STRATEGIC FORESIGHT FOR SUSTAINABILITY

Ajda Fošner*
GEA College – Faculty of Entrepreneurship,
Slovenia
ajda.fosner@gea-college.si

Katja Trop
GEA College – Faculty of Entrepreneurship,
Slovenia
ajda.fosner@gea-college.si

Abstract

The goal of this paper is to present the results of the interviews which were conducted in September 2022 by GEA College with various stakeholders, including representatives from the agri-food, health and mobility sectors, representatives from the education sector and consulting field to better understand the specific green, digital, and foresight skills required to drive sustainable practises in Slovenia. This paper gave us a more thorough picture of Slovenia's prospects and problems and serves as a valuable resource for understanding the current state of the industry, the required skills for a sustainable future, and the best practices that could be adopted to foster positive change.

Key Words

Strategic foresight; sustainability; education.

*Corresponding Author

INTRODUCTION

In many places, an enormous rise in human activity has been noted since the 1950s. The natural resources required for expansion have decreased as a result of global growth. "The great acceleration" refers to the acceleration of progress and the depletion of natural resources. Twelve socio-economic megatrends and twelve ecological megatrends are juxtaposed in the model of the same name. These indicators show a strong correlation between economic development and changes in the Earth's systems since 1950. This indicates that human-induced development made a major contribution to the major changes in the Earth's systems (Stefen et al., 2015)

Currently, humanity is consuming the equivalent of 1.7 planets to provide the resources needed to produce goods and recycle waste. This means that the earth needs one year and seven months to regenerate what is used in one year. The date on which all resources available to the country are used up is also called "Planet Overshoot Day". If we carry on as before, i.e., if the needs of the population and consumption trends continue to develop in the same way, we will need the equivalent of 2 planets in the 2030s to be able to continue our lives as we know them (Global Footprint Network, n.d.).

Foresight methods are strongly related to sustainability since they offer useful tools for comprehending, anticipating, and reshaping the future in a way that promotes sustainable development. They are strategic methods that help with foresight and planning, empowering stakeholders to make wise choices and lead to desired outcomes. These methods are essential for spotting new trends, threats, and opportunities in the context of sustainability as well as for directing the creation of sustainable plans and practices (Major et al., 2001).

Numerous industries and academic fields use foresight methods. They provide strategic planning, product creation, and innovation in business and industry by detecting emerging markets, consumer trends, and technology developments. Foresight methods aid in long-term planning, policy creation, and risk management in government and policymaking. A proactive strategy for anticipating and influencing the future is crucial in industries including science and technology, education, healthcare, environmental sustainability, and social development. These sectors all benefit from foresight (Meissner, 2012).

Let us also point out that strategic foresight is not strategic planning. In strategic planning, specific goals, objectives, and action plans are defined based on the most recent knowledge of the organization's capabilities and the market trend focusing on immediate to medium-term activities. On the other hand, strategic foresight is about anticipating and preparing for the future (AGRIP, n.d.; UNIPAN, n.d.).

Popper (2008) defines 33 foresight methods which are divided into three groups: qualitative, quantitative and semi-quantitative. In order to investigate potential future situations and trends, qualitative foresight approaches collect and analyse expert opinions, subjective data, and insights. These methods are particularly useful when dealing with complex, uncertain, and qualitative aspects of the future. Quantitative foresight methods involve the use of

numerical data, statistical analysis, modelling, and simulations to quantify future trends, patterns, and probabilities. These methods are particularly valuable when dealing with measurable and quantifiable aspects of the future. Many quantitative methods are used in foresight, for providing an evidence base for futures thinking, or supplying forecasting tools themselves like trend extrapolation. Semiquantitative foresight methods combine qualitative and quantitative elements, incorporating both subjective insights and objective data analysis. These methods bridge the gap between purely qualitative and quantitative approaches and provide a more comprehensive understanding of the future (Adegbile et al., 2017; Giaoutzi and Sapio, 2012).

When looking for more innovative and sustainable solutions, businesses still aspire to make evidence-based decisions, which is often translated into "show me the data" that this solution/innovation is viable. With no data available on the future, organizations fail to make leaps towards more sustainable futures. To overcome this dilemma we need to form corporate agents capable of dealing with diverse stakeholder values in uncertain environments that are governed by the rules of complex systems. Features of complex systems include being subject to delays, governed by trade-offs, resistant to change and counterintuitive.

The second dilemma relates to the development of curricula and master classes. Training curricula are still too often built within existing knowledge domains with little cross-fertilization from other disciplines and tend to be resistant to changes in response to societal needs. They are of course also subject to employer feedback and governmental review, which unfortunately often reinforces disciplinary excellence rather than opening the door towards impact-driven programs that are built on multi-disciplinary elements.

According to the above dilemmas, the project Strategic Foresight for Sustainability (SF4S), funded by Erasmus + program (2022 - 2024), supports the transition to a more sustainable European economy. It addresses the lack of green, digital, and future (i.e. sustainability foresight) skills among students and professionals and by connecting knowledge flows between HEI, VET, and industry actors that are necessary for Europe to develop collaborative solutions on a large scale and support the recommendations for action in the major reports and initiatives: Green Deal, NextGenerationEU, and European Skills (SF4S, 2023). This project is in response to two needs:
- Approaches to co-develop solutions for grand sustainability challenges in three industries (agri-food, health and mobility), in multi-actor settings and complex opportunity spaces.
- Portable skills that allow individuals to engage in results-driven foresight projects across institutional boundaries and across the industry/academia divide to identify solutions for sustainable development.

Within the project, we developed engagement and insight from three industries through interviews. GEA College – Canter of Higher Vocational Schools, as a full partner of the consortium, conducted interviews with managers from Slovenian business entities from the above-mentioned sectors. The goal of this paper is to present the results of the interviews. On

that basis, we will prepare, test and deploy learning and training materials and workshops for HEIs, VETs and the business sector throughout the community.

By the project SF4S, 400 students will be initially reached and its open-access materials, which have a pan-European scope. Beyond the project itself, the living community of practice will spread to different sectors. The long-term impact, which is already a springboard for a transition across Europe, will be three industries adopting new sets of future sustainability foresight skills, and both VET and HEI students entering the workforce with Foresight for Sustainability skills that allow them to develop actions that support the long-term green transition that Europe needs.

MATERIALS AND METHODS

Based on semi-structured interviews with the key community actors, we identify key skills and good practices. To better understand the specific green, digital, and foresight skills required to drive sustainable practises and innovations within the industry, we conducted 12 interviews with various stakeholders, including representatives from the industry, education sector, and consulting field.

We were able to investigate the perspectives and experiences of a wider spectrum of people working in the sector thanks to the interviews, which allowed us to look beyond the viewpoints of senior executives and specialised consultants. We intended to discover important competencies and best practices through these interviews that businesses are presently doing to improve sustainability and foresight projects.

We also attempted to explore how these good practices may be transmitted and applied on a larger scale within the industry by probing the experiences of various stakeholders. This method assisted us in finding extra skills and knowledge that could help promote and support sustainable practices.

In addition to interviews with some key players in the fields of agri-food, mobility, and health, we also conducted interviews with representatives from the education sector and consulting industry which allowed us to gain valuable insights from different perspectives. These experts gave us a more thorough picture of Slovenia's prospects and problems. We were able to collect a wide range of perspectives and recommendations for prospective advancements and breakthroughs in the domains by including these stakeholders.

Furthermore, investigating the demands and recommendations from the education sector helped us comprehend how we may better prepare future professionals with the abilities and knowledge to manage difficulties associated with sustainability and innovation in these industries. The insights from the consultancy sector, on the other hand, contributed significantly to the practical strategies and solutions that can be put into place to help the shift to a more sustainable and technologically sophisticated European economy. We were able to identify potential areas of collaboration and

synergy between various sectors and stakeholders thanks to the inclusion of this broader perspective, opening the door for more effective and significant responses to the constantly changing problems in Slovenia and throughout Europe.

All interviews have been transcribed and a summary of the interviews, using a shared project template, has been uploaded to a shared platform. As a result, we wrote a synthesis report that summarized the key results. This report serves as a valuable resource for understanding the current state of the industry, the required skills for a sustainable future, and the best practices that could be adopted to foster positive change. Furthermore, the insights obtained from the interviews form a fundamental cornerstone for organizing workshops tailored to cater to the needs of managers, industrial collaborators, and other key personnel within various companies.

RESULTS

In September 2023, we conducted 12 interviews with representatives from selected sectors, as shown in Table 1.

Table 1: The list of companies

Organization/Company	Cluster
Atlantic Trade	Agri-Food
Eko School	Agri-Food, Education
DARS Slovenija (Company for Highways of the Republic of Slovenia	Mobility
PETROL Slovenija	Mobility
Faculty of Logistics, University of Primorska	Mobility, Education
CER Sustainable Business Network Slovenia	Consulting
Recosi Slovenia	Consulting
Chamber of Commerce and Industry in Slovenia (GZS)	Consulting

The purpose of these semi-structured interviews was a conceptual analysis of how the interviewee understands and perceives the topic "Strategic Foresight for Sustainability". The interviewer wanted to map the subject's or a group of subjects', conceptions and intersections of the tasks domains of "strategic foresight", "organizational sustainability" and "innovation management". Each interview explored the respondents' understanding of these three domains, his or her experience-based knowledge and methodological approach to deal with their intersections, and persisting challenges.

In-depth knowledge of the participants' opinions, experiences, and views on foresight, sustainability, and digitization, as well as how these areas affect innovation inside their organisations, was the goal of the interviews. The interview consisted of three main sections, focusing on future possibilities

and challenges, foresight methods and practices, and teaching sustainability foresight.

Participants were first questioned about their unique methods for managing or promoting innovation in the fields of foresight, sustainability, and digitization. The interview then concentrated on examining potential future developments in sustainability and digitization as well as their obstacles, while identifying the critical knowledge and abilities needed to effectively address these new developments.

Concerning industry trends, developing subjects, weak signals, and wild cards, the use of foresight methods and practises, as well as unique foresight demands were highlighted. Lastly, the interview focused on the significance of sustainable innovation and foresight abilities and competences in the participants' current roles as well as their opinions on the variables influencing the future of teaching sustainable innovation and foresight. The participants were also urged to suggest topics for additional talks or the participation of additional experts in similar interviews.

The questions in the interviews are provided in the appendix. Below, we present the summaries of the responses by sections.

Future possibilities and challenges in sustainability and digitalisation

According to interviewees, by improving procedures, content, monitoring, and accessibility, digitalization plays a crucial role in achieving sustainability. Understanding complex sustainable difficulties and their effects is aided, which makes it easier to put solutions into action. It does, however, also call for new competencies and abilities. Key problems include rapid change and the requirement for swift adaptation.

The energy crisis, as well as issues with information and cyber security, are obstacles in the fields of sustainability and digitalization. To address the energy crisis, rational energy consumption, the introduction of energy solutions, and the promotion of a culture of care are crucial. The importance of information and cyber security is increasing as technological development quickens.

While presenting opportunities for adaptation, new disruptive inventions also present hazards to the stability and well-being of society. Multiple stakeholders must be involved in education and capacity-building initiatives to successfully manage these changes. It is essential to be digitally literate and to comprehend how innovation and digitalization support sustainable development. Collaboration between businesses, research facilities, educational institutions, and the economy is seen as an essential first step.

An additional challenge in this context is the need to develop competencies and knowledge for assessing the risks associated with new technologies. Investments in new technologies are substantial and often risky, making it crucial for businesses to have experts with a wide range of skills capable of properly evaluating the risks and opportunities associated with digitization.

Table 2: Future possibilities and challenges in sustainability and

	Key Points
1.	Digitalization plays a crucial role in achieving sustainability.
2.	The importance of information and cyber security.
3.	Rapid change requires swift adaptation.
4.	Collaboration between businesses, research facilities, and educational institutions is essential.
5.	Investments in new technologies are substantial.

digitalization

Foresight methods and practices

The interview findings reveal that Slovenian companies generally exhibit limited usage of foresight methods. Foresight needs differ among the interviewees, with a notable emphasis on obtaining information regarding industry trends, emerging topics, weak signals, and wild cards to navigate future possibilities and challenges.

For companies seeking to advance sustainability goals, creating a roadmap is considered essential. For instance, if a company aims to achieve carbon-free emissions, integrating this goal into product roadmapping becomes crucial during the development phase. Some interviewees reported utilizing foresight methods such as roadmapping and scenario planning for market entry and product development, although not explicitly for sustainability purposes.

Given the dynamic nature of society, nature, and technology, many companies recognize the necessity of utilizing foresight methods to adapt to rapid changes. Preparing for the advent of 5G and 6G technologies is considered imperative for future operations. Targets for reducing carbon footprints are defined through projections and micro-process planning, allowing companies to make tangible contributions to overarching corporate sustainability goals. Effective integration of predictive models is emphasized for formulating strategies and implementing policies, particularly concerning corporate climate policies.

Overall, while some companies embrace foresight methods and acknowledge their importance, there remains a potential for wider adoption of such methods, especially in the context of sustainability and in response to the ever-changing landscape across various industries.

Table 3: Foresight methods and practices

	Key Points
1.	Strategic foresight methods play a pivotal role in the realm of sustainability and merit increased utilization.
2.	A lack of familiarity with various foresight techniques, particularly those of a quantitative nature.
3.	Roadmapping is one of the key methods used in companies.

Teaching sustainability foresight

The interviews have provided valuable insights into the importance of sustainable innovation competences and key changes in the future. Today, the most crucial competences include the ability to understand and address the complexity of sustainable issues, fostering digitalization and innovation solutions that can be practically applied in various industries and everyday life. Soft skills such as problem-solving, adaptability, networking, empathy towards the environment and society, and multidisciplinarity are also highly valued.

Looking ahead, the future of teaching sustainable innovation and foresight will be influenced by rapid technological progress and the interconnection of different fields, calling for greater emphasis on soft skills. Furthermore, the adoption of innovative teaching methods and ICT equipment is crucial in the pedagogical process.

To promote sustainable innovation, it is essential for management and employers to recognize its significance, along with fostering soft skills among employees. Additionally, educational institutions should place greater emphasis on sustainable topics in their programs.

The rapid development of ICT equipment and robotization will significantly shape the future of teaching and learning. Alongside these technological advancements, soft skills will gain even more prominence, especially in the context of natural, economic, and social challenges. Lifelong learning will become imperative to keep up with the evolving trends.

Additionally, the prevalence of microcredentials, which are brief, focused certificates in a variety of sectors, will increase. Microcredentials will be particularly relevant in the context of rapidly evolving industries and technologies, where professionals need to adapt swiftly to stay competitive. With the help of these microcredentials, people will be able to quickly pick up specialised knowledge and abilities and adjust to the labour market's rapid changes. They will provide professionals with a flexible and convenient option to advance their skills and stay competitive in their particular sectors. As a result, the educational environment will diversify more to accommodate people's varied learning needs in the digital age.

Table 4: Teaching sustainability foresight.

	Key Points
1.	The most crucial competences include the ability to understand and address the complexity of sustainable issues, fostering digitalization and innovation solutions that can be practically applied in various industries and everyday life.
2.	Educational institutions should place greater emphasis on sustainable topics.
3.	ICT significantly shape the future of teaching and learning.
4.	The significance of soft skills is continuously increasing.
5.	Microcredentials are the future of education.

DISCUSSION

Within this study, we used semi-structured interviews as a research method to provide in-depth insights and valuable firsthand information, enabling us to gain a comprehensive understanding of the sectors' needs, challenges, and opportunities in moving towards a sustainable future. In September 2023, we conducted 12 interviews with representatives from agri-food, mobility, and health sectors as well as with representatives from the education sector and consulting industry which allowed us to gain valuable insights from different perspectives.

An important finding from the interviews was that foresight, as a competency covering different methodologies, emerged as a critical capability. Nearly all of the businesses that were surveyed stated that there remains a potential for wider adoption of foresight methods, especially in the context of sustainability. During the interviews, scenario-based techniques and evidence-based, data-driven approaches were the two foresight trajectories that were most frequently highlighted.

A significant issue in many companies is the limited awareness and understanding of various foresight methods, particularly those that involve quantitative approaches. This gap in knowledge hinders their ability to effectively anticipate and plan for future developments in a data-driven manner.

After analysing the interviews, some meta-level competencies that will be crucial in the future were pointed out. Cognitive competences such as systems thinking and future orientation, coupled with emotional competences like a connection with nature and empathic care, will play a vital role in enhancing innovation and fostering organizational learning capabilities in the context of sustainability.

First, a comprehensive awareness of systemic fabrics and specific relationships within a domain is required for systems thinking, which has emerged as an essential competency. Understanding broader systemic contexts, such as relationships between socio-economic areas like agri-food, mobility, and health, is also included here. Moreover, a fundamental competency recognised across all areas is critical thinking, which is not only important for understanding dynamics in the general operational environment but also for scientific or research and development activity. The fourth competency relates to digital skills, particularly in data administration, visualisation, and analysis. Additionally, social and cultural competencies like networking and communication abilities were considered as becoming more and more important.

Interviews also showed a need for innovative storytelling abilities to portray events, products, and solutions through a variety of narratives. Additionally listed as emerging abilities for future employment were emotional intelligence and empathy. Last but not least, a category known as "new literacies" arose, including numerous skills required to comprehend our technologically impacted and contextually rich contexts. This comprises knowledge of information (data), sustainability, algorithms, and the future.

CONCLUSIONS

Fostering collaborative action and innovation to drive sustainability on a European level requires many roadblocks to be overcome. Within the SF4S project, we tackle two in particular:
- The lack of integrated green, digital and future (i.e. sustainability foresight) skills among students and professionals. To mainstream such skills and tackle grand industrial challenges, the solution search needs to start in the distant future and apply systemic thinking to leverage trigger points for lasting change towards sustainable development. However, current HEI, VET and executive curricula are still dominated by linear and uni-disciplinary solutions that prevent innovation professionals and leaders from leading from and towards desirable futures that tackle sustainability at scale.
- The lack of approaches to make flows of knowledge connect between HEI, VET, industry and the next generations. Innovation requires connecting different planes of thought, knowledge from different domains and tacit knowledge from different stakeholders. This is particularly important for developing solutions for the sustainable development of industries. Good practices are still scarce, not sufficiently accessible and not sufficiently used.

This paper aimed to present a small part of the broader project that took place in Slovenia. More precisely, the focus was on showcasing the results of interviews conducted by GEA College, aiming to gain a deeper understanding of the state of sustainability and foresight methods, particularly within the agri-food and mobility sectors. These three industries were chosen for the interviews based on several criteria:
- The agri-food and mobility sectors have a crucial effect on society and the environment.
- These sectors are facing several issues, including maintaining food security, creating environmentally friendly transportation options, and improving medical technology.
- These sectors' lessons learnt and best practices can be applied to other industries, advancing efforts towards sustainable development as a whole.
- Participating various industries encourages cross-sector collaboration and knowledge-sharing, which can result in new ideas and improvements in sustainable practices.
- The project's goal was to conduct interviews in these particular sectors to learn more about their existing procedures, difficulties, and possibilities for growth to help the larger community have a more sustainable future.

By conducting interviews in these specific sectors, we learnt more about current practices, challenges, and potential opportunities for further advancement, thus contributing to a more sustainable future for the broader community.

The described results are limited only to Slovenia. However, within the SF4S project, we also conducted interviews in other countries: Denmark,

Estonia, Finland, France, and Germany. The broader research findings will be summarized in a report, which will be published on the project's website and will serve as a basis for developing study materials and training programs for managers, students, and lecturers.

The ambition of the SF4S project is to continue its work and engagement with the target group after the project is finished, the end of the project will be the start of a bigger community. This is precisely the reason that the project implements sustainability planning, the final version of which, the SF4S Action Plan (Sustainability strategy) will define the continuation of the project and ensure that target groups are reached efficiently and effectively. Strategically therefore and during the project, outreach activities will be tested and the most prominent channels put in place.

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Appendix

INTERVIEW QUESTIONS

Starting the interview

Do you have experience in foresight, sustainability and digitalisation? If so, what are your specific approaches in these domains to manage or drive innovation?

I Future possibilities and challenges in sustainability and digitalisation

In your view, what are the most important future possibilities or challenges in the domains of sustainability and digitalisation that could have an impact on your innovation strategy and practices? What impacts these could have in your organisation?

What are the most important sustainability/digitalisation skills and competences for tackling these emerging changes?

II Foresight methods and practices

Have you utilized foresight methods (e.g. horizon scanning, exploratory or normative scenarios, roadmapping) in the context of innovation?

What are the specific foresight needs in your work and organisation (e.g. industry trends, emerging topics, weak signals, wild cards)?

III Teaching sustainability foresight

Which sustainable innovation and foresight skills and competences are important in your job already today? How do you see them changing in the future?

In your view, what factors (e.g. ideas, developments, technologies) will potentially influence the teaching of sustainable innovation and foresight in ten years? What skills and competencies would then be needed [in sustainable innovation and foresight]?

Ending the interview

In your view, are there any issues that should have been discussed? Do you have recommendations on who else should we talk to?