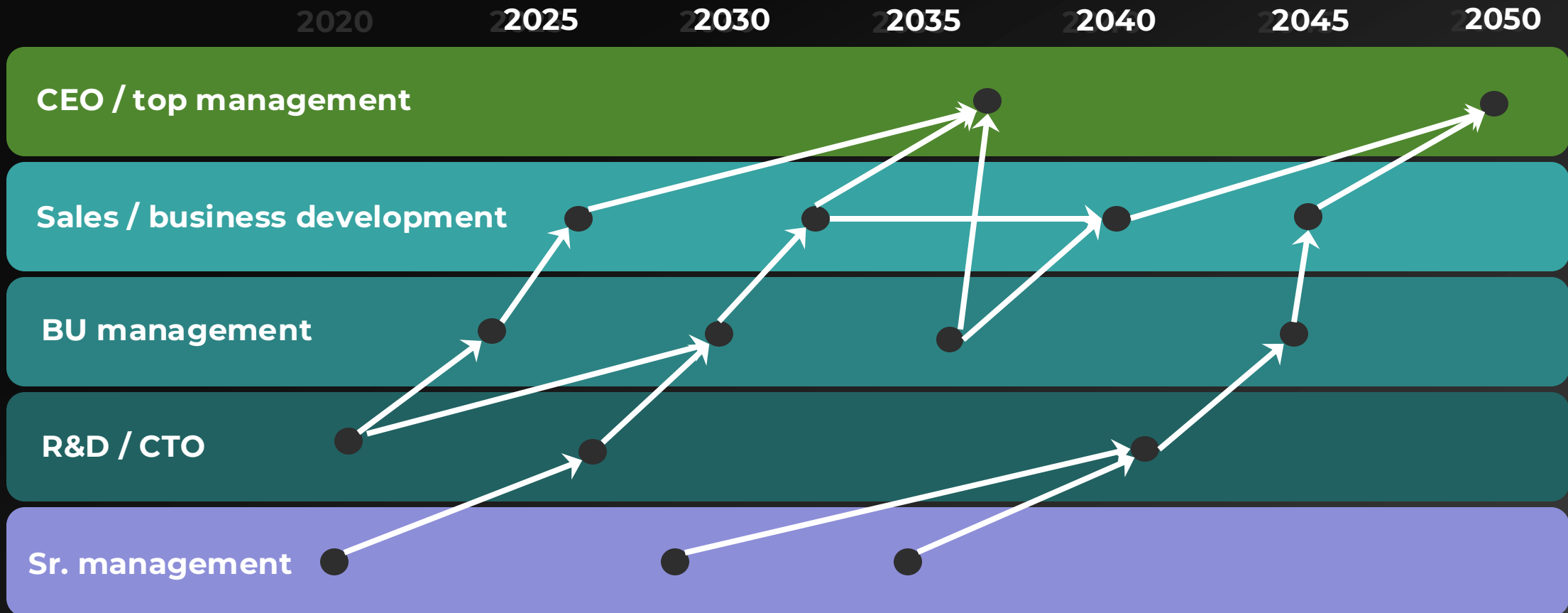
# Layered Strategy Roadmaps

Rather than focusing on technology, take an integrated approach



# A Platform for Communication

Involve all stakeholders at the right level and time



# Posing the Right Questions

Backcasting the strategy by articulating the right questions



# Providing Relevant Answers

A productive dialogue to make coherent choices



2020



Short-term

2035

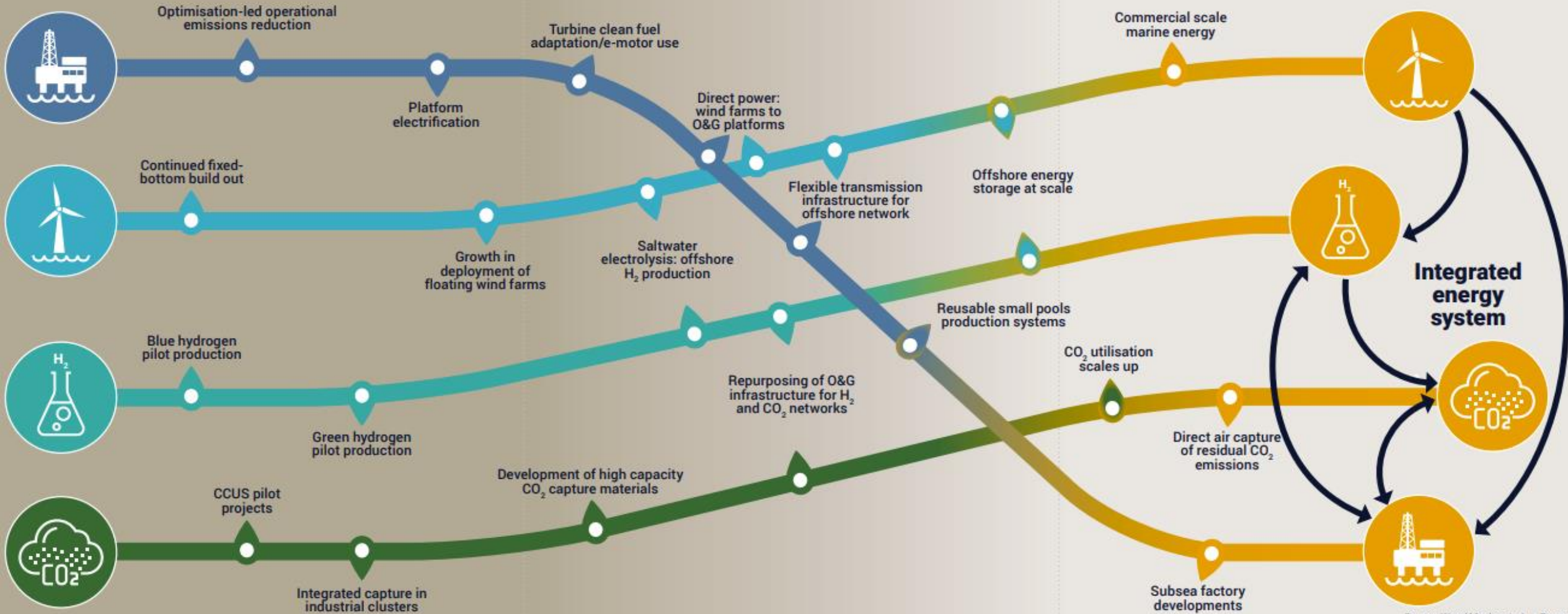


Mid-term

2050



Long-term



Source: Wood Mackenzie, Lux Research

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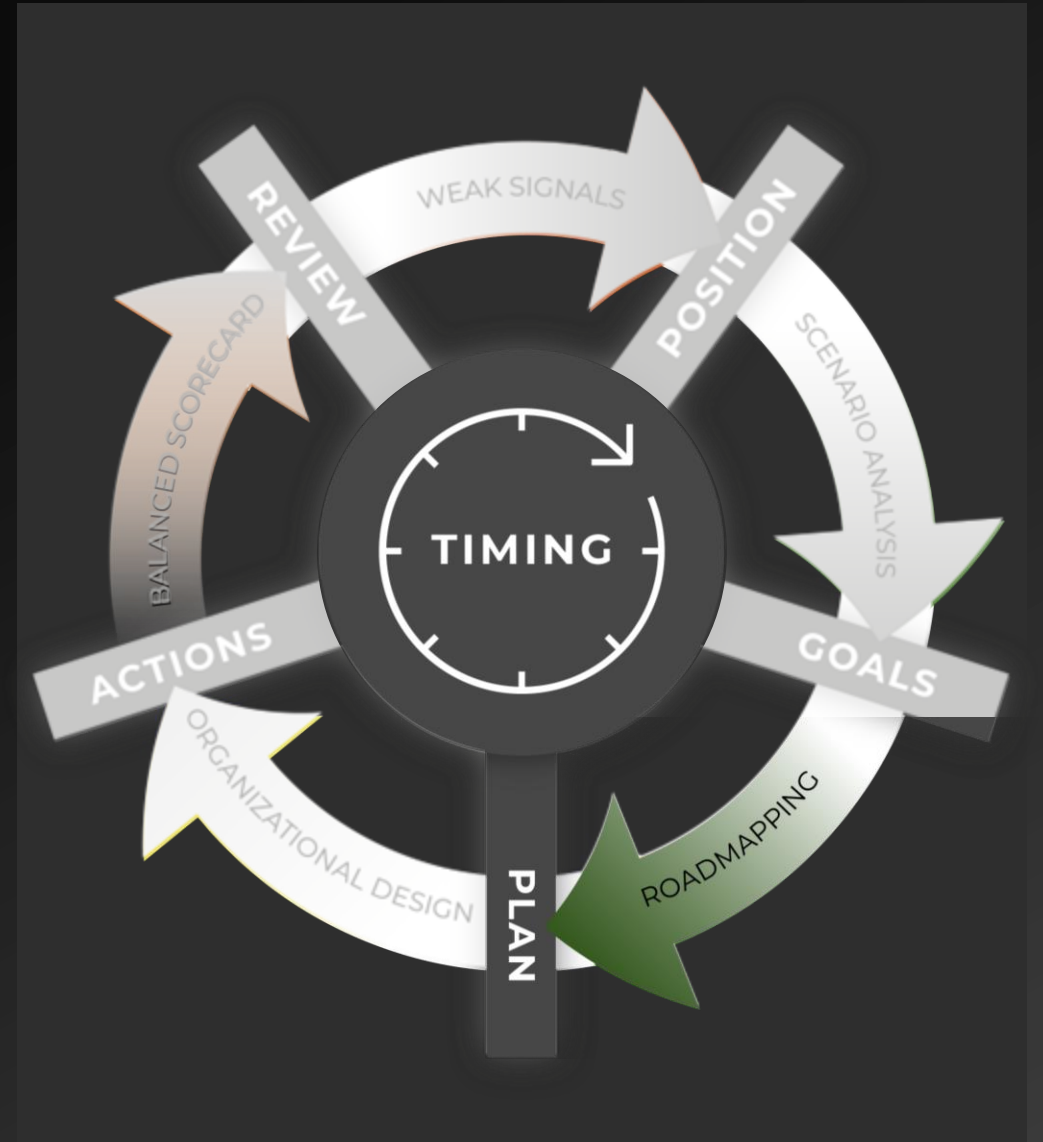
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# Start by Laying the Foundation



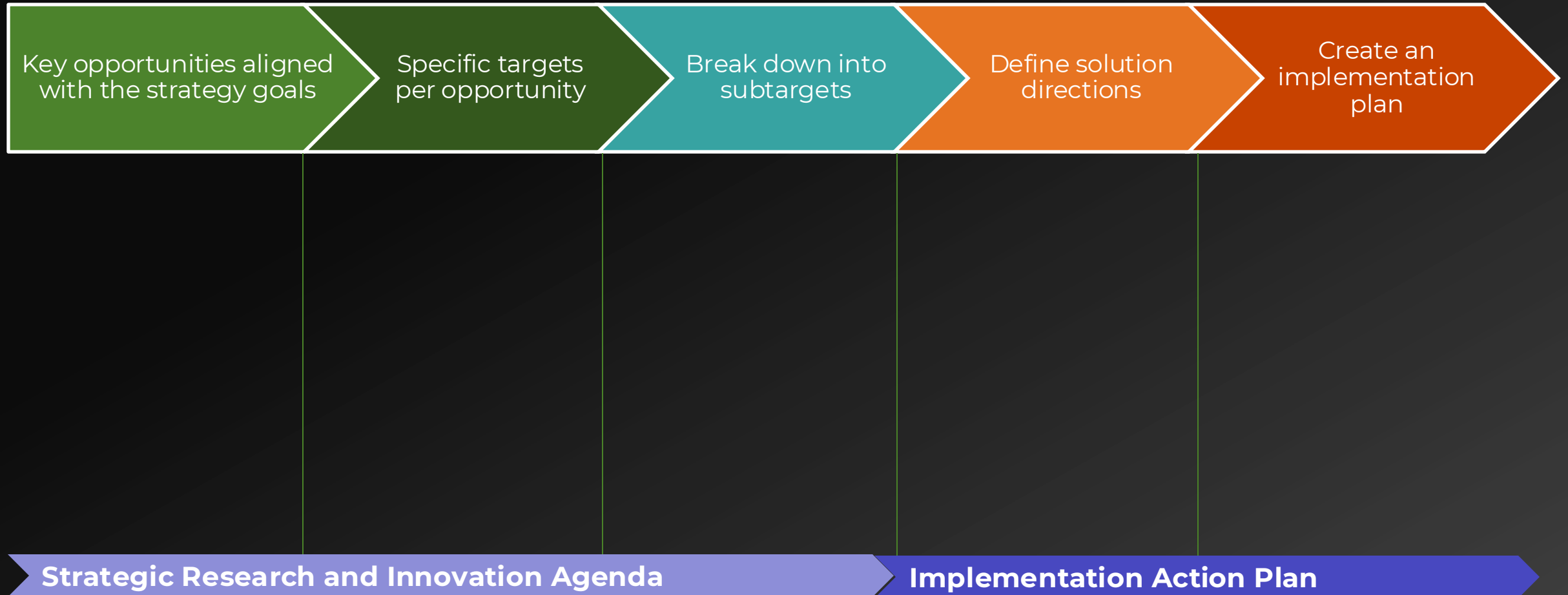
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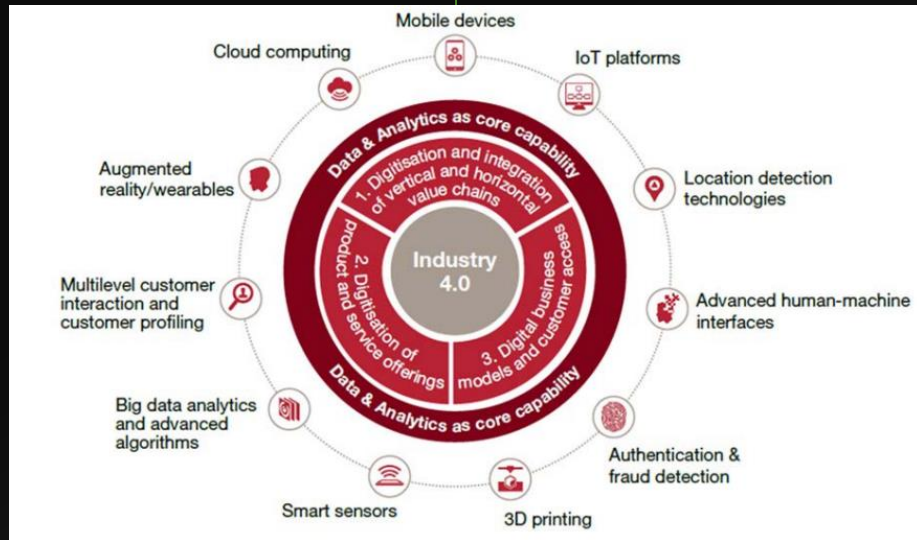
# Two Decisions, Five Steps

Establish a strategic agenda first, then define the actions



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The smart industry roadmap identifies 10 opportunities for product development, originating from the Industry 4.0 trend.

Strategic Research and Innovation Agenda

Implementation Action Plan

# Two Decisions, Five Steps

Establish a strategic agenda first, then define the actions

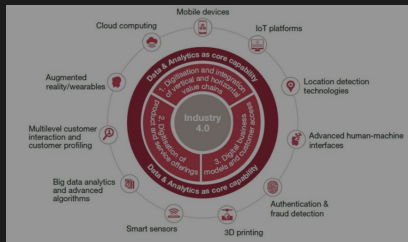
Key opportunities aligned with the strategy goals

Specific targets per opportunity

Break down into subtargets

Define solution directions

Create an implementation plan



The smart industry roadmap identifies 10 opportunities for product development originating from the Industry 4.0 trend

## Production Equipment Technology Requirements

Year of Production	2015	2017	2019	2021	2023	2025	2027	2029
<b>DRAM ½ Pitch (nm) (contacted)</b>	24	22	18	15	12	10	9	8
<b>Wafer Diameter (mm)</b>	300	300	300	450	450	450	450	450
<b>Process equipment availability (A80)–300mm</b>	>95%	>95%	>96%	>96%	>96%	>96%	>96%	>96%
<b>Process equipment availability (A80)–450mm</b>			93%	> 93%	>93%	>93%	>93%	>93%
<b>Metrology equipment availability (A80)–300mm</b>	>98%	>98%	>98%	>98%	>98%	>98%	>98%	>98%
<b>Metrology equipment availability (A80)–450mm</b>			> 95%	> 96%	>96%	>96%	>96%	>96%
<b>Maximum allowed electrostatic field on wafer and mask surfaces (V/m) for ESD prevention</b>	2,600	2,000	1,550	1,300	1,000	775	650	TBD
<b>Maximum recommended electrostatic field at chrome mask surfaces (V/m) for EFM</b>	500	500	500	500	500	500	500	500
<b>Minimum equipment data output rates (Hz) from a tool</b>	10Hz	100Hz	100Hz	1kHz	1kHz	>1kHz	>1kHz	TBD
<b>Pervasiveness of APC as an integral part of equipment design and operation</b>	Partial	All	All	All	All	All	All	All
<b>Pervasiveness of predictive technologies such as virtual metrology PdM, yield prediction and predictive scheduling in certain equipment components (e.g., vacuum, abatement, gas supply systems) feeding into overall equipment predictive solution, to support improvements such as reduction in unscheduled downtime and improved yield.</b>	Partial	Partial	Partial	All	All	All	All	All
<b>Pervasiveness of Equipment Health Monitoring capability as a common health indication capability across tools</b>	Partial	All	All	All	All	All	All	All

The semiconductor industry roadmap is very specific about targets to hit per year.

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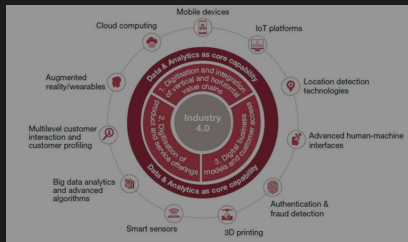
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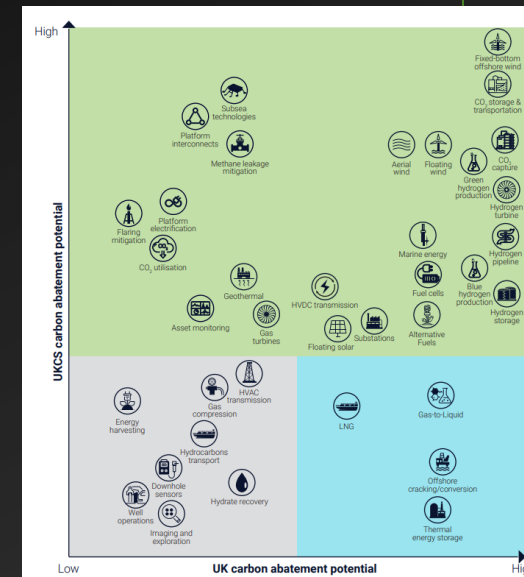
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For the U.K. net-zero technology centre, we mapped solutions by impact and attractiveness

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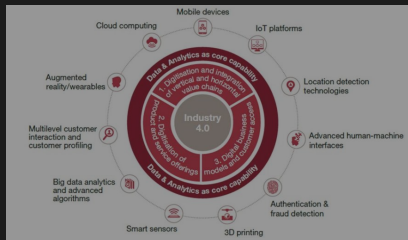
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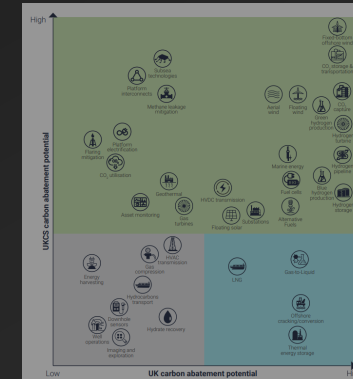


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For the UK net-zero technology centre, we mapped solutions by impact and attractiveness

The implementation plan is a description of all projects to be developed.

Strategic Research and Innovation Agenda

Implementation Action Plan

# Key Takeaways

1

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## Roadmaps are a communication platform.

By labeling your roadmap a “technology” roadmap, you diminish its power as a platform for the innovation dialogue in your company.

Make sure to involve all stakeholders when developing the roadmap.

2

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## Roadmaps require a carefully structured development process.

The main purpose of the roadmap is to create alignment. This must happen across various levels and functions.

The roadmapping process must first develop the “right” questions and then propose the “best” answers.

3

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## A strategic innovation roadmap must consider 5 factors.

Technology deployment depends on five critical factors that must converge.

Instead of just considering technology, an innovation roadmap must ensure convergence of all these factors.

# Lux Client Action Items

- 1 Lux can help you hit the ground running for your roadmap.**

Before developing the roadmap, you must have a clear overall goal. Use our consumer insights and our annual trends reports to define it or ask Lux consultants to help.
- 2 Use patent and news trends to identify white spaces.**

Use the Lux patent trends and news trends reports to identify white spaces and opportunities to put on your roadmap.
- 3 Use Consumer Insights and our case studies to define clear targets.**

Define quantitative targets for the selected opportunities using the Lux Research case studies and the virtual anthropologist.
- 4 Use Lux's analysts as a sounding board or our consultants as a team extension.**

Lux is here to provide you with the latest insights, feedback, and new ideas. You can do this through inquiry or by getting the help of our team of experienced consultants.



# Thank You



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# About Lux

Lux Research fuels innovators to not only imagine what's possible in the future but also operationalize innovation success in the near term. We deliver research and advisory services to inspire, illuminate, and ignite innovative thinking that reshapes and grows businesses. Using quality data derived from primary research, fact-based analysis, and opinions that challenge traditional thinking, our experts focus on finding truly disruptive innovations that are also realistic and make good business sense.

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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