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## **The Road(map) Not Taken**

Navigating Sustainable Shipping Transitions

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The logo for Roskilde University (RWU) is displayed in the top left corner. It consists of the letters 'RWU' in a bold, black, sans-serif font, with a blue circular graphic element to the right of the 'U'.The background of the slide is a photograph of the entrance to Roskilde University. The entrance is a large, modern structure with a dark, metallic-looking facade. The words 'Roskilde Universitet' are inscribed in a light color on the top edge of the entrance. The sky is a clear, bright blue. In the foreground, there are several large, dark rocks on a paved area. In the background, other university buildings and greenery are visible under the blue sky.

Roskilde Universitet

## **Road(map) not taken**

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**Marie Lützen**

**Niels Gorm Rytter**

**Nicholas J. Rowland**



## Dr. Matthew Spaniol

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### Expertise:

- Strategic foresight
- Sociology of science and technology (STS)
- Maritime & ocean economies
- Scenario-based strategizing
- Open innovation
- Business model innovation

**Roskilde University**  
Assistant Professor & Fellow



**Aarhus BSS, Aarhus University**  
Post-Doctoral Fellow



**Danske Maritime**  
ePhD Fellow



**PERISCOPE**  
Project Manager



**CIFS**  
Foresight Analyst



# STS & Science Studies



Robert K. Merton

The provision of certified knowledge

Ontological multiplicity



Thomas Kuhn

Paradigm shift



Bruno Latour

Science is culture

Controversy & closure



Sergio Sismondo



Annamarie Mol

Logical constructivism



Jens Bartelso

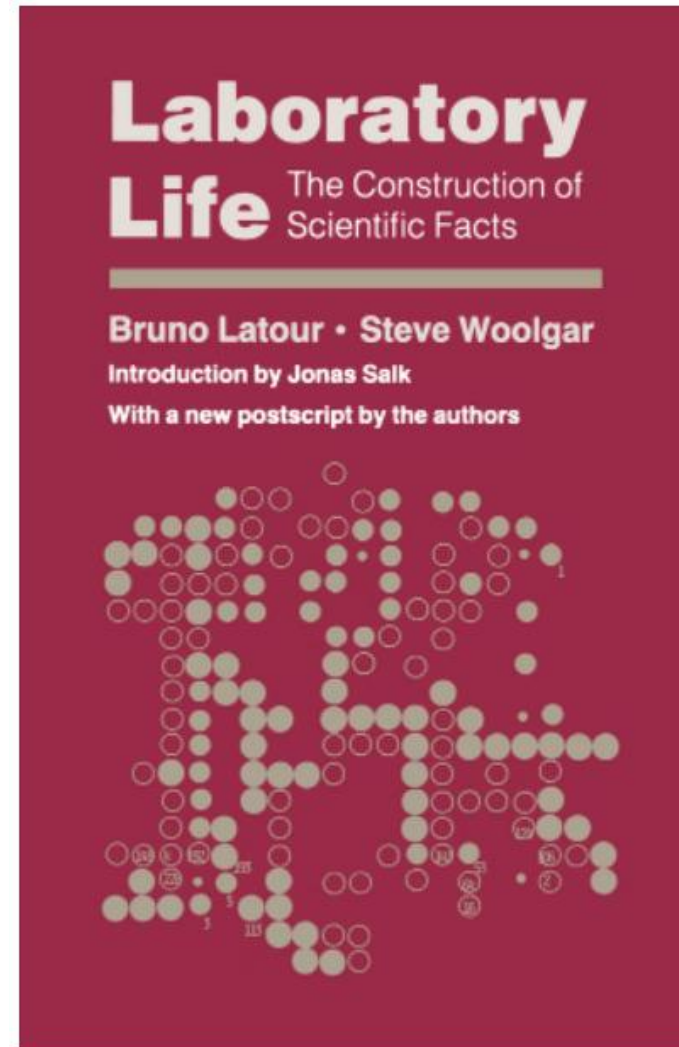


# Laboratory Studies

## Ethnography



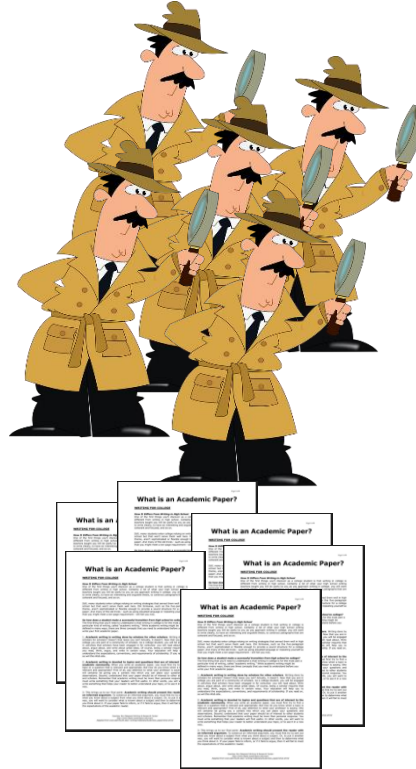
Bruno Latour



STS



Scholarly community of  
futures and foresight  
researchers

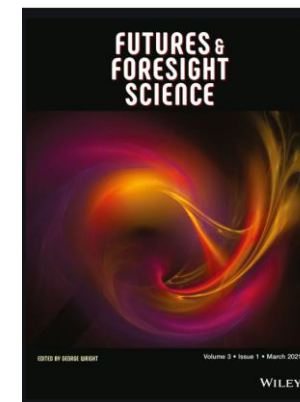
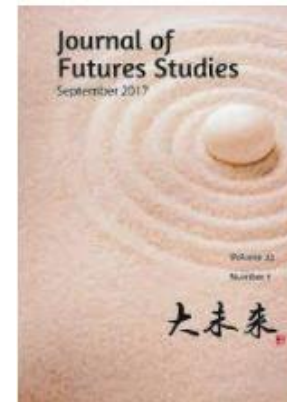


Groups create futures in the  
present to plan

Groups construct fictitious  
"personas" who interpret and  
act in futures

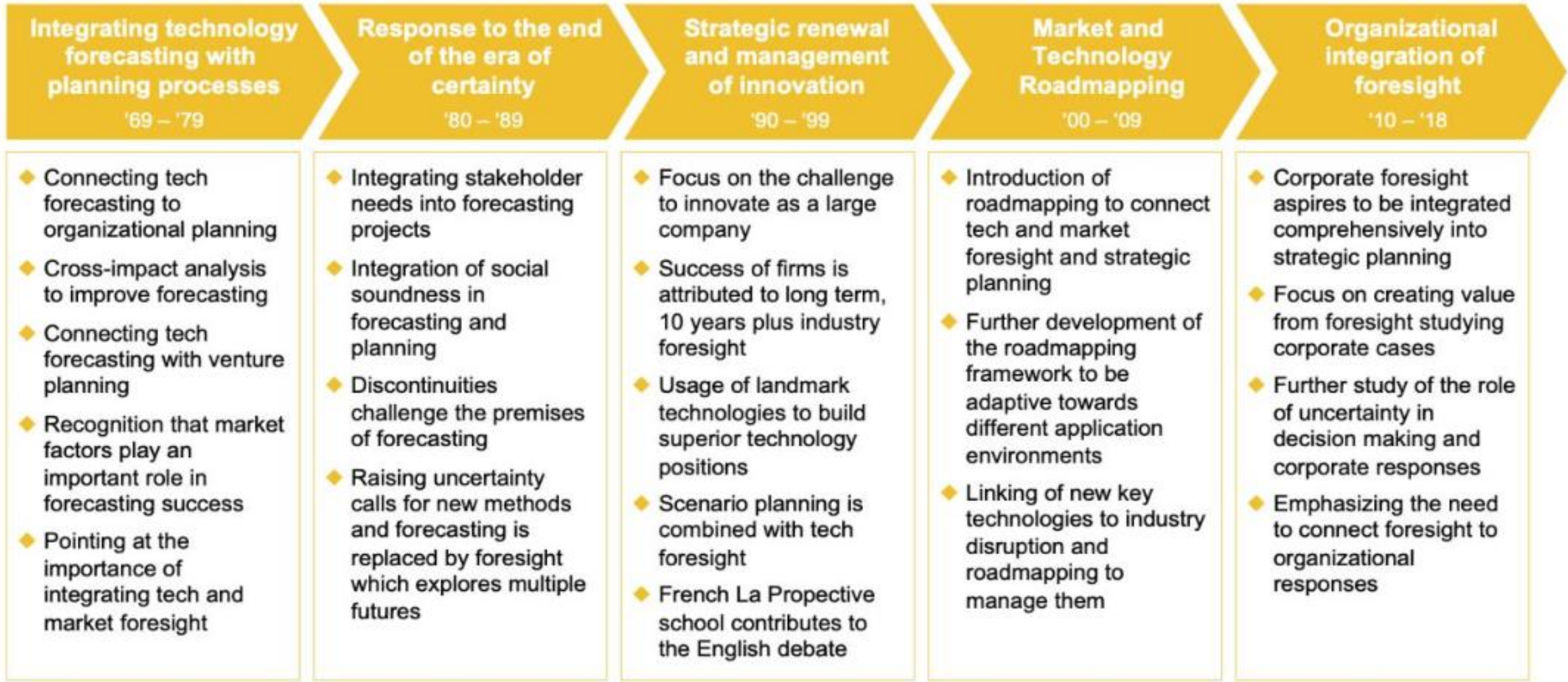


# Futures & foresight science as an scholarly discipline



# EVOLUTION OF CORPORATE FORESIGHT

1969 to 2019



**Source:** Gordon, A. V., Ramic, M., Rohrbeck, R., & Spaniol, M. J. (2020). 50 Years of corporate and organizational foresight: Looking back and going forward. *Technological Forecasting and Social Change*, 154. <https://doi.org/10.1016/j.techfore.2020.119966>

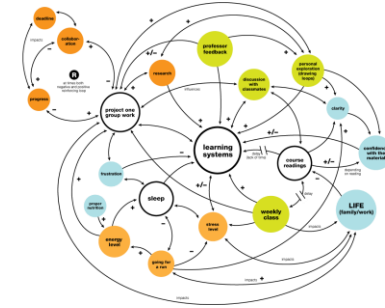


# applied foresight toolbox

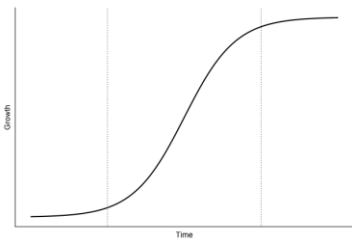


SCIENCE SPECTRUM	STRATEGIC PRIORITY	OFFERING TYPE	TARGET SEGMENTS	OPERATING MODEL	CUSTOMER FACING	SECURITY
<b>Full Spectrum</b> Broad range of offerings from basic research to commercial products.	<b>Strategic Priority</b> High-level strategic priorities that guide the organization's long-term direction.	<b>Offering Type</b> Types of offerings, such as products, services, or solutions.	<b>Target Segments</b> The primary and secondary target markets for the offerings.	<b>Operating Model</b> The internal processes and structures that support the offerings.	<b>Customer Facing</b> The customer-facing elements of the offerings, such as branding and user experience.	<b>Security</b> The security measures in place to protect the offerings and the organization's data.
<b>Platform</b> A foundational technology or service that enables other offerings.	<b>Core Leadership</b> The core areas of expertise and leadership that drive the organization's success.	<b>Component</b> Individual parts or modules that make up the offerings.	<b>Segmentation and Targeting</b> The process of identifying and targeting specific market segments.	<b>Business Model</b> The way the organization generates revenue from its offerings.	<b>Customer Experience</b> The overall experience that customers have when using the offerings.	<b>Compliance</b> The adherence to legal and regulatory requirements.
<b>Enabling &amp; Core</b> The foundational technologies and services that support the offerings.	<b>Product Excellence</b> The commitment to high-quality products and services.	<b>Platform</b> The foundational technology or service that enables other offerings.	<b>Operational Excellence</b> The commitment to efficient and effective operations.	<b>Value Proposition</b> The unique benefits that the offerings provide to customers.	<b>Self-Service</b> The ability for customers to interact with the offerings on their own terms.	<b>Policy Governance</b> The framework of policies and procedures that govern the organization's activities.

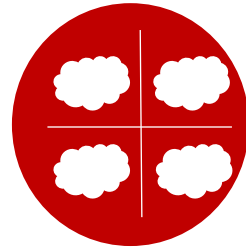
Strategy playboxes



Systems analysis



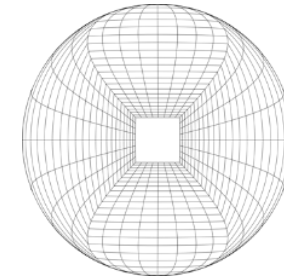
Technology forecasting



Scenarios

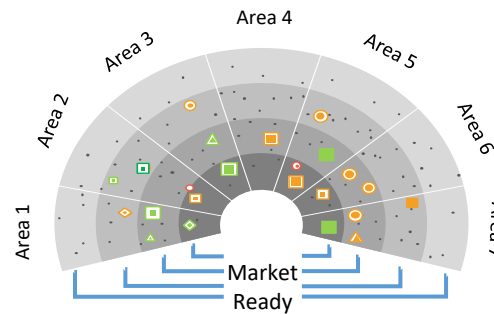


Wargaming

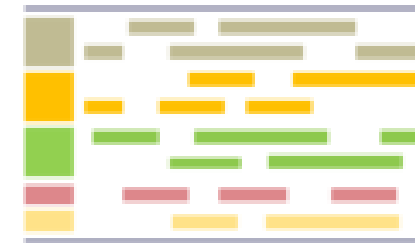


Delphi

Foresight radars



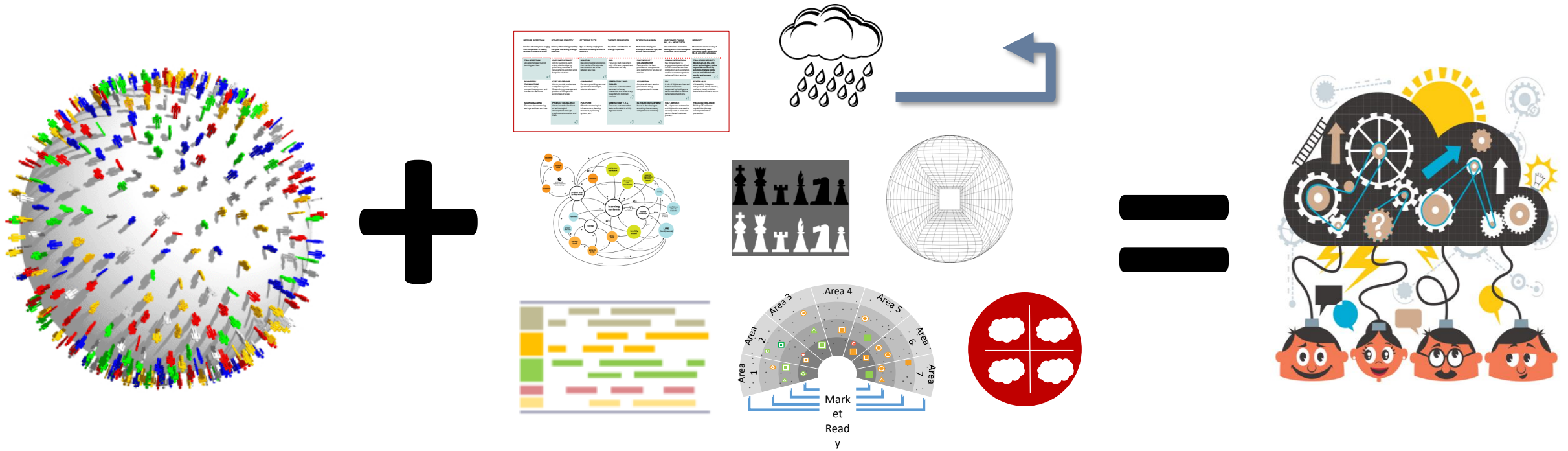
Technology roadmapping



Trend auditing



# Strategic foresight



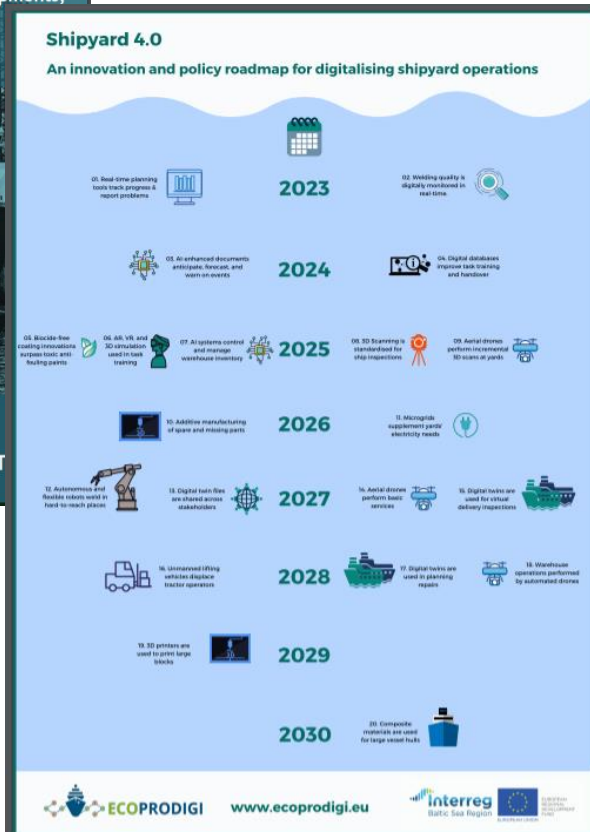
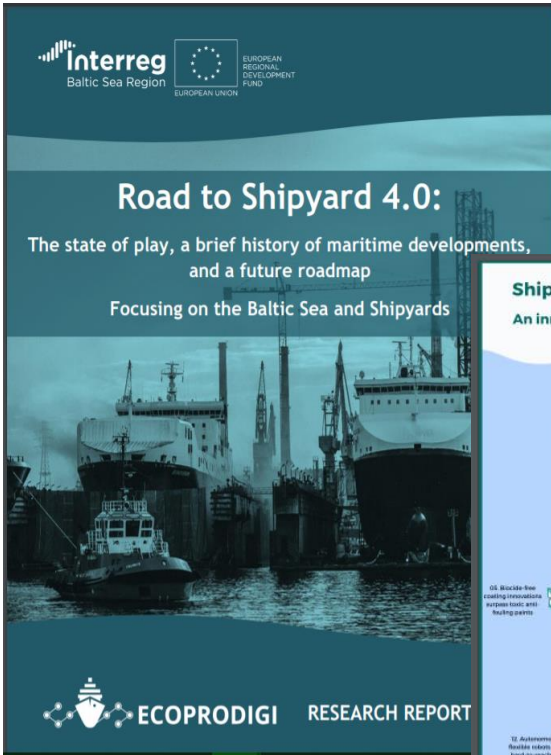
Distributed  
Knowledge

Tools for  
Future Thinking

Effective  
Strategizing

# ROADMAP TO SHIPYARD 4.0

# ROADMAP INTEGRATED SHIP OPERATIONS



# *The road not taken* by Robert Frost (1916)



Two roads diverged in a yellow wood,  
And sorry I could not travel both  
And be one traveler, long I stood  
And looked down one as far as I could  
To where it bent in the undergrowth;

Then took the other, as just as fair,  
And having perhaps the better claim,  
Because it was grassy and wanted wear;  
Though as for that the passing there  
Had worn them really about the same,

And both that morning equally lay  
In leaves no step had trodden black.  
Oh, I kept the first for another day!  
Yet knowing how way leads on to way,  
I doubted if I should ever come back.

I shall be telling this with a sigh  
Somewhere ages and ages hence:  
Two roads diverged in a wood, and I—  
I took the one less traveled by,  
And that has made all the difference.

# Purpose of the roadmaps



- anticipation of changes that are forthcoming in the industry
- engaging wider stakeholders from outside the consortium in dialogue and input
- developing materials to help policymakers define and structure policies that will further the regions' ongoing success in the maritime and marine sectors

# Research question: What doesn't get roadmapped and why?

P: Principles

C: Criteria

E: Explanation

Un-forecastable

Out of scope

Bygone technologies

Implausibility

Impossibility

Unstable

Not aesthetically pleasing

Not already here

P: The critical structure of the roadmap is the X axis that depicts “time” or years into the future.

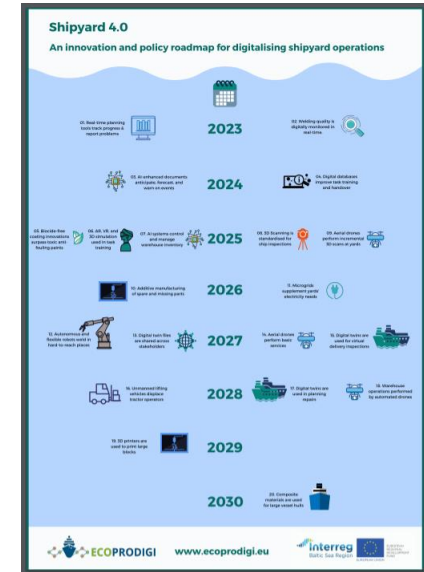


*C: Is the element forecastable?*

E: In order to be forecastable, the element must be a discrete event, and **must be answerable to the question**: When will this become accepted practice or commercially available?

P: Elements must be actionable by the representatives of the project partners

*C: Is the element out of scope?*



E: Because the focus of the project was **primarily concerned** with the upgrading of the *existing fleet of vessels*, there were no project partners that could contribute with sufficient knowledge about electrofuels. Similarly, **subsurface drones** that scan harbors are not included.



P: The roadmap has to be novel

*C: Is the element deemed a  
“bygone” technology?*

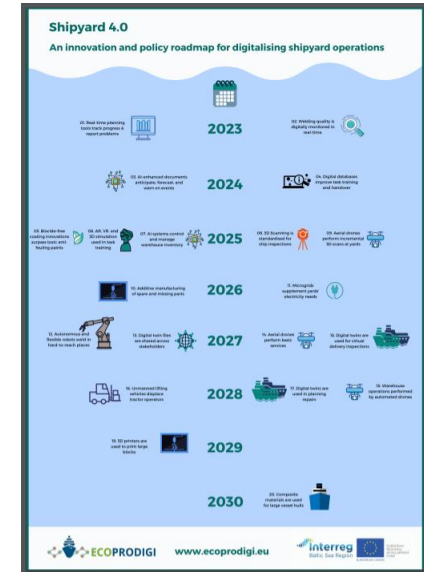
E: Lightweight containers were considered. However, all though they are not currently used in practice in any significant quantity, they have been around and available for a long time.



P: The roadmap should be taken seriously

*C: Is the element deemed to be implausible?*

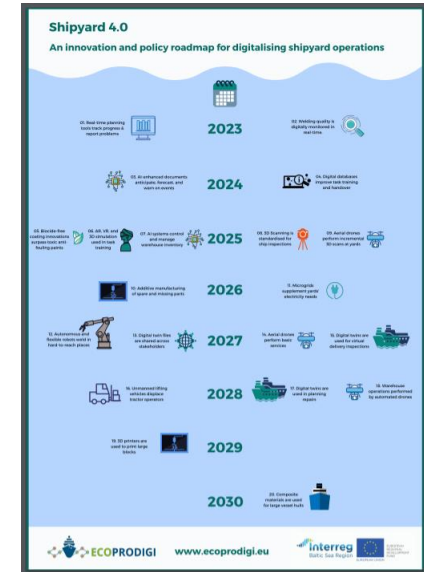
E: Implausible technologies would not be taken seriously by users, for example “game controllers for vessel navigation.” Including it may go against acceptable dialogue, and risk that the other elements – by association – call the entire roadmap into question.



P: The roadmap should be aesthetically pleasing

*C: Is the element deemed to be possible?*

E: Nearly all of the elements had at least one rater thinking that “will never happen.” However, none of them had 100% of raters believing that it will never happen. These were not displayed - there would be no roadmap.



P: The roadmap should support or create opportunities for inter-organizational project development



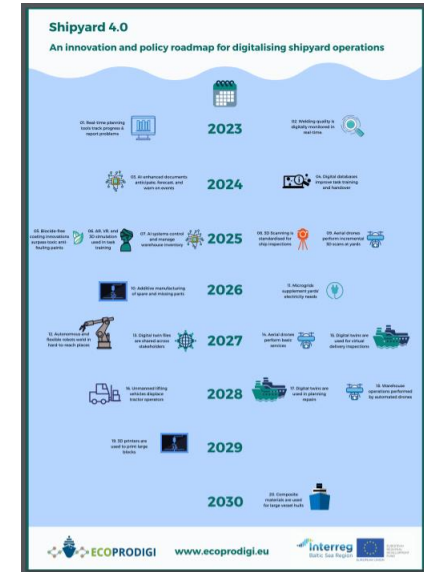
*C: Is the information stable enough to be deemed an opportunity?*

E: The individual ratings, displayed in the violin plots, were discarded in favor of the singular median rating.

P: The roadmap should be about the future

*C: Is the element deemed to be already here?*

E: Some events were rated as “already here,” but this could be overcome by reformulating the element by injecting more technological capabilities, such as “powered by AI.”



# Research question: What information isn't on the roadmap?

P: Principles

C: Criteria

E: Explanation

Un-forecastable

Out of scope

Bypassed technologies

Implausibility

Impossibility

Unstable

Not aesthetically pleasing

Not already here

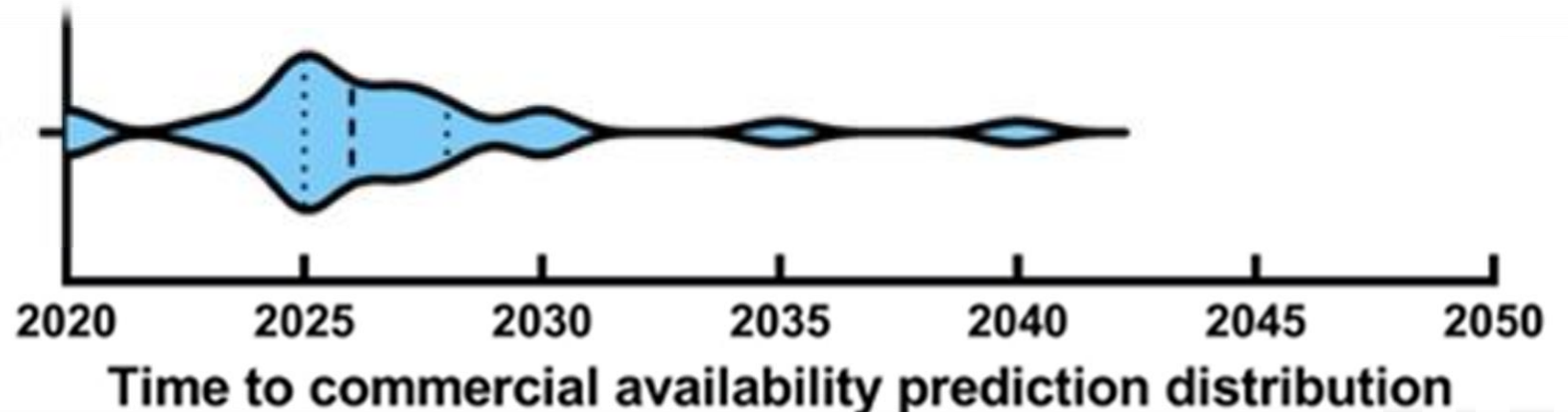


# INTERNATIONAL MRV: CENTRALIZED DATA REPOSITORY FOR FLEET

Maritime transport emits around 940 million tonnes of CO2 annually and is responsible for about 2.5% of global greenhouse gas (GHG) emissions. Establishing a central data warehouse would require a standardization of the digital data file formats that national regulatory bodies can agree to. In turn, this can inform efforts to develop maritime carbon and emission trading schemes.

Median	Mode	Mean	Avg+1std dev.	% already here	% never happen
2026	2025	July/2027	Dec/2031	8%	13%

A central data repository is established to monitor global ship performance data



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Thank you

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