

Analysis of Maritime Pilots' Education in the Republic of Croatia

A. Zekić¹, Z. Sanchez-Varela², I. Skoko² & R. Ivčec³

¹ University of Zadar, Zadar, Croatia

² University of Split, Split, Croatia

³ University of Rijeka, Rijeka, Croatia

ABSTRACT: This paper systematically and comprehensively presents maritime pilots' education, internships, and training in the Republic of Croatia. The paper will analyse their additional education since maritime pilots play a crucial role in ensuring maritime safety and environmental protection. The pilotage in the Republic of Croatia is subject to the provisions outlined in the Maritime Code and the Ordinance on Sea Pilotage. To effectively carry out their duties, maritime pilots require specialised training and education, as outlined in IMO Resolution A.960(23). Universities and specialised institutions respond to the growing demands of the maritime sector by offering additional education. They use simulators to train pilots in various manoeuvring scenarios under different weather conditions. Although not legally mandated in Croatia, pursuing additional education has proven to be highly beneficial for the maritime industry. The paper's primary goal is to investigate the implementation and quality of additional education for maritime pilots, emphasising the possibilities for further training. The research involved creating a questionnaire assessing the implementation of further education initiatives for maritime pilots in Croatia. The results have shown that maritime pilots consider additional education necessary, especially for specific types of vessels.

1 INTRODUCTION

According to Chauvin et al. [1], shipping is considered a safe, economical, and environmentally benign form of commercial transport. However, it is important to consider alternative perspectives as well. Praetorius and Sellberg [2] argue that shipping is a high-risk industry that can negatively impact not only those who work on board but also the marine environment and the public in the event of an incident or accident. Dynamic development and changes that bring both advantages and challenges characterise today's maritime industry. The growing density of marine traffic is evident in the daily movement of hundreds of thousands of ships transporting people and goods globally. Large ships and mega-cruisers are increasingly common on the seas, with sizes

significantly larger than in previous decades. Coastal states worldwide are increasingly encountering a growing range of risks that threaten the security of their national maritime territories. These risks include potential ship collisions, spills of hazardous substances, marine pollution, threats to the ecosystem, and risks to human safety and local infrastructure.

Effective pilotage is crucial for safe navigation in ports, straits, and other areas of inland waters and territorial seas. Mandatory pilotage is required for ships of certain types and sizes to ensure safe navigation and protect the environment.

Pilotage includes the guidance of a waterborne craft by a competent person (maritime pilot) and expert advice given to the master of the waterborne craft, safe navigation in ports, straits, and other areas of internal

waters and the territorial sea of the Republic of Croatia [3]. Maritime pilots possess extensive knowledge of local navigation, ship interactions, and meteorological conditions [4] and excellent communication skills to effectively collaborate with crew members and other participants in maritime operations [5]. The primary goal of all maritime operations, including pilotage, is to ensure the safety of ships, cargo, passengers and the port community while protecting the environment at the same time [6].

During pilotage, the marine pilot takes responsibility for the safe operation of the ship, providing the master with expert guidance on navigation, berthing or unberthing, and anchoring. Their task is to issue warnings about specific conditions on the fairway and inform the ship about the relevant regulations for the region through which it passes. Pilots have a thorough knowledge of the local sea lanes, depths, sea currents, tides, and other factors affecting safe navigation. Due to major economic and environmental challenges, the role of maritime pilots is becoming crucial, especially when managing large vessels.

While pilotage services may initially seem like a specialised offering for shipping companies, they also serve a public purpose by playing a crucial role in ensuring safe navigation [7]. In fact, in complying with their duties, pilots ensure safe navigation in the public interest [8]. Maritime pilots have a critical role in ensuring the safe navigation of vessels in their care by ensuring the orderly transit of pilotage districts in conformance with local regulations and rules for navigation, by protecting port facilities and commerce and by providing a defence of the public interest in ensuring practical conservancy functions of harbour authorities and protection of the environment [9].

IMO Resolution A.960 (23) [10] provides essential guidelines and establishes a foundation for modern, standardised, and continuous training of maritime pilots. It emphasises safety, ethical guidelines, the use of modern technologies, and preparedness for crises. Key components include ensuring compliance with international standards, training for different ship types, and using simulations and advanced equipment. Implementing these guidelines aims to reduce accidents at sea and increase the professionalism of pilots, thereby contributing to global maritime safety.

Maritime pilot education has been studied infrequently in the literature. Most of the research focuses on the level of job satisfaction [11], stress [12], fatigue [13–14], and health problems [15–16].

There are three categories of pilots in Germany: regular, offshore, and harbour. Pilotage certificates for regular and offshore pilots are issued by the Federal Republic of Germany, and those of harbour pilots by port authorities. As well as theoretical and practical training, pilot candidates must undergo 6-month internships under the supervision of experienced pilots [11]. In their first 6 months, they are permitted to work on ships up to 170 m long; between 6 and 9 months, on ships up to 220 m; between 9 and 12 months on ships up to 260 m, and between 12 and 18 months on ships up to 310 m, after which they can work on all ships [7].

In Australia, pilotage services are carried out by commercial companies, independent contractors, port operators, and public institutions. Lack of federation structure in Australia has increased commercial pressure on pilots [7]. The study shows that 53% of Australian pilots were exposed to commercial pressure, and majority of pilots were dissatisfied with their income level [9].

There are two qualifications available in Turkey: pilot (ships up to 20,000 GT) and senior pilot (all ships for which they are authorised). A pilot requires an unlimited master license, should sail for 1 year as a master, needs 5 days basic pilot training, should work for 6 months as a trainee pilot, and should complete a 6-month internship under supervision of an experienced pilot [7].

In United States, to qualify for training, pilots must have navigation and tug experience. The programme lasts 4–7 years. Training is undertaken by experienced pilots.

There are three categories of pilots in Japan: class 1, 2, and 3. Class 1 is the highest qualification, for which it is necessary to work on board (3000 GT or more) for at least 2 years as a captain, complete class 1 training successfully (9 months of training, of which 4 months is practical), and pass physical, written, and oral examinations. The training period for a Class 2 license is 18 months or can be earned by working for 2 years on vessels over 3000 GT as a captain or unlimited chief officer. There is a 30-month training period for the Class 3 license, or it can be earned by working as a captain on vessels of 1000 GT for 1 year. Pilots in Japan are regarded as self-employed worker. Their income varies by license type and number of pilotage services performed [7].

In Croatia, pilotage services are provided by private pilot companies [17], with a total of 35 maritime pilots performing pilotage duties. Since the Republic of Croatia requires only a limited number of pilots, there are no specific legal education requirements for this profession. Consequently, pilot companies provide additional training to their pilots based on their specific needs.

The paper is structurally divided into five main parts. Following the introduction, in the second part the formal education of maritime pilots in the Republic of Croatia is described. The research methodology is presented in the third part. Maritime pilots' satisfaction with additional education is analysed using the basic research method, the survey method. Namely, pilot companies conduct additional pilot education in accordance with their specific needs. The results of the research are presented in the fourth part. Maritime Pilots show a great interest in additional education, emphasizing the importance to expand knowledge and skills, which confirms a high motivation for improving professional competences and continuous education. The research detected topics that are important for future maritime pilot education. The aim of the research was to obtain data on the quality of additional education with a focus on identifying potential opportunities for improvement. The final, fifth part, consists of the final remarks.

2 FORMAL EDUCATION OF MARITIME PILOTS IN THE REPUBLIC OF CROATIA

Pilots are responsible for precisely and safely handling ships entering and leaving ports, navigating narrow channels, and passing through complex or dangerous waterways, often in difficult weather conditions. Therefore, training and education are crucial in equipping mariners with the skills and tools to ensure safety in operations [18]. Figure 1 shows the necessary steps to obtain a pilot's license. Additional education is not mandatory.

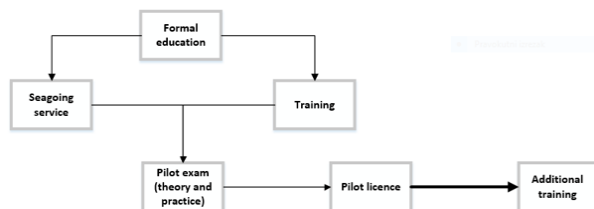


Figure 1. Education of maritime pilots.

To successfully pass the pilot exam, the Croatian Maritime Pilots Associations must ensure that candidates receive hands-on pilotage experience in a specific area, with the guidance of a mentor pilot. To obtain a pilot's certificate, candidates must pass the exam's theoretical and practical components while meeting specified requirements. The theoretical part of the exam is oral and covers topics such as navigation safety, sea pilotage, and the English language. The practical part of the exam consists of manoeuvring a ship while entering and leaving the port, as well as navigating between two ports within an area of mandatory coastal pilotage.

The pilot exam can be taken by any person who:

- holds a Certificate of Competency as Master on Ships of 3,000 GT or more and who attended lectures and passed all the exams of the Nautical Program based on STCW Table A-II/2,
- possesses a certificate for working on tankers, a General Radio Operator Certificate, and additional certificates required to obtain the Certificate of Competency as Master on Ships of 3,000 GT or more, such as Basic Safety Training, Advanced Fire Fighting, Proficiency in Survival Craft and Rescue Boats (other than fast rescue boats), Medical First Aid, Advanced Medical Care, or ECDIS.
- has at least 12 months of seagoing service in the capacity of Chief Officer or ship Master after obtaining the Certificate of Competency as Master on Ships of 3,000 GT or more,
- meets the prescribed health requirements for the deck department,
- has at least 50 port pilotages for a specific port pilotage area and at least five coastal pilotages under the supervision of a licensed pilot. The candidate must keep a log for each pilotage, which is then verified by both the pilot and the master of the piloted ship. When applying for the pilot exam, the candidate must submit the verified log to the Harbour Master's office.

Maritime pilots are highly qualified seafarers with unique experience, extensive local knowledge, and specific skills [19]. They represent a distinct category of seafarers, all having completed extensive training and gained substantial sea experience before pursuing a

maritime pilot career. Considering that pilot companies in Croatia are private, it is necessary to emphasize that any education requires their own funds.

3 METHODOLOGY AND DATA

Data were collected using a specially designed pilot form, which included 26 questions and was tailored to this profession's specific requirements.

3.1 Participants

The study involved 28 pilots from seven different pilot companies, providing a representative sample of maritime pilots in Croatia. All participants possessed a valid marine pilot license, a fundamental requirement for this challenging profession. All respondents had prior experience working on merchant ships, which provided them with practical knowledge and skills essential for the safe navigation and operation of a vessel in various conditions.

3.2 Procedure

The research was conducted using a questionnaire written in English, which was emailed to seven different pilot companies, engaging a total of 35 pilots. The data collection methodology involved self-administered questionnaires completed by the respondents. The questionnaire used multiple-choice and open-ended questions to gather quantitative and qualitative data for a more thorough analysis. Respondents were provided with predefined options in the multiple-choice questions to facilitate responses and standardise data processing. Participants had to select one of the answers from the options provided. Open-ended questions allowed respondents to freely express their opinions and observations, providing valuable insights into their attitudes and experiences.

The questionnaire comprised inquiries about personal information, work experience, satisfaction with additional education and recommendations for future education. The section on personal information addressed demographic issues. In the work experience section, pilots were asked about their experiences before and after beginning their careers as pilots. In the section evaluating educational satisfaction, questions addressed the number, type, and specific education components. In the final section, the pilots presented recommendations for future education, which were explored through open-ended questions. Also, significant topics for the continued development of additional education have been identified.

Out of 35 pilots who received the questionnaire, 28 completed and returned it correctly, resulting in an 80% return rate. A high response rate indicates the respondents' interest and motivation to participate in the research. Participation was voluntary, and responses were anonymous to protect respondents' privacy and encourage honest feedback. The data collected were used solely for research purposes, as highlighted in the instructions provided to respondents along with the questionnaire.

4 RESULTS AND DISCUSSION

4.1 Personal information

The average age of maritime pilots participating in the survey is 49 years. The age distribution indicates that 42% of the pilots are between 35 and 45 years of age, followed by 33% between 45 and 55 and 25% between 55 and 65. Among the surveyed pilots, 42% have completed undergraduate studies, while 58% have obtained graduate degrees. This result indicates that pilots in the Republic of Croatia possess a high level of maritime education. The respondents represent various pilotage regions along the Croatian coast, including specific areas and ports with different navigational conditions and safety challenges.

4.2 Work experience

The respondents reported having work experience in the merchant fleet, ranging from ten to twenty-four years. This level of seniority reflects extensive professional knowledge and skills gained from years of service at sea. Years of experience in diverse working conditions, including international waters and various types of vessels, enhance their expertise, enabling them to respond effectively to the demands of complex maritime operations.

Most of them had previously worked as ship masters, with experience ranging from 0 to 19 years. Their experience in seagoing service included the following types of ships: dry cargo carriers, ro-ro ships, oil tankers, liquefied gas carriers, container ships, chemical tankers, and high-speed crafts. The respondents in the study had varying experiences as maritime pilots, ranging from 1 to 18 years. This diversity allowed the sample to include experienced pilots and those with relatively shorter experience, providing valuable insights into pilots' challenges and perspectives at different career stages.

4.3 Surveys on satisfaction with additional education

92% of the respondents received additional training, while 8% did not receive any additional training. Currently, the implementation of additional trainings ranges from one to four. The topics covered are Bridge Team Management, bridge simulator training, ECDIS course, cargo operations, Pilot management simulation training including LNG vessels handling, manoeuvring, introduction and safety awareness in LNG and container industries, working on simulator in handling LNG and container vessels in various mooring/unmooring scenarios.

The pilots' knowledge and skills were assessed before and after they had received additional training (see Figures 2 and 3).

The results indicated that the additional training positively affected the pilots' competences, significantly improving their knowledge and skill levels. After completing the training program, pilots conducted self-assessments of their skills and knowledge. 7% rated their abilities as excellent, 32% considered them suitable, and the majority, 61%, rated their knowledge and skills as very good. The results

indicate that the additional training successfully increased the pilots' level of expertise.

Figure 4 illustrates the connection between educational goals and the requirements of maritime pilots.

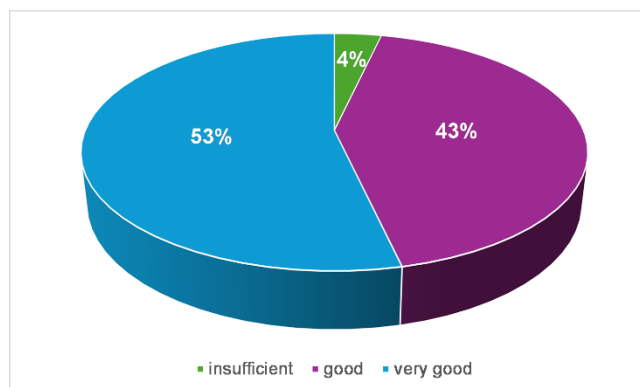


Figure 2. Evaluation of knowledge and skills before the training.

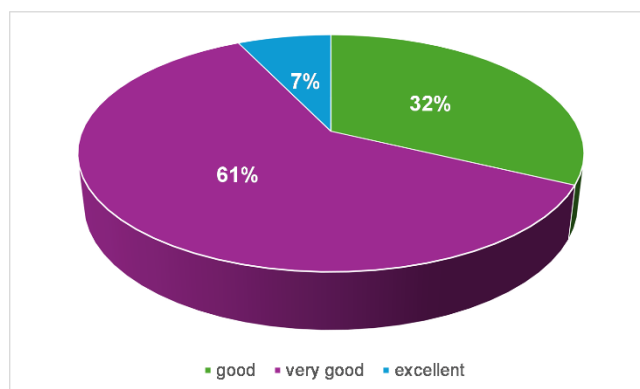


Figure 3. Evaluation of knowledge and skills before and after the training

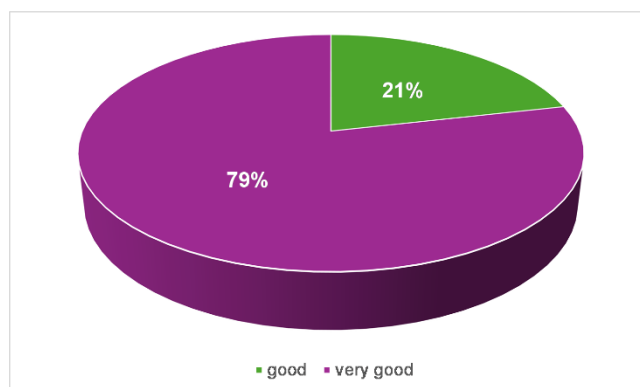


Figure 4. Evaluating the correlation between educational goals and the needs of maritime pilots.

When the participants were asked about aligning educational goals with the pilot's needs, 79% rated this match as very good. This result indicates that most felt the educational goals effectively addressed their specific needs and requirements. The significant level of satisfaction observed reflects that the objectives of the educational program are effectively aligned with the necessary skills and knowledge required for the profession of pilots. Moreover, the program's content is well-suited to meet the realistic demands of the maritime industry. Conversely, 21% of the participants rated the alignment of the educational goals with their

needs as good. This indicates that a smaller proportion of participants feel that some aspects of the program could be further adjusted or improved. This suggests the importance of further tailoring education to meet the specific needs of participants, ensuring that educational goals are more precise and effectively address the challenges pilots encounter daily.

The next question assessed respondents' satisfaction with the quality of supplementary materials, including handouts, additional literature, and practical examples. (Figure 5).

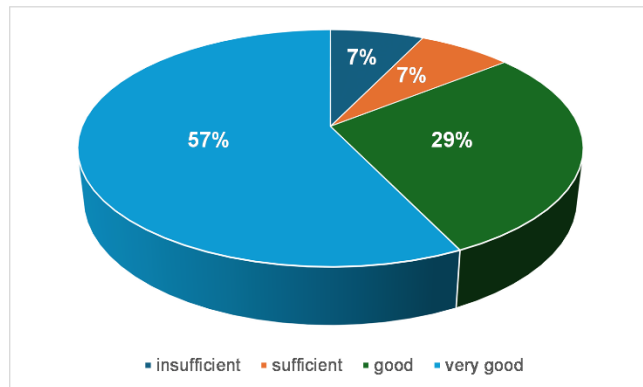


Figure 5. Satisfaction levels regarding the quality of supplemental materials.

Most respondents expressed satisfaction with the supporting materials. The materials received positive feedback, with 57% of participants rating them as very good and 29% as good. Most participants are satisfied with the materials provided. These materials help them learn and apply the skills they have gained. However, there is also a smaller number of those who are not completely satisfied. Namely, 7% of participants think that the materials were only sufficient, while another 7% rate the materials as insufficient. These results highlight the necessity for further enhancement in the quality of the supporting materials. Improvements in this area have the potential to increase satisfaction among all stakeholders and further enhance the overall quality of education.

The next question focused on sharing ideas and experiences among participants (as shown in Figure 6).

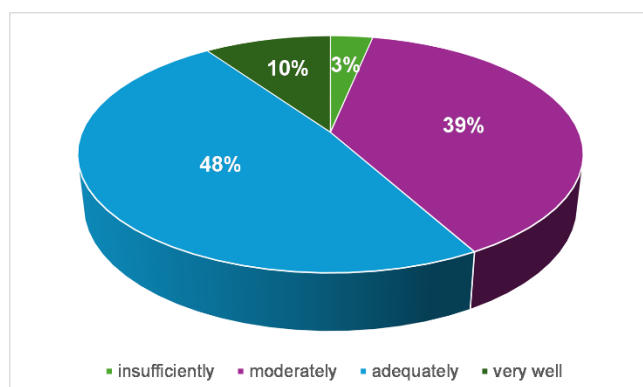


Figure 6. Exchange of ideas and experiences among participants

When asked about the exchange of ideas and experiences among participants, 48% rated this interaction as adequate, meaning that almost half considered the exchange of information and experiences appropriate and valuable for their

education. This result indicates that participants were broadly satisfied with how interaction and dialogue were enabled during the program. However, 39% of respondents rated the exchange of ideas and experiences as moderate, suggesting room for improvement in this segment. Only 10% of participants rated the exchange of ideas and experiences as very good, indicating that a smaller number of those considered the level of interaction to be exceptionally high. On the other hand, 3% of participants expressed dissatisfaction, rating the exchange of ideas and experiences as insufficient. Facilitating more significant opportunities for exchanging ideas and experiences can enhance educational quality and enable participants to effectively use shared knowledge and expertise.

Figures 7 and 8 illustrate the participants' satisfaction with the education's theoretical (Figure 7) and practical (Figure 8) components.

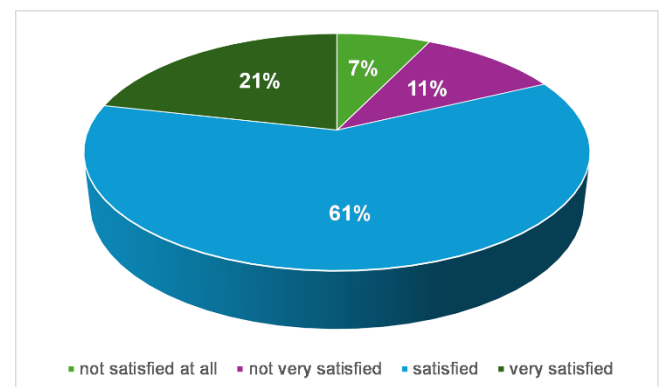


Figure 7. Participants' satisfaction with the theoretical aspect of education

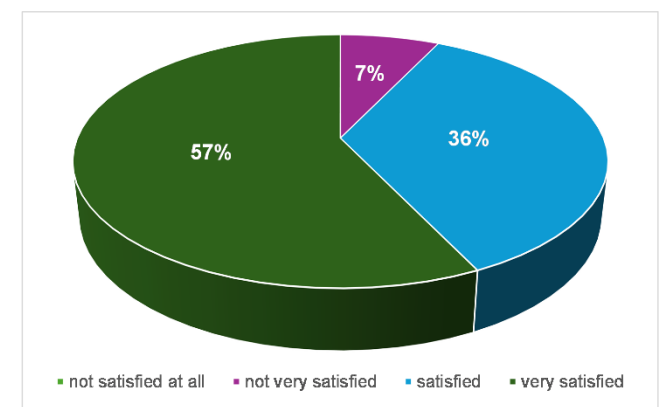


Figure 8. Participants' satisfaction with the practical aspect of education

Most participants, precisely 61%, reported satisfaction with the theoretical component of the educational program. Furthermore, 21% classified this component as very satisfactory. These findings indicate that the predominant impression among participants is one of positivity regarding the theoretical aspect of the program. On the other hand, 11% of participants believe that the theoretical part did not fully meet their expectations, while 7% express dissatisfaction with theoretical education. The findings indicate potential enhancement in the theoretical framework to ensure that the content and teaching methods are more effectively aligned with the needs and expectations of all participants.

The results regarding the practical component are highly positive. 57% of participants were very satisfied with the practical part of the education program, and an additional 36% were satisfied. Only 7% of participants indicated that they were not fully satisfied with the practical education, suggesting high success in meeting their expectations.

Notably, in both the theoretical and practical segments, no participants indicated that they experienced “extreme satisfaction.” This data suggests that while the education meets basic standards and leaves most participants with a positive impression, there are opportunities for improvement in both the theoretical and practical aspects.

Figure 9 displays the satisfaction with the duration of further education.

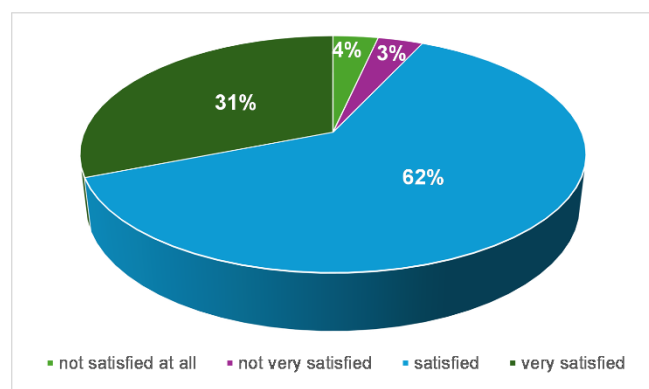


Figure 9. Level of satisfaction with the duration of the education

Most respondents expressed positive opinions about the duration of the training. The results indicate that 62% of respondents are satisfied with the duration of the training, and an additional 31% report being very satisfied. This result indicates that participants were generally satisfied with the length of the training. However, fewer respondents expressed dissatisfaction with the length of the training. Specifically, 3% reported being “not very satisfied,” and 4% indicated that they were not at all satisfied with the duration of the training. These data indicate that while most respondents find the training duration adequate, a minority may prefer adjustments by shortening or lengthening the training period.

Examining the balance between theoretical and practical training, 67% found it appropriate, while 33% disagreed. Consequently, 20% of respondents believe practical training needs to be more comprehensive. Pilots are well-experienced seamen and must familiarise themselves with local situations, port regulations, limitations, and other considerations. They also believe that the theoretical component is not as crucial.

It should be emphasised that all respondents expressed a strong interest in the possibilities of additional education, showing a desire to expand their knowledge and skills. The results point towards a significant motivation among respondents to improve their professional competences and engage in continuous training, thereby contributing to their professional development.

Most respondents (83%) believe that all aspects of education are important for developing and acquiring relevant skills. This high level of consensus indicates that most participants recognise the importance of an integrated approach to education, where theoretical, practical and interactive components complement each other to ensure a comprehensive education. On the other hand, 17% of respondents emphasise that theoretical education is less important than other aspects. These results suggest that the program could be improved by placing a greater emphasis on practical elements to ensure it meets the needs of all participants.

Topics that have been identified as important for each participant include the following: emergency scenario simulation, case study discussions, manoeuvring techniques, stress control, and any future formal education standard for maritime and harbour pilots as deemed necessary by the competent pilotage authority (i.e. MMPI maritime safety directorate) should be conducted only by active and experienced pilots to ensure they fit the purpose, practical work, familiarisation with the most recent national and international maritime regulations, as well as any relevant local regulations, communication and tug handling techniques, practical training, ship manoeuvring and Maritime English, human interface, navigation stability, new designs handling characteristics. These topics are crucial for the continued development and safety of maritime operations.

The knowledge and skills gained from further education are relevant in all instances. Respondents expressed their intention to apply lessons learned from emergency scenarios, communication training, and practical experience in their future work. They will focus on understanding different marine engine fuels, the advantages and disadvantages of engine performance, potential causes of engine failure, and how these failures impact the vessel’s manoeuvrability. Furthermore, they will use lessons learned from ship handling procedures and handling ships with unusual manoeuvring characteristics and shapes. They will apply their theoretical knowledge to manage dangerous and unpredictable situations, including ship equipment and engine malfunctions, berthing and unberthing in severe weather conditions, and emergency situations, along with the best possible mitigating measures.

4.4 Recommendations for future training

To enhance the quality of additional education, maritime pilots have proposed specific measures and approaches to further improve their expertise, efficiency, and safety at sea. Their proposals address different aspects of professional training, outlined below.

Pilots suggest sharing best practices among pilot organisations to enhance navigation safety and efficiency. The proposed system will support structured joint sessions among pilots to discuss their experiences with challenging scenarios, thus improving their readiness for similar events in the future. The exchange of experiences among pilots not only aids individual professional growth but also

enhances the overall safety of maritime navigation. Namely, every crisis, whether bad weather conditions, port congestion or technical failure, poses a unique challenge for pilots. Sharing experiences on how different pilots have managed similar situations establishes a common framework for identifying practical solutions and procedures that can be applied across various conditions.

Maritime pilots also stress the importance of group training in cooperation with tug masters. Joint education and simulations allow for better understanding and coordination of ship work, especially in complex situations when precise tugboat guidance is required in narrow waterways or ports. Such education would allow pilots and Tug Masters to focus their skills on common goals, developing teamwork essential for safe and efficient navigation.

One of the pilot's key recommendations is expanding the scope of education to include diverse and potentially risky scenarios. The training should include less common situations, such as extreme weather conditions, technical failures, port congestion, and other critical situations. Thorough preparation is key for pilots; it allows for better crisis management and quicker, more effective decision-making. Pilots can enhance their crisis management skills by preparing for various scenarios, ultimately improving their professional readiness.

The International Maritime Organization (IMO) provides guidelines for maritime pilot training in Resolution A.960(23). The pilots propose that training be fully aligned with these guidelines to ensure uniformity in education and the application of global standards. The resolution emphasises the importance of continuing education, including safety, ethical guidelines, and specific requirements for operating different types of ships.

Pilots recommend incorporating various types of ships into training programs to ensure quality training. This training should include large container ships, tankers, and cruise ships, as each type presents distinct challenges related to manoeuvring, navigation, and safety. Training that includes working with different types of ships allows pilots to acquire a broader range of skills and a better understanding of the unique requirements of each type of vessel.

To improve training, pilots advocate for integrating modern maritime equipment, including advanced navigation systems, automated ship control systems, and sophisticated simulators. Utilising these tools enables pilots to understand and operate advanced ship technologies, thus improving the safety and precision of navigation.

These proposals serve to improve the quality of further education for pilots. By improving preparation for diverse scenarios, cooperating with colleagues, and leveraging modern technologies, pilots can more effectively meet the challenges of the increasingly demanding maritime sector.

Furthermore, maritime pilots believe that additional training should include topics such as bridge team management for pilots, legal advice, recovery of pilots from the sea and use of safety equipment, manned model training, more practical

work, constant upgrade of sessions with the latest rules and regulations in force, using modern technologies when handling new age vessels, ship handling with tugs, practical training, pilot-tug boat communication, hands-on training and BRM. The variety of proposed topics testifies to the great interest in additional training.

5 CONCLUSION

In the Republic of Croatia, supplementary training for maritime pilots is not legally required. Nevertheless, it remains a crucial tool in facilitating professional development and improvement. Additional training is organised based on the specific requirements of each pilot company.

This research has highlighted the importance of providing additional educational opportunities for Croatian maritime pilots to facilitate their ongoing professional development. The research can provide a fundamental framework for developing and implementing new educational initiatives to enhance the quality of maritime pilot services. The research methodology employed a questionnaire to evaluate the quality of supplemental education, analyse acquired competences, and identify improvement areas.

Maritime pilots who participated in additional training assessed their knowledge and skills before and after the training. The study demonstrated significant skills advancements for participants following the training program. These data indicate the success of the existing programs and confirm the importance of continuous education. Notwithstanding a generally favourable correlation between educational goals and the requirements of maritime piloting, the study reveals opportunities for further development.

Further training is of great importance for maritime pilots as it enhances key skills, thus improving navigational safety and environmental protection. One recommendation for improving continuing education is the incorporation of new topics.

These topics include bridge team management for pilots, legal advice, recovery of pilots from the sea and use of safety equipment. Manned model training, more practical work, and modern technologies in handling new-age vessels are also important. Key areas include ship handling with tugs, practical training, and effective pilot-tug boat communication. In addition, constant upgrading of sessions with the latest rules and regulations in force is crucial for the long-term development of pilots. Improvements in hands-on training and BRM can significantly increase the efficiency and safety of pilot duties.

Introducing new topics into additional education greatly benefits maritime pilots, enabling them to enhance their knowledge and skills. By undergoing systematic education and continuous training, maritime pilots can enhance not only their own knowledge and skills but also make valuable contributions to ensuring greater maritime safety and environmental protection.

ACKNOWLEDGEMENTS

This research is part of the European project "Micro-qualifications in Seafarers' Education and Training," which is funded under the Erasmus + program under section KA220 – "Cooperation Partnership in Higher Education."

REFERENCES

- [1] C. Chauvin, S. Lardjane, G. Morel, J.P. Clostermann, B. Langard, "Human and organisational factors in maritime accidents: Analysis of collisions at sea using the HFACS", *Accid. Anal. Prev.*, 59, 26–37, 2013. <https://doi.org/10.1016/j.aap.2013.05.006>
- [2] G. Praetorius, C. Sellberg, "Exploring Strengths and Weaknesses in Professional Marine Pilot Education". In *Proceedings of the 13th International Conference on Human Factors in Transportation*, New York, 2022, 60,657–664. <https://doi.org/10.54941/ahfe1002502>
- [3] Maritime Code of the Republic of Croatia, Official Gazette of the Republic of Croatia, No. 181/04, 76/07, 146/08, 61/11, 56/13, 26/15, 17/19.
- [4] Đ. Šabalja, S. Kos, "Strukturna analiza prijenosnog peljarskog računal", *Pomorstvo*, 21, 2, 139–150, 2007. <https://hrcak.srce.hr/19031>
- [5] C. Sellberg, E. Nordenström, R. Säljö, "The development of visual expertise in a virtual environment: A case of maritime pilots in training", *FLR*, 12, 1, 16–33, 2024. <https://doi.org/10.14786/flr.v12i1.1217>
- [6] R. Petrinović, N. Matulić Sumić, "Obvezno peljarenje na temelju novih odredaba Pomorskog zakonika", *Poredbeno pomorsko pravo*, 53, 168, 83–99, 2014. <https://hrcak.srce.hr/137491>
- [7] Ö. Uğurlu, M. Kaptan, S. Kum, S. Yildiz, "Pilotage services in Turkey; key issues and ideal pilotage", *JMET*, 16, 2, 51–60, 2016. <https://doi.org/10.1080/20464177.2016.1262596>
- [8] G. Berlingieri, "The Italian Supreme Court of Cassation Denies the Entitlement of Pilots to Salvage Remuneration", *Poredbeno pomorsko pravo*, 61, 176, 83–93, 2022. <https://doi.org/10.21857/y6z0lb6drn>
- [9] R. M. Darbra, J. F. E. Crawford, C. W. Haley, R. J. Morrison, "Safety culture and hazard risk perception of Australian and New Zealand maritime pilots", *Mar. Policy*, 31, 6, 736–745, 2007. <https://doi.org/10.1016/j.marpol.2007.02.004>
- [10] IMO: Resolution A.960(23), "Recommendations on Training and Certification and on Operational Procedures for Maritime Pilots Other than Deep-Sea Pilots", December 5, 2003.
- [11] M. Andresen, M. E., Domsch, A. H. Cascorbi, "Working Unusual Hours and Its Relationship to Job Satisfaction: A Study of European Maritime Pilots", *Journal of Labor Research*, 28, 4, 714–734, 2007. <https://doi.org/10.1007/s12122-007-9010-5>
- [12] J. Van Damme, "Prevention of post-traumatic stress disorder amongst maritime pilots", *Internat Marit Health*, 54, 1-4, 2003.
- [13] GÇ. Ceyhun, GK. Özbağ, "The impact of safety, climate, job autonomy and feedback on fatigue: a case study of Turkish marine pilots", *Am J Soc Issues Hum*, 4, 190–199, 2014.
- [14] W. Rhodes, V. Gil, "Fatigue management guide for Canadian marine pilots: a trainer's handbook", New York: Rhodes, 2003.
- [15] S. M. Scovill, T. K. Roberts, D. J. McCarty, "Health characteristics of inland waterway merchant marine captains and pilots", *Occupational medicine*, 62, 8, 638–641, 2012. <https://doi.org/10.1093/occmed/kqs156>
- [16] H. Kim, C. S. Yang, B. W. Lee, Y. H. Yang, S. Hong, "Alcohol effects on navigational ability using ship handling simulator", *International Journal of Industrial Ergonomics*, 37, 9-10, 733–743, 2007. <https://doi.org/10.1016/j.ergon.2007.05.006>
- [17] P. Amižić Jelovčić, "Legal framework on pilotage in Croatia with special regard to 2021 amendments to the Ordinance on Sea pilotage", *Pomorstvo*, 36, 2, 381–388, 2022. <https://doi.org/10.31217/p.36.2.21>
- [18] G. Praetorius, C. Hult, C. Österman, "Maritime resource management: Current training approaches and potential improvements", *TransNav*, 14, 3, 573–584, 2020. <https://doi.org/10.12716/1001.14.03.08>
- [19] M. Hontvedt, "Professional vision in simulated environments - Examining professional maritime pilots' performance of work tasks in a full-mission ship simulator", *Learn. Cult. Soc. Interact.*, 7, 71–84, 2015. <https://doi.org/10.1016/j.lcsi.2015.07.003>