

**STRENGTHENING THE
CAPACITY FOR EXCELLENCE
OF SLOVENIAN AND
CROATIAN INNOVATION
ECOSYSTEMS TO SUPPORT
THE DIGITAL AND GREEN
TRANSITIONS OF
MARITIME REGIONS**



Funded by
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REPORT ON INNOVATION ECOSYSTEMS' NEEDS

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Authors	Nikolina Pomenić (PRIGODA), Dubravko Podnar (PRIGODA)
Reviewers	Hrvoje Vukušić (UNIRI), Anna Maria Poljak (UNIRI) Robert Cupac (MS Tech), Mario Vukelic (STEP RI)
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Abstract	This Report on Innovation ecosystems needs is the result of the Gap analysis of both Slovenian and Croatian maritime innovation ecosystems. The gap analysis is based on conducting two workshops with the Slovenian and two workshops with the Croatian stakeholders within the maritime innovation ecosystems. The results of the Gap analysis serve to identify the gaps between the current and desired state of the ecosystem and provide a better understanding of ecosystems' needs.
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EXECUTIVE SUMMARY

This Report on ecosystems' needs is the output of Task 2.2 – Gap analysis whose purpose is to collect stakeholders' views regarding common and distinct R&I needs, gaps challenges, and opportunities as well as best practices, unmet needs, and possible solutions.

The purpose of the Analysis is to identify gaps and deficiencies in the Croatian and Slovenian maritime innovation ecosystem and determine areas of improvement. Various aspects of the maritime industry have been assessed including production, shipping, regulations, education, financing, and environmental impact considering economic, environmental, and social factors affecting the ecosystem. In that respect, both internal and external factors are taken into account which provides a comprehensive and more complete understanding of the ecosystems' current state and desired future state.

A gap analysis is used to assess the difference between the ecosystem's current state and its desired or ideal state. It helps identify areas where there are disparities or "gaps" between the two, which can then be addressed to achieve better performance and improvements.

The importance of the Gap analysis is in providing insight relevant to strategic decision-making for industry stakeholders and policymakers.

The results of the Gap analysis are based on conducting two workshops with the Croatian stakeholders and two workshops with the Slovenian stakeholders in the maritime innovation ecosystems.

This deliverable is a compilation of a Report on data collection for Adriatic Croatian maritime innovation ecosystem needs and gaps and a Report on data collection for Western Slovenian maritime innovation ecosystem needs and gaps.

This Report describes the Methodology which is presented in Chapter 2. The Croatian workshops overview is analysed in Chapter 3, and the Slovenian workshops overview is presented in Chapter 4. Ecosystems' needs and gaps are described in Chapter 5. The Path to Gap Analysis – Key Challenges is provided in Chapter 6. Finally, the Conclusions for Croatian and Slovenian Innovation Maritime Ecosystem needs are presented in Chapter 7.

TABLE OF CONTENTS

DELIVERABLE INFORMATION	2
EXECUTIVE SUMMARY	6
TABLE OF CONTENTS	7
LIST OF FIGURES	8
LIST OF TABLES	9
ABBREVIATIONS	10
1 INTRODUCTION	11
1.1 Project overview and objectives	11
1.2 Scope and objectives of conducting the Gap analysis	12
2 METHODOLOGY	13
2.1 Designing and conducting workshops	13
2.2 Data analysis	16
2.3 Identifying solutions	17
2.4 Preparing a report	17
3 CROATIAN WORKSHOPS OVERVIEW	18
3.1 Participants	18
3.2 Workshop findings	25
3.3 Summary of workshop findings	29
4 SLOVENIAN WORKSHOPS OVERVIEW	30
4.1 Participants	31
4.2 Workshop findings	35
4.3 Summary of workshop findings	39
5 ECOSYSTEMS' NEEDS AND GAPS	41
6 PATH TO GAP ANALYSIS - KEY CHALLENGES	46
6.1 Croatian ecosystem	46
6.2 Slovenian ecosystem	47
7 CONCLUSION	48
REFERENCES	50

LIST OF FIGURES

Figure 1: 1 st Workshop participants by category	20
Figure 2: 1 st Workshop participants structure with regard to the 4-helix framework.....	21
Figure 3: 2 nd Workshop participants by category.....	21
Figure 4: 2 nd Workshop participants structure with regard to the 4-helix framework	22
Figure 5: 1 st & 2 nd Workshop participants by category.....	23
Figure 6: 1 st & 2 nd Workshop participant's structure with regard to the 4-helix framework	23
Figure 7: Participants of workshops as per the 4-helix framework.....	24
Figure 8: 1 st & 2 nd Workshop participants by category.....	33
Figure 9: 1 st & 2 nd Workshop participants structure with regard to the 4-helix framework	33
Figure 10: Participants in workshops as per the 4-helix framework.....	34

LIST OF TABLES

Table 1: Focus group questions	14
Table 2: Current strengths and weaknesses of the maritime innovation ecosystem in Adriatic Croatia.	25
Table 3: Current strengths and weaknesses of the maritime innovation ecosystem in Western Slovenia	35
Table 4: Results of the Gap Analysis of the Adriatic Croatian Maritime Innovation Ecosystem.....	41
Table 5: Results of the Gap Analysis of the Western Slovenian Maritime Innovation Ecosystem	44

ABBREVIATIONS

INNO2MARE	Strengthening the capacity for excellence of Slovenian and Croatian innovation ecosystems to support the digital and green transitions of maritime regions
R&I	Research and Innovation
ToC	Table of Content
WP	Work Package

1 INTRODUCTION

1.1 Project overview and objectives

INNO2MARE is a project funded by the European Commission and is meant to enhance the capacity for excellence of Western Slovenian and Adriatic Croatian innovation with Belgium support within and between these three ecosystems. A set of jointly designed and implemented actions will support the digital and green transitions of the maritime industries and others, that are connected with those industries.

The main goal of INNO2MARE is to strengthen the capacity for excellence of Western Slovenian and Adriatic Croatian innovation ecosystems through a set of jointly designed and implemented actions that will support the digital and green transitions of the maritime and connected industries. Based on an in-depth mapping of the ecosystems and needs & gaps analysis, the consortium will formulate a long-term R&I strategy aligned with regional, national and EU strategies, as a visionary framework, and a joint action & investment plan, with concrete steps for building coordinated, resilient, attractive and sustainable maritime innovation ecosystems. To support the joint strategy and provide a model for the future collaborative R&I of the ecosystems' actors, the project will implement three R&I pilot projects that address some of the key challenges related to maritime education and training, security & safety in marine traffic as well as energy conversion and management systems' efficiency. These pilots will be the basis for further development, scale-up and translation of the generated research results into innovative business opportunities through the coordinated mobilization of public and private funding. The consortium will also implement innovative programs that will support the engagement of citizens in the innovation processes, knowledge transfer for mutual learning, entrepreneurship & smart skills training and attraction of best talents, involving more than 1.000 participants across the Quadruple Helix. In all the project activities, the two ecosystems will strongly benefit from the sharing of best practices of the Flemish ecosystem, one of the most developed maritime innovation ecosystems globally. The project will contribute to reducing the innovation divide in Europe by systematically connecting the innovation actors within and between the ecosystems and creating synergies in R&I investments' planning and execution, thus developing a true innovation culture.

Specific objectives of the projects are:

- Develop the joint R&I strategy for strengthening the maritime innovation ecosystems' excellence.
- Contribute to knowledge gaps in maritime R&I through co-design and joint implementation of three pilot projects by ecosystem actors.
- Develop the joint action & investment plan for building coordinated, resilient, attractive, and sustainable maritime innovation ecosystems.
- Accelerate the uptake of new technologies by the ecosystems industry through preplanning for pilots and demonstrators based on the three R&I pilot projects.
- Enhance the level of collaboration within and between place-based ecosystems through innovative approaches to knowledge transfer, community engagement, and competence building.

To achieve the objectives of the project, the INNO2MARE partnership will collaborate through a common working environment and will apply standardized procedures in the implementation of the foreseen

tasks. In doing so, the INNO2MARE partners will ensure the timely delivery of quality outputs, will gain a common understanding of their individual roles, and will be able to provide quick responses to possible problems and roadblocks.

1.2 Scope and objectives of conducting the Gap analysis

Conducting a gap analysis of the Western Slovenian and Adriatic Croatian maritime innovation ecosystem is crucial for providing a clear understanding of the current situation and the potential opportunities for growth and development. Together with in-depth mapping of the ecosystems that was done in the previous phase, Gap analysis which is presented in this report regarding the Croatian and Slovenian maritime innovation ecosystem will serve as a base to formulate a long-term joint R&I strategy aligned with regional, national, and EU strategies, as a visionary framework with concrete steps for building coordinated, resilient, attractive and sustainable maritime innovation ecosystems.

Gap analysis helps stakeholders to identify the most effective strategies and interventions for improving the ecosystems' performance and competitiveness. By identifying these gaps, a more comprehensive understanding of the ecosystems' needs can be developed. Moreover, gap analysis ensures that all relevant factors are taken into account, including both internal and external factors that may impact the ecosystems' performance. This helps to ensure that the analysis is comprehensive and accurate, providing a complete picture of the ecosystem's status.

The general objective of conducting a Gap analysis is to provide a systemic approach to identify and understand the needs and gaps between the current state and the desired state of the Croatian maritime innovation ecosystem, to identify enablers and inhibitors of innovative performance across the involved ecosystems and to define potential solutions for addressing the identified R&I needs, gaps, challenges & opportunities.

In more specific terms, the objectives are:

- to evaluate the current state and level of innovation in the maritime ecosystems, and identify areas for improvement;
- to assess the availability and quality of infrastructure and resources that support the maritime ecosystems;
- to identify the current and potential inhibitors to innovation and growth in the maritime ecosystems;
- to identify potential areas of collaboration and synergy between different actors and stakeholders in the maritime ecosystems;
- to analyse the impact of policy and regulatory frameworks on the performance and competitiveness of the maritime ecosystems;
- to assess the potential impact of emerging technologies, such as digitalization and Industry 4.0, on the maritime ecosystems.

This report is a result of conducting two workshops with Croatian ecosystem stakeholders and two workshops with Slovenian ecosystem stakeholders that analyzed the ecosystems' needs and gaps following the proposed Methodology.

2 METHODOLOGY

The Gap analysis methodology includes the following steps to ensure a comprehensive and systematic approach to identifying the current situation and potential opportunities for growth and development of the maritime ecosystems of Western Slovenia and Adriatic Croatia.

The methodology for conducting Gap analysis includes four steps:

- Designing and conducting workshops
- Analysing the data
- Identifying solutions
- Preparing a report

2.1 Designing and conducting workshops

Workshops are conducted by organizing focus groups which are comprised of stakeholders that were previously identified within T2.1- Mapping the ecosystem. Therefore, the use of focus groups has several advantages:

- Encourages discussion and collaboration by bringing together stakeholders with diverse backgrounds and perspectives which can create an environment where participants feel comfortable sharing their views and engaging in a productive dialogue with others. This can help generate a range of ideas and perspectives that might not have emerged through other methods.
- Enables the gathering of detailed information by focusing on specific questions or topics, focus groups can generate rich, detailed data on the R&I needs, gaps, challenges & opportunities as well as innovative performance enablers and inhibitors for the two ecosystems. This can help to identify specific areas where further research or intervention may be needed.
- Helps with exploring synergies: By bringing together stakeholders from different sectors, focus groups can help to identify areas of overlap and potential for collaboration between different initiatives or actors.

The approach

The proposed approach involves conducting four to six focus groups, with each group comprising 6 to 12 participants representing various stakeholder groups identified in the previous step (T2.1). After careful consideration, this number was chosen as optimal, as it is small enough to encourage each participant to voice their opinions and ideas, while still being large enough to foster group dynamics.

To determine the optimal number of participants various scientific sources have been consulted. Selecting 6 to 12 participants for each focus group is grounded in established research practices. This range is considered optimal as it allows for a diversity of perspectives while maintaining manageable group dynamics. Krueger and Casey (2000) suggest that six to eight participants are generally sufficient for effective focus groups. Krueger (1994) specifically notes that ten participants strike a balance between gathering varied viewpoints and avoiding disorderly or fragmented discussions. The upper limit of 12 participants is set to prevent the group from becoming unwieldy, as larger groups may split into smaller

subgroups, potentially compromising the integrity of the discussion (Krueger, 1994). This carefully considered range ensures that each participant has ample opportunity to contribute while fostering rich, interactive dialogue.

The inclusion of different stakeholder representatives in each focus group aims to elicit diverse perspectives. The duration of each focus group session will range from 90 to 120 minutes. The workshops should be conducted in the local language with local stakeholders, preferably 2 workshops for the Slovenian ecosystem and 2 for the Croatian ecosystem.

The focus groups will be carried out in accordance with the following steps:

- Introduction and ice-breaker activities to help participants get to know each other and build rapport.
- Presentation of the project objectives to provide participants with an overview of the focus group's purpose.
- Open-ended questions to explore stakeholders' perceptions, experiences, and attitudes regarding R&I needs, gaps, challenges, and opportunities, as well as innovative performance enablers and inhibitors for the two ecosystems.
- Group discussions and brainstorming sessions to generate ideas and suggestions for improving maritime R&I in the two ecosystems.
- Closing remarks and feedback collection from the participants.

Each focus group will be structured to encourage discussion and collaboration among participants, with the moderator guiding the conversation and ensuring that all relevant topics are covered. The discussion will proceed from the general to the specific. The entire conversation will be recorded. The moderator's assistant will take notes during the conversation and record important non-verbal reactions of the participants.

The main aim of the focus groups is to provide the answers to the questions presented in Table 1.

Table 1: Focus group questions.

No.	Main question	Sub-questions
1.	What are the current strengths and weaknesses of the maritime innovation ecosystems in Western Slovenia and Adriatic Croatia, respectively?	<p>1.1 What are the current resources available for maritime innovation in each ecosystem?</p> <p>1.2 What are the key players and their roles in promoting maritime innovation?</p> <p>1.3 What are the current success stories of maritime innovation?</p> <p>1.4. What are the challenges faced in promoting maritime innovation?</p>
2.	What are the most pressing challenges facing the maritime industry in these ecosystems, and how can they be addressed through R&I?	<p>2.1. What are the major challenges facing the maritime industry?</p> <p>2.2. How can R&I address these challenges and improve the competitiveness of the maritime industry?</p> <p>2.3. How can collaboration between academia, industry, and other</p>

No.	Main question	Sub-questions
		stakeholders help address these challenges?
3.	What are the most promising areas of innovation in the maritime sector in these ecosystems, and what needs to be done to support their development?	<p>3.1. What are the most promising areas of innovation in the maritime ecosystem?</p> <p>3.2. What are the factors that contribute to their potential for success?</p> <p>3.3. What needs to be done to support the development of these areas of innovation?</p>
4.	What are the key inhibitors to innovation?	<p>4.1. What are the major inhibitors to innovation in the maritime ecosystem?</p> <p>4.2. How can these inhibitors be overcome to promote innovation?</p> <p>4.3. What policies or interventions are needed to address these inhibitors?</p>
5.	How can collaboration be improved between different actors in the maritime ecosystem to better leverage R&I opportunities?	<p>5.1. What are the current forms of collaboration between different actors in maritime sector?</p> <p>5.2. How can these collaborations be improved?</p> <p>5.3. What are the benefits and challenges of collaboration between different actors in the maritime ecosystem?</p>
6.	What specific digital, circular economy, and Industry 4.0 priorities should be pursued to support maritime R&I in these ecosystems?	<p>6.1. What are the specific digital, circular economy, and Industry 4.0 priorities in the ecosystem's national smart specialization strategy?</p> <p>6.2. How can these priorities be applied to the maritime sector?</p> <p>6.3. What additional priorities should be pursued to support maritime R&I?</p>
7.	How do policy and regulatory frameworks impact the performance and competitiveness of maritime ecosystems?	<p>7.1. What specific policies and regulations have had the greatest impact on maritime ecosystems?</p> <p>7.2. In what ways have these policies and regulations influenced the performance and competitiveness of maritime ecosystems?</p> <p>7.3. How can policy and regulatory frameworks be modified or improved to better support the performance and competitiveness of the maritime ecosystems?</p>

2.2 Data analysis

The data collected from the focus groups will be analysed to identify common and distinct themes and patterns. To analyse and synthesize the data collected from the focus groups, the following steps will be taken:

- **Transcription:** Transcribe the audio recordings of the focus groups and create written transcripts for each group.
- **Coding:** Coding the transcripts to identify themes and patterns. This involves identifying keywords, phrases, or ideas that are repeated throughout the transcripts.

At first, the workshop notes were analysed using Lexicool, a free online text analyser and word counter to find and quantify frequently occurring keywords and phrases that are contextually significant. The results were the count of one-word, two-word, and three-word phrases. The most repeated one-words in descending order were: maritime, industry, development, projects, sector, companies, lack, between, education, and emphasized. The two-word count was mostly similar, and since it also counted the articles, it didn't prove more significant. The count of three-word phrases was also in line with the previous count, but two new phrases emerged: exchange of information and the public institutions. Since the participants mostly answered questions by giving examples from their companies/ institutions everyday business life, and experiences using very different speech styles, many different words and phrases were used to describe the same theme, so just using word counting does not show sufficient relevance and the words had to be put into a context.

Therefore, it was necessary to perform manual coding by reading through workshop notes and manually highlighting sections related to predefined or emerging themes. Following that approach, the thematic analysis was performed to identify and interpret themes like communication, education, mindset, workforce development, etc that emerged while analysing the workshop notes. The same approach was used to identify patterns i.e. regular occurrences of the data that indicate a relationship or trend. Patterns like "lack of communication", "lack of funding", "lack of interest in maritime studies", etc. were linked with identified themes and grouped regarding their significance.

- **Categorization:** Grouping the coded data into categories based on their similarities. This allows for the identification of common and distinct R&I needs, gaps, challenges & opportunities, as well as innovative performance enablers and inhibitors for the two ecosystems.

A hybrid approach was applied for categorization with initial categories based on proposed questions but later expanded based on the received data. Initially, categories were defined through the questions posed to the participants and included: strengths and weaknesses, challenges, most promising areas of innovation, key inhibitors to innovation, collaboration, digital and circular economy priorities to support maritime R&D, and policy and regulatory framework within the maritime innovation ecosystems. However, when reading through the workshop notes it turned out that some of the questions were partially answered or led in a different direction and thus a bottom-up approach was applied. Following that approach and after the thematic analysis the data was categorised according to identified themes i.e. predefined and newly emerged that served as the basis for categorization.

- **Prioritization:** Prioritizing the categories based on their significance, urgency, and potential impact on the ecosystems. This helps to identify the areas that require immediate attention and resources.

- Synthesis: Synthesizing the prioritized categories to form a comprehensive view of the R&I needs, gaps, challenges & opportunities, as well as innovative performance enablers and inhibitors for the two ecosystems.

2.3 Identifying solutions

Based on the focus group analysis, potential solutions will be identified. The identification of potential solutions will follow these steps:

- Review the categories that were prioritized based on their significance, urgency, and potential impact on the ecosystems.
- Brainstorm potential solutions that address the R&I needs, gaps, challenges & opportunities, as well as innovative performance enablers and inhibitors identified in the prioritized categories.
- Evaluate the potential solutions to determine their feasibility, effectiveness, and potential impact on the ecosystems. This can be done by involving expert opinions and stakeholder feedback.
- Select the most appropriate solutions based on the evaluation criteria and the available resources and capacities.

2.4 Preparing a report

The report summarizing the findings of the gap analysis will include the following elements:

- An executive summary that provides a brief overview of the report's purpose, methodology, and main findings.
- An introduction that sets out the context of the analysis, including the objectives of the study and the scope of the analysis.
- An analysis of the data collected from the focus groups, including a summary of the common and distinct R&I needs, gaps, challenges & opportunities as well as innovative performance enablers and inhibitors for the two ecosystems.
- Identification of potential solutions for addressing the identified R&I needs, gaps, challenges & opportunities as well as innovative performance enablers and inhibitors for the two ecosystems, informed by the existing policy framework.
- Identification of possible synergies between existing actors and initiatives, with respect to specific maritime R&I domains with the highest development potential.
- Recommendations for future action, based on the findings of the gap analysis and informed by the existing policy framework, to support the development of the joint maritime innovation ecosystems' R&I strategy in Western Slovenia and Adriatic Croatia (T2.3).
- Conclusion that summarizes the key findings of the gap analysis and provides an overview of the recommendations for future action.
- Appendices that provide additional information, such as the focus group questions, a list of participants, and any other relevant supporting documents.

3 CROATIAN WORKSHOPS OVERVIEW

The workshops were held on the 11th and 12th of July 2023 in the VIP salon of the University of Rijeka Trsat Campus and online and each one lasted approximately 120 minutes. A total of twenty-two participants were present in both workshops.

The workshops have been recorded and the notes are saved in the INNO2MARE repository and can be given on request. These notes represent the base for this Report and the findings that are presented.

Although the initial idea was to organize workshops in presence only, which better enables direct contact between participants and encourages and facilitates open discussion, online attendance proved to be indispensable to stakeholders that were situated in different cities and also to the stakeholders that were unable to join due their current workload and other business requirements.

The purpose of the workshops was to gather stakeholders from all categories that were previously identified in task 2.1 Mapping the ecosystem, which was presented in the Innovation Canvas of the Croatian maritime innovation ecosystem, meaning that all relevant and identified stakeholders within the ecosystem were, based on their core activity, categorized into one of the following categories: Logistics, Production, Shipping, Software development, Service, Infrastructure, Startups, Incubators and VC, Research and Academia, Other, Private organizations and Public entities.

The aim of organizing such workshops was to engage stakeholders from different categories that otherwise do not interact on a regular basis in a meaningful discussion in order to encourage the exchange of ideas, opinions, views, and experiences on the current and desired state of the Croatian maritime innovation ecosystem, identify its needs and existing gaps in order to improve the performance and competitiveness of the ecosystem.

3.1 Participants

The participants were selected primarily among the stakeholders that responded to the questionnaire that was sent during the mapping process and showed interest in the project by expressing their willingness to participate in project activities that include stakeholder feedback. Besides that, the participants who were mapped by means of desk research were also invited to take part in the workshops.

Also, their availability had to be taken into consideration, meaning that stakeholders from all categories were not present in both workshops due to their inability to participate for various business reasons, and because of that the perfect sample was impossible to obtain. Therefore, it was managed to adjust in the best way possible. Furthermore, several cancellations happened virtually just days or hours before the workshops, and the replacement participants were found to our best ability if possible.

It is important to note that the names and positions of the participants within their company/organization are not disclosed in this Report since it will be publicly available.

In the first Workshop, there were twelve participants, of which ten participants were actively engaged in discussion and two online participants did not contribute due to urgent business requirements so they were sporadically listening.

The participants who took part in the first Workshop were:

- Representative from the naval design company Brodoplan (category Production).

- Representative from the company Jadrolinija, Croatia's largest liner shipping (category Shipping).
- Representative from Step RI- Science and Technology Park of the University of Rijeka (project partner, category Incubators and VC).
- Representative from Regional Development Agency of the Primorje-Gorski (project partner, member of INNO2MARE Innovation Council, category Public institutions).
- Representative from Faculty of Maritime Studies Rijeka, Department of Marine Engineering and Energetics (project partner, category Research & Academia).
- Representative from the company Maritime Center of Excellence (project partner, category Production).
- Representative from company Hexis (category Software developers).
- Representative from the company MEP (category Production), online participant.
- Representative from the naval design company Navis Consult (category Production), online participant.
- Representative from Metris Research Center (category Research&Academia), online participant.
- Representative from Metris Research Center (category Research&Academia), online participant, did not engage in discussion due to simultaneously ongoing business demands.
- Representative from the company Sarda (category Software developers), the online participant did not engage in discussion due to simultaneously ongoing business demands and therefore sporadically listening.

In the second Workshop, there were nine participants of which three were online participants and one of them did not engage in conversation due to simultaneously ongoing business requirements.

The participants who took part in the second Workshop were:

- Representative from Technical Faculty of Rijeka (project partner, category Research& Academia).
- Representative from V. Lenac shipyard (category Production).
- Representative from the Faculty of Informatics and Digital Technologies in Rijeka (project partner, category Research&Academia).
- Representative from company Lürssen Design Center Kvarner (category Production).
- Representative from the Croatian branch of the French company CMA CGM (category Shipping).
- Representative from the company ACI Croatia (category Infrastructure).
- Representative from 3. maj shipyard (category Production), online participant.
- Representative from the company Jadranski pomorski servis (category Shipping), online participant.
- Representative from the company Vard (category Production).

- Representative from the Adriatic Diving Service company (category Other) - did not engage in discussion due to simultaneously ongoing business demands and therefore sporadically listening, online participant.

In total, there were 22 participants representing eight categories that were identified in the mapping process of the Croatian maritime innovation ecosystem. The categories represented in the workshops are Shipping, Production, Incubators, Public entities, Software developers, Research&Academia, Infrastructure, and Others.

The workshops were moderated by Nikolina Pomenic, and Dubravko Podnar was taking notes (both from PRIGODA).

The following figures show the structure of Workshops participants by categories that were used during the mapping phase.

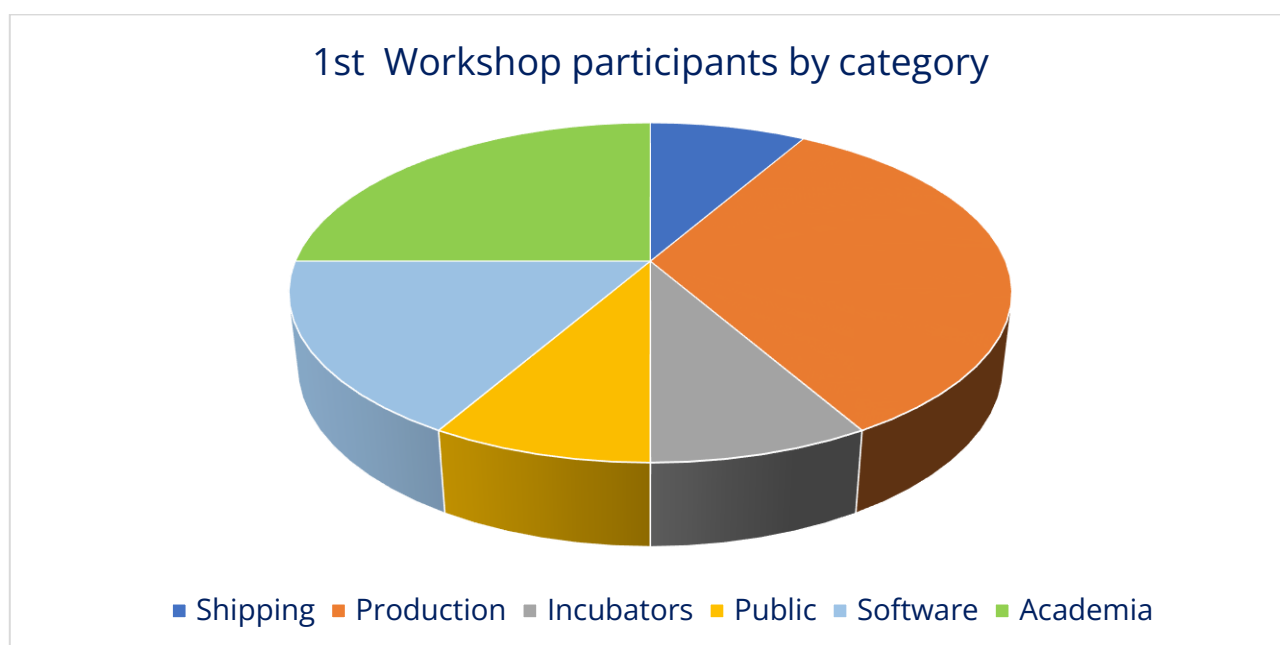


Figure 1: 1st Workshop participants by category.

In the 1st Workshop, as it is shown in Figure 1. most participants were from the Production category – 4 participants representing 33%, followed by Research& Academia – 3 participants representing 25%, then Software developers – 2 participants representing 17% of the total participants that were present in the 1st Workshop. Categories Public, Incubators, and Shipping were all at 8%, meaning that there was only one participant per each category.

The participants in the Production category were all from naval design companies that have a strong presence in Rijeka. The intention was not to group them all in one workshop but due to their (un) availability to participate, we had to adjust to their business schedule and in a way compromise the aim of creating a perfect sample of participants that would represent all categories in equal numbers.

With the regard to four-helix framework, which includes all ecosystem stakeholders classified into the following sectors: research& education institutions, government bodies, societal actors, industry, and 4helix intermediaries, the structure of the 1st Workshop participants is shown in the following figure:

1st Workshop participants structure with regard to the 4-helix framework

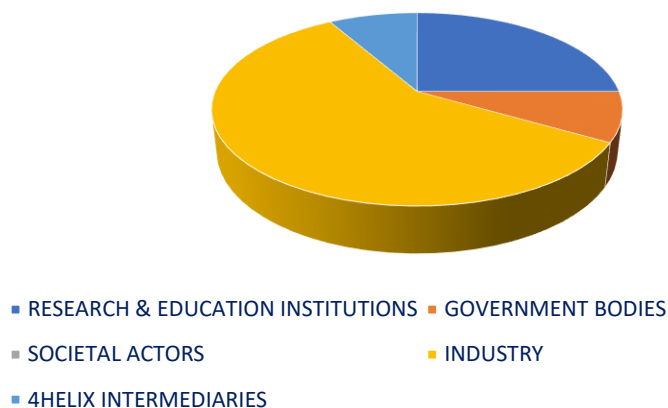


Figure 2: 1st Workshop participants structure with regard to the 4-helix framework.

As it can be seen in the Figure 2, most participants were from the industry, followed by Research and education institutions, Government bodies, and 4 helix Intermediary. Societal actors were not represented. As mentioned before, regarding the Figure 1, which represents the structure of 1st Workshops participants by categories that were used during the mapping phase and the structure according to four -helix framework, the perfect sample of stakeholders from all categories was not obtained.

The following figure represents the structure of participants of the 2nd Workshop according to classification used in the mapping phase:

2nd Workshop participants by category

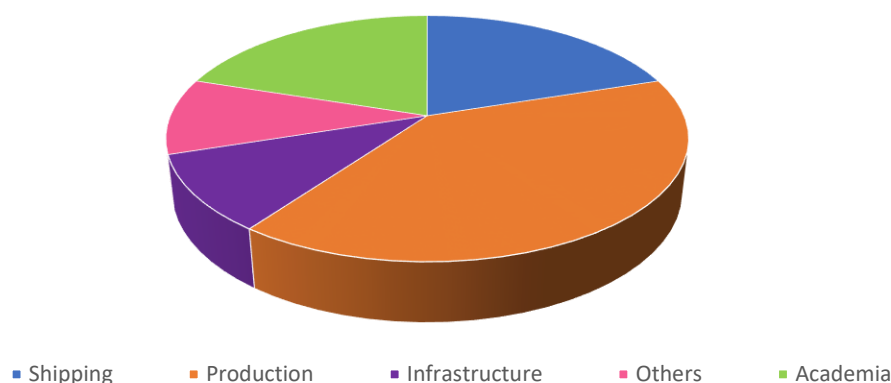


Figure 3: 2nd Workshop participants by category.

In the 2nd Workshop, as it is shown in Figure 2 the majority of participants were also from the Production category – 4 participants representing 40%, followed by Research& Academia – 2 participants and

Shipping – both present with 2 participants representing 20%, then equally represented categories Infrastructure and Others at 10% of the total participants were present in the 2nd Workshop.

In this workshop, most of the participants in the Production category were representatives of shipyards (2 participants) and one participant from a naval design company.

Stakeholders from the Auxiliary services category i.e., Classification societies were also invited as were representatives from the Maritime Innovation Cluster, but their attendance was cancelled at the last moment. Regarding the Startups category, it was not possible to find a stakeholder interested in participating in the workshops.

As it was mentioned before regarding the 1st Workshop, the aim of creating a perfect sample of participants that would represent all categories in equal numbers was also abandoned in the 2nd Workshop due to the unavailability of stakeholders to participate.

The structure of participants with regard to four-helix framework is shown in the following figure 4.

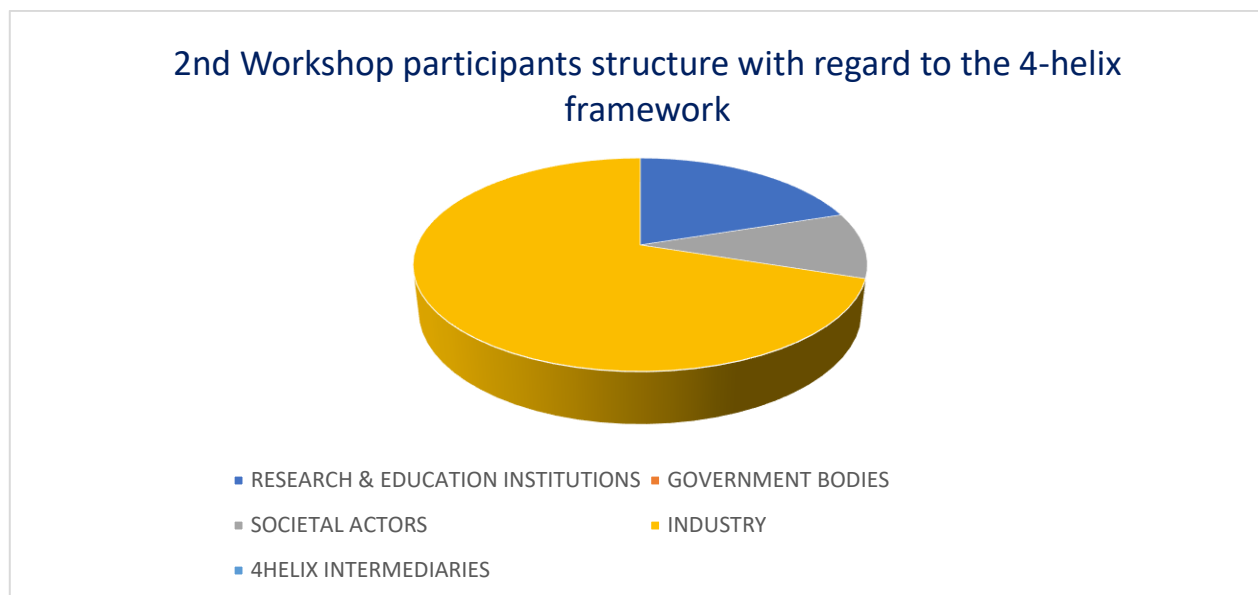


Figure 4: 2nd Workshop participants structure with regard to the 4-helix framework.

As shown in Figure 4 and mentioned before in the 2nd Workshop the participants from representing all 4-helix sectors were not present, and most of them represented the industry category, followed by Research and Educational Institutions and Societal actors.

Figure 5 represents the structure of participants of both workshops combined. Combining two workshops together shows that overall, 8 participants were from the Production category – 36%, followed by 5 representatives of the Academia category - 23%, then 3 participants from the Shipping category – 14%, then 2 participants from the Software developers' category - 9% and at the end one participant – 5% from categories Incubators, Public institutions, Infrastructure, and Others.

In total, the participants belonging to the Production category were the most represented in the workshops which is in line with the mapping results of the Croatian maritime innovation ecosystem where the Production category is the most present- 47% and most innovative companies were found within that category.

The categories that were not represented at all except the aforementioned regarding the 2nd Workshop like Services and Logistics were mapped using mainly database and desk research methods since there were no responses received regarding the questionnaires that were sent.

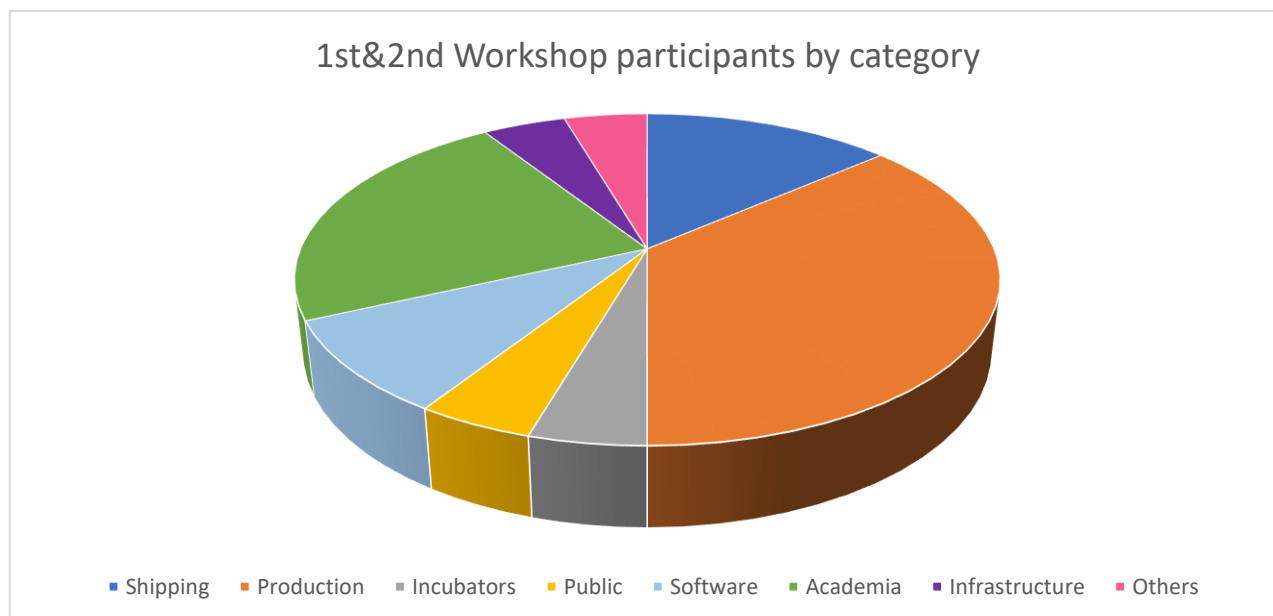


Figure 5: 1st & 2nd Workshop participants by category.

Combining the two Workshops according to the four-helix framework is shown in Figure 6. When combining two workshops, as shown in Figure 6, the representatives from all four-helix framework actors were included in the workshops, and the industry sector was predominantly represented, followed by Research & Educational Institutions representatives. Government and Societal actors and 4-helix intermediaries were less represented but provided valuable contributions and insight into the ecosystem needs and gaps.

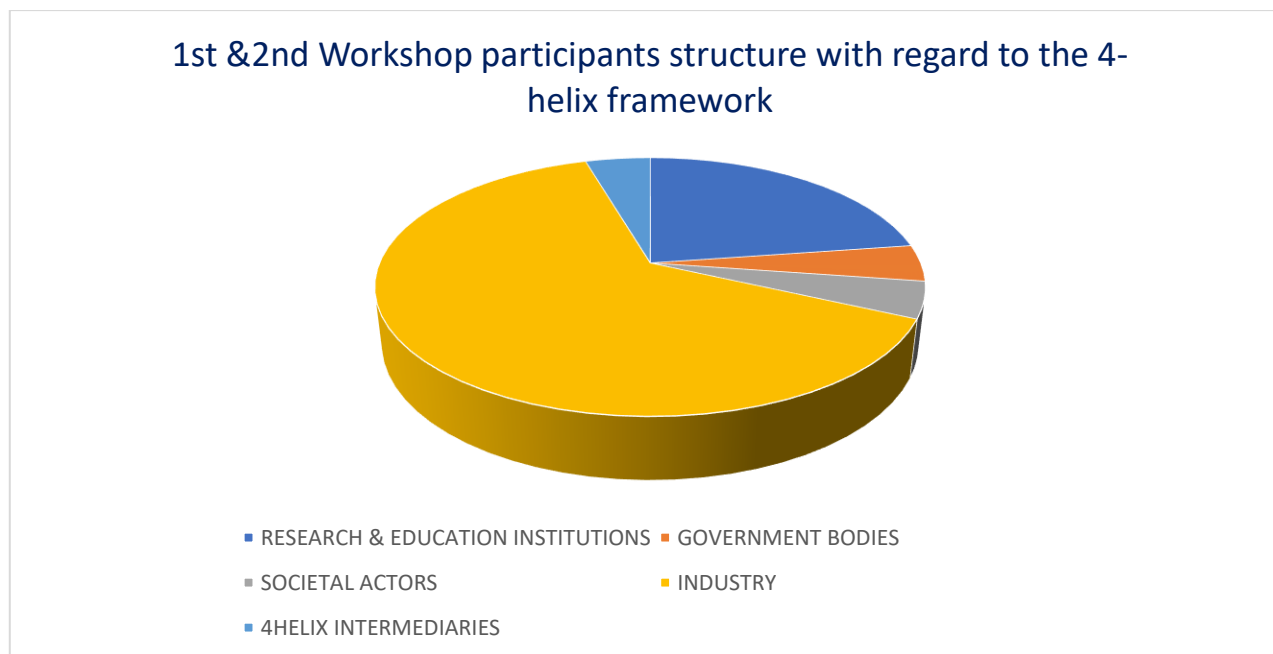


Figure 6: 1st & 2nd Workshop participant's structure with regard to the 4-helix framework.

The following figure 7 represents all the participant stakeholders of Adriatic Croatia within the 4-helix framework:

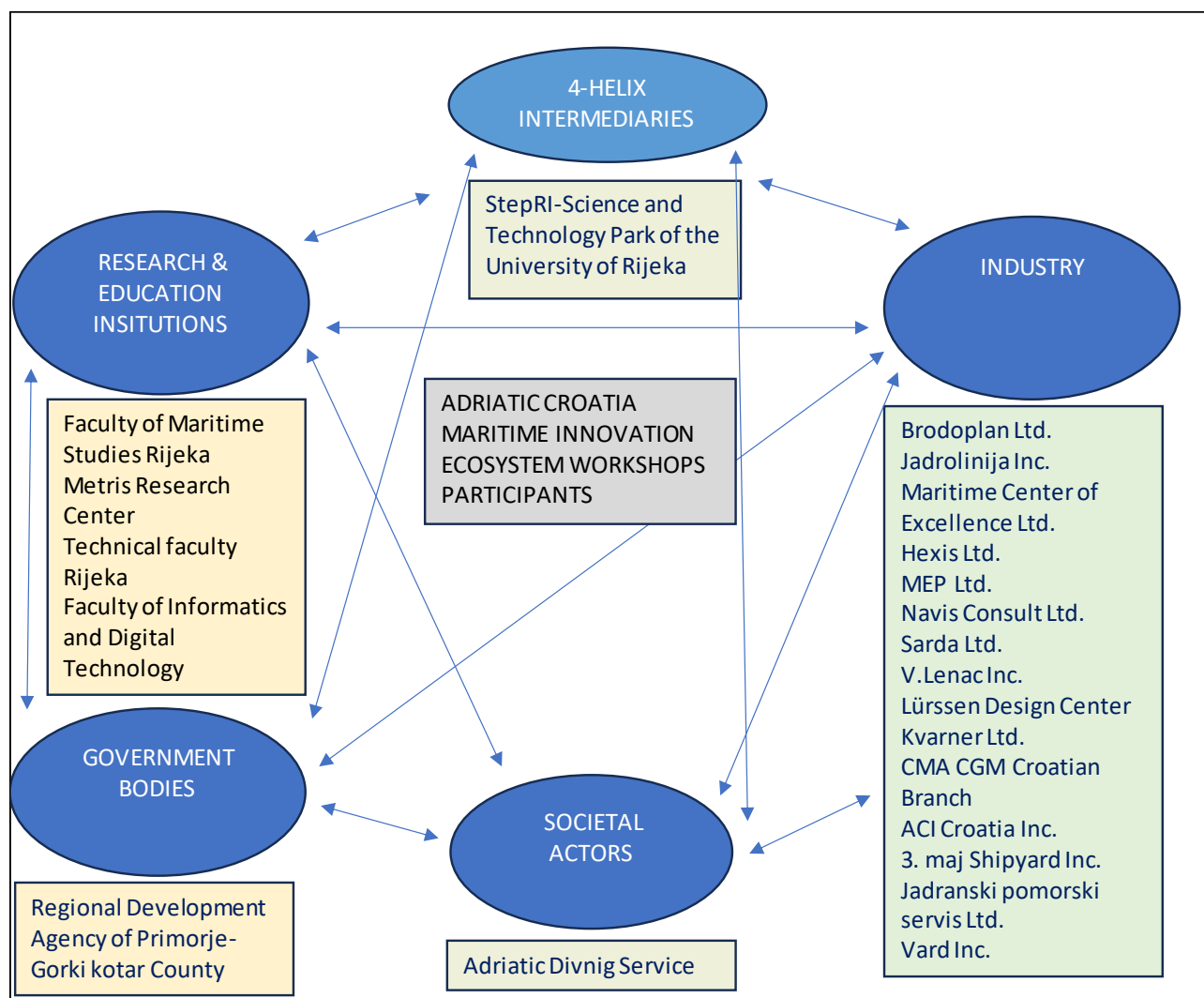


Figure 7: Participants of workshops as per the 4-helix framework.

The workshops were conducted using the aforementioned Methodology, and participants were asked to answer the same questions. It is interesting to notice that the two workshops provided different answers to the same questions (which in a way was the aim) depending on the stakeholders' core business and as a result, the discussion led in different directions.

The moderator encouraged open discussion and did not interrupt the stakeholders letting the conversation flow spontaneously and between the participants themselves. Furthermore, although the questions were posed to everyone the participants were engaged according to their interests and expertise.

At the beginning of the workshops, a short introduction about the INNO2MARE project was given and the moderator explained the purpose and the role of the participants. There were participants that were identified through desk research and that were not familiar with the project itself and they required and were given additional explanations.

3.2 Workshop findings

The coding was carried out following the categories that are in accordance with the focus group question guide. The following chapter represents the synthesis of both workshop participants' answers.

The first question was to identify the current strengths and weaknesses of the maritime innovation ecosystem in Adriatic Croatia.

The table below shows the synthesis of answers received:

Table 2: Current strengths and weaknesses of the maritime innovation ecosystem in Adriatic Croatia.

Strengths	Weaknesses
University support	Lack of resources- personnel (taken over from other areas and technologies such as telecommunications and energy sector)
Acceptable costs (labor cost, resources, etc.)	In recent times no single Strategy for the maritime sector has been drawn up, from which concrete actions would result
Safety (geopolitical environment)	Absence of realization of pilot projects
Croatia as the No. 1 nautical destination in the world	Permanently devastated shipyards
Rijeka, the center of maritime activity, the pool of engineers	Non-involvement of Croatian subsidiaries of foreign groups in innovation and development
Strong naval design companies	Complex and long-term equipment and product certification procedure
Faculty's tradition in engineering education	Legal vagueness, lack of infrastructure, and lack of capacity for switching to low-emission fuels
	Maritime sectors are slow to change and lagging compared to other industries
	Maritime regulation because it is set by World Maritime organizations
	Lack of production of modern ships in Croatian shipyards and lack of local shipowners
	The absence of a centralized hub where information will be exchanged between shipbuilders, shipowners, services, and other stakeholders
	Inadmissibility of the shipyards as an applicant for invitations and tenders due to its size and co-ownership by the state
	Disconnection between innovators and users of innovation

Strengths	Weaknesses
	Mismatch of study programs with the needs of the maritime industry

As can be concluded from Table 2. many answers concentrated on perceived weaknesses of the Croatian maritime innovation ecosystem, and when compared with the SWOT analysis from the mapping phase it is obvious that some of them were already identified, and new ones emerged like the absence of realization of pilot projects or complex and long-term equipment and product certification procedure.

Likewise, the strengths were commonly recognized among participants who agreed upon the fact that there are strong naval design companies with highly qualified engineers especially concentrated in the Rijeka area, support of the Universities and incubators was also recognized, that labor cost is a competitive advantage and Croatia being the no1. nautical destination in the world.

The second question inquired about the most pressing challenges facing the maritime industry in the Croatian ecosystem, and how can they be addressed through R&I.

The participants emphasized the conservatism of the maritime industry as a great challenge, adding that that is also characteristic of the maritime industry in the world, not just Croatia.

The other pressing challenge is the problem of the big ship paradigm in Croatia's history and maritime tradition. There is a lack of awareness that the ship is not the only product that the maritime industry can explore because there are also numerous challenges and products to develop besides the ship itself. The participants stated the necessity to start with small things and achieve small victories and successes instead of dealing with large projects that are too big a challenge (e.g., saving a shipyard). It is important to communicate problems, accept mistakes, and agree to start with small victories.

Furthermore, the negative demographic trend in Croatia and little interest in enrolling students in the naval architecture study program and other engineering programs was also highlighted as a current pressing challenge. The decline in students' interest in naval design and shipbuilding can be explained by the decline of shipyards in Croatia which creates a negative image in the public.

Moreover, the lack of personnel, specifically seafarers, and lack of women on ships was also identified as well as cyber security, ballast water issues, and the global challenge regarding the change of ship fuel due to complex accompanying activities that require years of research and supply assurance.

It is important to notice that there were answers that targeted the ecosystem as a whole but there were also answers that pointed out challenges that were specifically related to stakeholder categories i.e., ballast waters issues that are affecting shipowners, companies in the infrastructure category (marinas), or shipyards.

The third question interrogates about most promising areas of innovation in the maritime sector in Croatian ecosystems and what needs to be done to support their development.

None of the participants did exactly specify the most promising areas of innovation but instead concentrated on how to support their development. Turns out that education is perceived as an important factor that holds an important place in the maritime innovation ecosystem.

When responding to this question the participants stated that it is important to start with the things that can be improved and that it does not have to be necessarily a ship. Therefore, they predominantly highlighted innovation in the field of maritime and engineering education through the use of virtual reality in education. The necessity to teach students the basics of software that is used in naval design companies and shipyards was also emphasized as well as the need to create alternative education

programs that will be shorter and specially designed to provide specific knowledge that is required by the companies in the maritime ecosystem.

Thus, a closer connection between universities and the private sector is needed to support the development of innovation. Also, the need to concentrate on more agile things, that do not require huge resources was underlined.

The fourth question deals with key inhibitors to innovation.

The participants identified that key inhibitors to innovation are due mostly to issues regarding obtaining capital funding, closed mindset, and inaccessibility of foreign subsidiaries in Croatia to innovation that takes place in their owners' headquarters.

More specifically, the participants identified key inhibitors to innovation as:

- lack of capital funding
- directing financial support mostly to universities and public institutions, instead of entrepreneurs
- mistrust of the state when allocating funds to lesser-known entrepreneurs due to previous bad experiences of fraud
- the complex system of obtaining subsidies and grants.
- lack of pragmatic funding sources for the maritime industry (funding sources that are fast and easily obtained)
- the non-involvement of state and public institutions whose task is to be the initiator and should take the action required to facilitate innovation development.
- mindset, closedness of companies, instead of sharing knowledge, resources, and experience
- reluctance of key people in the maritime industry to accept novelties and innovative solutions
- overload of the companies with regular business activities, which makes it difficult to cooperate and implement projects with partners from universities.
- "Service mindset" which signifies the belief there is no need for market research and development
- the distance from the centre of corporations makes it difficult for subsidiaries to be involved in innovation
- non-involvement of salespeople and business developers in the zero phase of product development

During the discussion, a more detailed explanation of the functioning of corporate ways of financing innovation was given. The necessity to invest in innovation is crucial because what happened in other sectors and will reach the maritime sector, is the decline of those companies which did not invest. Strong and financially independent companies accepted mistakes and agreed to higher investment rates in development. In addition, a mindset of enabling development is needed, as well as research permissions within corporations.

The problem with the "service" mindset is the belief that there is no need for market research and development, and this is identified as one of the new resources that will be needed.

The fifth question refers to collaboration and how it can be improved between different actors in the Croatian maritime ecosystem to better leverage R&I opportunities.

All participants share the opinion that collaboration is fragmented and needs to be improved and that the current state of communication between different stakeholders in the Croatian maritime ecosystem is not satisfactory.

These are the suggestions they proposed to improve collaboration:

- by the arrival of foreign companies that employ domestic personnel and emphasize the development and excellence of the maritime sector (like Lürssen group Rijeka)
- by forming consortia and clusters, which are a prerequisite for application to Industrial Transition of Adriatic Croatia funds which carry the largest amounts of allocation for research and development
- by clearly defining the tasks and duties of stakeholders
- by fostering an environment of mutual trust and sincere intentions in partner projects
- by an agreement at the regional level on what to be the best at, what to focus on as a region
- by the creation of a hub/ platform with a register of ongoing innovation projects
- by organizing forums with the purpose of presenting industrial achievements and the needs of businesses to universities and other stakeholders
- by organizing conferences and creating platforms for sharing information and exchanging ideas

The need for better communication within the Croatian maritime innovation ecosystem is perceived as a necessity and a priority among all participants and they all agreed that constant and regular communication between them should be encouraged.

The sixth question is about what specific digital, circular economy and Industry 4.0 priorities should be pursued to support maritime R&I in these ecosystems.

This question has been characterized by some of the participants as a "difficult one". They identified the priorities as cyber security, modern infrastructure (which should be financed by the state), and the creation and adoption of a Value Chain Strategy for the maritime sector of Adriatic Croatia which is of crucial importance. In order to support Industry 4.0 priorities specialization is needed, and not blind following of trendy „ buzzwords “.

The digitalization of domestic shipyards is also perceived as a way of supporting the transition to Industry 4.0. The domain knowledge of domestic shipyards can be very valuable if combined with digital knowledge and there must be a synergy between people who carry out shipbuilding processes and digitization processes. Since the major shipyards in Croatia are (partially) state-owned their future depends on Government decisions that further complicate their current situation.

The seventh question deals with policy and regulatory frameworks that impact the performance and competitiveness of maritime ecosystems.

The participants in the first Workshop showed no interest in answering this question. However, the participants in the second Workshop gave a much more detailed view of the problems that emerge as a result of regulatory frameworks. It turns out that stakeholders in the infrastructure category and the shipyards suffer negative consequences due to the vagueness of local regulations.

As main regulatory issues, they stated the following:

- the gap or the mismatch between land and sea regulations that include local spatial plans that often block development which is linked to the growing demand of the tourist sector
- environmental associations that are against the development of shipyards perceiving them as sources of sea pollution
- inconsistency of the law interpretation and implementation with the administrative division of the coastal area (Different counties in Adriatic Croatia apply different interpretations and requirements considering the same laws)
- the problem of a comprehensive overview of activities in the maritime ecosystem in a way that shipbuilding is considered an industry and falls under the governance of the Ministry of Economy and Sustainable Development, ports are under the governance of the Ministry of the Sea, Transport, and Infrastructure.
- the official classification in the Croatian Bureau of Statistics makes it difficult to search, register, and represent companies in the maritime sector due to companies being placed in many various categories.

It was agreed between participants that public authorities should be more involved and work together to adjust the regulations to facilitate business activities in the maritime ecosystem. Furthermore, regarding naval design offices in the Rijeka area, the participants stated that they have never received any help from local authorities.

3.3 Summary of workshop findings

To summarize, it is important to emphasize that the participants in the focus groups view the situation in the Croatian maritime innovation ecosystem primarily from their perspective and in that way show expert knowledge within their domain. However, thinking in larger terms of the Croatian maritime innovation ecosystem as a whole in some regard turns out to be a challenging task.

On the other side, the participants expressed their satisfaction with the workshops and the opportunity to participate in the exchange of views and ideas with different stakeholders from the maritime sector. Also, they strongly emphasized the need to organize similar workshops on a regular basis to improve communication within the ecosystem.

The keywords, phrases, or ideas that were repeated throughout the workshops are synthesized and from them, the Croatian maritime innovation ecosystem's needs are identified.

Therefore, as can be concluded from the stakeholder feedback the needs of the Croatian maritime ecosystem can be identified and categorized as follows:

Communication: There is an urgent need to establish systemic and continuous communication between all stakeholders present in the Croatian maritime ecosystem, especially between companies, academia and research institutions, and the public sector.

Education and Workforce Development: Modernizing the education system to be in line with the requirements of companies in the maritime sector, and also to increase the number of students enrolled. Developing a skilled workforce in maritime-related fields is essential.

Investment and Financing: Providing accessibility to funds, attracting domestic and foreign investments to support maritime projects, infrastructure development, and research initiatives that can drive economic growth and innovation within the Croatian maritime ecosystem.

Mindset: Changing the mindset to be more open, risk-embracing, and market-oriented in a way that creates an environment that encourages innovation within the Croatian maritime ecosystem.

Specialization: There is a need to reach an agreement and establish priority areas of specialization and find niches in which the stakeholders of the Croatian maritime ecosystem have the greatest potential to develop competitiveness on a global scale.

Regulatory Framework: Establishing clear and effective maritime regulations and policies on a local level is essential for fostering a conducive business environment within the maritime sector.

Technological Innovation: Embracing and investing in advanced technologies and digitalization that enhance operational efficiency and reduce the environmental impact of maritime activities.

Research and Development: Encouraging research and development in maritime sciences and the cooperation between universities, incubators, and companies to overcome the phase of the pilot project and to be able to monetize the product on the market while promoting innovation within the maritime sector.

Infrastructure: Investment in telecommunication infrastructure and in modern and efficient port and marina facilities in order to support the development of the Croatian maritime ecosystem.

Value-chains: Establishing value chains and reaching a consensus on the values and priorities of the digital, circular economy, and Industry 4.0.

Subsidiaries and branch offices: Involving the Croatian companies that are part of large foreign companies and groups in the innovation process by transferring the innovation process or its parts in Croatia and thus strengthening the innovation performance of the Croatian maritime innovation ecosystem. (It is important to note that it is a decision within the owner's company and their business policy and therefore may not be influenced or changed by the demand or needs of the Croatian maritime ecosystem, i.e., local Branch office and similar).

4 SLOVENIAN WORKSHOPS OVERVIEW

Two workshops took place on August 21st and August 30th in the Ivan Hribar Hall at the University of Ljubljana, and both lasted throughout the whole day. A total of 26 participants took part in the two workshops, eleven participants in the first workshop and fifteen in the second workshop. Everyone was present live, despite the fact that we also enabled remote participation just in case, if someone could not participate, due to any understandable reasons, business trips, meetings, but would nevertheless be ready to participate.

Workshops were organized by BSC in order to bring together different types of stakeholders from the Slovenian maritime innovation ecosystem. These stakeholders were grouped into categories based on their core activity, such as Logistics, Production, Shipping, Software development, Service, Infrastructure,

Startups, Incubators and VC, Research and Academia, Other, Private organizations and public entities. Not all groups were represented, as some of those invited unfortunately did not respond to the invitation.

These categories were derived from task 2.1 Mapping the ecosystem, which was shown in the Innovation Canvas of the ecosystem. The workshops are aimed at connecting and discovering the most innovative ideas that would meet the goals and development of the Slovenian maritime innovation ecosystem as well as reach its full potential.

4.1 Participants

According to the responses to the invitations and according to the representatives of individual categories, the groups were formed as best as possible, which would bring the most effective results. Of course, it would be optimal for at least one representative from all categories to attend the workshops, but unfortunately, it was not possible to achieve this due to a lack of responsiveness.

Nevertheless, the following categories were represented:

- Logistics
- Shipping
- Private Organizations
- Industry Representatives
- Software Development
- Startups
- Incubators and VC
- Public Entities
- Research and Academia

In the first Workshop, all eleven participants were actively engaged in discussion. The participants who took part in the first Workshop were:

- Representative from Faculty of Mechanical Engineering, University of Ljubljana (project partner, category Research & Academia)
- Representative from ISKRA, electro and system solutions, d.o.o. (project partner, category software development)
- Representative from DIGITEH, optimization of production processes, d.o.o. (project partner, category software development)
- Representative from ZOTKS, Association for Technical Culture of Slovenia (project partner, category software development)
- Representative from the company SEAVISION d.o.o. (category start-ups)
- 2 Representatives from Faculty of Maritime studies and Transport, Slovenia (category Research & Academia)

- Representative from cohesion implementation office, Ministry of Cohesion and Regional Development, Slovenia (category public entities)
- Representative from Slovenian Maritime Administration, Ministry of Infrastructure (category public entities)
- Representative from Port of Koper (category industry representatives)
- Member of incubator centre Kovačnica, Kranj (category incubator and VC)

In the second Workshop, there were 15 participants all actively engaged in conversation. The participants that took part in the second Workshop were:

- Representative from Kuehne+Nagel, Slovenia (category logistics)
- Representative from Maritime Chamber of Commerce, Slovenia (category private organizations)
- Representative from Slovenian Diving Association (category private organizations)
- Representative from Port of Koper (category industry representatives)
- Representative from Podrkižnik d.o.o. (category software development)
- Representative from Sentinel Labs, development of electronics and software, d.o.o. (category software development)
- Representative from Technology Park Ljubljana (category private organizations)
- Representative from the Faculty of Maritime studies and Transport, Slovenia (category Research & Academia)
- Representative from the Ministry of Natural Resources and Space, Slovenia (category public entities)
- Representative from the Ministry of Foreign and European Affairs, Slovenia (category public entities)
- Representative from BSC regional development center, Kranj (category partner, public entities)
- Representative from Geodetic Institute of Slovenia (category public entities)
- Representative from EUROSEA d.o.o. (category shipping)
- Representative from the Faculty of Natural Sciences and Engineering, University of Ljubljana, Slovenia (category Research & Academia)
- Representative from INTERLOGIS d.o.o. (category logistics)

Both workshops were moderated by Jelena Vidović (from BSC).

The following figure 8 shows the structure of both Workshops' participants by categories that were used during the mapping phase. Combining two workshops together shows that overall, there were 6 representatives of public entities – 23%, followed by 5 representatives of the Academia category - 19% and 5 participants from the Software developers' category - 19%, then 3 participants from private organizations – 11%, then 2 participants from incubators and VC and industry representatives – 8% and 1 participants from the start-ups, incubators and VC, shipping – each 4%.

In total, the participants belonging to the Public Entities category were the most represented as they play a regulatory role in industries, including the maritime sector, and are providing funding and support for innovation.

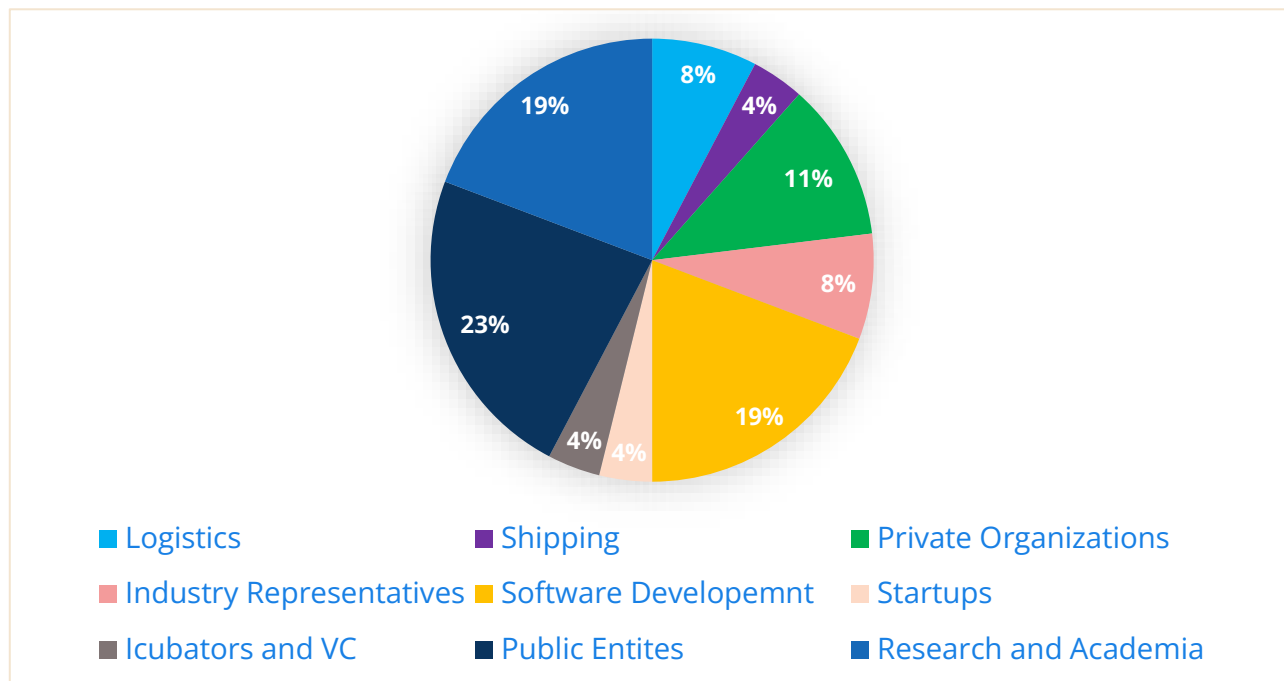


Figure 8: 1st & 2nd Workshop participants by category.

The structure of two workshops combined with regard to the four-helix framework is presented in Figure 9:

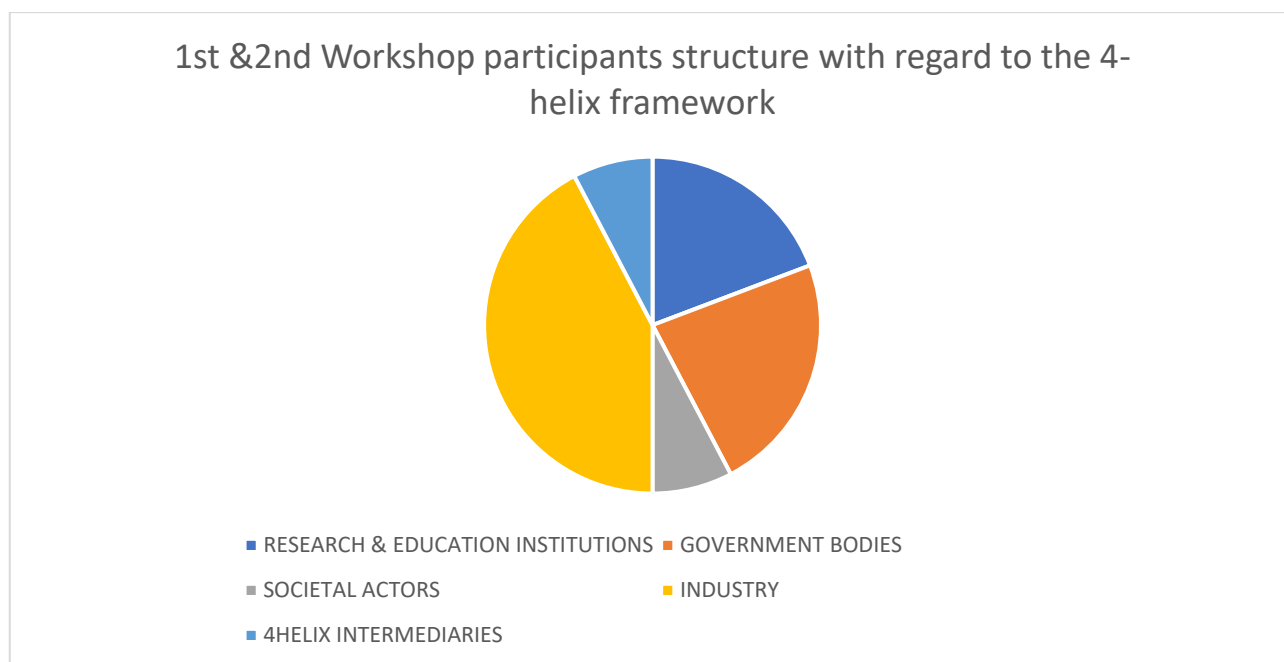


Figure 9: 1st&2nd Workshop participants structure with regard to the 4-helix framework.

Combining the two workshops according to the four-helix framework shows that all 4-helix stakeholders were represented, with Industry participants being the most represented, followed by Government bodies, Research&Educational Institutions, Societal Actors, and 4-helix Intermediaries.

The following figure represents participants of Western Slovenia's maritime innovation ecosystem per four-helix framework:

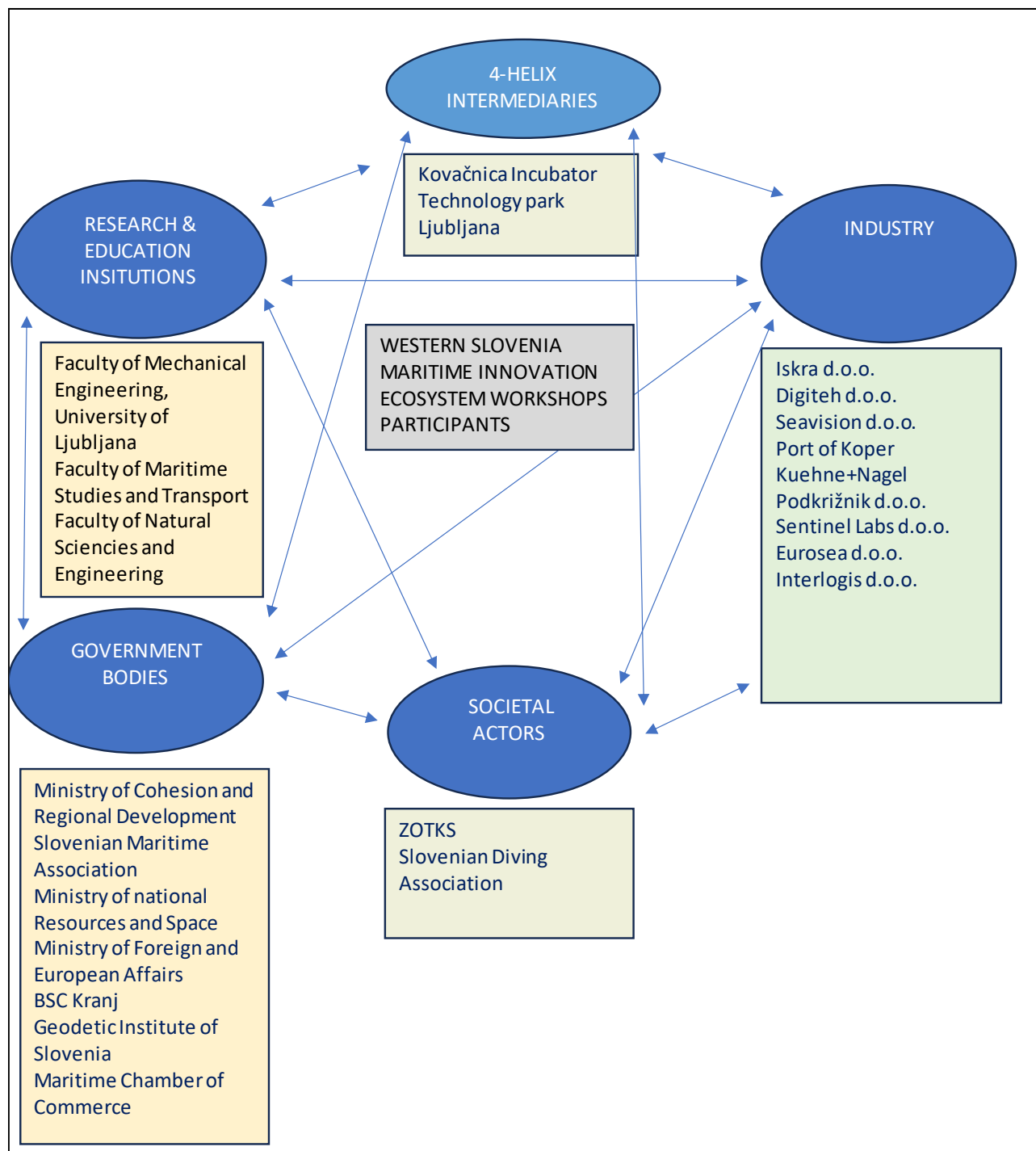


Figure 10: Participants in workshops as per the 4-helix framework.

The workshops commenced with a brief overview of the INNO2MARE project, provided by the moderator. The role and expectations of the participants were also clarified. Among the attendees were individuals who had been identified through preliminary desk research and were not previously acquainted with the project. These participants were given further explanations to ensure their understanding and engagement.

4.2 Workshop findings

The coding was carried out following the categories that are in accordance with the focus group question guide. The following chapter represents the synthesis of both workshop participants' answers.

The first question was to identify the current strengths and weaknesses of the maritime innovation ecosystem in Western Slovenia.

The table below shows the synthesis of answers received.

Table 3: Current strengths and weaknesses of the maritime innovation ecosystem in Western Slovenia.

Strengths	Weaknesses
University support	Maritime sectors slow to change, lagging compared to other industries, because of its size
Collaboration – the ecosystem benefits from a consortium of partners working together to strengthen innovation in underwater robotics and sensors	Environmental Challenges: The Adriatic Sea faces threats such as pollution and over-fishing.
Education and Innovation: The Innova Mare project includes business education courses and the building of underwater robotic and sensor prototypes.	Need for Better Monitoring: There is a need for better environmental protection and monitoring.
Luka Koper – the center of maritime activity, with great connections	Lack of resources – especially personnel
Strategic location	Not much interest in maritime studies
Great study programs connected to maritime	Disconnection with other sectors

The maritime innovation ecosystem in Western Slovenia has several strengths, including university support, collaboration among partners, educational initiatives, the central role of Luka Koper, and strategic location. However, it also faces challenges such as a slow pace of change in the maritime sector, environmental threats to the Adriatic Sea, a need for better environmental monitoring, a lack of resources particularly personnel, low interest in maritime studies, and disconnection with other sectors.

The second question inquired about the most pressing challenges facing the maritime industry in the Slovenian ecosystem, and how can they be addressed through R&I.

The participants emphasized the Slovenian ecosystem is currently facing a number of pressing challenges. One of the most significant of these is cybersecurity. As the maritime sector becomes

increasingly digitalized, the risk of cyber threats has grown. In particular, the vulnerabilities of satellite navigation systems, such as the Global Positioning System (GPS), have become a major concern.

Another major challenge the participants pointed out is environmental. The Adriatic Sea, a key part of Slovenia's maritime ecosystem, is under threat from pollution and overfishing. These environmental challenges pose a significant risk to the health and sustainability of the maritime ecosystem.

In addition to these challenges, the participants alerted that there is also a need for better environmental protection and monitoring. Current monitoring systems are not sufficient to fully protect the environment and ensure the sustainability of the maritime industry.

R&I can play a crucial role in addressing these challenges. In terms of cybersecurity, R&I can lead to the development of more secure systems and protocols to protect against cyber threats. This includes improving the cybersecurity of products and implementing multiple positioning, navigation, and timing (PNT) systems onboard maritime vessels to complement GPS-only navigation.

In terms of environmental challenges, R&I can contribute to the development of more sustainable practices in the maritime industry. This includes exploring cleaner fuels, electrification of ships, renewable energies, and fuel cells.

Finally, in terms of environmental monitoring, R&I can lead to the development of better monitoring systems for environmental protection. This includes leveraging technologies like sensors loaded onto data buoys for remote monitoring of offshore locations.

In conclusion, the participants have pointed out that the Slovenian maritime ecosystem faces several pressing challenges, however, there are also numerous opportunities for innovation and improvement. Through targeted R&I efforts, it is possible to address these challenges and ensure the sustainability and success of Slovenia's maritime industry.

The third question interrogates about most promising areas of innovation in the maritime sector in Slovenian ecosystems and what needs to be done to support their development.

None of the participants did exactly specify the most promising areas of innovation but instead concentrated on how to support the project aims and the most promising areas for the Slovenian ecosystem. Regarding this matter, the participants again emphasized the importance of cybersecurity emerging as a key area of innovation. As the maritime sector becomes increasingly digitalized, there is a growing need for innovative solutions to protect satellite navigation systems and other digital infrastructure.

But in line with supporting these innovative areas, several actions need to be taken. Participants first point out that adequate funding and resources must be provided for research and development. This could come from government grants, private investment, or partnerships with research institutions.

Second, collaboration between various stakeholders should be encouraged. This includes universities, research institutions, government agencies, and industry partners. By working together, these entities can pool their resources and expertise to drive innovation.

Third, education and training programs need to be developed to equip the workforce with the necessary skills. These programs should focus on areas such as digital technology, green practices, and cybersecurity.

Fourth, supportive policies and regulations need to be developed to facilitate innovation. These policies should provide a conducive environment for research, development, and commercialization of innovative solutions.

Finally, investment in infrastructure is crucial. This includes physical infrastructure like research facilities and digital infrastructure like high-speed internet and data centers.

In conclusion, while there are several promising areas of innovation in the Slovenian maritime sector, a concerted effort is needed to support their development. Through funding, collaboration, education, policy development, and infrastructure investment, Slovenia can harness its potential and become a leader in maritime innovation.

The fourth question deals with key inhibitors to innovation.

The participants identified that key inhibitors to innovation are due mostly to issues regarding obtaining capital funding, closed mindset, and inaccessibility of foreign subsidiaries in Slovenia to innovation that takes place in their owners' headquarters.

More specifically, the participants identified key inhibitors to innovation as:

- lack of resources
- directing financial support mostly to universities and public institutions, instead of entrepreneurs
- mistrust of the state when allocating funds to lesser-known entrepreneurs due to previous bad experiences of fraud
- lack of pragmatic funding sources for the maritime industry funding sources that are fast and easily obtained)
- slow pace of change due to lack of resources, particularly personnel and funding to support innovation efforts
- mindset, closedness of companies, instead of sharing knowledge, resources, and experience
- regulatory challenges that may not keep pace with technological advancements, creating uncertainty for innovators.
- overload of the companies with regular business activities, which makes it difficult to cooperate and implement projects with partners from universities
- need for better monitoring
- cybersecurity threats
- non-involvement of salespeople and business developers in the zero phase of product development

The fifth question refers to collaboration and how it can be improved between different actors in the Slovenian maritime ecosystem to better leverage R&I opportunities.

All participants share the opinion that collaboration is the key ingredient most innovative and efficient Slovenian maritime ecosystem. Currently, participants think collaboration and communication have a lot of space for improvement and therefore should enhance collaboration between various stakeholders.

These are the suggestions they proposed to improve collaboration:

- organizing any type of collaborative invention events regularly
- forming working groups focusing on specific topics and regularly reporting duties
- improve the creation and management of collaborative networks between the maritime sectors
- better digital collaboration between public and private entities
- developing new data-sharing platforms
- building partnerships with startups – build collaboration between industry leaders and startups that can bring fresh ideas and perspectives
- create a structure for investing in infrastructure
- support more research, development, and commercialization

By taking these actions, the Slovenian maritime ecosystem can enhance collaboration among various stakeholders and better leverage R&I opportunities.

The sixth question is about what specific digital, circular economy and Industry 4.0 priorities should be pursued to support maritime R&I in these ecosystems.

Participants agree that in order to bolster maritime Research and Innovation (R&I) within the Slovenian ecosystems, it is crucial to focus on several key priorities within the realms of digitalization, the circular economy, and Industry 4.0. It was pointed out that in order to bolster maritime Research and Innovation (R&I) within the Slovenian ecosystems, it is crucial to focus on several key priorities within the realms of digitalization, the circular economy, and Industry 4.0.

Digitalization serves as a cornerstone for enhancing the competitiveness and resilience of the maritime sector. This involves fostering digital collaboration across private and public entities within the maritime supply chain, which can lead to significant efficiency gains, safer and more resilient supply chains, and lower emissions. The adoption of digital technologies such as big data, the Internet of Things (IoT), fifth-generation technology (5G), blockchain solutions, wearable devices, unmanned aircraft systems, and other smart technology-based methods can significantly improve performance and economic competitiveness.

The circular economy approach is another vital aspect that can minimize environmental harm while boosting profits and competitiveness. This involves creating a system where waste is minimized, and resources are used in a way that they can be reused or recycled.

Industry 4.0 technologies also hold immense potential for the maritime sector. The use of digital twins, which are digital 3D models of assets that can improve maintenance and efficiency, is one such example. Additionally, robust cybersecurity measures are crucial to protect digital assets.

To support these priorities, it's essential to foster an environment conducive to innovation. This includes ensuring adequate funding, facilitating collaborative opportunities, providing regulatory support, and offering education and training programs.

The seventh question deals with policy and regulatory frameworks that impact the performance and competitiveness of maritime ecosystems.

There was more response from public entities, who said how they are trying to improve the policy and regulatory framework.

The other categories, mainly from the private sector have expressed an idea of collaborating and contributing to the creation of such policies and frameworks, as to be the most efficient and up-to-date. The private sector can provide more up-to-date information from practice, which can essentially create a relevant policy and framework.

Both sides of participants – public and private entities have essentially encouraged further participation and involvement in creating any privacies. All that is connected to collaboration and communication that still needs to be more strongly and firmly established.

To summarize, not all questions stimulated equal discussions, but they definitely stimulated thoughts and future ideas that may still arise.

In principle, all categories are quite balanced regarding the goals and purposes of this project. Their perspectives are quite consistent and share many common interests. However, the divide between the ideas, innovation, and improvement in public entities compared to private entities is still a bit behind. The right collaboration products and shared overviews could lead to optimal results as the Slovenian ecosystem is still seen as very unique with a lot of potential for any form of innovation.

4.3 Summary of workshop findings

In an overview conclusion from the stakeholder feedback from the workshops, the following categories and needs of the Slovenian maritime ecosystem can be identified as follows:

Communication: There is an urgent need to establish systemic and continuous communication between all stakeholders present in the Slovenian maritime ecosystem, especially between start-ups and public entities.

Education: More encouragement to students to enrol in studies in this field.

Resources: Directing financial support mostly to universities and public institutions, instead of entrepreneurs

Mindset: Changing the mindset to be more open, risk-embracing, and market-oriented, overall, more engagement to start-ups thinking. Building partnerships with startups – build collaboration between industry leaders and startups that can bring fresh ideas and perspectives

Regulatory Framework: Establishing clear and effective maritime regulations and policies on a local level is essential for fostering a conducive business environment within the maritime sector. All to become a result of collaboration of all stakeholders from all the categories.

Digital Collaboration: Better digital collaboration between private and public entities across the maritime supply chain will result in significant efficiency gains, safer and more resilient supply chains, and lower emissions.

Research and Development: Encouraging research and development in maritime sciences and the cooperation between universities, incubators, and companies to overcome the phase of the pilot project and to be able to monetize the product on the market while promoting innovation within the maritime sector.

Better monitoring: Developing new data-sharing platforms, preventing cyber threats, and creating a structure of investing in infrastructure.

5 ECOSYSTEMS' NEEDS AND GAPS

In order to assess and evaluate the ecosystems' needs and gaps as well as insight of possible actions and solutions two tables that synthesize and summarise workshops' findings were prepared.

The Croatian maritime innovation ecosystem needs and gaps are synthesized and presented in the following table:

Table 4: Results of the Gap Analysis of the Adriatic Croatian Maritime Innovation Ecosystem.

CURRENT STATE	IDENTIFIED GAP	POSSIBLE ACTIONS	DESIRED FUTURE STATE
Communication between stakeholders is not-satisfactory being sporadic, scattered, and practically non-existent	No systemic approach to communication	<ul style="list-style-type: none"> • Creation of a centralized hub/ platform where information can be exchanged between all stakeholders • Establishing a project registry of all ongoing innovation projects • Organizing conferences and workshops on a regular basis • Organizing forums with the purpose of presenting industrial achievements and the needs of businesses to universities and other stakeholders 	Stakeholders share a continuous open communication
<ul style="list-style-type: none"> • Large number of universities with a long tradition present in Adriatic Croatia that offer high-quality programs of maritime studies and engineering • The programs are in some aspects outdated and need to be modernized • Decreasing interest among students in enrolling in maritime studies, especially naval engineering 	<ul style="list-style-type: none"> • Mismatch of study programs with needs of the modern maritime industry • Demand for a high-quality workforce, especially engineers are higher than the supply 	<ul style="list-style-type: none"> • Creation of new study programs aligned with the needs of the maritime industry • Use of new technologies within the educational process like VR etc. • Introducing software that is used in companies to students within the study programs • Creation of alternative courses that match the specific needs of companies within the maritime industry • Promotional campaigns that promote the benefits 	<ul style="list-style-type: none"> • Study programs are compatible with the needs of the modern maritime industry • Universities produce sufficient graduates that satisfy the needs of the Croatian maritime industry • The new graduates adapt quickly to companies' requirements and easily enter the workforce

CURRENT STATE	IDENTIFIED GAP	POSSIBLE ACTIONS	DESIRED FUTURE STATE
		of engineering and maritime studies	
<ul style="list-style-type: none"> Funds for financing innovation are not sufficient, companies rely mostly on their own resources Procedures to obtain grants are complicated and take a long time Most of the funds are directed at universities, not companies Dependence on EU funding is present Large shipyards are excluded from obtaining financing due to their size 	<ul style="list-style-type: none"> The companies struggle to find financing to invest in innovation Shipyards can't obtain the financing needed for their modernization 	<ul style="list-style-type: none"> Opening more funds and programs that finance innovation in the maritime sector Encouraging and forming consortia and clusters between stakeholders within the Croatian maritime innovation ecosystem so that they can apply funds from the Plan of Industrial Transition of Adriatic Croatia 	<ul style="list-style-type: none"> The process of obtaining financing for innovation is quick and easy Companies as well as universities, research institutions, and shipyards have equal access to financing
<ul style="list-style-type: none"> Mindset of the maritime industry is closed and conservative when compared with other industries Closedness of companies, instead of sharing knowledge, resources, and experience The reluctance of the key people in the maritime industry in accepting innovations <p>The problem of the "big ship paradigm" existing in our history and maritime tradition</p>	<ul style="list-style-type: none"> The maritime sector is slow to change and adapt to new technologies Closedness of stakeholders within the ecosystem causes a disconnection between innovators with the users of the innovation "Service mindset" which signifies the belief there is no need for market research and development The pilot projects remain in the pilot phase; the focus is mainly on big ship production 	<ul style="list-style-type: none"> Change the mindset to be more open and risk-embracing by emphasizing the need and benefits of innovation Acceptance of mistakes as a normal part of research and innovation Changing the "Service mindset" to a mindset of production which includes market research and development Education of the key people in the maritime industry to accept innovative solutions 	<ul style="list-style-type: none"> The open mindset of the maritime ecosystem that embraces change and encourages the environment in which innovations are quickly accepted Innovations are more easily introduced to the market and monetized
<ul style="list-style-type: none"> Croatian maritime industry is, except international regulators (IMO), also regulated by Croatian laws which include both maritime and land regulation The governance of various sectors within the 	<ul style="list-style-type: none"> There are problems with respecting maritime and land regulations because in many cases they contradict each other The authorities in different counties of Adriatic Croatia interpret the same laws in a 	<ul style="list-style-type: none"> Action is needed from the Government to adjust the maritime and land regulations in the greatest way possible to be coherent with one another Providing a clear and concise interpretation by 	<ul style="list-style-type: none"> The Croatian maritime industry is completely in line with all regulatory requirements Local regulations are clear, and stakeholders can easily respect them The process of

CURRENT STATE	IDENTIFIED GAP	POSSIBLE ACTIONS	DESIRED FUTURE STATE
<p>maritime ecosystem (i.e., ports shipyards, etc) falls under different Ministries</p> <p>The complex and long-term procedure of certification of equipment and products</p>	<p>different manner</p> <ul style="list-style-type: none"> • The companies must contact different Ministries in order to conduct business which is very demanding and time-consuming • The companies are exhausted by requirements and give up on innovations due to the complexity and duration of the process of certification 	<p>the Ministries of the laws that have to be used in all Counties of Adriatic Croatia in the same way</p> <ul style="list-style-type: none"> • Companies from the same sectors within the maritime industry should jointly approach Ministries by demanding open communication • Changing the laws and requirements to be faster and easier to implement to encourage innovative business activities 	<p>certification is quick and easy for companies</p> <ul style="list-style-type: none"> • The Croatian maritime industry is sustainable and respects the environment (IMO requires decarbonization of the industry by 2050)
<ul style="list-style-type: none"> • A long tradition of shipbuilding • Shipyards are partially state-owned, and their future depends on Government's decisions • Regional naval design hub concentrated in Rijeka • Presence of subsidiaries and branches of foreign companies and groups • Non-existence of value chains in the maritime sector • Non-existence of specialization strategy 	<ul style="list-style-type: none"> • Shipyards are mostly devastated and need state support • Shipyards need modernization and transition from Industry 2.0 to Industry 4.0 • Non-involvement of Croatian companies owned by foreign groups in innovation and development • The lack of action plans due to the absence of a strategy for the maritime sector • Trying to follow all trends and "buzzwords" within the maritime industry without concentrating strategically on any goal 	<ul style="list-style-type: none"> • The synergy between engineers who carry out processes in Croatian shipyards and have domain knowledge with IT experts to digitalize and improve processes • Persist with bringing the innovation from the owner company headquarters to Croatia, work together with teams from headquarters and teams situated in Croatia • Creation and establishment of value chains and reaching a consensus on the values and priorities of the digital, circular economy and Industry 4.0 • Focus on new niches in shipbuilding, yachts, and special vessels • Start with "small wins" that multiply over time, do not get lost in problems that are "too big of a challenge" 	<p>The maritime sector of Adriatic Croatia is a highly specialized export-oriented sector that produces innovative products and represents a force in the Croatian economy and is recognized on international markets</p>

It can be concluded from Table 3, that some of the potential solutions for the gaps in the Croatian maritime innovation ecosystem which are presented in the column Possible Actions have a significant impact on the ecosystem heavily depend on governmental decisions and strategies, and can take time to establish and implement.

The Slovenian maritime innovation ecosystem needs and gaps are synthesized and presented in the following table:

Table 5: Results of the Gap Analysis of the Western Slovenian Maritime Innovation Ecosystem.

CURRENT STATE	IDENTIFIED GAP	POSSIBLE ACTIONS	DESIRED FUTURE STATE
Communication between stakeholders is not-satisfactory being sporadic, scattered, and practically non-existent	No systemic approach to communication	Organizing any type of collaborative invention events regularly <ul style="list-style-type: none"> • Better digital collaboration between public and private entities • Organizing conferences and workshops on a regular basis • Developing new data sharing platforms • Forming working groups focusing on specific topics and regularly reporting duties 	Stakeholders share a continuous open communication
Large offer of various programs and studies at various faculties studies, especially naval engineering	Demand for enrolling in maritime studies, especially engineers is decreasing in new generations and is not nearly close to expectations, compared to offered studies	<ul style="list-style-type: none"> • More campaigns and publicity that will encourage young people to study engineering and maritime studies • Use of new technologies within the educational process like VR etc. • Introducing software and future opportunities that are used in companies to students 	<ul style="list-style-type: none"> • Study programs are compatible with the needs of the modern maritime industry • The new graduates adapt quickly to companies' requirements and easily enter the workforce • The study offer is more effective in practice
<ul style="list-style-type: none"> • Lack of resources • Directed financial support mostly to universities and public 	<ul style="list-style-type: none"> • The companies struggle to find financing to invest in innovation • Shipyards can't obtain the financing needed for 	<ul style="list-style-type: none"> • Opening more funds and programs that finance innovation in the maritime sector 	<ul style="list-style-type: none"> • The process of obtaining financing for innovation is quick and easy • Companies as well as universities, research

CURRENT STATE	IDENTIFIED GAP	POSSIBLE ACTIONS	DESIRED FUTURE STATE
<p>institutions, instead of entrepreneurs</p> <ul style="list-style-type: none"> • Dependence on EU funding is present • Lack of pragmatic funding sources for the maritime industry funding sources that are fast and easily obtained • Slow pace of change due to lack of resources, particularly personnel and funding to support innovation efforts 	<p>their modernization</p> <ul style="list-style-type: none"> • There is no clear structure of accessibility and form of financing 	<ul style="list-style-type: none"> • Create a structured and clear picture of financing • Find new resources • More pragmatic funding • Open more funding to private entities and start-ups 	<p>institutions, and shipyards have equal access to financing</p> <ul style="list-style-type: none"> • A new clear structure of financing is made
<ul style="list-style-type: none"> • Mindset of the maritime industry is closed and conservative when compared with other industries • Closedness of companies, instead of sharing knowledge, resources, and experience • The reluctance of the key people in the maritime industry in accepting innovations • Overload of the companies with regular business activities • Mistrust of the state when allocating funds to lesser-known entrepreneurs due to previous bad experiences of fraud 	<ul style="list-style-type: none"> • The maritime sector is slow to change and adapt to new technologies • Closedness of stakeholders within the ecosystem causes a disconnection between innovators with the users of the innovation • "Service mindset" which signifies the belief there is no need for market research and development • The pilot projects remain in the pilot phase; the focus is mainly on big ship production 	<ul style="list-style-type: none"> • Change the mindset to be more open and risk-embracing by emphasizing the need and benefits of innovation • Acceptance of mistakes as a normal part of research and innovation • Changing the "Service mindset" to a mindset of production which includes market research and development • Education of the key people in the maritime industry to accept innovative solutions 	<ul style="list-style-type: none"> • The open mindset of the maritime ecosystem that embraces change and encourages the environment in which innovations are quickly accepted • Innovations are more easily introduced to the market and monetized

It can be concluded from Table 4, that the potential solutions for the gaps in the Slovenian maritime ecosystem that the participants proposed and that are presented in the column Possible Actions some of the solutions that have a significant impact on the ecosystem heavily depend on Governmental decisions and strategies and can take time to establish and implement.

6 PATH TO GAP ANALYSIS - KEY CHALLENGES

Gap analysis followed the methodology presented and validated in the document "Gap Analysis of the Western Slovenian and Adriatic Croatian maritime innovation ecosystem" in which the main tool for conducting the analysis was organizing workshops with stakeholders from the Croatian and Slovenian maritime innovation ecosystem. There were several challenges while organizing and performing workshops present in both ecosystems.

6.1 Croatian ecosystem

Firstly, the organization of workshops turned out to be a great challenge. On the one hand, the timing and the deadlines of the project schedule were not compatible in any way with stakeholders' availability due to the festive/ vacation period in Croatia. Organizing workshops during the summer months is a difficult task in Croatia. Therefore, with great effort and determination, the workshops were organized at the beginning of July which was in a way the last period to gather stakeholders before the summer vacations in August.

Secondly, the underlying issue of the non-responsiveness of stakeholders which was already identified as a challenge during the Mapping phase was also an issue while organizing workshops. Recruiting a wide network of stakeholders and participants across the ecosystem is not an easy task. With great effort and determination, it was managed to gather some of the stakeholders that had already answered the questionnaire that was sent in the Mapping phase. Also, there were other stakeholders that accepted to participate and that did not answer the questionnaire previously. It is important to emphasize that stakeholders /participants within the Croatian maritime innovation ecosystem are very busy people and there were some last-minute cancellations due to their business priorities and/or workload. For those reasons, it was not possible to obtain participants that would represent stakeholders from all categories that are present in the Croatian maritime innovation ecosystem and in that way provide a perfect sample for analysis.

Furthermore, the majority of participants were from the Rijeka area which is very satisfactory due to Rijeka being a naval engineering hub of Croatia, but on the other hand, the participants from other regions of Adriatic Croatia were missing. Some of them agreed to participate but had to cancel because of their unavailability due to urgent business issues. Due to the size of Adriatic Croatia and the weak communication links that exist in the Croatian maritime innovation ecosystem, some were simply out of reach and unresponsive, which is not surprising when compared with the experience in the Mapping phase.

Moreover, it is important to note that the participants who took part in the workshops were inquiring about their role, our expectations regarding their contribution, and the aim of the workshop, and needed familiarizing with the INNO2MARE project and the method of Gap analysis itself. Many of them were concerned about whether the workshops would be in Croatian or English, stating that they would only participate if the workshop was in Croatian, so using a local language turned out to be a good decision.

On the other hand, all participants expressed their satisfaction with the workshops and expressed their wish to participate in similar workshops in the future and in a way expect us from the INNO2MARE project to organize stakeholders' meetings on a continuous basis. Also, the need to communicate between various stakeholders was expressed and highlighted many times which is positive insight for the activities

that will be organized in other WPs and that require stakeholders' participation. The project partners that were present as stakeholders in the ecosystem showed a great level of cooperation and support.

Regarding the Gap analysis content, the input that was received from participants was analysed to the best ability. The participants answered questions from their own point of view and experiences and some of the questions were only partially answered, so the results of the Gap analysis are presented accordingly. The task to analyse and think in terms of the whole ecosystem and not just the company's point of view proved challenging for some stakeholders who are deeply involved in their particular business issues and don't have time or interest to deal with the ecosystem as a whole.

Nevertheless, the Gap analysis of the Croatian maritime innovation ecosystem has been successfully conducted regardless of all mentioned above and thus provided us with valuable findings that can be used for the preparation of Cross -border joint R&I strategy.

6.2 Slovenian ecosystem

Firstly, the preparation of the workshop faced no particular obstacles or problems in securing a venue, as the University, a project partner, kindly offered the use of their premises.

Secondly, the list of participants was created, and cooperation via online applications and video connections was enabled. While the response to the online participation option was positive, all participants chose to attend in person. Live participation was deemed more effective for active engagement and response, although online participation offers greater diversity due to the ease of attending from any location, particularly for private sector individuals who travel frequently.

Thirdly, the challenge of identifying and inviting relevant stakeholders from the Slovenian maritime innovation ecosystem was significant. Despite sending invitations, the response rate was low, impacting the initial workshop plans. It was found beneficial to clearly present the expected contributions and benefits of participation to encourage engagement.

To further involve participants, it was effective to design and develop content for activities and present the main workshop objectives in advance. This included preparing surveys for participants to complete before the workshop and preparing points to encourage brainstorming sessions.

A PowerPoint presentation was sent to participants beforehand, guiding the workshops for the most part. However, discussions often naturally diverged from the planned topics, which was generally beneficial.

Future workshops may benefit from a marketing and PR campaign to attract new participants who were not initially considered. Effective methods included questionnaires, brainstorming sessions, group discussions, and presentations. Participants expressed a desire for more pre-prepared anchor points to facilitate smoother conversations without constant prompting, allowing them to prepare more coherent contributions.

For future workshops, participants suggested working in smaller groups with representatives from different fields to address concrete questions and propose solutions. They also recommended shorter workshops that do not last the entire day. The location and accessibility of workshops were not a problem, likely due to Slovenia's small size and the easy accessibility of Ljubljana. There were no problems or criticisms regarding these logistical aspects.

7 CONCLUSION

This document focuses on the Gap analysis of the Adriatic Croatia and Western Slovenia maritime innovation ecosystems. The participants representing the stakeholders identified existing gaps between the current and desired state of the Adriatic Croatian and Western Slovenian maritime innovation ecosystem and addressed them by providing recommendations for future action.

Furthermore, it is important to emphasize that the two ecosystems share similar gaps regarding the lack of communication, knowledge sharing, education, research&development, funding, and mindset.

Possible actions regarding the communication, networking, and knowledge sharing that can be implemented in both Western Slovenia and Adriatic Croatia maritime innovation ecosystems are focused on establishing a robust platform for knowledge exchange, networking, and collaboration among maritime innovation ecosystem stakeholders which will include startups, established companies, investors, and government agencies and thus enable better digital collaboration between public and private entities. Regarding networking among stakeholders, organizing conferences, meetings, collaborative invention events, and workshops, forming working groups focusing on specific topics and regularly reporting duties are critical steps. These events will facilitate the sharing of best practices, experiences, and lessons learned, accelerating innovation. Both ecosystems should aim to develop new data-sharing platforms to streamline communication and information dissemination.

In terms of bridging the gap regarding education, research, and development it is crucial to modernize study programs to align with the maritime industry's needs in the two ecosystems. Possible actions to tackle these issues include campaigns and publicity to attract more students to engineering and maritime studies, promoting new technologies, and showcasing modern software, preferably from local startups. Emphasizing research and development activities in maritime-related fields, including market research, can lead to advancements in ship design and production that can be monetized. Encouraging collaboration between academia, research institutions, and industry players will drive innovation.

Regarding the perceived gap related to funds and financing, ensuring equal access to funding for all stakeholders and increasing the funds available to the maritime sector is vital. Forming consortia between stakeholders can facilitate easier financing. Both ecosystems of Adriatic Croatia and Western Slovenia need to open more funds and programs that finance maritime innovation, create a structured and clear overview of financing options, and find pragmatic new sources of funding.

A change of mindset is needed in the maritime innovation ecosystems of Western Slovenia and Adriatic Croatia. It is essential to foster a risk-taking mentality and accept mistakes as part of the innovation process. Creating an environment that encourages innovation will help shift the mindset towards one that embraces experimentation and learning from failures.

Regarding policy and regulation, collaboration with regulatory bodies to establish a conducive environment for innovation is crucial. Recommended actions to bridge the existing gap include streamlined approval processes for new technologies and certification, and shaping policies that promote innovation while ensuring compliance with international maritime standards and regulations. Regarding especially Adriatic Croatian maritime innovation ecosystem ensuring clear interpretation and application of local laws and policies is essential. In the Western Slovenia maritime innovation ecosystem, improving the currently more or less non-existent collaboration and communication between policymakers, regulators, companies, and private entities is particularly important.

Value chain and specialization are especially important for the maritime innovation ecosystem of Adriatic Croatia. Positioning Adriatic Croatia as a hub for maritime innovation on the international market can attract foreign partnerships and collaborations. Enhancing the Adriatic Croatia maritime innovation ecosystem's competitive edge through strategic specialization and the establishment of value chains is essential. This involves promoting areas where Adriatic Croatia's maritime innovation ecosystem can excel and developing specialized capabilities that can serve the global maritime market.

Regarding the infrastructure, driving the modernization of ports, shipping facilities, telecommunication infrastructure, and logistics networks using innovative technologies and smart solutions is vital for both ecosystems, especially the Adriatic Croatia maritime innovation ecosystem. Implementing smart port technologies, improving connectivity, and enhancing logistics networks will support the growth and efficiency of the maritime sector.

However, it can be observed that there is a lack of awareness of sustainability as a central horizontal topic for the innovative maritime economy in the Croatian ecosystem when compared with the Slovenian ecosystem and there is an imbalance/gap between the Croatian ecosystem and the Slovenian ecosystem in this regard.

The same principle applies to the related sectors of offshore energy and aquaculture, although this is not a horizontal topic, but rather an expansion of the scope of the Croatian innovation ecosystem beyond traditional sectors. And this is about a perceived gap, both in terms of economic opportunities and in terms of knowledge/skills.

By acknowledging the needs of the two ecosystems and by implementing suggested actions to bridge the existing gaps, Adriatic Croatia and Western Slovenia can foster a dynamic and innovative maritime ecosystem. The two maritime innovation ecosystems will leverage improved communication, modernized education, accessible funding, open and risk-embracing mindset, supportive policies, strategic specialization, and advanced infrastructure to drive forward their maritime industries.

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