Co-funded by the European Union

Anticipating Strategic Long-term Challenges

D2.2 Student Learning Content and Support Materials

Grant Agreement Project 101184483

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Copyright

© Copyright 2025 The ASTRAL Consortium

Consisting of:
BWCON GmbH (BWCON)
Hochschule der Medien (HDM)
EOLAS S.L. (EOLAS)
Lucidminds B.V. (LM)
Asociación de Industrias de Conocimiento y Tecnología de Euskadi (GAIA)
Syddansk Universitet (SDU)
MKO Investments SA (MKO)
Université Clermont Auvergne (UCA)
Universidade de Vigo (UVIGO)
Green Innovation Group A/S (GIG)

This document may not be copied, reproduced, or modified in whole or in part for any purpose without written permission from the ASTRAL Consortium. In addition, an acknowledgement of the authors of the document and all applicable portions of the copyright notice must be clearly referenced.
This document may change without notice.

Document Classification	
Title	D2.2 Student Learning Content & Support Materials
Type	Deliverable
Output	WP2 – T2.5 Development of the ASTRAL Student Learning and Support Materials
Partners	ASTRAL Consortium
Authors	UCA
Dissemination Level	PU

Version Control			
Version	**Description**	**Name**	**Date**
1.0	**Initial version**	**Yingfei Yan**	**18.08.2026**
1.1	**Revised**	**Yingfei Yan**	**04.09.2026**
1.2	**Final Version**	**Yingfei Yan**	**28.09.2026**

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Table of Contents

1. Introduction 5
1.1 Target users and intended use 5
1.2 Living document and further refinement 5
2. LTFF Curriculum 6
2.1 Recommended approach 6
2.2 Learning objectives and outcomes 6
2.3 General build up of the modules and units 7
2.4 Module and unit overview 7
2.5 Recommended learning pathways 16
2.6 Recognition of learning: Diploma Supplement and micro-credentials 17
2.7 Validation of the student pedagogical approach and curriculum 18
3. Learning Materials and Delivery 18
3.1 Role of the learning materials 18
3.2 Classroom individual and group use 19
3.3 Cross disciplinary adaptation 19
4. Case Studies and Practical Application 19
4.1 Purpose and structure of the case studies 19
4.2 Common resource ontology for cases and assignments 20
4.3 Case study overview 21
4.4 Using cases in classroom and self-work 22
5 Assignment Library 23
5.1 Selecting and preparing an assignment 23
5.2 Using assignments in different learning settings 23
5.3 Minimum checks before release 24
5.4 Maintaining the living assignment library 24
6 Appendix 25
6.1 Case Study: Capita: After the Breach Risk-Opportunity Matrix 25
6.2 Case Study: BlaBla Car 33
6.3 Case Study: DHL Logistics Trend Radar 36
6.4 Case Study: Danish Drones 39

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

6.5 Case Study: EU Policy Lab Future Garden 42
6.6 Case Study: GoPro 45
6.7 Case Study: Lime 47
6.8 Case Study: NHS RFID 50
6.9 Case Study: Spain 2050 52
6.10 Case Study: Spotify 54
6.11 Case Study: Swiss Railway 56
6.12 Case Study: Tesla 59
6.13 Case Study: Too Good To Go 63
6.14 Case Study: AI Revolution and its Impact on Europe 66
6.15 Case Study: Foresight Micro-Routines in Agile Workflows 67
6.16 Case Study: Siemens AG 69

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

1. Introduction

The ASTRAL LTFF HE Student Learning Content & Support Materials presents a recommended curriculum for teaching Long-Term Future Foresight (LTFF) to higher education students and a suite of learning and support materials for practical use. It is based on the ASTRAL research phase and co-design work and is intended to support teaching across high-technology, deep-technology and related fields.

The curriculum is an example framework rather than a fixed programme. Educators may adapt the sequence, examples, workload, disciplinary context and delivery mode to their own courses, while retaining the relevant learning outcomes, future horizon, central LTFF method and transparent treatment of evidence, assumptions and uncertainty.

1.1 Target users and intended use

The primary learners are higher education students who need to develop future literacy, strategic foresight and responsible long-term thinking. The document also supports HE educators who select the curriculum, organise the learning materials and assess student attainment. Student-facing materials are written so that they can be distributed directly, while educator-facing notes explain preparation, facilitation, differentiation and assessment where needed.

1.2 Living document and further refinement

This deliverable represents the current version of the ASTRAL student pedagogical approach, curriculum and learning and support materials. In line with the iterative development approach of the project, the curriculum and associated resources are intended to be further tested with the target groups during the piloting activities. Feedback from educators, students and other relevant participants will be used to review and, where necessary, improve the pedagogical approach, learning materials, case studies and assignments.

Where revisions are made following validation and piloting, updated versions of the relevant resources will be made available through the ASTRAL learning platform. The project will retain a record of the main changes and improvements made on the basis of user feedback.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

2. LTFF Curriculum

2.1 Recommended approach

The recommended approach combines concise conceptual input with inquiry, cases, method practice, comparison of alternatives, reflection and transfer to a new context. Students work on a meaningful future-oriented challenge and explain how their evidence and assumptions support their conclusions.

- Inquiry-based learning built around open but bounded future-oriented questions.
- Experiential use of foresight methods rather than concept recall alone.
- Case-based transfer from an ASTRAL example to a new organisation, sector, technology or societal context.
- Collaborative learning that makes different perspectives, assumptions and stakeholder interests visible.
- Responsible use of evidence, data and AI-supported suggestions, with factual claims checked against reliable sources.
- Iterative outputs that improve through peer feedback, educator feedback, reflection and revision.

Educators may use the full sequence or select a connected set of modules and units that supports the approved outcomes of the host course.

2.2 Learning objectives and outcomes

The curriculum aims to develop futures literacy, practical method use and responsible action. Across an appropriate pathway, students should be able to:

- explain the purpose of LTFF and distinguish foresight from prediction or a single forecast;
- identify signals, trends, drivers, assumptions and critical uncertainties relevant to a future-oriented challenge;
- construct and compare more than one plausible future;
- apply selected foresight, strategy and innovation methods to a real problem or opportunity;
- analyse stakeholders, ethical issues, social impacts and possible unintended effects;
- translate future insight into an adaptive action, experiment, decision or roadmap;
- work independently and collaboratively while documenting evidence, assumptions and contributions; and
- evaluate the quality and limitations of an LTFF output and revise it after feedback.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

For a particular course or assignment, educators should select only the outcomes relevant to the student level, workload and approved learning outcomes of the host programme. These selected outcomes should then determine the activity, expected evidence and assessment criteria.

2.3 General build up of the modules and units

The curriculum is organised into modules, units and learning elements. A module covers a coherent area of LTFF capability. A unit corresponds to a top-level numbered section in the relevant Module 0 to 9 Index or Content Index and Learning Map. Decimal-numbered subsections are learning elements within that unit. For example, Module 3 Unit 2 is Horizon Scanning; its subsections explain aspects of that method.

Although the subject matter changes across the ten modules, most modules follow the same learning logic: orientation and learning outcomes; concepts or methods; practical application through exercises or cases; assessment and reflection; and supporting resources or tools. This allows educators to select individual units while preserving a recognisable learning progression from understanding to application and reflection.

For example, a student may read the relevant concept unit before class, apply the method to a case in class, and then revise the output after feedback. The selected unit remains part of a coherent learning sequence even when a full module is not taught.

2.4 Module and unit overview

The following descriptions retain the modules and top-level unit numbering used in the module indexes. Module titles that refer to business or SMEs identify the source curriculum; students can apply the methods to disciplinary, public-sector or societal challenges. Educators should select units and assessment evidence in line with the outcomes of their own course.

Module 0 Future Readiness Self Assessment

This module establishes a baseline for digital, AI and uncertainty-related readiness before the main learning pathway begins. You identify strengths, gaps and organisational conditions that should shape your use of the later modules.

Unit 1 Welcome and Module Overview. This unit introduces the purpose, learning outcomes and structure of the readiness module. You locate the self-assessment within the wider LTFF pathway and define what a useful baseline should reveal.

Unit 2 Digital and AI Competence Baseline. This unit helps you examine current confidence in digital tools, data and AI-supported work. You identify capabilities that enable foresight practice and areas where additional guidance or safeguards may be needed.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Unit 3 Uncertainty Handling Baseline. This unit explores how you currently respond when evidence is incomplete, conditions change or several futures remain plausible. You recognise habits that support or restrict thoughtful action under uncertainty.

Unit 4 Organisational Foresight Culture Scan. This unit examines whether an organisation creates space for long-term thinking, diverse perspectives and challenge. You identify cultural enablers and barriers that influence whether foresight insights are used.

Unit 5 LTFF Maturity Categories. This unit introduces categories for describing how systematically LTFF is understood and applied. You use them to locate current practice and select a realistic next step rather than treating maturity as a fixed score.

Unit 6 Assessment and Reflection. This unit consolidates the baseline results and asks you to interpret what they mean for learning and implementation. You turn the findings into a focused development priority and a reasoned learning plan.

Unit 7 Resources and Tools. This unit brings together the templates, prompts and reference materials used in the readiness module. You select only the resources needed to document the baseline and support the next stage of learning.

Module 1 LTFF Foundations for Business

This module introduces the purpose and language of Long Term Future Foresight and explains why it matters for organisations. You distinguish foresight from prediction and connect long-term change to decisions made today.

Unit 1 Welcome and Module Overview. This unit introduces the module goals, key concepts and expected learning outputs. You consider where long-term change already affects your discipline, organisation or professional field.

Unit 2 What Is LTFF. This unit defines Long Term Future Foresight as a structured way to explore change and prepare for more than one plausible future. You learn the core vocabulary needed for later methods and cases.

Unit 3 LTFF vs Prediction. This unit compares foresight with forecasting and prediction. You practise recognising when a single expected outcome is useful and when multiple plausible futures provide a stronger basis for learning and decision-making.

Unit 4 LTFF as Structured Decision Making Under Uncertainty. This unit explains how foresight organises evidence, assumptions and uncertainty around a decision. You connect future exploration to choices, experiments and monitoring rather than treating it as speculation alone.

Unit 5 Why Foresight Matters for SMEs. This unit considers why smaller organisations need practical ways to anticipate change despite limited time and resources. You identify where foresight can reduce blind spots and support timely adaptation.

Unit 6 The Business Value of LTFF. This unit examines how LTFF can contribute to resilience, innovation, investment and strategic alignment. You learn to express its value through decisions and capabilities instead of broad claims about the future.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Unit 7 Horizon Thinking Looking 10 to 20 Years Ahead. This unit extends attention beyond immediate planning cycles. You explore how a ten- to twenty-year horizon changes the questions asked, the stakeholders considered and the assumptions that need to be tested.

Unit 8 Long Term Trends Shaping Markets. This unit introduces the analysis of sustained technological, economic, environmental, political and social change. You consider how trends interact and why their implications differ across sectors and contexts.

Unit 9 The Human Role in an AI Driven World. This unit explores how human judgement, values and responsibility remain central when AI supports analysis. You examine where automation can assist foresight and where interpretation, challenge and accountability must remain visible.

Unit 10 Assessment and Reflection. This unit checks understanding of foundational LTFF concepts and their relevance to practice. You explain the difference between prediction and foresight and identify a suitable field of application.

Unit 11 Resources and Glossary. This unit provides definitions, readings and supporting materials for the foundations module. You use the glossary to establish shared language and the resources to deepen topics that matter in your context.

Module 2 Future Literacy and Mindset Development

This module develops the mindset needed to work constructively with uncertainty and alternative futures. You practise noticing assumptions, widening imagination and reflecting on how mental models shape present choices.

Unit 1 Welcome and Module Overview. This unit introduces futures literacy as a capability that can be learned and strengthened. You review the module pathway and identify the habits of mind required for open but disciplined exploration.

Unit 2 Futures Literacy Foundations. This unit explains how people use images of the future to interpret the present and guide action. You begin to examine where these images come from and how they influence judgement.

Unit 3 Multiple Futures Thinking. This unit moves beyond one expected future by developing several plausible alternatives. You learn to compare their assumptions and implications without selecting a preferred answer too early.

Unit 4 Future Imagination. This unit strengthens the ability to describe futures that differ meaningfully from the present. You use prompts and constraints to make imaginative ideas coherent, relevant and open to critical examination.

Unit 5 Mental Model Transformation. This unit explores the beliefs and frames that make some possibilities easy to see and others difficult to consider. You practise reframing a challenge and observing how the available choices change.

Unit 6 Ambiguity Tolerance. This unit develops confidence in working when evidence is incomplete or competing interpretations remain. You practise delaying premature closure while still defining responsible next steps.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Unit 7 Cognitive Biases in Foresight. This unit introduces common biases that affect scanning, interpretation and decision-making. You learn practical ways to surface anchoring, confirmation bias, availability effects and overconfidence in individual and group work.

Unit 8 Strengthening a Future Oriented Mindset Through Curiosity Adaptability and Self Reflection. This unit turns futures literacy into repeatable learning habits. You practise asking better questions, revising assumptions and reflecting on how new evidence should change your position.

Unit 9 Assessment and Reflection. This unit asks you to demonstrate multiple-futures thinking and identify changes in your own reasoning. You compare initial assumptions with later interpretations and define one mindset practice to continue.

Unit 11 Resources and Glossary. This unit gathers the concepts, prompts and further readings used to support futures literacy. You choose resources that help learners expand imagination while maintaining evidence, coherence and reflective discipline.

Module 3 Strategic Foresight Tools and Methods

This module develops practical methods for finding change, interpreting signals and building alternative futures. You apply human and AI-supported approaches while keeping sources, assumptions and limitations transparent.

Unit 1 Welcome and Module Overview. This unit introduces the strategic foresight toolkit and shows how the methods connect. You identify a challenge, future horizon and evidence need that can guide practice throughout the module.

Unit 2 Horizon Scanning. This unit explains how to search systematically for developments that may shape the future. You practise collecting diverse evidence across domains rather than relying on familiar sources or dominant trends.

Unit 3 Weak Signal Detection and Interpretation. This unit focuses on early, uncertain indications of possible change. You learn to record signals carefully, assess their relevance and avoid turning limited evidence into confident predictions.

Unit 4 Trend to Impact Mapping. This unit connects observed change to consequences for organisations, stakeholders and decisions. You trace direct and indirect impacts and test where different contexts may produce different outcomes.

Unit 5 Scenario Planning and Mini Sprints. This unit introduces scenarios as coherent descriptions of alternative operating environments. You practise a compact scenario process that moves from critical uncertainties to implications and strategic questions.

Unit 6 Backcasting and Systems Mapping. This unit combines a desired or plausible future state with analysis of the system that could enable it. You work backwards to identify dependencies, interventions and barriers between the future and the present.

Unit 7 AI Supported Horizon Scanning. This unit explores how AI can assist with searching, clustering and summarising large amounts of scanning material. You evaluate outputs against original sources and keep human judgement responsible for relevance and interpretation.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Unit 8 AI for Weak Signal Detection and Early Warning. This unit examines how AI may help identify emerging patterns and unusual developments. You design an early-warning approach that includes verification, thresholds and human review.

Unit 9 Predictive Analytics vs Long Term Foresight. This unit compares data-driven estimates of likely outcomes with exploration of structural change and alternative futures. You decide when the approaches can complement each other and where their assumptions differ.

Unit 10 LLMs for Qualitative Sense Making. This unit considers how language models can support coding, comparison and synthesis of qualitative material. You practise prompting and checking outputs while protecting context, source integrity and uncertainty.

Unit 11 Human AI Comparison Exercise. This unit asks you to complete and compare a foresight task with human-led and AI-supported processes. You evaluate differences in coverage, originality, bias, transparency and practical usefulness.

Unit 12 Assessment and Reflection. This unit evaluates whether you can select and apply an appropriate method with transparent evidence and assumptions. You reflect on the limits of the output and explain how it informs a decision.

Unit 13 Resources and Toolkit. This unit provides templates and references for scanning, signals, scenarios, mapping and AI-supported analysis. You assemble a proportionate toolkit for the challenge, horizon and time available.

Module 4 Decision Making Under Uncertainty

This module connects foresight evidence to choices that must be made without certainty. You compare options, test failure conditions and design decisions that remain useful across several plausible futures.

Unit 1 Welcome and Module Overview. This unit introduces the relationship between uncertainty, foresight and decision quality. You select a real decision that can be examined through the methods and exercises in the module.

Unit 2 Understand Uncertainty. This unit distinguishes different sources and degrees of uncertainty. You consider what can be measured, what requires judgement and what should remain visible rather than being simplified away.

Unit 3 Decision Making Methods. This unit introduces structured approaches for comparing choices when outcomes are not fully known. You learn to match a method to the decision, evidence, reversibility and time horizon.

Unit 4 Risk Opportunity Matrix. This unit examines possible negative and positive consequences together. You use a matrix to compare likelihood, significance and preparedness while recognising that assessments may change across futures.

Unit 5 Decision Trees Applied to Real Scenarios. This unit uses decision trees to make choices, conditions and consequences explicit. You apply the technique to scenarios and identify where probabilities or assumptions require caution.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Unit 6 Quantum Threat Scenarios. This unit uses quantum technology as a context for decisions with long lead times and uncertain timing. You explore preparedness options that balance present cost with potentially high future consequences.

Unit 7 AI Failure Mode Scenarios. This unit examines how AI-enabled systems might fail technically, organisationally or ethically. You build scenarios that reveal dependencies, affected stakeholders and safeguards needed before deployment.

Unit 8 Red Team vs Blue Team. This unit uses constructive challenge to test a proposal from opposing perspectives. You practise identifying vulnerabilities, defending assumptions and improving a decision without turning disagreement into personal conflict.

Unit 9 Assessment and Reflection. This unit asks you to justify a decision against more than one plausible future. You explain the evidence, trade-offs, residual uncertainty and conditions that would trigger review.

Unit 10 Resources and Tools. This unit brings together decision templates, scenario prompts and review tools. You select materials that make reasoning auditable and support revision as evidence or conditions change.

Module 5 Innovation and Transformation Skills

This module uses foresight to identify opportunities for innovation and prepare transformation. You connect future needs to business models, creative choices, experiments and practical implementation.

Unit 1 Welcome and Module Overview. This unit introduces innovation as a response to changing needs, systems and possibilities. You identify a challenge where foresight can widen the range of options considered.

Unit 2 What Is Innovation. This unit distinguishes innovation from ideas, invention and routine improvement. You examine how value is created, adopted and sustained for users, organisations and wider stakeholders.

Unit 3 Future Business Models. This unit explores how value propositions, partners, resources and revenue models may change over time. You develop a future-oriented business model and test it against alternative conditions.

Unit 4 Unlocking Creativity. This unit uses structured prompts and divergent thinking to move beyond familiar solutions. You generate options, combine perspectives and delay evaluation until the possibility space has widened.

Unit 5 Implementing Transformative and Innovative Strategy. This unit turns an innovation concept into a sequence of experiments, responsibilities and decisions. You identify barriers, learning milestones and evidence needed before wider commitment.

Unit 6 Assessment and Reflection. This unit evaluates whether an innovation proposal responds to future change and can be tested responsibly. You explain its assumptions, value, risks and next learning step.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Unit 7 Resources and Glossary. This unit provides innovation canvases, creativity prompts, implementation aids and key definitions. You choose the resources that best support the maturity and scope of the proposed transformation.

Module 6 Collaboration and Ecosystem Foresight

This module explores how foresight work changes when customers, partners, suppliers, regulators and communities are considered together. You practise ecosystem mapping and identify how shared vision, trust and collective intelligence can improve long-term action.

Unit 1 Welcome and Module Overview. This unit introduces ecosystem foresight and the need to work across organisational boundaries. You identify a shared challenge that no single actor can understand or address alone.

Unit 2 Breaking Down Silos. This unit examines how separate functions, disciplines and organisations create fragmented views of change. You practise sharing evidence and connecting decisions that are usually considered in isolation.

Unit 3 Building Trust and a Shared Language. This unit explores the conditions that allow diverse participants to work with uncertainty together. You develop common terms, transparent expectations and ways to discuss disagreement safely.

Unit 4 Collaboration Roles and Dynamics. This unit makes roles, influence and participation patterns visible in foresight work. You consider how facilitation, expertise, decision authority and lived experience should contribute.

Unit 5 Cross Functional Foresight Processes. This unit designs a repeatable process that connects scanning, interpretation and action across functions. You define handovers, decision points and responsibilities so insights do not remain isolated.

Unit 6 Ecosystem Mapping. This unit maps actors, relationships, dependencies and flows within a wider system. You identify where change may propagate and where collaboration, tension or missing voices affect outcomes.

Unit 7 Sector Specific Collaboration. This unit adapts collaboration methods to the incentives, regulation and operating conditions of a sector. You determine which partners and forms of coordination are realistic for the challenge.

Unit 8 Building Shared Long Term Visions. This unit supports participants in developing a direction that reflects common interests without erasing differences. You compare desirable futures and identify principles that can guide joint action.

Unit 9 Strategic Positioning Within Your Ecosystem. This unit considers how an organisation can contribute, influence and remain resilient within a changing network. You clarify its role, dependencies and choices under alternative futures.

Unit 10 Assessment and Reflection. This unit evaluates the quality of an ecosystem analysis and collaborative response. You reflect on participation, missing perspectives, shared value and the feasibility of proposed action.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Unit 11 Resources and Tools. This unit provides mapping templates, stakeholder prompts and collaboration aids. You select tools that fit the number of participants, sensitivity of the topic and maturity of the partnership.

Module 7 Ethical Social and Human Foresight

This module examines the human, social and ethical consequences of technological and organisational futures. You identify affected groups, conflicting values and safeguards that support responsible innovation and action.

Unit 1 Welcome and Module Overview. This unit introduces ethical and social inquiry as a necessary part of foresight. You identify a technology or strategic choice whose benefits and burdens may be distributed unevenly.

Unit 2 Ethics and Social Dimensions of Technology. This unit explores how technologies embed values and reshape relationships, access and power. You examine consequences beyond technical performance or commercial success.

Unit 3 Human Dimensions of Technology. This unit focuses on human capabilities, behaviour, identity and wellbeing in technological change. You consider how different people may experience the same future in different ways.

Unit 4 Ethical Strategies for Responsible Innovation. This unit introduces ways to integrate ethics into design and decision processes. You identify principles, review points and safeguards before impacts become difficult to reverse.

Unit 5 Social Strategies for Foresight Futures. This unit develops responses to inclusion, participation and social impact across plausible futures. You connect stakeholder needs to practical measures and indicators.

Unit 6 Integration and Action Planning. This unit combines ethical, human and social analysis with a concrete plan. You assign responsibilities, mitigations and monitoring signals to the proposed action.

Unit 7 Assessment and Reflection. This unit asks you to evaluate a future-oriented proposal through multiple stakeholder perspectives. You justify trade-offs and identify remaining uncertainty, unintended effects and accountability needs.

Unit 8 Resources and Tools. This unit gathers ethics prompts, stakeholder tools and impact-review materials. You choose resources that make values, affected groups and mitigation decisions explicit.

Module 8 Roadmapping and Long Term Strategy Execution

This module turns foresight insight into a sequenced roadmap for action and learning. You connect vision, dependencies, milestones and monitoring signals so strategy can adapt as conditions change.

Unit 1 Module Overview. This unit introduces roadmapping as the bridge between future direction and present action. You identify the decision scope, time horizon and outputs that the roadmap must support.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Unit 2 From Foresight to Strategy Foundations of Roadmapping. This unit explains the core layers and logic of a roadmap. You connect foresight findings to strategic choices, capabilities and time-bound actions.

Unit 3 Vision Building for SMEs. This unit develops a clear and relevant future direction that can guide prioritisation. You frame the vision so it is ambitious enough to matter and concrete enough to test.

Unit 4 Backcasting From Future to Present. This unit begins with a defined future state and works backwards to the present. You identify necessary conditions, decisions and intermediate outcomes along the path.

Unit 5 Dependency Mapping and Strategic Sequence Planning. This unit examines which actions, resources and capabilities depend on others. You arrange work in a credible sequence and identify bottlenecks or critical assumptions.

Unit 6 Transformation Roadmaps and KPI Integration. This unit combines strategic milestones with measures that show progress and learning. You select indicators that support adaptation rather than rewarding activity alone.

Unit 7 Strategic Alignment Within SMEs. This unit connects the roadmap to priorities, resources, governance and daily work. You identify conflicts and create ownership across the people responsible for delivery.

Unit 8 Turning Foresight into Actionable Strategies. This unit converts scenarios and implications into choices, experiments and commitments. You define what should begin now, what should be prepared and what should be monitored.

Unit 9 Personal Professional Foresight Plan. This unit applies the roadmapping logic to individual professional practice. You set a direction, identify capability needs and define routines for reviewing change over time.

Unit 10 Assessment and Reflection. This unit evaluates whether the roadmap is coherent, feasible and responsive to uncertainty. You explain its assumptions, milestones, signposts and revision triggers.

Unit 11 Resources and Tools. This unit provides roadmap canvases, backcasting prompts, dependency tools and indicator guidance. You assemble the resources needed to create and maintain an actionable roadmap.

Module 9 LTFF for SMEs Application and Barriers

This module focuses on making foresight workable in everyday organisational practice. You design small routines, address common barriers and create an implementation approach that can continue after formal training ends.

Unit 1 Welcome and Module Overview. This unit introduces the challenge of moving from occasional foresight exercises to sustained practice. You identify where LTFF can enter existing routines without creating unnecessary burden.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Unit 2 LTFF Entry Points. This unit examines practical moments where future thinking can influence decisions, projects and conversations. You select entry points with a clear owner, purpose and near-term opportunity for use.

Unit 3 Develop Continuous Foresight Micro Routines. This unit designs short, repeatable activities for scanning, interpretation and review. You create a routine that fits available time and produces evidence that can inform action.

Unit 4 Apply LTFF and Foresight in Daily Operations. This unit integrates foresight questions and outputs into meetings, planning and operational decisions. You clarify how insights will be recorded, shared and revisited.

Unit 5 Barriers and Application for LTFF Implementation. This unit addresses constraints such as limited time, uncertain ownership, weak data, resistance and competing priorities. You develop proportionate responses and identify where leadership support is required.

Unit 6 Assessment and Reflection. This unit evaluates whether the proposed routines and implementation plan are realistic. You reflect on evidence of use, remaining barriers and the next improvement to test.

Unit 7 Resources and Tools. This unit provides micro-routine templates, implementation prompts and review checklists. You select a small resource set that can be maintained and reused in normal work.

2.5 Recommended learning pathways

The formats below illustrate use of selected units within each pathway; they do not state the time required to complete every listed module. The educator should agree the scope and expected workload before teaching, separating contact time, individual or group self-work, and assessment. A module or activity may span several sessions to fit the institution's timetable.

Teaching purpose	Modules to select from	Possible format	Main output
Introduce future literacy	Modules 0-2	Selected introductory units across one or two classes, with preparation and reflection	Learning goal and reflection on assumptions and plausible futures
Teach a practical foresight method	Modules 2-4 + one case	Two or three linked classes	Method canvas, evidence log and decision implication
Develop responsible innovation	Modules 3, 5, 6 and 7	Project, workshop or capstone theme	Future-oriented concept, stakeholder analysis and ethical reflection
Connect futures to action	Modules 3, 4, 8 and 9	Project sequence or intensive	Scenarios, roadmap, signposts and implementation plan

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Build integrated competence	Modules 0-9 selectively	Semester or programme pathway	Portfolio with feedback, revision and final synthesis

A blended example is to use selected reading and an evidence log before the first class, frame and apply the method during that class, develop the output between sessions, and compare, revise and reflect in the next class. Provide one deliverable and checkpoint for each stage. The workload estimates in Chapter 5 are teaching examples to be adjusted to local course requirements.

2.6 Recognition of learning: Diploma Supplement and micro-credentials

The ASTRAL student curriculum is designed so that learning achieved through LTFF activities can be documented transparently and, where appropriate, recognised within the learner's higher education programme.

For recognition purposes, educators should define in advance the selected learning outcomes, expected workload, learning activities, required evidence and assessment criteria. Recognition should be based on demonstrable individual attainment. Where students work in groups, the assessment should therefore include an identifiable individual contribution, reflection or explanation in addition to the shared group output.

Diploma Supplement

Where permitted by the participating higher education institution, successful participation in ASTRAL LTFF learning activities may be documented in the Diploma Supplement or an equivalent institutional record. The description should, as applicable, include:

- the title and purpose of the LTFF learning activity or pathway;
- the relevant learning outcomes;
- the LTFF methods and topics covered;
- the learning format and approximate workload, including contact and self-study time;
- the type of assessment and evidence used to demonstrate attainment;
- the level of achievement or result according to the institution's assessment system;
- the language of delivery; and
- reference to the ASTRAL programme and learning resources.

The exact format and wording remain subject to the rules and procedures of the issuing higher education institution.

Micro-credentials

ASTRAL learning activities may also provide a basis for micro-credentials where this is compatible with the institutional and national framework of the issuing organisation. A micro-credential should relate to a coherent and assessable set of learning outcomes rather than participation alone.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

As a minimum, the issuing organisation should document the learner, issuing organisation, title of the learning experience, learning outcomes, workload, level where applicable, form of participation, assessment method, evidence of attainment, date of issue and applicable quality-assurance arrangements. Where ECTS or another credit system is used by the institution, the corresponding workload or credit information may also be included.

ASTRAL does not replace institutional accreditation or recognition procedures. The final decision on whether and how a Diploma Supplement entry or micro-credential is issued remains with the responsible education provider.

2.7 Validation of the student pedagogical approach and curriculum

The ASTRAL student pedagogical approach and curriculum were developed on the basis of the project research phase and the results of the T2.1 co-design workshops.

In accordance with the project work plan, the proposed approach and curriculum were presented for validation to a sample of 12 participants, with three participants per participating country drawn from the T2.1 co-design process. Feedback focused on the relevance of the pedagogical approach, learning objectives and outcomes, curriculum structure, proposed learning materials and suitability for use in different higher education contexts.

The feedback and recommendations were reviewed by the project team and used to refine the curriculum and the associated learning and support materials. The project records retain the reviewed version, validation feedback and resulting changes.

The curriculum and materials should nevertheless be considered living resources. Further feedback collected during piloting and practical use with the target groups may result in additional improvements. Updated versions will be made available through the ASTRAL learning platform where appropriate.

3. Learning Materials and Delivery

3.1 Role of the learning materials

The ASTRAL student materials are designed for two uses: educators can use them to teach LTFF in a classroom or blended course, and students can use selected materials directly for self-study or self-work. The suite includes module slide decks and learning content, case studies, assignment briefs, exercises, handouts, templates, checklists and assessment support.

The existing ASTRAL module slide decks can also be used for student teaching. Educators should select the relevant slides and provide an appropriate brief, vocabulary support and task. D2.1 HE Teacher Guideline explains the structure and pedagogical use of the resources;

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

this document develops the student curriculum and the materials students use to practise and demonstrate LTFF.

3.2 Classroom individual and group use

Educators can combine the same resource set in different learning modes. The important point is to keep the learning objective, method, expected output and assessment evidence clear even when the amount of facilitation changes.

Mode	Recommended resource sequence	Support and accountability
Facilitated classroom	Selected slides/short input; case extract; guided template; comparison and debrief	Educator models the first step and collects a group or individual output plus reflection.
Individual self-study / self-work	Learning objective; selected slides or reading; case; template; criteria; reflection	Provide a clear sequence, example or checkpoint and require a complete individual output.
Group self-work	Shared brief; evidence sources; roles; template; peer review; submission criteria	Require contribution records, interim checkpoints and individual reflection or explanation.
Blended learning	Concepts before class; application in class; refinement and assessment after class	Make preparation necessary for the class activity and connect feedback to the next task.

3.3 Cross disciplinary adaptation

The materials are method-based so that they remain relevant across high-tech and deep-tech fields. Educators may replace the sector, organisation, technology, dataset or challenge with one that is meaningful to their students. The adaptation should preserve the future horizon, the central LTFF method, the need to compare alternatives, and the requirement to distinguish evidence from assumptions and uncertainty.

For example, A01 may examine circular-economy services or the external drivers affecting a deep-tech venture; A03 may examine a smart-campus system, advanced manufacturing or healthcare technology; A05 may explore the social implications of a future technology. Choose a case and evidence pack that fit students' prior knowledge. Offer accessible text or table alternatives to visual outputs when they demonstrate the same learning outcomes.

4. Case Studies and Practical Application

4.1 Purpose and structure of the case studies

The current ASTRAL working library contains 16 case studies. They make foresight concrete by showing how organisations, public bodies and policy initiatives used different forecasting and foresight methods to investigate change, strategic choice or implementation. The cases are not model answers. Their purpose is to help students

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

understand a method in context, critique its use and transfer the method to another organisation, sector or discipline.

The case studies are distributed across complementary method families, including market and strategy analysis, scanning and environmental analysis, scenario/narrative and participatory futures, and decision/roadmapping/implementation. Several cases combine more than one method, so the classification below indicates the primary teaching emphasis rather than an exclusive category.
Case study files generally include a summary, classification, context, implementation or analysis, impacts, reflection questions and resources, followed by guidelines for HE instructors and educators. Educators use the final section to select discussion questions, practical exercises and debrief prompts; students use the narrative and task materials selected for their activity.

4.2 Common resource ontology for cases and assignments

The shared classification follows the existing case-study fields: related module, industry or sector, and type of organisation. Retain these tags when preparing an assignment based on a case, and identify additional activity contexts as suggested adaptations. The teaching fields below add the information needed to select and run an assignment. They are a proposed resource specification, not a description of finished platform search functions.

Field	How to use it
Identifier and title	Stable resource identifier, descriptive title, version and source case.
Related module and unit	Use the existing module classification. Add unit links to show the specific learning connection; distinguish these teaching links from original case tags.
Industry or sector	Use the case categories: High tech – Mobility & production; High tech – Green technologies; High tech – ICT; Other high tech; or Other with a stated sector.
Type of organisation	Use SME, Large enterprise or Other. For an open assignment, the educator selects the relevant tag for the organisation chosen.
Method and learning outcomes	Name the method, the capability practised and the evidence students should demonstrate.
Level and prerequisites	State the learner level, prior knowledge and preparation or scaffolding.
Work mode and delivery	State individual, pairs or groups; identify on-site, online or blended delivery and a suitable group size.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Horizon and workload	State the future year or horizon, contact time and self-work, with a total for the selected route.
Resources and tools	Identify the case, module material, worksheet format, sources and permitted digital or AI support.
Outputs and assessment	State deliverables, individual evidence and selected assessment criteria.
Keywords and accessibility	Add concise search terms and the support or equivalent formats learners may need.

4.3 Case study overview

The table lists the 16 cases in the working library. Suggested module links indicate possible teaching connections and may extend the classification in an original case file. Methods include both documented practice and the educational applications described in the case. A01 to A05 identify the five paired assignments in Chapter 5.

Case study	Primary method	Suggested module links	Paired assignment
Capita: After the Breach	Risk-Opportunity Matrix	4, 5, 7, 8	—
BlaBlaCar	Blue Ocean Strategy and ERRC	5	—
DHL Logistics Trend Radar	Horizon scanning and trend radar	3, 5, 8	—
Danish Drones	Flash Fiction and participatory futures	2, 3, 7	—
EU Policy Lab Futures Garden	Horizon scanning and speculative design	3, 4, 5, 6, 8	—
GoPro	Blue Ocean Strategy and Strategy Canvas	3, 5	A02
Lime	PESTLE analysis	2, 3, 4	—
NHS RFID	Scenario-driven technology roadmapping	3, 4, 6, 7, 8	A03
Spain 2050	Horizon scanning, Delphi, scenarios and backcasting	1, 3, 4, 8	—
Spotify	Porter Five Forces	3, 4, 5	A04
Swiss Railway	Flash Fiction and needs discovery	2, 3, 7	A05

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Tesla	Blue Ocean Strategy and Strategy Canvas	5	—
Too Good To Go	PESTLE analysis and plausible futures	3, 4, 7, 8	A01
AI Revolution and its Impact on Europe	Narrative strategic foresight and roadmapping	3, 4, 7, 8	—
Foresight Micro-Routines in Agile Workflows	Continuous foresight routines	2, 3, 5, 8, 9	—
Siemens AG	Innovation typologies, business models, experimentation and roadmapping	5, 8	—

The library supports several teaching emphases: Blue Ocean Strategy and value innovation (BlaBlaCar, GoPro and Tesla); environmental and competitive analysis (Lime, Too Good To Go and Spotify); scanning and policy foresight (DHL, Futures Garden and Spain 2050); narrative and participatory futures (Danish Drones, Swiss Railway and the Europe AI case); and decisions, implementation and sustained practice (Capita, NHS RFID, Siemens and Micro-Routines). Cases may support more than one method family.

The 16 case studies listed in Section 4.3 form part of the D2.2 student learning and support materials are provided in the appendix of this deliverable. They will subsequently also be made available through the ASTRAL learning platform.

4.4 Using cases in classroom and self-work

The same case can support different modes of learning. The table below shows how the preparation and evidence requirements change while the core method and learning objective remain consistent.

Mode	Before	During / student work	Evidence
Facilitated classroom	Select a case extract, method template and one outcome.	Model the first step, use pairs/groups, compare outputs and debrief.	Group or individual output plus short individual reflection.
Individual self-work	Provide the full case, method explanation, template and criteria.	Learner completes the method and records evidence, assumptions and uncertainties.	Completed template, analysis and self-assessment.
Group self-work	Set roles, evidence requirements, checkpoints and deadline.	Learners document contributions and challenge assumptions.	Group product plus individual contribution statement or reflection.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Blended sequence	Use the case narrative or slides before class.	Use class time for application, interpretation and feedback; refine afterwards.	Revised output submitted after feedback.

5 Assignment Library

The assignment library is maintained as a set of stand-alone documents. Assignments are distributed through the current project resource folder and, when published, through the ASTRAL learning platform.
Each assignment is a complete student brief with its own instructions, worksheets, learning outcomes, assessment guidance and educator implementation notes. It may be used independently or linked to a relevant module, unit and case study. This chapter explains how to use the library without duplicating the full assignment content.

5.1 Selecting and preparing an assignment

• Start with the intended learning outcome and choose an assignment whose method and expected evidence match it.
• Confirm the assignment version, exact title of any linked case study, prerequisite knowledge, delivery mode and estimated workload.
• Decide which module topics, case extracts, source pack, worksheets and student-support tools are required before releasing the brief.
• Adapt the level, disciplinary context or assessment weighting only where the learning outcomes remain achievable, and communicate changes before students begin.
• Use an accessible, editable copy and provide a non-digital or equivalent submission route where needed.

5.2 Using assignments in different learning settings

The same stand-alone assignment can support teacher-facilitated learning, individual self-study, group self-learning or a blended sequence. The educator should always identify the starting resource, required task, deadline, expected evidence and feedback or assessment route.

Use setting	How to use the assignment	Minimum evidence
Teacher-facilitated class	Issue the brief and sources in advance, model the first method step, use checkpoints during the activity and debrief the reasoning and trade-offs.	Completed assignment output plus a short individual reflection.
Individual self-study	Provide a direct sequence, accessible inputs, a worked example or checkpoint, the self-check and a clear route for questions or feedback.	Individual output, source and AI disclosure, and self-assessment.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Group self-learning	Set group roles, contribution records, interim checkpoints and a submission route; require each learner to explain one assumption or decision.	Shared output plus an individual contribution or learning statement.
Blended use	Use platform topics and case preparation before class, apply the method collaboratively in class, then require revision and submission after feedback.	Version history or feedback record showing revision.

5.3 Minimum checks before release

Before an assignment is released, confirm that its Basic Information, Purpose and Strategic Value, Learning Outcomes, Exercise Description, Methods Used, AI and Digital Tools, Assessment, Learning Evidence, and Inclusivity and Accessibility sections are complete. Students should receive the exact case or input named in the brief, editable worksheets, assessment criteria, source requirements, AI-use conditions and any group-contribution record needed for individual evidence.

5.4 Maintaining the living assignment library

New or revised assignments should use the current HE Exercise Template and the common ASTRAL ontology. Record a stable asset identifier, title, linked module and unit, method, sector, organisation type, level, workload, delivery mode, language, accessibility format, expected output, assessment type, AI-use conditions, owner, version, status and platform link. Additions and removals should be made in the live register; the guideline should not rely on a fixed total.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

6 Appendix

6.1 Case Study: Capita: After the Breach Risk-Opportunity Matrix

This case study examines how a data-heavy professional services company can use a Risk–Opportunity Matrix to decide whether to pause, continue, or redesign its technology transformation after a major cyber incident.

Context:
Capita is a UK-based outsourcing and professional services company. It provides services across areas such as customer experience, pensions administration, contact centres, learning and training, financial services, public services, health, transport, and digital services. Capita describes itself as an outsourcer working across eight countries, taking on complex and time-consuming tasks for customers, and its website also shows that its services now include AI solutions, data management, digital services, and customer communications.

This type of organisation depends heavily on data. Capita and similar companies may process personal data on behalf of public bodies, pension schemes, private companies, employees, and citizens. This can include names, addresses, pension information, employment records, financial information, health-related data, and other sensitive records.

In March 2023, Capita experienced a major cyber incident. Public reporting states that attackers gained access to Capita systems, stole personal data, deployed ransomware, and disrupted parts of the company's IT services. In 2025, the UK Information Commissioner fined Capita plc and Capita Pension Solutions Limited a combined £14 million after the personal data of around 6.6 million people was compromised. The affected data reportedly included pension records, staff information, financial information, criminal-record-related data, and other sensitive personal data.

The wider context is important. Organisations are under pressure to modernise their digital services, use more automation, improve efficiency, and explore AI tools. At the same time, the cyber threat level is increasing. Sensitive data is valuable to attackers, and new technologies can create both opportunities and vulnerabilities. There is also a longer-term technology issue: organisations that store confidential data for many years need to think about future encryption risks, including the migration to post-quantum cryptography. The UK National Cyber Security Centre says this migration is a mass technology change that will take years, with milestones for organisations to define goals and assess systems by 2028, carry out high-priority migration activities by 2031, and complete migration by 2035.
For this case study, the key question is not only: **"How could Capita recover from the incident?"**
The broader strategic question is:
How can a data-heavy organisation continue technology transformation while reducing cyber, data protection, reputational, and long-term technology risks?

Implementation

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

This case study uses the **Risk–Opportunity Matrix** as the main Long-Term Future Foresight method.
There is no public evidence that Capita used this exact matrix. Instead, the matrix is applied here as an ASTRAL learning activity. You are asked to use the Capita case as a real-world starting point and then make a structured decision about future technology transformation.

Why use LTFF in this case?
The need for Long-Term Future Foresight is detected because the organisation faces uncertainty on several levels:

- **Short-term uncertainty:** How can services continue safely after a major incident?
- **Medium-term uncertainty:** Which digital tools, cloud platforms, automation systems, or AI tools should be introduced or limited?
- **Long-term uncertainty:** How should the organisation prepare for future cyber threats, stronger regulation, new client expectations, and post-quantum encryption needs?
-

The cyber incident makes the need visible. It shows that technology decisions are not only technical decisions. They affect trust, legal compliance, client relationships, service continuity, reputation, and future competitiveness.

Why choose the Risk–Opportunity Matrix?
The Risk–Opportunity Matrix is suitable because it is simple, visual, and easy to use without deep technical knowledge. It helps compare both sides of a decision:

- What could go wrong?
- What value could be created?
- Which risks need urgent attention?
- Which opportunities are worth pursuing?
- Which option gives the best balance between innovation and responsibility?
-

This method is especially useful when the answer should not be a simple **yes** or **no**. In this case, the organisation should not necessarily stop all technology innovation, but it should also not continue as if nothing happened.

Step 1: Define the strategic decision
The decision to analyse is:
Should a data-heavy outsourcing and professional services company pause, continue, or redesign its technology transformation after a major cyber incident?
Possible technology transformation areas include:

1. cloud migration;
2. stronger cyber monitoring;
3. improved access controls;
4. safer data management;
5. approved AI and automation tools;
6. better incident response systems
7. post-quantum encryption planning.

Step 2: Identify opportunities

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Code	Opportunity	Explanation	Likelihood	Impact	Score
O1	Stronger cyber security modernisation	The incident can justify investment in better monitoring, access control, and incident response.	4	5	20
O2	Rebuilding client trust	Visible improvements can show clients that the organisation is taking data protection seriously.	3	5	15
O3	More efficient digital services	Modern platforms can reduce manual work and improve service delivery.	4	4	16
O4	Safer approved AI and automation	Approved tools could support document review, report drafting, compliance preparation, and service analysis.	4	4	16
O5	Better compliance readiness	Stronger governance can help meet regulatory, contractual, and client expectations.	4	4	16
O6	Long-term encryption readiness	Planning for post-quantum cryptography can protect data that must remain confidential for many years.	2	5	10

Step 3: Identify risks

Code	Risk	Explanation	Likelihood	Impact	Score
R1	Further sensitive data exposure	Personal or client data could be exposed again if weaknesses remain.	3	5	15
R2	Staff use unapproved tools	Staff may use unofficial AI, cloud, or file-sharing tools if official tools are unclear or difficult to access.	4	5	20
R3	Regulatory penalties or legal claims	Data protection failures can lead to fines, claims, contract disputes, and audits.	3	5	15

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

R4	Loss of client trust	Clients may leave or reduce contracts if they believe data is not protected.	3	5	15
R5	Operational disruption during change	New systems may interrupt services if rollouts are rushed or poorly tested.	3	4	12
R6	Vendor dependency	More digital services may increase reliance on external technology providers.	3	4	12

Step 4: Plot the matrix

When the risks and opportunities are plotted, the matrix shows that the organisation faces both high-value opportunities and serious risks.



Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483



The highest-scoring opportunity is:

- **O1: Stronger cyber security modernisation** — score 20

The highest-scoring risk is:

- **R2: Staff use unapproved tools** — score 20

Other high-priority risks are:

- **R1: Further sensitive data exposure**
- **R3: Regulatory penalties or legal claims**
- **R4: Loss of client trust**

The important long-term issue is:

- **O6 / R7: Long-term encryption readiness**

This last item has a lower likelihood score because the impact may not be immediate. However, the impact score is high because organisations that store sensitive data for many years need to prepare for future changes in encryption. NIST released its first three finalised post-quantum encryption standards in 2024 and encouraged system administrators to begin transitioning because full integration will take time.

Step 5: Compare decision options

Option	What it means	Main benefit	Main risk	Main trade-off
A. Pause major technology projects	Stop most new technology projects and focus only on	Reduces immediate change risk.	Innovation slows and staff	Safety vs. stagnation

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

	recovery, compliance, and cyber security basics.		may still use unofficial tools.	
B. Continue as planned	Keep current technology plans moving quickly.	Maintains business momentum.	Does not reduce enough risk after a major incident.	Speed vs. responsibility
C. Controlled technology roadmap	Continue modernisation through approved tools, staged pilots, staff training, access controls, and review points.	Captures benefits while adding safeguards.	Requires time, governance, and training.	Innovation vs. control
D. Rapid AI and automation rollout	Introduce AI and automation widely to improve productivity.	Fast productivity gains.	High risk of data misuse, errors, and trust damage.	Efficiency vs. exposure
E. Security-first transformation	Prioritise cyber security, data protection, monitoring, encryption, and post-quantum readiness before scaling new tools.	Stronger cyber foundation.	Benefits from new tools arrive slowly.	Resilience vs. momentum

Step 6: Make the decision

Based on the matrix, the strongest option is:

Option C: Controlled technology roadmap

This option avoids two weak responses.

The first weak response would be to stop technology transformation completely. That may feel safe, but it can delay improvements, reduce competitiveness, and push staff toward unofficial tools.

The second weak response would be to continue transformation too quickly. That may protect momentum, but it does not respond properly to the risks revealed by the cyber incident.

A controlled roadmap allows the organisation to move forward, but with safeguards.

The roadmap should include:

- approved tools only;
- clear rules on what staff can and cannot use;
- no personal or sensitive client data in public or unapproved systems;
- staff training on safe technology use;
- stronger access controls;
- monitoring of unusual activity;

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

- testing before full rollout;
- human review for client-facing reports, advice, or decisions;
- supplier and vendor security checks;
- incident response procedures;
- review points after each pilot;
- identification of long-lived sensitive data;
- planning for future encryption needs.

A suitable decision summary is:
Because the organisation needs to modernise its services and strengthen cyber resilience, **but** sensitive data exposure, unapproved tool use, regulatory risk, and loss of client trust remain serious concerns, **therefore** it should follow a controlled technology roadmap **with** approved tools, staged pilots, staff training, stronger monitoring, human review, and long-term encryption planning.

Impact
The Capita case shows that cyber incidents can have consequences beyond the IT department. Public reporting states that Capita's 2023 incident involved data theft, disruption to IT services, ransomware, regulatory scrutiny, and later a £14 million fine. The incident reportedly affected personal data relating to around 6.6 million people.
The impact of applying the Risk–Opportunity Matrix is that the decision becomes more structured. Instead of reacting emotionally to a cyber incident, the organisation can compare risks and opportunities in a transparent way.
Several things improve through this approach:
1. The decision is not reduced to "technology is good" or "technology is dangerous."
The matrix shows that technology can create value and risk at the same time.
2. The organisation can see which risks require the most attention.
In this case, unapproved tool use, further data exposure, regulatory risk, and loss of trust are high-priority risks.
3. The organisation can see which opportunities should not be ignored.
Cyber modernisation, safer approved tools, better compliance readiness, and efficient digital services are important opportunities.
4. The final decision becomes easier to justify.
A controlled technology roadmap is more balanced than a full pause or rapid rollout.
5. The future vision becomes clearer.
The organisation's future direction should be to become a more resilient, trusted, and future-ready digital service provider. This means improving cyber security, adopting technology carefully, preparing staff, strengthening governance, and planning for long-term risks such as post-quantum encryption.
The vision for the future is not to avoid technology. It is to use technology in a way that is controlled, accountable, and aligned with the protection of client and citizen data.

Reflection

- Which risk in the case deserves the most attention, and why?
- Which opportunity could create the most long-term value for a data-heavy organisation?

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

- Why might a complete pause on technology projects be risky, even if it feels safe after a cyber incident?
- What safeguards would need to be in place before approving AI, automation, or cloud tools in this type of organisation?
- How could your own organisation, or an organisation you know, use a Risk–Opportunity Matrix before adopting a new technology?

Resources

Capita official website: https://www.capita.com/about-us
Provides background on Capita's services, sectors, digital work, AI solutions, data management, and organisational context.

Capita cyber incident and regulatory outcome: https://www.theguardian.com/business/2025/oct/15/capita-fined-for-data-protection-failings-in-2023-cyber-attack
News coverage of the 2023 incident, data exposure, affected individuals, regulatory fine, and cyber security failings.

NIST Cybersecurity Framework 2.0: https://www.nist.gov/cyberframework
A practical framework to help organisations understand and improve how they manage cyber security risk.

NCSC Timelines for Migration to Post-Quantum Cryptography:https://www.ncsc.gov.uk/guidance/pqc-migration-timelines
Explains why post-quantum cryptography migration is a long-term technology change and why organisations should start planning early.

NIST Post-Quantum Encryption Standards:https://www.nist.gov/news-events/news/2024/08/nist-releases-first-3-finalized-post-quantum-encryption-standards
Explains the first finalised post-quantum encryption standards and why organisations should begin transitioning because full integration will take time.

Publications / papers / books

ISO 31000: Risk Management Guidelines
Useful for understanding risk management as a structured process.

ISO/IEC 27001: Information Security Management Systems
Useful for understanding how organisations structure information security governance.

NIST Cybersecurity Framework 2.0:https://www.nist.gov/cyberframework
Useful for connecting the case to cyber risk governance, protection, detection, response, and recovery.

NIST Post-Quantum Cryptography Standards:https://www.nist.gov/news-events/news/2024/08/nist-releases-first-3-finalized-post-quantum-encryption-standards

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Useful for understanding how encryption standards are changing in response to future quantum computing risks.

NCSC post-quantum cryptography migration guidance
Useful for understanding long-term planning for organisations that store sensitive or long-lived data. https://www.ncsc.gov.uk/guidance/pqc-migration-timelines

6.2 Case Study: BlaBla Car

BlaBlaCar: identifying a market niche with Blue Ocean Strategy

This case study explores how BlaBlaCar used Blue Ocean Strategy to identify and create a unique niche in the European market for transport of persons, by connecting car owners with those that need transport to a particular destination.

Context
BlaBaCar was founded in 2006 in Paris, and today it is the world's leading community-based travel app. The technology matches drivers with empty seats with passengers heading the same way, so they can share the cost of the trip.
It´s mission is to to be the go-to marketplace for shared travel, BlaBlaCar combines carpooling with bus journeys from over 6 000 operators to offer a wide choice of affordable and sustainable travel solutions, all in one app.
As of early 2026, BlaBlaCar has over 100 million members, operates in 22 countries, and is valued at $2 billion, cementing its status as a leading European unicorn.

Implementation
BlaBlaCar identified a niche opportunity with regards to the inefficiency of single-occupancy vehicles and high costs of other transport options, and offer a cost-effective, social, and flexible travel option.
The Blue Ocean Strategy was employed to differentiate the company´s offering, in the saturated market of transport of persons, and focus on an until then, unexplored niche of inter-city carpooling, which at the time was not (sufficiently) covered by existing public transport or private taxi services.
The strategy was chosen due to its adequateness for differentiating and tap into new market opportunities or create new (niche markets).
1. Strategic Planning and Analysis:
Initially, BlaBlaCar conducted extensive research to understand the pain points of persons travelling and using traditional modes of transportation. This included surveys and focus groups to gather insights on customer dissatisfaction with existing options due to high costs, limited schedules, and underutilised car capacities.
The team analysed competitors, including train services, bus networks, and traditional carpooling boards, to understand the strengths and limitations of current offerings in the inter-city travel market.
2. Eliminate-Reduce-Raise-Create (ERRC) Grid:

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Through the use of the ERRC Grid, BlaBlaCar focused on value innovation by integrating cost savings with a social travel experience. This was not just about being cheaper but providing a more enjoyable and community-oriented journey.
Eliminate-Reduce-Raise-Create (ERRC) Grid:

- Eliminate: High travel costs and the complexity of arranging carpools through informal networks.
- Reduce: Environmental impact and dependencies on fixed schedules of public transport.
- Raise: User convenience, trust through verified profiles and user reviews, and the social experience of traveling.
- Create: A new market for organized long-distance ridesharing using a digital platform that ensures safety, reliability, and social interaction.

Development and testing
The technical team developed a user-friendly platform that facilitated easy posting of available seats by drivers and simple booking by passengers. The platform included features like secure messaging, easy payment systems, and a transparent user rating system. Initial testing was conducted in smaller markets to gather feedback and refine the platform. Adjustments were made to enhance user interface, security features, and the overall user experience.

Marketing and Community Building:
BlaBlaCar used targeted digital marketing strategies focusing on the benefits of cost savings, meeting new people, and traveling more sustainably. They engaged in social media campaigns, local events, and partnerships with universities and workplaces to spread the word.
To build a community of trust, BlaBlaCar encouraged users to leave detailed reviews and share their travel experiences. They highlighted stories of positive travel experiences through their platforms and social media to attract new users.

Scaling:
Following successful pilots, BlaBlaCar methodically expanded into new regions, adapting their strategy based on regional travel habits, regulatory environments, and local market needs. BlaBlaCar continuously innovated the platform by integrating additional services like real-time GPS tracking, in-app payments, and automated ride-matching algorithms to improve service quality and user satisfaction.

Monitoring and Adaptation:
Regular feedback was solicited from users to understand their needs and experiences. This feedback informed ongoing improvements and adaptations in the service. Key performance indicators such as user growth, ride frequency, user retention rates, and customer satisfaction scores were monitored to assess the impact of strategic initiatives and guide further development.
Impact
The Blue Ocean Strategy allowed the company to create a new demand instead of competing for a space on an overcrowded existing market.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Through the adoption of the Blue Ocean Strategy, BlaBlaCar successfully redefined the inter-city transportation landscape across Europe. By offering a novel solution that combined cost efficiency with a social travel experience, BlaBlaCar not only created a new market but also became the leading player in this space. The platform's unique approach to connecting drivers with empty seats to passengers looking for a ride resonated well with consumers who were eager for an alternative to more expensive and less flexible travel options.

BlaBlaCar's strategic expansion into various international markets was marked by careful customisation to meet local preferences and regulations, which was instrumental in replicating its European success globally. Each new market entry was strategized based on extensive research and pilot testing, ensuring that the core value proposition was maintained while meeting the specific needs of local users.

Operationally, the impact of the Blue Ocean Strategy was evident in the continuous enhancements made to BlaBlaCar's platform. Leveraging user feedback, the company implemented advanced algorithms to improve the matching of drivers and passengers, streamlined payment systems for ease of transaction, and introduced robust safety features that enhanced trust and security for its users. These improvements not only increased user satisfaction but also boosted the platform's efficiency and reliability.

In terms of sustainability, BlaBlaCar made a significant environmental impact by effectively reducing the number of cars on the road. This was achieved by maximizing the occupancy of vehicles already making specific journeys, thus contributing to lower carbon emissions per traveler compared to traditional modes of transport such as individual car use or even some public transportation options.

Moreover, BlaBlaCar's growth facilitated strategic partnerships that further broadened its service offerings.

The company is blending carpooling, bus networks (BlaBlaCar Bus), and commuter services into a single platform. This includes expanding its bus network in Western Europe and accelerating the digitization of bus services in emerging markets like Brazil.

Collaborating with local public transport systems and other travel-related services, BlaBlaCar is able to offer an integrated travel experience that included last-mile connectivity and options beyond just carpooling. These partnerships not only expand BlaBlaCar's market reach but also solidified its position as an integral part of the broader transportation ecosystem.

Beyond Europe, the company is heavily focused on growth in India and Brazil, adapting its trust-based platform to local needs.

Reflection

What other methods or tools could BlaBlaCar have used to identify the new market, and why you think these are appropriate?

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

How can BlaBlaCar use the Blue Ocean Strategy for defining the strategy for the years to come, and use it to differentiate itself from similar platforms that have arisen over the years?

Considering BlaBlaCar's expansion into markets like India and Brazil, how can a "trust-based" platform be adapted to meet specific local regulatory or cultural challenges in your own professional context?

In what ways can an organization like BlaBlaCar maintain its "Blue Ocean" status—where it focuses on sustainability and reducing environmental impact—while simultaneously pursuing aggressive global scaling and financial valuation goals?

What are in your opinion the pros and cons of the Blue Ocean Strategy for your company or industry in which you work (or envision to work after your studies)?

Resources
Links
Company website: https://newsroom.blablacar.com/

Case study on BlaBlaCar´s Blue Ocean Strategy:
https://www.essay48.com/case/50756-BlaBlaCar-The-Emergence-of-a-New-Market-Blue-Ocean-Strategy

Publications/papers/books
Saxena, Deepak & Muzellec, Laurent & Trabucchi, Daniel. (2020). BlaBlaCar: Value creation on a digital platform. Journal of Information Technology Teaching Cases. 10. 119-126. 10.1177/2043886919885940.
https://www.researchgate.net/publication/341759211_BlaBlaCar_Value_creation_on_a_digital_platform

Hanchuk, Olena & Bondarenko, Olha & Pakhomova, Olena & Varfolomyeyeva, Iryna. (2023). Characteristics of BlaBlaCar as one of the world's ridesharing leaders. IOP Conference Series: Earth and Environmental Science. 1254. 012133. 10.1088/1755-1315/1254/1/012133.
https://www.researchgate.net/publication/375305634_Characteristics_of_BlaBlaCar_as_one_of_the_world's_ridesharing_leaders

Maume, Fabian. (2016). ASIT applied to Blue Ocean Strategy. 10.13140/RG.2.1.2725.8003.
https://www.researchgate.net/publication/299411748_ASIT_applied_to_Blue_Ocean_Strategy

European Startups - Why You Should Build an Early Footprint in Europe, presentation by Nicolas Brusson (BlaBlaCar)
https://youtu.be/k71SNj3uoVY?si=yvGTteSSfvlVZW0y

6.3 Case Study: DHL Logistics Trend Radar

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

DHL Logistics Trend Radar: Operationalising Horizon Scanning for Long-Term Supply Chain Resilience

This case study explores how DHL uses its proprietary Logistics Trend Radar to systematically scan, evaluate, and map technological and socio-economic trends, translating abstract future signals into concrete corporate innovation strategies.

Context

Operating across more than 220 countries and territories, DHL manages some of the world's most complex global supply chains. In the logistics sector, long-term capital expenditure such as building mega-warehouses, investing in aircraft fleets, or redesigning regional distribution hubs requires decades to amortize. However, the industry is constantly disrupted by volatile geopolitical shifts, rapid advancements in artificial intelligence, and tightening climate regulations.

Relying solely on historical market data (lagging indicators) to plan these multi-million-dollar investments leaves the organization highly vulnerable to sudden market shifts. To mitigate this risk, DHL established a dedicated global Trend Research team. The objective was to transition the company from reactive operational troubleshooting to proactive strategic positioning, ensuring that long-term infrastructure investments are resilient to future disruptions.

Implementation

The core engine of DHL's strategic foresight is the **Logistics Trend Radar**, a structured framework that visualizes and assesses trends based on a clear matrix:

The implementation process follows a rigorous, repeatable four-step lifecycle:

- **Step 1: Continuous Horizon Scanning:** The DHL Trend Research team monitors a vast array of information sources, including university research papers, startup funding rounds, patent filings, and cross-industry mega-trends. This step deliberately looks outside traditional logistics boundaries to detect "weak signals" before they enter the mainstream market.
- **Step 2: Dual-Perspective Evaluation:** To prevent biased or purely tech-driven assessments, every identified signal is filtered through two distinct lenses:
    - *Social & Business Trends:* Shifts in consumer behavior, workforce demographics, and regulatory frameworks (e.g., *The Rise of the Omnichannel*, *Silver Economy*, or *De-carbonization Regulations*).
    - *Technology Trends:* Breakthroughs in hardware and software engineering (e.g., *Computer Vision*, *Exoskeletons*, *Bio-logical Logistics*, or *Quantum Computing*).
- **Step 3: Temporal & Impact Mapping:** Trends are formally plotted onto a circular radar canvas. The position of each trend is determined by two variables:
    - *Time Horizon (Distance to Center):* Divided into *Short-Term* (expected to impact logistics within less than 5 years) and *Long-Term* (expected to scale in 5 to 10+ years).

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

    - *Impact Level (Color/Visual Weight):* Classified as *Transformational* (fundamentally disrupting the business model), *High*, *Medium*, or *Low*.
- **Step 4: Incubation and Roadmapping:** The radar does not remain a static document. High-impact trends positioned in the "less than 5 years" zone are directly linked to DHL's Innovation Centers. They trigger concrete corporate actions, such as launching hardware pilots (e.g., deploying robotic packing arms in warehouses) or funding strategic joint ventures with tech startups.

Impact

The Logistics Trend Radar has transformed how DHL allocates its innovation capital. Instead of chasing fleeting industry hype, the company uses the radar as a central compass for its strategic roadmap.

For instance, early signal detection of *Computer Vision* and *Autonomous Mobile Robots (AMRs)* on the radar led to targeted investments years before these technologies became standard off-the-shelf commercial solutions. Today, thousands of automated guided vehicles navigate DHL sorting centers globally, directly improving operational throughput. Furthermore, by publishing the radar publicly every two years, DHL has positioned itself as an ecosystem thought leader, creating a shared vocabulary for risk and innovation among its corporate clients, suppliers, and academic partners.

Reflection

- **On Horizons:** DHL limits its long-term radar horizon to 10 years, which aligns with typical corporate asset lifecycles. For macro-infrastructures or public policy, planning horizons often extend to 25 or 30 years. How does your specific sector's capital investment timeline dictate the ideal width of your foresight window?
- **On Categorization:** The radar splits trends into *Social/Business* and *Technology*. Think about a recent disruption in your industry. Was it triggered by a new technology, or by a shift in societal behavior/regulation? Why is it dangerous for an organization to monitor only one side?
- **On Scaling for SMEs:** DHL runs a heavily funded, dedicated global trend department. How could a small or medium-sized enterprise (SME) with limited budget and no internal research team adopt a simplified version of this radar framework without operational overload?
- **On Sunk Costs:** Imagine a trend you invested heavily in suddenly drops in importance on the next edition of the Trend Radar. How should a leadership team handle the emotional and financial "sunk costs" of pivoting away from a failing strategic roadmap?

Resources

Links

DHL Logistics Trend Radar: https://www.dhl.com/global-en/home/insights-and-innovation/insights/logistics-trend-radar.html

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Publications/papers/books

- DHL Trend Research. (2024). *Logistics Trend Radar (6th Edition)*. Deutsche Post DHL Group.
- Phaal, R., Farrukh, C. J., & Probert, D. R. (2004). Technology roadmapping: A planning framework for evolution and revolution. *Biomedical Microdevices*, 6(1), 5-13.

6.4 Case Study: Danish Drones

Danish drones: identifying consumer visions of far-future drones use cases

This case study relates how the Flash Fiction was used to inform policy decision-makers at governmental and corporate level about how citizens envision drones will impact daily life and society in the future, a type of knowledge critical to ensure the development of sustainable drone solutions.

Context

Aerial drones for civil purposes will expectedly become ubiquitous in society and potentially overfly everyone and everything. This case study relates how the Flash Fiction method was used to inform policy decision-makers at governmental and corporate level about how citizens envision drones will impact daily life and society in the future, a type of knowledge critical to ensure the development of sustainable drone solutions.

Far-future customer needs are difficult to identify, survey, and validate. Potential customers have difficulties in expressing their long-term future needs because these are not part of their explicit knowledge. This method uses very short fictional stories of 150-300 words gathered in creative writing workshops.

Denmark was the first EU country to develop a strategy for the civil use of drones, supporting industry and research to develop drone-oriented projects and breaking down the barriers for using drones in society. The gathering of citizens' far-future envisioning about the uses and impacts of this technology was designed to inform decisions for policy and corporate.

The activity was carried out by a Danish research centre with the purpose of reaping the benefits of accessing consumer visions for long-term strategy-making and innovation efforts by incorporating consumer Flash Fiction into scenario development.

Implementation

The data was collected through a total of 7 workshops where citizens wrote fictional stories about drones in the distant future of 2057. The sample of 135 citizens covered a broad age range as well as difference in genders and drone technology knowledge levels, to reflect multiple perspectives. Each participant attended one of the seven creative writing workshops that took place in the southern region of Denmark between November 2018 and March 2020.

Each participant was asked to write 3 very short flash fiction stories of around 300 words, focussing on one topic or conflict and one person and thinking of the year 2057. They were

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

given 2 to 3 minutes per story so they had no time to rationalise and access explicit knowledge while writing.
Participants were briefly to contemporary designs and recent applications of drones. Then, they were informed about the research project, the planned use of the stories in case they decided to hand them in and options for remaining anonymous.
Three warm-up sessions were used to get the participants started and introduce them to the format of flash fiction stories. First, they were given a served to get a creative writing prompt in the shape of an unfinished sentence and given 1 min to continue a story starting with this sentence. Then 2 short session used pictures on which in 1 minute they were asked to write a story. After these sessions three creative writing sessions lasting 2½–3 min each took place, where the participants were asked to imagine and describe the world with drones in the year 2057 and imagine 3 scenarios. a main character and a situation in which s/he will be exposed to drones in 2057; a positive encounter between this main character and a drone in 2057 and a negative encounter in 2057.
Once all three stories were written, writers who volunteered read their stories out loud to others. This spurred small debates about the pros and cons of implementing drones for the purposes suggested in the stories.
A total of 405 stories were collected, which were coded in iterative rounds by the coordinating researchers to identify related concepts and classify the stories accordingly.

Impact

The most often imagined uses were 'Delivery service drone' (mentioned in 67 stories) and 'Personal and animal transportation service drone' (mentioned in 39 stories), followed by 'House assistant drone' (20 stories), 'Ambulance drone' (16 stories), 'Medicine drone' (13 stories) and 'Fetch and carry drone' (11 stories). Overall, private-use service drones that provide pick-up and carry services, transportation of living beings and assistance in domestic tasks were dominating the stories.
The use of the flash fiction method provided details about the potential distant future with drones that can serve to inspire today's policy decision-making regarding the further implementation of drone technology. The different uses imagined by the participants showed both positive and negative impacts of increasingly implementing drones in society. Policy decision-makers must deal with both these negative and positive impacts, i.e. consider if the advantages outweigh the disadvantages and if anything can be done to minimise the latter.
The use of forecasting methods and in particular the flash fiction method allow policy makers to expand their perspective of how the larger-scale implementation of drones will potentially alter our society, and support them in identifying appropriate instruments for regulating or supporting initiatives through back-casting towards citizen-desired futures,

Impact	Governmental Attention	Corporate Attention
Negative reactions	Penalties for destroying drones	Insurance for destroyed drones
Malfunctions	Responsibility for failures; drone-specific law?	Quality procedures; insurance
Crime/warfare	Penalties for criminal drone use	Misuse-preventing design
Hidden data collection	Data rules for collection/storage/use	Guidelines preventing data misuse

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Drone interactions	Rules for swarms and conduct	Interoperability guidelines
Artistic inspiration	Allow room for creativity	Design enabling freestyling
Ease life	Different rules for areas/types of use	Portfolio prioritizing valuable uses
Inefficiency	Financial support for access	Align with financial/user capabilities
Environmental benefits	Incentives for electric drone use	Eco-friendly mission design; replace vehicles
Safer lifeworld	Incentives for safer mobility	Safety-oriented design
Delivery downsides	Reduce consumption; encourage exercise	Design minimizing consumption and promoting activity
Job loss	Define drone scope in public sector	Ensure drones don't replace humans
Anxiety	Design requirements (look/function)	Compliance with design standards
Environmental problems	Design rules; restrict flight times	Low-pollution design
Isolation	Promote human interaction	Design supporting social contact
Dependency	Restrictions; promote skill-building	Design teaching new skills
Enjoyment	Design pleasing to humans	Design aligned with human preferences
Efficiency	Require drones where they save cost/time	Ensure drones save cost/time

Table 1: Potential areas of attention

Reflection

What other methods or tools could the research body have used to identify the long-term & far-future needs of their customers, and why you think these are appropriate?

With which other methods and techniques would you combine the Flash Fiction method to benchmark the results and create a context for the visions of the customers?

What are in your opinion the pros and cons of the Flash Fiction Method for your company or industry in which you work (or envision to work after your studies)?

In which areas or on which problems do you think you could use Flash Fiction in your work (or future work after your studies)?

Resources

Links

Danish drones case study: Frederiksen, Marianne & Wolf, Patricia & Klotz, Ute. (2024). Citizen visions of drone uses and impacts in 2057: Far-future insights for policy decision-makers. Technological Forecasting and Social Change. 204. 123438. 10.1016/j.techfore.2024.123438.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

https://www.researchgate.net/publication/381870305_Citizen_visions_of_drone_uses_and_impacts_in_2057_Far-future_insights_for_policy_decision-makers

Publications/papers/books
Wolf, Patricia & Klotz, Ute & Frederiksen, Marianne. (2024). Consumer flash fiction: A methodology to support the early sensing of far-future innovation opportunities. Technovation. 133. 103014. 10.1016/j.technovation.2024.103014.
https://www.researchgate.net/publication/380255558_Consumer_flash_fiction_A_methodology_to_support_the_early_sensing_of_far-future_innovation_opportunities

6.5 Case Study: EU Policy Lab Future Garden

Futures Garden: Combining Horizon Scanning with Speculative Design

The EU Policy Lab's Futures Garden initiative combines systematic horizon scanning with speculative design, which is the practice of creating tangible objects and experiences from imagined futures, to help European policymakers engage with long-term change in a concrete and emotionally resonant way.

Context
Policymaking in Europe increasingly faces a difficult challenge. By the time a new law or regulation is fully developed and implemented, the world it was designed for may have already changed. Traditional approaches to policy tend to react to developments that are already visible, and they are less well-suited to exploring futures that are still uncertain, distant, or genuinely surprising.
The EU Policy Lab is part of the European Commission's Joint Research Centre and was established to experiment with new ways of working. Futures Garden is one of its projects. The initiative works on a long-term horizon, exploring possible futures set in the 2050s, which is roughly 25 to 30 years ahead. At this distance, the future is highly uncertain, and data alone cannot tell policymakers what to prepare for. Instead, policymakers need imagination structured by evidence. While horizon scanning provides evidence, speculative design adds an imaginative layer.
Futures Garden addresses this by combining two complementary methods: horizon scanning, which systematically identifies early signals of change, and speculative design, which turns those signals into concrete experiences that people can see, touch, and discuss. Together, they help policymakers move from abstract thinking about the future to active preparation for it.

Implementation
Futures Garden follows a structured four-step approach. Each step builds on the previous one, moving from evidence to experience to policy reflection.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Step 1: Horizon Scanning The process begins with horizon scanning, which means deliberately looking beyond what is already familiar. This step involves regularly monitoring a wide range of information sources to spot emerging developments before they become widely recognised. The process systematically searches for early signals of change across many different domains, including technology, society, governance, and the environment. The EU Policy Lab uses the ESPAS Horizon Scanning process for this, led by foresight experts supported by a network of scanners drawn from EU institutions and international organisations. The goal is to identify developments that are not yet mainstream but that could shape Europe's future.

Step 2: Speculative Design Once signals of change have been identified, they are handed to designers, futurists, and artists. The team's task is to transform abstract ideas into tangible artefacts, such as objects, films, audio pieces, or interactive experiences that bring a possible future to life. Speculative design is a creative practice that uses design to explore possibilities in the future rather than to solve problems in the present. Instead of asking how to fix a current issue, it asks what if the world worked like this, aiming to make futures feel real enough to be discussed seriously.
This approach is a significant departure from how foresight is usually communicated. Instead of a written report describing possible futures in abstract terms, Futures Garden produces experiences that people can engage with directly. Several artefacts have been developed, including:

- **Symbiotic:** A scenario set in the 2050s exploring a world where the boundary between human intelligence and the wider ecosystems of the planet has been fundamentally rethought.
- **Inwards:** A future in which European citizens, having lost faith in narratives of perpetual economic growth, turn toward self-sufficiency and community rather than technological solutions.
- **After Jubilee:** A speculative radio show set in a future Europe after a mass erasure of debt and a restructuring of social and economic priorities.
- **Coming of Age 20/40:** An interactive collective experience exploring what it means to grow up in a transformed future Europe.

Each artefact is designed to provoke reflection and conversation rather than to predict the future. They prompt participants to consider if these scenarios could happen, whether society would want them to, and what they would mean for governance.

Step 3: Citizen Engagement Futures Garden does not stop with policymakers. The speculative artefacts are also used in workshops and engagement activities with EU citizens. Participants are invited to respond to the scenarios by agreeing, challenging, or imagining alternatives. This brings diverse perspectives into the foresight process, including voices that rarely shape policy at the European level.

Step 4: Policy Reflection The final step involves bringing the insights from citizen engagement and experimentation back into the policy process. Teams from various Directorates-General, which are the departments of the European Commission responsible for different policy areas, have used the artefacts as starting points for small-scale

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

experiments and new ways of thinking about emerging challenges. The emphasis here is on reflection and exploration rather than immediately producing legislation.
The goal is to help policymakers develop futures literacy, which refers to the capability to use imagination and evidence together to think critically and creatively about the future as a regular part of their work. This concept was developed by Riel Miller at UNESCO and is increasingly used in policy and education contexts to describe the forward-looking competence that institutions need to navigate complex change and uncertainty.

Impact
Several features distinguish Futures Garden from more traditional foresight projects:

- **From Reports to Experiences:** Most foresight work is communicated through reports, presentations, or text-based scenarios. Futures Garden uses physical artefacts, films, audio experiences, and interactive formats instead. These formats help people engage with possible futures in a more personal and memorable way. Research on the initiative suggests that these experiences can support richer discussion and co-creation among both citizens and policymakers.
- **Making Futures Easier to Discuss:** Many long-term futures feel distant and abstract. Futures Garden helps make them more concrete. By experiencing a possible future rather than simply reading about it, participants can discuss opportunities, risks, and policy implications more openly.
- **Creating Space for Experimentation:** The EU Policy Lab provides a setting where ideas can be explored before they are linked to formal policy proposals. The initiative describes this as "provo-typing", which is a method that combines provocation and prototyping. The aim is to test assumptions, challenge existing thinking, and explore alternatives before decisions need to be made.

Challenges and Limitations: The initiative also highlights several limitations. First, translating a speculative future into concrete policy action remains difficult, as an engaging future experience does not automatically lead to a policy recommendation. Second, the project brings together designers, scientists, foresight practitioners, and policymakers, and these groups often have different expectations about evidence and decision-making. Third, horizon scanning reflects the sources it draws upon; if those sources are limited, the futures that emerge may also be limited. Finally, while citizen engagement has been an important part of the project, there is still a difference between asking citizens to react to futures and involving them directly in creating those futures.

Reflection
Thee questions are designed to support discussion and critical analysis of the case study:
On Evidence and Imagination: Futures Garden combines horizon scanning with speculative design. Why is it useful to combine evidence-based analysis with creative exploration? What might be lost if one of these elements is removed?
On Communicating Futures: Imagine you have completed a foresight project for a small business or public organisation. Would you communicate the results through a written report, a workshop, a video, a physical artefact, or a combination of formats? Why?
On Practical Application: Think about a strategic challenge facing your organisation or sector. What future artefact could help decision-makers engage with that challenge? Describe what it might look like and what conversation it could stimulate.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

On Participation: Who should be involved in creating future scenarios for your organisation? Employees, customers, suppliers, citizens, experts, or other stakeholders? What perspectives might each group contribute?
On AI and Foresight: How could AI tools support a process like Futures Garden? Consider activities such as horizon scanning, signal detection, trend analysis, scenario generation, citizen engagement, or impact assessment. Which tasks should remain primarily human-led?
On Moving from Insight to Action: One challenge identified by Futures Garden is translating future visions into practical decisions. What steps would you take to move from an inspiring future scenario to a concrete action plan, investment decision, or policy proposal?

Resources

Links

Project Website:
https://policy-lab.ec.europa.eu/futures-garden_en

Publications/papers/books

- Bol, E., Krzysztofowicz, M., Mehnert, W., & Rosa, A. B. (2025). Futures Garden — Using speculative design to inspire policy making. *World Futures Review*, *17*(1–3), 228–246. https://doi.org/10.1177/19467567251338770
- Dunne, A., & Raby, F. (2013). *Speculative everything: Design, fiction, and social dreaming.* MIT Press.

6.6 Case Study: GoPro

GoPro: Capturing the Action Sports Market with Blue Ocean Strategy

This case study explores how GoPro used Blue Ocean Strategy to create an entirely new market category for action cameras, transforming from a niche SME into a globally recognised brand.

Context

GoPro, founded by Nick Woodman in 2002, began as an SME enabling action sports enthusiasts to capture quality photos and videos in extreme environments. The founder identified the gap during surfing trips, realising the need for a hands-free, robust camera solution for dynamic outdoor activities. Traditional cameras were too fragile and complex for these use cases, and the market for personal action video capture simply did not exist.

Implementation

GoPro adopted Blue Ocean Strategy to differentiate itself from established camera manufacturers by creating a new market for everyday adventurers and sports enthusiasts who needed durable and easy-to-use cameras.
Market Boundary Reconstruction: GoPro looked beyond the typical camera market to identify opportunities among non-consumers, including sports enthusiasts and amateur filmmakers who were frustrated by the inability to capture high-quality action footage.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Big Picture Focus (Strategy Canvas and ERRC Grid): GoPro eliminated the technical complexity and fragility common in traditional cameras. The company simplified the user experience and enhanced the camera's durability and versatility, creating cameras that could be mounted on any surface and withstand extreme conditions.

1. Non-Customer Focus: By addressing the needs of people who wanted to capture video in situations where traditional cameras could not go, GoPro expanded into entirely new customer segments — not just photographers, but anyone engaged in outdoor activities, extreme sports, and everyday family events from unique perspectives.
2. Strategic Sequence: GoPro ensured their cameras provided unmatched utility in action settings, were priced affordably to attract a broad audience, managed costs through innovative and simple manufacturing designs, and tackled adoption barriers by creating extensive online tutorials and leveraging user-generated content.
3. The ERRC Grid in practice: Eliminate — need for professional filming equipment; Reduce — price complexity and technical barriers; Raise — durability, ease of use, and mounting versatility; Create — user community, content sharing ecosystem, and new mounting accessories.

Impact

GoPro successfully created a new category within the camera market, branded around lifestyle and adventure. This approach not only expanded the market but established GoPro as a synonym for action cameras.

The company transformed from a niche product into a globally recognised brand. GoPro expanded the market by making high-quality video capture accessible across various settings, not just extreme sports.

A key element of GoPro's success was the organic marketing generated by its user community. By encouraging content sharing, GoPro created a virtuous cycle where users effectively marketed the product through their own footage.

GoPro's approach to Blue Ocean Strategy demonstrated that SMEs can create entirely new market spaces without competing directly with established players, by focusing on unmet needs of non-consumers.

The company continues to innovate with new camera technologies, including 360-degree cameras and drones, aiming to remain at the forefront of personal video capture technology.

The case illustrates the power of Blue Ocean Strategy for SMEs: rather than competing in crowded markets, companies can create uncontested market space where competition becomes irrelevant.

Reflection

How did GoPro's identification of non-consumers lead to the creation of a new market space, and what can other companies learn from this approach?

What role did community building and user-generated content play in GoPro's Blue Ocean Strategy, and how does this relate to modern platform strategies?

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

How could the Blue Ocean Strategy framework be applied to identify new market opportunities in your industry or field of study?

What challenges might GoPro face as competitors enter the action camera market, and how should it respond to maintain its blue ocean?

Resources

Links

GoPro Official Website: https://www.gopro.com

https://www.researchgate.net/publication/332948080_WHAT_CAN_WE_DO_FOR_YOU_FAR-FUTURE_MOBILITY-RELATED_CUSTOMER_NEEDS

Publications/papers/books

Kim, W.C. & Mauborgne, R. (2004). Blue Ocean Strategy. Harvard Business Review, 82(10), 76–84.

https://www.researchgate.net/publication/364596813_Zukunftige_Kundenbedurfnisse_und_Mobilitat_-_oder_mit_Hilfe_von_Science-Fiction_Geschichten_neue_Wege_beschreiten

6.7 Case Study: Lime

Lime: Strategizing for Global Expansion in the Mobility Sector Through PESTLE Analysis

An exploration of how Lime applied PESTLE analysis to navigate diverse political, economic, social, technological, legal, and environmental factors during its rapid international expansion in shared electric mobility.

Context

Lime operates in the urban mobility sector, providing an environmentally friendly transportation alternative through its fleet of shared electric scooters and bicycles. Founded in 2017 in San Francisco, Lime expanded rapidly to cities worldwide, needing to understand various external factors that could impact its business model. The need for comprehensive external analysis was particularly evident as Lime planned its entry into diverse international markets with varying regulatory landscapes, cultural attitudes to shared mobility, and infrastructure readiness.

Implementation

Lime adopted PESTLE analysis to systematically assess external factors that could influence its business operations and strategic decisions during its rapid international expansion.
The analysis was structured across the six PESTLE dimensions:

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

1. Political Factors: Analysed government regulations on shared mobility solutions, including permits and restrictions in different cities. This proved critical, as cities range from highly welcoming (e.g., Paris, where scooter-sharing is integrated into urban transport plans) to restrictive (e.g., cities that impose fleet caps, speed limits, or outright bans on dockless vehicles).
2. Economic Factors: Assessed economic stability, disposable income levels of potential customers, and the presence of competing transportation services which influence pricing strategies. Lime found that unit economics varied dramatically between markets, requiring city-specific pricing models.
3. Social Factors: Evaluated societal attitudes towards shared mobility and environmental consciousness. Acceptance varied widely: while young, urban, environmentally conscious demographics were early adopters, other communities raised concerns about sidewalk clutter, safety risks, and accessibility barriers for pedestrians and people with disabilities.

Technological Factors: Explored advancements in electric vehicle technology, IoT-based fleet management, and digital payment systems to enhance user experience and operational efficiency. Legal Factors: Reviewed legal implications of operating shared transport services, including insurance requirements, liability for injuries, and compliance with local transportation laws which differ substantially between jurisdictions.
Environmental Factors: Considered environmental impacts, promoting sustainability as a core part of its value proposition. However, the analysis also revealed tensions: while e-scooters reduce car trips, questions about battery lifecycle, charging logistics, and vehicle disposal complicated the sustainability narrative.

Impact
The PESTLE analysis had wide-ranging impacts on Lime's strategy and operations, though it also revealed the limitations of macro-environmental analysis for a fast-moving start-up.
Regulatory Adaptations: Lime tailored its operations to comply with local regulations in each new city. In some European cities with stricter vehicle safety regulations, Lime introduced newer, more robust scooter models with additional safety features. By anticipating political and legal climates, Lime successfully obtained operational permits in highly regulated markets such as New York City and several European capitals.
However, the regulatory landscape also dealt significant setbacks. Several cities imposed bans or restrictions: Atlanta, Detroit, and St. Louis restricted shared e-scooter use; Lime withdrew from San Diego after new regulations caused ridership to decline; and Rome suspended Lime's service in 2025 for repeated violations of parking and fleet management rules. These outcomes demonstrate that even thorough PESTLE analysis cannot fully predict the pace and direction of regulatory change.
Market Penetration and Growth: Economic and social analyses guided Lime to prioritise expansion into cities with high levels of environmental consciousness and a young, tech-savvy demographic. Strategic partnerships with local businesses and transit authorities helped integrate Lime's services with public transportation systems, increasing adoption rates.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Product and Service Innovations: In response to the technological factors identified, Lime invested in advanced IoT technology to improve vehicle tracking and maintenance. Social trends emphasising health and safety during the COVID-19 pandemic prompted Lime to introduce new sanitisation protocols and contactless operations.
Sustainability — a Mixed Picture: Environmental factors drove Lime to commit to carbon neutrality, implementing measures such as purchasing renewable energy credits and optimising charging routines. Lime developed recycling programmes for scooter batteries. However, critics have pointed out that the short lifespan of shared scooters (often under two years), the carbon cost of manufacturing and logistics, and the fact that many scooter trips replace walking or cycling rather than car journeys complicate the sustainability claims.
Financial Outcomes: By understanding the economic landscapes of different regions, Lime optimised its pricing models to maintain competitiveness while ensuring profitability. Strategic entries into key markets propelled revenue growth, though Lime — like most shared mobility companies — took years to approach profitability, highlighting the gap between PESTLE-informed strategy and financial reality.

Reflection
How effective was PESTLE analysis as a tool for guiding Lime's international expansion, and what are the limitations of this approach for a fast-moving start-up operating in a sector where regulations change rapidly?

Which of the six PESTLE dimensions proved most critical for Lime, and which factors did the framework struggle to capture (e.g., community backlash, vandalism, competitor pricing wars)?

How might the insights from a PESTLE analysis change if Lime were expanding into markets in Sub-Saharan Africa or South-East Asia rather than Europe and North America?

What complementary strategic tools would you recommend using alongside PESTLE analysis for an urban mobility company, and what additional insights would they provide?

Resources
Links
Lime Official Website: https://www.li.me/
Smart Cities Dive: E-scooter bans, restrictions can leave some riders behind (2023). https://www.smartcitiesdive.com/news/e-scooter-bans-restrictions-leave-riders-behind-lime-bird/645092/

Publications/papers/books
Aguilar, F.J. (1967). Scanning the Business Environment. Macmillan, New York.
Yüksel, I. (2012). Developing a Multi-Criteria Decision Making Model for PESTEL Analysis. International Journal of Business and Management, 7(24), 52-66.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Hollingsworth, J., Copeland, B. & Johnson, J.X. (2019). Are e-scooters polluters? The environmental impacts of shared dockless electric scooters. Environmental Research Letters, 14(8).

6.8 Case Study: NHS RFID

Scenario-driven technology roadmapping for RFID technology adoption in the NHS

This case study examines how a special interest group for Radio Frequency Identification (RFID) used scenario-driven roadmapping to develop a technology foresight strategy for RFID adoption across the English National Health Service.

Context
The case study is based on a technical paper by Hussain et al. (2017) on scenario-driven roadmapping for technology foresight. The method was applied with the GS1 Healthcare User Group (HUG) of the UK Department of Health, founded in 2009 to drive adoption of RFID technologies through a coordinated approach in the UK healthcare system. RFID technologies promise great potential in patient safety, error reduction, process efficiency, inventory management, and information exchange within supply chains. However, adoption has been limited in the NHS due to localised decision-making, limited funding, and controversy around large national IT projects. Although HUG is competent and knowledgeable, it has neither mandates nor financial resources; its role is to shape, coordinate, and orchestrate developments so that system-wide learning is facilitated. The programme lasted 16 months.

Implementation
The scenario-based roadmapping process centred on three half-day workshops combined with interviews before, after, and between the workshops. Participants were drawn from a wide range of organisations, including four technology providers and three public sector organisations.
In the first phase, participants were asked three questions to identify weaknesses in current planning methods, followed by interviews to gain a comprehensive understanding of key drivers and barriers to RFID adoption in the NHS, analysed using a PEST framework. In Phase 3, driving forces were categorised on a scale and discussed in a workshop.
In Phase 4, different scenarios were developed and selected for further exploration. Three scenarios were chosen:

1. IT has not saved NHS (low capital budget for new technologies / low quality online patient records)
2. The National Programme for IT worked (high technology regulation / high data standards across healthcare)

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

3. Great IT, poor public health (high capital budget for new technologies / low health of the population)

All three scenario narratives were visualised as the website of the online industry magazine iHealth Insider, widely known to participants. In the final phases, further workshops encouraged participants to discuss scenarios and their impact on society, the industry, and their organisations.
Participants also evaluated the content of a technology roadmap across four categories (internal business strategy, products/services/systems, technology, and resources) over four time intervals (1 year, 3 years, 10 years, and vision). Five flex points with major influence on RFID development were identified.

Impact

RFID technology has many applications in the healthcare sector. This case study examined the use of scenario-based roadmapping for technology foresight at the portfolio level, rather than for a single product, making it a technology portfolio map illustrating development plans for the NHS environment.
The results indicated that the NHS is expected to move towards paperless workflows and automated processes, with home monitoring remaining a key area for RFID technologies. Although the purpose was to develop a system-wide technology foresight, participants tended to focus on their own organisations.
Nevertheless, many contributions reinforced the evidence for effective integration of scenario development and technology roadmapping, underpinning the link between the future of RFID technologies in the NHS and individual organisations.
Approximately 12 months after the scenario development, a final interaction showed that some participants had brought experiences from the intervention into their organisations, begun discussing longer-term planning, and started perceiving the influence of the scenarios on their strategic thinking.
Overall, the implementation of scenario-led technology roadmapping within the HUG intervention was effective. The process enabled participants to develop three scenarios as a platform and work with flex points to create a technology roadmap for RFID in the NHS. The systematic and participatory development of scenarios prompted participants to think carefully about drivers and create plausible alternative futures. The scenarios and roadmap supported joint strategy development at both the system level and within individual organisations.

Reflection

What advantages and limitations does scenario-driven roadmapping offer compared to traditional technology forecasting methods, and in what contexts would you recommend its use?

How might the decentralised decision-making structure of a large public healthcare system like the NHS affect the implementation of technology foresight exercises?

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

What role did the participatory workshop format play in the success of the roadmapping process, and how might this approach be adapted for your own organisation or industry?

If you were leading a similar technology foresight exercise in your sector, which stakeholders would you involve and why?

Resources

Links

Hussain, M., Tapinos, E. & Knight, L. (2017). Scenario-driven roadmapping for technology foresight. Technological Forecasting & Social Change, 124, 160-177. https://doi.org/10.1016/j.techfore.2017.05.005

RFID Technology: https://www.ttelectronics.com/blog/rfid-technology/ | GS1 Healthcare User Group: https://www.gs1uk.org/industries/healthcare/healthcare-user-group | NHS: https://www.nhs.uk/

Publications/papers/books

Hussain, M., Tapinos, E. & Knight, L. (2017). Scenario-driven roadmapping for technology foresight. Technological Forecasting & Social Change, 124, 160-177. https://doi.org/10.1016/j.techfore.2017.05.005

6.9 Case Study: Spain 2050

Foundations and Proposals for a Long-Term National Strategy Report

The Spain 2050 initiative represents Spain's most significant contemporary example of institutionalised strategic foresight aimed at strengthening anticipatory governance and addressing long-term structural challenges.

Context

In 2020, the Spanish Government established the National Office of Foresight and Strategy within the Office of the Prime Minister (Presidencia del Gobierno). Its mission was to strengthen long-term strategic thinking and anticipatory governance through systematic trend analysis and policy design. Unlike the Swiss Railways case, which employed the Flash Fiction method to capture citizens' long-term visions of mobility through creative storytelling (a form of participatory corporate foresight focused on users and customers), the Spanish case relies on a top-down national framework. It serves as an excellent model of institutionalised strategic foresight for anticipating systemic risks within governmental structures.

Implementation

The initiative relied on a diverse and rigorous set of foresight approaches to analyze the potential trajectories of structural drivers up to the year 2050. These approaches included:

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

National strategic foresight: Establishing a formalized macro-horizon for systemic country-wide planning.
Structural analysis: Dissecting variables and interconnected factors driving national development.
Socio-economic scenario development: Generating dynamic future pathways to incorporate deep uncertainty explicitly into policymakers' decisions.
Anticipatory governance: Linking long-term systemic insights directly into public administration and government architecture.
The exercise explored how a number of major structural issues could evolve up to 2050, acknowledging that the objective was not to predict the future precisely, but to build resilience against multiple risks. The analysed pillars include:
- Demographic ageing and the sustainability of the welfare system.
- Rural depopulation and territorial inequalities.
- Automation and labour market transformation.
- Climate change, energy transition, and water scarcity.
- Productivity challenges and technological transformation.
Beyond the canonical macro-strategy of Spain 2050, other relevant sector-specific foresight exercises in Spain include:
Climate and Hydrological Planning: Exercises undertaken by the Spanish Meteorological Agency (AEMET) and the Spanish Office for Climate Change, utilizing advanced climate models extending to the horizons of 2050–2100.
Energy Transition Foresight: Strategic scenario exercises conducted by infrastructure and utility leaders such as Redeia and Iberdrola to ensure grid resilience.

Impact
The primary and most prominent concrete outcome of this framework was the publication of the comprehensive report: *Spain 2050: Foundations and Proposals for a Long-Term National Strategy (España 2050: Fundamentos y propuestas para una Estrategia Nacional de Largo Plazo)*. This report acts as a foundational baseline linking strategic foresight directly with active policymaking to adapt public infrastructures and regulations ahead of long-term crises.

Reflection
What are the primary institutional advantages and limitations of placing a strategic foresight office directly within the Office of the Prime Minister?

How can governments effectively balance long-term planning horizons (up to 2050) with short-term political cycles and pressing daily crises?

In what ways do participatory corporate foresight methods (e.g., Swiss Railways) and national strategic foresight frameworks (e.g., Spain 2050) complement each other if applied to public utility planning?

Resources
Links

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Project page:
https://futuros.gob.es/en/our-work/spain-2050

Publications/papers/books

International Labour Organization, y OCDE. Approaches to anticipating skills for the future of work. Report prepared by the ILO and OECD for the G20 Employment Working Group. Ginebra, 2018.
https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@dgreports/@inst/documents/publication/wcms_646143.pdf

Kriechel, Ben, Tomáš Rašovec, y Rob Wilson. "Skills Forecast." En ETF, ILO y Cedefop. Developing Skills Foresight, Scenarios and Forecasts: Guide To Anticipating And Matching Skills And Jobs Volume 2. Parte B. Luxemburgo: Publications Office of the European Union, 2016.
https://op.europa.eu/en/publication-detail/-/publication/77089ba6-b79d-11e6-9e3c-01aa75ed71a1/language-en

National Office for Foresight and Strategy. Government of Spain. Spain 2050: Foundations and proposals for a Long-Term National Strategy. 2021.
https://futuros.gob.es/sites/default/files/esp2050/pdf/en/Spain_2050.pdf

6.10 Case Study: Spotify

Spotify: Harmonizing Innovation and Competition Through Porter's Five Forces

This case study examines how Spotify used Porter's Five Forces to navigate the competitive landscape of digital music streaming and carve out a market-leading positio

Context

Spotify, founded in Sweden in 2006, entered the digital music streaming industry when it was dominated by physical and digital sales (like CDs and iTunes). Spotify's business model centred around providing legal, on-demand access to music, supported by both an ad-based free tier and a premium subscription tier. The early 2000s witnessed a significant increase in illegal music downloads, and Spotify needed to assess whether a legal streaming model could viably compete against entrenched purchasing models and piracy. By 2024, Spotify had grown to over 246 million premium subscribers and 640 million monthly active users globally, generating EUR 15.67 billion in annual revenue and posting its first annual net profit of EUR 1.1 billion, demonstrating the long-term viability of its strategic approach.

Implementation

Spotify adopted Porter's Five Forces to strategically analyse the competitive music streaming landscape, identifying opportunities and threats, and to better understand the forces shaping the industry dynamics.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

The analysis was structured around the five forces framework, each revealing specific strategic implications:

1. Industry Rivalry: Spotify evaluated intense competition from Apple iTunes, Pandora, and later Apple Music and Amazon Music. By 2025, Spotify held approximately 31.7% of the global music streaming market, followed by Tencent (14.4%) and Apple Music (12.6%). This understanding led Spotify to continuously innovate its user experience, algorithmic playlist curation (e.g., Discover Weekly), and content diversification into podcasts.
2. Threat of New Entrants: Barriers to entry are high due to the required licences from music labels and the substantial capital needed to build a competitive music catalogue. Spotify's early agreements with major record labels gave it a first-mover advantage, making it difficult for new entrants to secure equally favourable terms.
3. Threat of Substitutes: With free music available through piracy and platforms like YouTube, Spotify emphasised unique features such as offline listening, exclusive content, and superior music discovery algorithms to differentiate its service from free alternatives.

Bargaining Power of Suppliers: Major music labels (Universal, Sony, Warner) and independent artists had significant power over Spotify, as obtaining licensing agreements was complex and expensive. To manage this, Spotify engaged in long-term licensing agreements and later pursued direct deals with artists and exclusive podcast content (e.g., acquiring Gimlet Media and The Joe Rogan Experience) to reduce dependency on traditional music labels.
Bargaining Power of Customers: Consumers had high bargaining power due to near-zero switching costs between streaming services with similar monthly subscription fees. Spotify responded by introducing various subscription models (individual, family, duo, student plans) and by building personalisation features that increased switching costs through curated playlists and listening history.

Impact

Spotify's emphasis on user-centric features, personalised playlists, and podcast integrations have kept it at the forefront of the industry despite increasing competition from well-resourced technology companies.
The Porter's Five Forces analysis helped Spotify position itself as the market leader in music streaming by focusing on three strategic pillars: accessibility (freemium model lowering barriers), exclusivity (original podcast content and direct artist deals), and user engagement (algorithmic personalisation creating high switching costs).
Spotify transformed from a start-up challenging piracy and traditional music sales into the world's largest music streaming platform, with over 100 million tracks and approximately 7 million podcasts available on its platform.
However, the analysis also highlights ongoing vulnerabilities: supplier power remains high as major labels renegotiate licensing terms, and the threat of substitutes has evolved as short-form video platforms (TikTok, YouTube Shorts) increasingly compete for listener attention and artist discovery.
Spotify continues to explore new content formats and market expansions, including moves into audiobooks and high-growth regions in Asia and Africa, diversifying beyond its original music-only model to build a broader audio platform.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Reflection
How effective was Porter's Five Forces as a strategic tool for Spotify in navigating the digital music industry, and what limitations does this framework have when applied to fast-changing digital markets?

What alternative strategic frameworks could Spotify have used to complement Porter's Five Forces, and what additional insights might they have provided?

How might the relative power of the five forces change for Spotify over the next decade as AI-generated music and short-form audio content grow, and what strategic adjustments would be needed?

In what ways could a small or medium-sized enterprise in a different industry apply the same Five Forces approach to guide its competitive strategy?

Resources
Links
Spotify Official Website: https://www.spotify.com
Spotify Investor Relations and Annual Reports: https://investors.spotify.com

Publications/papers/books
Porter, M.E. (2008). The Five Competitive Forces That Shape Strategy. Harvard Business Review, 86(1), 78-93.
Porter, M.E. (1980). Competitive Strategy: Techniques for Analyzing Industries and Competitors. Free Press, New York.

Skog, D. (2019). Strategic Plan and Analysis: Spotify. University of Montana, ScholarWorks. https://scholarworks.umt.edu/utpp/

6.11 Case Study: Swiss Railway

Swiss railway company investigating far-future mobility consumer needs

A Swiss Railway company used a Flash Fiction method to identify the potential needs of their consumers or travellers into the far-future, based upon their vision and ideas with regards to mobility and transport.

Context
Far-future customer needs are difficult to identify, survey, and validate, potential customers have difficulties in expressing their long-term future needs because these are not part of their explicit knowledge. The flash fiction method used by the Swiss Railway company is based on the premise that long-term or far future visions from customers are rooted in self-

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

transcending knowledge. This method uses very short fictional stories of 150-300 words gathered in creative writing workshops.

Implementation
A total of 84 participants were selected to participate in 4 workshops. They were asked to write up flash fiction stories in which their protagonist in 2057 travels for work or leisure. The participant sample was selected according to the six personas that a Swiss study had identified as those representing the future working population (Meissner et al. 2016).
The stories were written as part of a workshop session with the following steps:

1. Introduction to the theme and the method;
2. Passive and active warm-up;
3. Three writing sessions that were separated by phases of reading out the stories.

Each writing session had a different context and introduction: The first asked for a story describing the general environment in which the protagonist lives in 2057, the second story was about the protagonist traveling to a working meeting, and the third one about travel in the leisure time.
After 190 stories of the 235 were coded, the sample was regarded as saturated, meaning no new codes emerged.

Impact
The analysis of the flash fiction stories yielded four possible future mobility scenarios, and far-future customer mobility needs, that led to recommendations for mobility providers.
The future mobility scenarios provided a context for the customer needs regarding mobility, and therefore considered supportive for further analysis of these needs.
1. Mobile Life: Work and other activities are not tied to a certain place and people live and work in mobile boxes which either move around or are transported. Movement is purposeful and not an end in itself.
2. Self-determined work: The working population works mainly on creative tasks in a self-organized manner and robots take over routine tasks. Work requires few physical meetings and is largely conducted in a virtual environment. Mobility needs are often related to social events in the spare time.
3. Surveillance: Work is allocated centrally by virtual means by some form of authority. The population is constantly online, monitored and dependent of digital support. Mobility needs occur seldom in the frame of work meetings.
4. Emancipation: People in this scenario resist a live dependent from digital tools and have dropped out of the mainstream society. They are rediscovering craftsmanship and agriculture and live in small rural communities. Mobility needs are met by the individuals themselves (i.e. they are not really customers of mobility service providers but walk or use a bicycle) and do not involve technologically advanced forms of transportation.
Mobility is assumed a service that is provided and available in the far-future, except for the authors of stories in the emancipation scenario. Mobility is seen as a means to an end; customers worry about general changes in the living environment like surveillance and do not assume that there will be a problem with the provision of transportation services.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

The customer needs explicitly mentioned in the stories can be grouped into needs during travel and needs representing demands placed on the mobility providers. The first group of needs turns all means of transportation into optimal environments for work and leisure. Specifically, customers wish for the opportunity to:

- work using all available tools and resources usually available to a worker
- be catered for
- isolate from other passengers
- stay digitally connected with other people in order to receive up to date work related information and communicate with others
- relax, sleep, and receive services such as massages and make-up.

In the second group of needs, future customers demand the following from the mobility providers:

- All means of transportation must be digitally linked and synchronized with each other, no waiting times.
- Easy access with automated ticketing or purchase of ticket by a digital assistant and no need for planning by passenger.
- The journey starts from home, no last mile problem.
- Superfast transportation.
- Absolute punctuality.
- Environmentally friendly transportation.

From the scenarios and the needs presented above, the following general recommendations for mobility providers were deduced.

The mobility needs identified in scenario 1 are basic needs: The customers wish to eat, drink, work, communicate, relax and sleep in their mobile boxes. Privacy is not an issue because the boxes are considered to be private. Superfast transportation is not important, but the boxes need to be digitally connected and offer elements that can be turned into areas for meeting other people. Mobility providers should strategically participate in projects or consortia where mobile living and working environments are developed.

Scenarios 2 and 3 can be easily imagined for in the nearer far-future. In order not to miss developments concerning customer needs, mobility providers should evaluate customer needs in more detail and develop offerings that satisfy the needs for speed, efficiency and privacy, well-being and communication with others while traveling.

Although scenario 4 is a relatively unlikely scenario for the whole society, it might gain an increasing importance as a counter trend to the ongoing digitalisation. Mobility providers should develop an understanding of the motives of such drop-out groups. With this knowledge, offerings that respect the needs of technology sceptics could be developed, if such groups reach a critical mass

Given the general desire in all scenarios for seamless mobility from A to B, there will be a need for a mobility integrator in the future. This integrator will fulfil the task of providing a single point of contact between different transportation services (e.g. municipal bus operators, regional railway companies, international air lines) and their customers.

Reflection

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

What other methods or tools could the Rail Company have used to identify the long-term & far-future needs of their customers, and why you think these are appropriate?

With which other methods and techniques would you combine the Flash Fiction method to benchmark the results and create a context for the visions of the customers?

What are in your opinion the pros and cons of the Flash Fiction Method for your company or industry in which you work (or envision to work after your studies)?

In which areas or on which problems do you think you could use Flash Fiction in your work (or future work after your studies)?

Resources

Links

Swiss Railway case study: Wolf, Patricia & Klotz, Ute & Baumann, Sheron. (2019). What can we do for you? Far-future mobility-related customer needs. https://www.researchgate.net/publication/332948080_WHAT_CAN_WE_DO_FOR_YOU_FAR-FUTURE_MOBILITY-RELATED_CUSTOMER_NEEDS

Publications/papers/books

Klotz, Ute & Wolf, Patricia & Baumann, Sheron. (2019). Zukünftige Kundenbedürfnisse und Mobilität – oder mit Hilfe von Science-Fiction Geschichten neue Wege beschreiten. Anwendungen und Konzepte der Wirtschaftsinformatik. 7. 10.26034/lu.akwi.2019.3233. https://www.researchgate.net/publication/364596813_Zukunftige_Kundenbedurfnisse_und_Mobilitat_-_oder_mit_Hilfe_von_Science-Fiction_Geschichten_neue_Wege_beschreiten

Meissner, J.O., Weichbrodt, J., Hübscher, B., Baumann, S., Klotz, U., Pekruhl, U., Gisin, L., Gisler, A., 2016. Flexible neue Arbeitswelt: Eine Bestandsaufnahme auf gesellschaftlicher und volkswirtschaftlicher Ebene. vdf Hochschulverlag AG, Zürich.

Wolf, P., Linden, E., Wittmer, A., & Klotz, U. (2023). Enhancing scenario originality: A conceptual framework for leveraging self-transcending knowledge in scenario development. *Long Range Planning*, *56*(1), Article 102266. https://doi.org/10.1016/j.lrp.2022.102266

6.12 Case Study: Tesla

Tesla Inc.: Electrifying the Automotive Market with Blue Ocean Strategy

This case study explores how TESLA used Blue Ocean Strategy to disrupt the automotive industry and create a new market for electric vehicles. The case focuses on its first Blue Ocean phase which covers the period 2012 to 2020.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Context

Tesla, Inc., was founded in 2003 in California, USA, with the vision to prove that electric vehicles could be better, quicker, and more fun to drive than gasoline cars. Tesla not only wanted to commercialise electric vehicles but also to change the automotive industry's approach to manufacturing and selling cars. Their core activities include vehicle design, manufacturing, and sales, alongside energy generation and storage products.
The approach was chosen as it was considered as the most appropriate for creating a differentiation strategy on a saturated market of combustion vehicles, and creating the perspective of electric cars as a viable alternative.
Tesla became successful in the automotive industry, thanks to the effective use of the blue ocean strategy, which helped it in positioning itself in a new market with a focus on non-customers, offering high-quality electric vehicles at affordable prices, making competition less critical.

Implementation

1. Reconstruct Market Boundaries.
TESLA´s view was to create a new space combining sustainability, performance and luxury providing electric vehicles, and, although offering a means of transportation by private vehicle, did not consider that it competed directly with traditional car manufacturers.
Tesla didn't just look at the automotive industry, but looked across alternative industries. They also considered the energy sector, focusing on how cars could be part of the broader ecosystem for energy efficiency and sustainability. Their target groups were tech-savvy individuals and environmentally conscious consumers, initially focusing on affluent buyers who could afford high-end electric vehicles (EVs).
2. Focussing on the big picture.
Using the Strategy Canvas and ERRC, Tesla identified and eliminated factors that the automotive industry competed on but that were irrelevant to the modern, environmentally conscious consumer.
Strategy Canvas and Eliminate-Reduce-Raise-Create (ERRC) Grid: Tesla decided to eliminate the complexities and maintenance issues associated with traditional combustion engines and creating a luxury vehicle that also provided an environmental benefit.
3. Reach Beyond Existing Demand
The targeted customer segmented focussed on the so-call "non-customer", i.e. those that had never considered electric cars before due to concerns about performance, style, or charging infrastructure. Tesla´s approach was to provide high-performance vehicles and a growing network of charging stations to overcome their main concerns.
4. Get the Strategic Sequence Right
Tesla ensured that that their cars offered superior utility, matched price to buyer expectations, managed costs through innovation in battery technology, and overcame adoption hurdles by building a dedicated charging network.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

- Buyer Utility: Tesla vehicles offered utility through high performance, long-range capabilities, innovative technology like autopilot, and a nationwide Supercharger network.
- Price: Initially high, targeting premium buyers, but with plans for more affordable models to attract a broader market over time.
- Cost: Invested heavily in battery technology and manufacturing efficiency to manage costs over the long term.
- Adoption: Overcame hurdles by building a direct sales model, bypassing traditional dealerships to control the customer experience, and offering high visibility with showrooms in major urban centres.

Impact

The Blue Ocean Strategy allowed the company create a new market space in the automotive industry, fundamentally changing the way consumers think about electric vehicles. Their approach not only positioned them as a leader in electric vehicles but also forced the entire automotive industry to accelerate the development and production of electric cars.

The introduction of high-performance electric vehicles that compete with luxury gasoline cars, establishment of an extensive supercharger network, and significant advances in battery technology, offered the improvements and changes needed for customers to consider the acquisition of an electric vehicle.

Tesla´s vision for the future is to continue driving down the cost of electric vehicles and to make them accessible to a broader market, and progressing on full self-driving technology and expanding its energy solutions business.

Since 2021 the market situation has drastically changed, and the blue ocean that TESLA created has now become “red”, which means the initial created new market has now become crowded, and with competitors trying to outperform TESLA and gain market share. A situation completely different then when TESLA start and unlocked a new demand, making competitors irrelevant.

With a “Blue Ocean” philosophy solidly rooted in its DNA, TESLA is using the Blue Ocean Strategy to create new markets, in which it can build upon the experience and knowledge gained from its electric vehicles, but applied to create a new space on the market in areas which are not much explored, such as physical AI and the creation of humanoid robots. The question remains is they are able to replicate the success of the electric vehicles.

Reflection

What other methods or tools could TESLA have used to identify the new market, and why you think these are appropriate?

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

How can TESLA use the Blue Ocean Strategy for defining the strategy for the years to come, and use it to differentiate itself from other electric vehicles manufacturers that have arisen over the years?

Considering the rapid expansion and penetration of low-cost electric vehicles, such as those from China, or the upcoming of smaller, more basic electric vehicles, how can TESLA adapt to these challenges?

In what ways can an organisation like TESLA maintain its "Blue Ocean" status—where it focuses on sustainability and reducing environmental impact—while simultaneously pursuing aggressive global scaling and financial valuation goals?

What are in your opinion the pros and cons of the Blue Ocean Strategy for your company or industry in which you work (or envision to work after your studies)?

Resources

Links

Company website: https://www.tesla.com/

Tesla Case Study: Analyzing its Blue Ocean Strategy and Innovation: https://www.studocu.com/fr/document/edc-paris-business-school/project-management/tesla-case-study/78305198

Tesla: an example of Blue Ocean Strategy: https://www.strategykiln.com/post/blue-ocean-strategy-example

Publications/papers/books

Zaffaina, Luca. (2020). Blue Ocean Strategy: Il caso Tesla Inc..
10.13140/RG.2.2.17859.84004.
https://www.researchgate.net/publication/343399909_Blue_Ocean_Strategy_Il_caso_Tesla_Inc

Electric Vehicles – An Introduction of the Tesla for Strategy and Leadership; S. Gayathri, D. Anitha Kumari
https://www.researchgate.net/profile/Gayathri-Sivasubramanian/publication/335909733_Electric_vehicles_-_An_Introduction_of_the_Tesla_case_for_strategy_and_leadership/links/5d83130ea6fdcc8fd6f3c24b/Electric-vehicles-An-Introduction-of-the-Tesla-case-for-strategy-and-leadership.pdf

Du, Xiaofei & Li, Bingcan. (2021). Analysis of Tesla's Marketing Strategy in China.
10.2991/assehr.k.211209.270.
https://www.researchgate.net/publication/357610097_Analysis_of_Tesla's_Marketing_Strategy_in_China

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Sharma, S. The Tesla Phenomena: A Business Strategy Report.
https://www.academia.edu/25781072/The_Tesla_Phenomena_A_Business_Strategy_Report

6.13 Case Study: Too Good To Go

Too Good To Go: Revolutionising Food Waste Management with PESTLE Analysis

Too Good To Go used a PESTLE analysis to create a marketplace for surplus food from restaurants, bakeries, and supermarkets, offering it to consumers at a discounted price.

Context
Too Good To Go was founded in 2015 in Copenhagen by a group of young entrepreneurs who shared a dream of finding a solution for the massive amounts of food wasted by buffet restaurants in Denmark. They set out to create an app that would connect food businesses with people that were seeking to help solve the climate crisis, get access to good food, and save money.
The Too Good To Go marketplace app was launched in Denmark early in 2016. In the first few weeks hundreds of businesses uploaded their surplus food to the app and thousands of users started saving it, raising interest from others, leading to the creation of Too Good To Go in Norway, the UK and France.
Today, the company operates 21 countries across Europe, America and Asia Pacific and it has grown to a thriving community of 120 million registered users and 180,000 active partner businesses across the globe.
The company is a certified B Corp and social impact company on a mission to inspire and empower everyone to fight food waste together and was first accredited in 2021 with a score of 81.6, and in 2024, re-accredited with an improved score of 93.4. B Corp is a business certification that measures a company's social and environmental performance.
Too Good To Go employed PESTLE analysis to understand the macro-environmental factors affecting its business operations and to strategically navigate the complex and varied landscapes of the European markets. Its strategy to expand across Europe required a a comprehensive understanding of external factors that could impact its operations, from regulatory environments to social attitudes toward food waste.

Implementation
The PESTLE analysis was conducted bearing in mind the strategic vision to expand the company´s activities across a wider set of European countries, leveraging upon the success achieved in Denmark and the early adopters Norway, the UK and France.
1. Analyse political factors: The company analysed the political environment in each target country, including food waste regulations, government policies on sustainability, and subsidies or incentives for waste reduction. Understanding the political landscape helped the company identify supportive environments and potential regulatory challenges.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

2. Analyse economic factors: Economic indicators such as the overall economic health, consumer purchasing power, and the cost structure of potential markets were examined. This helped Too Good To Go price their offerings competitively and identify regions with high market potential.
3. Analyse Social Factors: Social attitudes toward food waste, sustainability, and the adoption of digital solutions were assessed. This allowed Too Good To Go to tailor their marketing strategies to resonate with local values and behaviors.
4. Analyse Technological Factors: The technological infrastructure of each market, including smartphone penetration and internet accessibility, was evaluated. Too Good To Go needed to ensure that the technology required to support their app was widely available and reliable.
5. Analyse Legal Factors: Legal aspects such as food safety regulations, liability laws regarding food donation, and data protection laws were analyzed. Compliance with these laws was crucial for smooth operations and maintaining consumer trust.
6. Analyse Environmental Factors: Environmental considerations included the environmental impact of food waste and the potential for positive environmental messaging.
Too Good To Go leveraged these factors to strengthen their value proposition and appeal to environmentally conscious consumers.

Impact
By leveraging PESTLE analysis, Too Good To Go was able to strategically navigate the complex and diverse European markets. The insights gained from the analysis informed their market entry strategies, helping them prioritize countries with supportive regulatory environments and high consumer readiness. This approach enabled Too Good To Go to effectively communicate their value proposition, resulting in rapid adoption and expansion.
Operationally, the company improved its technological infrastructure to ensure that the app functioned smoothly across different regions, addressing any technical challenges identified through the PESTLE analysis. This led to enhanced user experience and operational efficiency.
Socially, Too Good To Go's tailored marketing strategies, informed by social factor insights, resonated strongly with local communities. Campaigns emphasizing sustainability and the fight against food waste were particularly successful in engaging consumers and driving user growth.
Economically, the company's competitive pricing strategy, guided by economic factor analysis, allowed Too Good To Go to offer attractive deals to consumers while ensuring profitability. Understanding local economic conditions also helped in negotiating partnerships with food providers.
Politically, the company actively engaged with policymakers and participated in discussions about food waste legislation, which helped in shaping favourable regulatory conditions and establishing Too Good To Go as a key player in the sustainability sector.
The comprehensive PESTLE analysis not only facilitated Too Good To Go's successful expansion across Europe but also positioned the company as a leader in the fight against food waste, demonstrating the strategic value of understanding and adapting to macro-environmental factors.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Reflection

What other methods or tools could TO GOOD TO GO have used to identify the factors that would determine their expansion across a wider set of European countries, and why you think these are appropriate?

Can TO GOOD TO GO use the PESTLE analysis for defining the strategy for the years to come, and expand geographically or would a strategy focussing on developing new services be more adequate?

In case TO GOOD TO GO opts for the expansion through the development of new services or products, which (long-term) forecasting method do you think would be appropriate and why?

What are in your opinion the pros and cons of the PESTLE for your company or industry in which you work (or envision to work after your studies)?

Resources

Links

Company website: https://www.toogoodtogo.com/en-ca/about-us

Too Good To Go PESTLE case study
https://www.studeersnel.nl/nl/document/technische-universiteit-delft/besliskunde/grafentheorie-6-kopie-kopie/44739194
https://www.studocu.com/no/document/handelshoyskolen-bi/international-economics/case-study-country-comparison-for-too-good-to-go-expansion-bst/148549034

Publications/papers/books

Maciej Lewandowski,The strive to social innovation that thrives on the mobile application. A Case Study of Too Good To Go, Procedia Computer Science, Volume 225, 2023. https://doi.org/10.1016/j.procs.2023.10.077.
https://www.sciencedirect.com/science/article/pii/S1877050923012358#article

Derqui, Belén & Filimonau, Viachaslau. (2024). The (de)motives for using food waste reduction apps among hospitality providers. Sustainable Development. 32. 7262-7277. 10.1002/sd.3070.
https://www.researchgate.net/publication/381572928_The_demotives_for_using_food_waste_reduction_apps_among_hospitality_providers

Hong, Jiequan; AU - Kafa, Nadine; AU - Jaegler, Anicia. Exploring barriers and motivations in the adoption of food waste mobile applications; International Transactions in Operational Research. https://doi.org/10.1111/itor.13587
https://onlinelibrary.wiley.com/doi/full/10.1111/itor.13587

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

6.14 Case Study: AI Revolution and its Impact on Europe

Narrative Strategic Foresight on the AI Revolution and its Impact on European Sovereignty

This case study uses a fictionalized narrative to explore a Future Scenario where and how current European AI policies and cultural skepticism could lead to economic marginalization and a loss of strategic autonomy by 2031.

Context
The project was developed by a group of AI researchers, think-tankers, and investors (including experts from the Arq Foundation and MIT) who identified a dangerous gap between the rapid acceleration of AI in Silicon Valley and the deliberative, often skeptical atmosphere in Brussels. The scenario begins in early 2025, a time when European policymakers often view AI progress as bordering on science fiction or a repeat of previous tech hypes like NFTs. This context is framed as a "strategic warning" intended to shake the continent into action to prevent a "slide into irrelevance" where Europe loses its ability to fund its social model or defend its values.
It is a deliberate worst-case/dystopian future prediction, to showcase possible risks and the fast paced acceleration

Implementation
The "Europe 2031" project utilizes narrative strategic foresight, grounding its analysis in two fictional characters: Caroline Dubois (a Brussels policy worker) and Christian Vogt (a German AI founder in Silicon Valley). This method translates abstract macroeconomic and technological data—such as the exponential growth of AI capabilities and hardware bottlenecks—into relatable human experiences. The narrative traces a path through key hypothetical milestones, including a "ASML leverage crisis" (2028), a "Frontier Inference Services Rule" (2029), and a eventual fragmentation of the Eurozone under the weight of AI-driven economic disparity (2031).
We recommend taking the time to read the full scenario on the website Europe 2031

Impact
The primary impact of this project is its role as a catalyst for urgent debate regarding transformative AI and European agency. By detailing specific failure points—such as the "compute crunch," the lack of a "positive vision," and the inability to build physical infrastructure ("metal on our soil") at a scale of tens of gigawatts—the foresight study provides a roadmap for the drastic measures required to preserve European sovereignty. It highlights the "irrelevance spiral" caused by reactive rather than proactive policy.

Reflection
On Leverage vs. Sovereignty: In the scenario, Europe prioritizes "Buy European" mandates over building actual hardware leverage. How can a region balance the desire for homegrown technology with the immediate need to access global frontier tools to remain competitive?.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

On Narrative Power: The project suggests Europe failed because it lacked a "positive vision" and only responded to negative threats. How does a lack of compelling future storytelling hinder the public's willingness to accept the disruption caused by new technologies?.

On "Compute" Sovereignty: The text argues that sovereignty is impossible without hosting the "metal on our soil" at a scale of tens of gigawatts. Why is physical infrastructure more critical than regulatory frameworks in a rapidly accelerating AI landscape?

Resources
Links
Europe 2031 Website: https://europe2031.ai/
Full Scenario PDF: https://europe2031.ai/europe-2031.pdf
Publications/papers/books
Europe 2031, by Daan Juijn, Stan van Baarsen, Judith Dada, Maximilian Negele, Lily Stelling, Philip Fox, Alex Petropoulos, Tom Chivers, Michiel Bakker. https://europe2031.ai

6.15 Case Study: Foresight Micro-Routines in Agile Workflows

Strategic Foresight in SMEs: Integrating Continuous Micro-Routines into Agile Workflows

This study examines how small and medium-sized enterprises (SMEs) in the digital sector maintain continuous foresight by embedding small, repeatable "micro-routines" into their daily operations to overcome resource scarcity.

Context
SMEs in the digital and media industry operate in a **VUCA environment** (Volatility, Uncertainty, Complexity, Ambiguity) where technological leaps like AI can render business models obsolete within months. Unlike large corporations, these firms lack the "slack" resources—time, budget, and specialized departments—to run permanent foresight units. To remain resilient, they must find ways to "unlearn" old models and "surf" waves of change without losing focus on daily operations.

Implementation
Instead of one-off scenario projects, successful SMEs utilize specific **micro-routines** to find time for continuous foresight:

- **Innovation Time:** Companies allocate specific, repeatable time windows (e.g., one hour per week or every two weeks) for employees to explore future-oriented ideas or "what-if" scenarios.
- **Monthly "Strategy Refreshers":** Brief sessions designed to keep long-term strategic goals visible in the daily routine, preventing them from being forgotten under the weight of operational tasks.
- **Quarterly "Big-Picture" Meetings:** A routine check-in where teams pause to evaluate if their current trajectory still aligns with external market signals.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

- **OKR Coupling (Objectives & Key Results):** Identified trends are directly linked to quarterly or tertial OKRs. This translates abstract foresight into concrete, accountable tasks for operative teams.
- **Network Sparring:** Maintaining a "Best Friends" circle of partner companies for informal but regular exchange on emerging trends

Impact
By using these routines, SMEs shift from **reactive trouble-shooting** to **proactive strategic positioning**. The impact is a stronger "System-Umwelt-Fit" (alignment with the environment), allowing firms to recognize "strohfeuermäßig" (flash-in-the-pan) hypes and distinguish them from substantive long-term trends.

Reflection
On "Unlearning": Why is the ability to discard old mental models (unlearning) just as critical for continuous foresight as the ability to learn new ones?
On Bottom-Up Participation: How do micro-routines like "Innovation Time" help activate the deep expert knowledge of developers and operative staff for strategic decisions?
On Informal vs. Formal: In an SME context, is an intuitive, "lived" routine more effective than a highly formalized, specialized foresight unit?

Resources
Rehm, L. (2025). *Strategic Foresight in KMU der Digital- und Medienbranche: Voraussetzungen, Umsetzung und strategische Implementierung*. Stuttgart: Hochschule der Medien.

Groß, B., & Mandir, E. (2024). *Zukünfte gestalten*. (Recommended by sources for its "cookbook" approach to routines)

Guidelines for HE instructors/educators
The "SME Strategy Refresher" Simulation

- **Phase 1 (15 Mins):** Present a "Wildcard" event (e.g., a new AI chip export ban or a sudden shift in consumer labor laws).
- **Phase 2 (20 Mins):** Students must use a **"Trendsteckbrief" (Trend Profile)** to evaluate the impact of this event on an SME's current 3-year strategy.
- **Phase 3 (10 Mins):** Draft a single **OKR (Objective & Key Result)** for the next quarter to address this trend, simulating the bridge between foresight and action

Designing an "Innovation Time" Routine (30 Minutes)
Instruct students to design a 1-hour weekly routine for a 50-person media agency.
Task: How do you ensure the time is spent on **"Exploration"** (long-term growth) rather than just **"Exploitation"** (fixing current bugs)? Define the "deliverable" of that hour (e.g., a simple prototype or a 2-minute pitch)

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

6.16 Case Study: Siemens AG

Siemens: Digital transformation and business model innovation

This case study is designed as a strategic decision case. It uses Siemens as a real-world example of industrial digital transformation, but the central learning objective is transferability: participants should identify what high-tech and deep-tech SMEs can learn from Siemens while adapting the lessons to smaller firms with limited resources.

Context
Manufacturing has entered a period in which competitive advantage increasingly depends on the ability to combine physical products with digital capabilities. Industrial Internet of Things (IIoT), artificial intelligence, digital twins, cloud and edge computing, advanced analytics and platform ecosystems have changed how industrial firms create, deliver and capture value. These technologies also alter customer expectations: customers increasingly want uptime, energy efficiency, predictive maintenance, lifecycle optimisation and measurable outcomes rather than only machines, components or automation systems. Siemens provides a real and well-documented example of this transformation. Founded in 1847, Siemens developed into one of the world's largest industrial technology groups. Its historical strengths were engineering, electrification, automation and industrial infrastructure. By the mid-2010s, however, Siemens faced a strategic challenge familiar to many industrial companies: hardware and automation excellence remained important, but future growth increasingly depended on software, data, connectivity and digital services.

The case begins around 2016-2017, a critical decision point. Siemens had already invested heavily in industrial software and automation. MindSphere was emerging as a cloud-based open IoT operating system that could connect physical industrial assets to digital applications and services. At the same time, the wider Industry 4.0 agenda was accelerating, customers were experimenting with connected factories, and competitors were building their own digital platforms. The strategic question was no longer whether digital transformation mattered, but how Siemens should organize, commercialize and scale it.

For SMEs, the Siemens case is relevant not because smaller firms can copy Siemens' scale, but because they face similar strategic dilemmas in compressed form. A high-tech SME may manufacture sensors, robots, precision instruments, industrial components, medtech devices or clean-tech equipment. Such firms often ask: should we add connectivity to our products? Should we develop software or partner for it? Should we sell products, services, subscriptions or outcomes? How do we test new business models without risking cash flow? How can sustainability be integrated into the business model rather than treated as compliance? Siemens' transformation offers a real case through which these SME questions can be explored.

Strategic decision for participants: Imagine you are advising Siemens in 2016-2017. The company can continue strengthening its traditional automation business, make incremental digital additions, or commit to a broader transformation toward industrial software, IoT platforms, digital twins and ecosystem-based business models. Which path should it take, how should it commercialize the transformation, and what lessons can SMEs extract?

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Implementation

The implementation section is intentionally written as a decision pathway rather than a retrospective success story. Participants should first analyse what Siemens could do at the 2016-2017 decision point. Only after completing the activities should they compare their recommendations with what Siemens later did through MindSphere, digital twins, Siemens Xcelerator and related initiatives.

Step 1 - Diagnose the type of innovation

Participants begin by mapping Siemens' transformation using the innovation typologies in Module 5. The aim is to avoid treating digital transformation as a generic label and instead specify what kind of innovation is taking place.

Innovation dimension	Application to the Siemens decision
Product innovation	Industrial products become software-enabled, connected and data-generating assets. Digital twin capabilities expand the product from a physical object into a virtual-physical system.
Process innovation	Engineering, manufacturing, commissioning and maintenance processes become more data-driven through simulation, analytics, automation and predictive diagnostics.
Position innovation	Siemens can reposition itself from a supplier of automation equipment toward a partner for digital industrial transformation.
Paradigm innovation	The deepest change is business model innovation: moving from selling products and projects toward lifecycle solutions, software, platforms, subscriptions, services and ecosystem orchestration.

Using Henderson and Clark, the transformation can be debated as architectural innovation because existing industrial components are recombined through new digital architectures, and as radical innovation when data platforms and digital twins change the logic of competition. This ambiguity is pedagogically useful: students must justify their classification rather than search for a single correct answer.

Step 2 - Identify sources of innovation

The Siemens case also demonstrates that innovation rarely comes from one source. Industrial digital transformation depends on internal R&D, software acquisitions, customers, universities, cloud and AI partners, developers, suppliers and standards bodies. For SMEs, this is a central lesson: limited resources make open innovation and ecosystem participation more important, not less important.

Innovation source	Strategic value
Internal R&D and engineering	Build domain-specific industrial knowledge, software integration capabilities and cyber-physical systems expertise.
Customers and lead users	Use pilot factories and early adopter customers to validate which digital services create measurable value.
Technology partners	Access cloud, AI, cybersecurity, simulation, data infrastructure and developer ecosystems.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Universities and research institutes	Explore emerging technologies and reduce technical uncertainty through applied research collaborations.
Developers and ecosystem actors	Create complementary applications, integrations and use cases around industrial platforms.

Step 3 - Break-the-Pattern activity
The selected creativity activity for this case is Reverse Brainstorming. Participants are asked not to begin with the question "How can Siemens become more digital?" but with the deliberately inverted question:

"How could Siemens completely fail at digital transformation?"
Teams generate failure modes such as: building a platform customers do not use; over-investing in technology without a business model; ignoring SMEs; creating closed ecosystems; underestimating cybersecurity; pricing software like hardware; neglecting workforce skills; or treating sustainability as marketing. They then reverse these failure modes into design principles for successful implementation.

Reverse brainstorming output	Strategic response
Failure mode from reverse brainstorming	Design principle for innovation strategy
Customers see no value in the platform	Start with customer pain points, measurable outcomes and pilot use cases.
Digital tools remain disconnected from the core business	Integrate software, services and hardware into one coherent value proposition.
The platform is too closed	Design APIs, partner rules and ecosystem incentives.
SMEs cannot afford or implement the solution	Offer modular, scalable and lower-entry digital packages.
Cybersecurity incident damages trust	Build governance, data security and risk controls into the model from the start.
Employees resist the transformation	Invest in digital culture, training and cross-functional implementation teams.

Step 4 - Business model redesign
Participants then redesign Siemens' business model. They should compare a traditional industrial automation model with a digital-industrial platform model.

Business Model Canvas element	Siemens digital transformation interpretation
Value proposition	From reliable automation equipment to integrated digital solutions that improve uptime, productivity, energy performance and lifecycle decision-making.
Customer segments	Industrial manufacturers, infrastructure operators, utilities, mobility providers, machine builders and SMEs seeking digital transformation.
Channels	Direct sales, system integrators, digital marketplaces, partner ecosystems and cloud-based delivery.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Customer relationships	From project-based sales to continuous lifecycle partnerships and data-enabled service relationships.
Revenue streams	Equipment sales, software licences, subscriptions, maintenance contracts, consulting, data-enabled services and ecosystem revenue.
Key resources	Industrial expertise, software platforms, customer data, digital twins, patents, engineers, developers, brand trust and partner network.
Key activities	Software development, platform governance, industrial engineering, cybersecurity, ecosystem management, customer success and continuous innovation.
Key partners	Cloud providers, AI firms, universities, customers, developers, system integrators, standards bodies and industrial suppliers.
Cost structure	R&D, cloud infrastructure, cybersecurity, software talent, ecosystem management, acquisitions, training and customer implementation support.

Step 5 - Triple Layered Business Model Canvas

The Triple Layered Business Model Canvas is used to ensure that digital transformation is not evaluated only through revenue and efficiency. Participants must consider economic, environmental and social value creation.

Canvas layer	Strategic questions and value logic
Economic layer	Recurring revenue, customer lock-in through lifecycle value, higher-margin software and services, platform scalability, improved competitiveness and resilience against hardware commoditisation.
Environmental layer	Digital twins and predictive analytics can reduce waste, avoid unnecessary maintenance trips, extend asset life, improve energy efficiency and support customer decarbonisation. Environmental benefits must be measured against data-centre energy use and electronic waste.
Social layer	Workforce reskilling, safer industrial operations, reduced downtime for critical infrastructure, new digital jobs, possible displacement of routine work, data governance and fair access for SMEs.

Step 6 - Map uncertainty and risk

Innovation and uncertainty are inseparable. Participants assess Siemens' options using uncertainty categories from Module 5.

Uncertainty type	Case application
Technological uncertainty	Can industrial IoT platforms scale securely across heterogeneous machines, factories and sectors?
Market uncertainty	Will customers pay for subscriptions, analytics and digital services, or continue preferring project-based procurement?
Regulatory uncertainty	How will data governance, cybersecurity, industrial safety and AI regulation evolve?
Social and legitimacy uncertainty	Will employees, customers and partners trust data-driven industrial operations?
Timing uncertainty	Is Siemens early enough to shape the market, or too early for widespread customer adoption?

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Managerial uncertainty	Can leadership balance established hardware businesses with emerging software and platform models?
Consequence uncertainty	Could platform dependence, cybersecurity incidents or digital exclusion create negative impacts?

Step 7 - Rapid experimentation and validation

Before committing fully to a platform strategy, participants design experiments. The purpose is to avoid treating business model innovation as a large irreversible bet. Suitable experiments include:

Experiment	Purpose
Pilot factory / lead-customer MVP	Connect a limited number of assets and test whether predictive maintenance creates measurable savings.
Fake door test	Offer a digital service package to selected customers before fully building the platform to measure willingness to pay.
Wizard of Oz experiment	Simulate analytics recommendations manually before automating them with AI.
A/B pricing test	Compare licence, subscription and outcome-based pricing with different customer segments.
Partner sandbox	Allow selected developers or system integrators to build applications on defined APIs and test ecosystem interest.

Step 8 - Commercialization strategy

Participants evaluate commercialization options. The case does not assume that the best route is always direct platform ownership. The choice depends on complementary assets, excludability, partner dependence and customer adoption.

Commercialization route	Advantages and risks
Internal commercialization	Siemens builds and sells digital solutions directly, leveraging brand, sales force and installed base. Strong control but high investment.
Ecosystem/platform strategy	Siemens creates a platform that enables partners to build complementary applications. Scalable but requires governance and partner incentives.
Licensing or API strategy	Selected software, analytics or digital twin capabilities are licensed to partners. Lower market-entry burden but less control over customer experience.
Joint ventures / strategic alliances	Useful where domain expertise, cloud infrastructure, AI or regional access requires collaboration.
Niche entry before scaling	Focus on specific industrial use cases where value is easiest to prove, then scale across sectors.

Step 9 - Implementation roadmap

Time horizon	Implementation priorities
0-6 months	Define transformation vision; select priority customer pain points; identify pilot use cases; map digital capabilities and partner gaps.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

6-18 months	Run MVPs; build minimum data architecture; establish governance for data, IP and cybersecurity; launch first customer pilots.
18-36 months	Scale validated digital services; build partner ecosystem; train sales and service teams; introduce subscription or lifecycle revenue models.
36+ months	Integrate digital twin, AI and platform strategy across business units; expand ecosystem marketplace; continuously update business model based on adoption data and sustainability outcomes.

Impact
After participants complete their decision analysis, the instructor can reveal how Siemens actually moved. Siemens continued to develop MindSphere as a cloud-based open IoT operating system, positioned digital twins as a core industrial transformation capability, and launched Siemens Xcelerator in 2022 as an open digital business platform consisting of a curated portfolio, ecosystem and marketplace. These moves indicate that Siemens did not treat digital transformation as a single product launch but as a broader shift toward platform-enabled value creation, ecosystem collaboration and scalable digital services.

The impact of the case for learners lies not only in Siemens' outcomes, but in the strategic logic that participants can transfer to SMEs. Siemens demonstrates that digital transformation becomes strategically meaningful when it changes the business model, not merely when it adds technology. For SMEs, the same principle applies at smaller scale: digitalization should be linked to specific customer value, measurable experimentation, partner strategy, governance and commercialization logic.

Strategic challenge	Siemens response	Transferable SME learning
Hardware commoditisation	Software-enabled industrial solutions	SMEs should avoid competing only on product features or price; digital services can create differentiation.
Fragmented digital initiatives	Platform and ecosystem logic	SMEs may not build a platform, but they can join ecosystems, expose APIs or partner strategically.
Uncertain customer adoption	Pilot projects and measurable use cases	SMEs should validate willingness to pay before investing heavily.
Sustainability pressure	Digital twins, energy optimisation and lifecycle services	Sustainability can become part of the value proposition and not only compliance.
Skills gap	Digital culture, partnerships and reskilling	SMEs need targeted capability building and external knowledge integration.
Implementation risk	Roadmapping, governance and staged scaling	Transformation should be staged through experiments, milestones and risk controls.
Commercialization challenge	Licensing, subscriptions, services, ecosystems and direct offerings	SMEs should choose commercialization routes based on assets and market position.

Reflection

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

The following questions can be used for individual reflection, group discussion, written assignments or executive workshops. They are designed to push participants from description toward implementation and commercialization.

1. Which innovation types are visible in Siemens' transformation: product, process, position and/or paradigm? Which is most important and why?
2. Using Henderson and Clark, would you classify Siemens' digital transformation as incremental, modular, architectural or radical innovation? Does the classification change depending on whether you look at technology, organization or business model?
3. What was the core strategic problem Siemens faced around 2016-2017? Was it a technology problem, a business model problem, an ecosystem problem or a leadership problem?
4. Which assumptions would you test first before committing to a platform or software-as-a-service model?
5. What would be the minimum viable digital service Siemens could test with a customer? What would be the equivalent MVP for a high-tech SME?
6. How should Siemens balance open innovation with protection of proprietary technology, customer data and industrial know-how?
7. Which commercialization strategy is most appropriate: direct commercialization, licensing, ecosystem platform, joint venture, niche entry or spin-off? Justify your answer using complementary assets.
8. How does the Triple Layered Business Model Canvas change the strategic evaluation compared with a traditional economic Business Model Canvas?
9. Which environmental benefits of digital twins and predictive maintenance are credible, and which require further evidence?
10. What social risks could emerge from industrial digital transformation, including workforce displacement, skill gaps, data surveillance or SME exclusion?
11. What would be the key performance indicators for successful implementation in the first 12 months? Which indicators are leading indicators rather than lagging financial outcomes?
12. If you were advising an SME with only 75 employees, which Siemens lessons would you copy, which would you simplify, and which would you avoid?
13. How can foresight help a company decide whether to become a first mover, fast follower, niche player or ecosystem complementor?
14. What could go wrong if Siemens or an SME treats digital transformation as an IT project rather than a business model transformation?
15. What is one assumption about digital transformation that your own organization, sector or study programme should test immediately?

Resources

Links

Siemens Xcelerator launch press release:
https://press.siemens.com/global/en/pressrelease/siemens-launches-siemens-xcelerator-open-digital-business-platform-accelerate-digital

Siemens MindSphere press materials:
https://press.siemens.com/global/en/pressrelease/siemens-strengthens-its-iot-operating-system-mindsphere-through-technology-partnership

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Siemens Digital Twin materials: https://www.siemens.com/en-us/company/digital-twin/comprehensive-digital-twin-for-industry/

Siemens Annual Report / Siemens Report: https://assets.new.siemens.com/siemens/assets/api/uuid:ddec8b08-9346-4ba0-8957-67988f0dca2c/the-digital-transformation-imperative.pdf

Reuters reporting on Siemens software and platform strategy: https://www.reuters.com/technology/siemens-looks-digital-platform-tackle-automation-downturn-2024-10-10/

Publications/papers/books

Adner, R. (2017). Ecosystem as structure: An actionable construct for strategy. Journal of Management, 43(1), 39-58.

Baines, T. S., Lightfoot, H. W., Benedettini, O., & Kay, J. M. (2009). The servitization of manufacturing: A review of literature and reflection on future challenges. Journal of Manufacturing Technology Management, 20(5), 547-567.

Chesbrough, H. (2006). Open Business Models: How to Thrive in the New Innovation Landscape. Harvard Business School Press.

Chesbrough, H. (2010). Business model innovation: Opportunities and barriers. Long Range Planning, 43(2-3), 354-363.

Dyer, J. H., Gregersen, H. B., & Christensen, C. M. (2009). The innovator's DNA. Harvard Business Review, 87(12), 60-67.

Evans, S., Vladimirova, D., Holgado, M., Van Fossen, K., Yang, M., Silva, E. A., & Barlow, C. Y. (2017). Business model innovation for sustainability: Towards a unified perspective for creation of sustainable business models. Business Strategy and the Environment, 26(5), 597-608.

Felin, T., Gambardella, A., Stern, S., & Zenger, T. (2020). Lean startup and the business model: Experimentation revisited. Long Range Planning, 53(4), 101889.

Jalonen, H. (2012). The uncertainty of innovation: A systematic review of the literature. Journal of Management Research, 4(1), 1-47.

Kahn, K. B. (2018). Understanding innovation. Business Horizons, 61(3), 453-460.

Lüdeke-Freund, F., Joyce, A., & Paquin, R. (2018). The triple layered business model canvas: A tool to design more sustainable business models. Journal of Cleaner Production, 198, 380-393.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

OECD/Eurostat. (2018). Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th edition. OECD Publishing.

Teece, D. J. (2010). Business models, business strategy and innovation. Long Range Planning, 43(2-3), 172-194.

Tidd, J., & Bessant, J. (2018). Managing Innovation: Integrating Technological, Market and Organizational Change. Wiley.

Guidelines for HE instructors/educators

This section turns the Siemens case into an active learning experience. It is designed for higher education students, SME managers, entrepreneurship programmes, engineering management courses and innovation workshops. The full activity can run as a 3-hour workshop, a full-day executive session or a multi-week assignment.

Discussion

Before reading the full case, ask participants to write down three assumptions they hold about digital transformation. Examples may include: "digital transformation requires large budgets", "platforms are only for large firms", or "AI automatically creates innovation". Return to these assumptions at the end of the session.

- What makes the Siemens case a case of business model innovation rather than only technology adoption?
- How would Siemens' transformation look if it were undertaken by a 50-person SME?
- Which parts of the Siemens model are scalable down to SMEs, and which depend on large-enterprise resources?
- What are the dangers of copying a large-company digital platform strategy without adapting it?
- How can SMEs join ecosystems without becoming dependent on dominant platform owners?
- How should sustainability metrics be included in digital transformation decisions?
- What would be the ethical and social risks of data-driven industrial services?

Roleplay Exercise

Participants are divided into stakeholder groups. Each group receives a different objective and must negotiate a digital transformation strategy for Siemens at the 2016-2017 decision point.

Role	Primary interest
Executive board	Maximize long-term competitiveness while protecting profitability and reputation.
Digital Industries leadership	Argue for software, digital twins, MindSphere and platform investment.
Traditional automation unit	Protect current customers, margins and engineering priorities.
SME customer coalition	Demand affordable, modular and easy-to-implement digital services.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483

Sustainability and public policy group	Require measurable energy, material and social benefits.
Cybersecurity and risk committee	Challenge data governance, IP exposure, safety and operational resilience.
Ecosystem partners	Seek fair APIs, data access, revenue sharing and joint commercialization rules.

Appendix A: Participant worksheet

Participants can use this worksheet during the case discussion.

Question	Team answer
Strategic problem	
Innovation type	
Main uncertainty	
Customer assumption to test	
Business model change	
Environmental value	
Social value or risk	
Commercialization route	
First experiment	
First 12-month implementation milestone	

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Grant Agreement Project 101184483