

TITLE: EMPLOYABILITY, ANTICIPATING SKILLS NEEDS AND GAP MEASUREMENT



DELIVERABLE: 3.3
DATE: October 18, 2021
VERSION: 3.0

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|---------------------|--|
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| DISSEMINATION LEVEL | PUBLIC |

| VERSION HISTORY | | | |
|-----------------|------------|---------|--|
| VERSION | DATE | EDITOR | SUMMARY OF MODIFICATIONS |
| V1 | 20-04-2021 | EF Team | Draft |
| V2 | 28-04-2021 | EF Team | Incorporating comments and changes suggested by reviewers DMA, ECSA, ETF |
| V3 | 06-07-2021 | EF Team | Updated |

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Summary SkillSea Report

Deliverable: 3.3, version: 1.0, date: 15 September 2021

A key part of SkillSea's strategic mission is to devise an appropriate framework and mechanism to:

1. monitor and anticipate future skills needs to sustain and enhance the employability of maritime professionals.
2. measure related skills gaps.

This WP3 report addresses both these issues in the context of evolving employability and on the basis of European and international maritime skills frameworks, with input also from precursor WP1 deliverables such as current skills (D1.1.2), future skills (D.1.1.3).

To assess the impact on the employability of current skills resilience and of future skills dynamics and in order to obtain appropriate gauges of related gaps, extensive surveys were conducted among employers and employees in 2020 following exploratory surveys in 2019. The key findings of this interim report on the statistical analysis of the relevant survey data, and from material from the employers - employee surveys and workforce focus groups conducted in 2020, confirm common – at varying degrees – perceptions among industry and maritime professionals on outdated skills and educational material and also on the five-year resilience of current skills, especially in areas such as digitalisation and automation on board and remote operations and digital skills ashore. The statistical analysis suggests a generally common perception among employer and employee surveys of the need for a continuous update of related skills – including a number of transversal ones.

In terms of action proposed towards the final D3.3 report, there are two key directions ensuing from this interim analysis. Firstly, the proposed updatable Shipping Employability AHP Based Anticipating Tool (S.E.A.B.A.N.T.), based on the user-friendly Multiple Criteria Decision-Making Method of the Analytic Hierarchy Process, will be evaluated through the planned 2022 focus groups in order to be finalised and to validate its usefulness to MET stakeholders. Secondly, the report also sets out the essential elements of a future self-updatable mechanism for monitoring gaps – a potential substantial legacy of SkillSea, as highlighted in the Strategy Plan Framework. The detailed structure of the mechanism is planned to be completed after the planned 2022 final D3.3 survey and through validation by the 2022 focus groups, with a view to secure its sustainability and maximise stakeholder participation.

Future-proof skills for the maritime transport sector

Project SkillSea is co-funded by the Erasmus+ Programme of the European Union

Technology and digitalisation are transforming the shipping industry. 'Smart' ships are coming into service, creating demand for a new generation of competent, highly-skilled maritime professionals. Europe is a traditional global source of maritime expertise and the four-year SKILLSEA project is launched with the aim of ensuring that the region's maritime professionals possess key digital, green and soft management skills for the rapidly-changing maritime labour market. It seeks to not only produce a sustainable skills strategy for European maritime professionals, but also to increase the number of these professionals - enhancing the safety and efficiency of this vital sector.

Table of contents

| | |
|---|-----|
| Summary SkillSea Report..... | 3 |
| 1. Introduction: the state of play in a changing setting..... | 13 |
| 2. Shipping sector trends & impact on measuring gaps: a dynamic anticipation of skills employability | 18 |
| 3. Validating gaps' size: industry and workforce views | 25 |
| 4. Measuring gaps: a dynamic anticipation of skills..... | 50 |
| 5. Conclusions: anticipating skills and gaps for employability..... | 104 |

LIST OF ANNEXES

| ANNEX | TITLE | PAGE |
|--------------|---|-------------|
| 1 | SKILLS-RELATED MARITIME EMPLOYABILITY RECENT LITERATURE | 109 |
| 2A | SKILLS OBSOLESCENCE 2019 PILOT SURVEY QUESTIONNAIRE | 112 |
| 2B | SKILLS OBSOLESCENCE 2019 PILOT SURVEY DEMOGRAPHICS | 117 |
| 3A | 2021 SkillSea D3.3 SURVEY – EMPLOYEES’ QUESTIONNAIRE | 120 |
| 3B | 2021 SkillSea D3.3 SURVEY – EMPLOYEES’ QUESTIONNAIRE - SURVEY DEMOGRAPHICS | 125 |
| 3C | 2021 SkillSea D3.3 SURVEY – EMPLOYERS’ QUESTIONNAIRE | 132 |
| 3D | 2021 SkillSea D3.3 SURVEY – EMPLOYERS’ QUESTIONNAIRE - SURVEY DEMOGRAPHICS | 146 |
| 3E | SKILLSEA CIRCULATED 2021 SURVEY DISSEMINATION MATERIAL | 149 |
| 4A | FOCUS GROUPS’ PARTICIPATION (COUNTRIES) | 151 |
| 4B | FOCUS GROUP SPECIMEN OF ANSWERS | 153 |
| 5 | QUARTILES GRAPHS | 154 |
| 6 | LEVEL DESCRIPTORS IN THE EUROPEAN QUALIFICATIONS FRAMEWORK | 162 |

LIST OF FIGURES

| | | |
|--------------------|---|-----------|
| FIGURE 2.1 | MEASURING SKILLS GAPS FOR ENHANCING EMPLOYABILITY | 19 |
| FIGURE 3.1A | SKILLS RELATED TO JOB REQUIREMENTS | 26 |
| FIGURE 3.1B | SKILLS RELATED TO JOB REQUIREMENTS (EEA- Others) | 26 |
| FIGURE 3.2A | RATING OF SKILL LEVEL FROM MET GRADUATES | 27 |
| FIGURE 3.2B | RATING OF SKILL LEVEL FROM MET GRADUATES (EEA-Others) | 27 |
| FIGURE 3.3A | PERCENTAGE OF OUTDATED KNOWLEDGE AND SKILLS | 28 |
| FIGURE 3.3B | PERCENTAGE OF OUTDATED KNOWLEDGE AND SKILLS (EEA-Others) | 29 |
| FIGURE 3.4A | LIKELIHOOD OF SKILLS BECOMING OUTDATED IN THE NEXT FIVE YEARS | 29 |
| FIGURE 3.4B | LIKELIHOOD OF SKILLS BECOMING OUTDATED IN THE NEXT FIVE YEARS (EEA-Others) | 30 |
| FIGURE 3.5A | NEED FOR FURTHER TRAINING DUE TO TECHNOLOGICAL PROGRESS AND NEW DEVELOPMENTS | 30 |

| | | |
|--------------|---|----|
| FIGURE 3.5B | NEED FOR FURTHER TRAINING DUE TO TECHNOLOGICAL PROGRESS AND NEW DEVELOPMENTS (EEA-Others) | 31 |
| FIGURE 3.6A | ADDITIONAL SKILLS AND JOB PERFORMANCE | 31 |
| FIGURE 3.6B | ADDITIONAL SKILLS AND JOB PERFORMANCE (EEA-Others) | 32 |
| FIGURE 3.7A | SKILLS RANKINGS BASED ON MET GRADUATES EXPERIENCE | 33 |
| FIGURE 3.7B | SKILLS RANKINGS BASED ON MET GRADUATES EXPERIENCE (EEA-Others) | 33 |
| FIGURE 3.8A | EXISTENCE OF MISMATCH BETWEEN MET TEACHING MATERIAL AND INDUSTRY NEEDS | 34 |
| FIGURE 3.8B | EXISTENCE OF MISMATCH BETWEEN MET TEACHING MATERIAL AND INDUSTRY NEEDS (EEA-Others) | 34 |
| FIGURE 3.9A | METHODS TO GAIN NEW SKILLS | 35 |
| FIGURE 3.9B | METHODS TO GAIN NEW SKILLS (EEA-Others) | 35 |
| FIGURE 3.10A | PERCEPTION OF MET GRADUATES ON THE NEED FOR LIFELONG LEARNING | 36 |
| FIGURE 3.10B | PERCEPTION OF MET GRADUATES ON THE NEED FOR LIFELONG LEARNING (EEA-Others) | 36 |
| FIGURE 3.11 | QUESTIONS OF FOCUS GROUPS | 39 |
| FIGURE 3.12 | GUIDING ROADMAP TO ENHANCE EMPLOYABILITY OF MARITIME PROFESSIONALS | 46 |
| FIGURE 4.1 | EXTENT OF SKILLS POSSESSION BY OFFICERS | 53 |
| FIGURE 4.2 | LEVEL OF SKILLS REQUIRED | 54 |
| FIGURE 4.3 | PERCENTAGE OF OUTDATED KNOWLEDGE AND SKILLS | 54 |
| FIGURE 4.4 | DEMAND FOR SKILLS | 55 |
| FIGURE 4.5 | DIFFICULTIES IN RECRUITING OFFICERS | 56 |
| FIGURE 4.6 | BARRIERS TO RECRUITING SHIP OFFICERS WHO GRADUATED FROM EUROPEAN METs | 57 |
| FIGURE 4.7 | LIKELIHOOD OF SPECIFIC STRATEGIES IF FACED WITH DIFFICULTIES IN FILLING VACANCIES | 58 |
| FIGURE 4.8 | IMPACT OF EUROPEAN MET REPUTATION ON RECRUITMENT OF GRADUATES | 58 |
| FIGURE 4.9 | LEVEL OF PREPARATION OF FULLY SKILLED SEAFARERS BY EUROPEAN METs | 59 |
| FIGURE 4.10 | POTENTIAL BENEFITS OF COLLABORATION BETWEEN SHIPPING COMPANIES AND EUROPEAN METs | 59 |
| FIGURE 4.11 | CAUSES OF SHORTAGES OF WELL-TRAINED GRADUATES OF EUROPEAN MET COURSES | 60 |

| | | |
|--------------|--|----|
| FIGURE 4.12A | FIVE-YEAR RESILIENCE OF NAVIGATION SKILLS ONBOARD | 61 |
| FIGURE 4.12B | FIVE-YEAR RESILIENCE OF DIGITALISATION SKILLS ONBOARD | 61 |
| FIGURE 4.12C | FIVE-YEAR RESILIENCE OF SAFETY SKILLS ONBOARD | 62 |
| FIGURE 4.12D | FIVE-YEAR RESILIENCE OF SUSTAINABILITY - QUALITY SKILLS ONBOARD | 62 |
| FIGURE 4.12E | FIVE-YEAR RESILIENCE OF AUTOMATION SKILLS ONBOARD | 63 |
| FIGURE 4.13A | FIVE-YEAR RESILIENCE OF OPERATIONS SKILLS ASHORE | 63 |
| FIGURE 4.13B | FIVE-YEAR RESILIENCE OF DIGITALISATION SKILLS ASHORE | 64 |
| FIGURE 4.13C | FIVE-YEAR RESILIENCE OF SAFETY SKILLS ASHORE | 64 |
| FIGURE 4.13D | FIVE-YEAR RESILIENCE OF SUSTAINABILITY - QUALITY SKILLS ASHORE | 65 |
| FIGURE 4.13E | FIVE-YEAR RESILIENCE OF REMOTE OPERATIONS SKILLS ASHORE | 65 |
| FIGURE 4.14 | THE MOST USUAL TRAINING STRATEGY FOR ONBOARD MARITIME PROFESSIONALS FOLLOWED BY RESPONDENT'S COMPANY | 66 |
| FIGURE 4.15 | DEGREE OF AGREEMENT THAT THE COOPERATION BETWEEN SHIPPING COMPANIES AND EUROPEAN METs CAREER OFFICES FOR RECRUITING IS VERY SATISFACTORY | 67 |
| FIGURE 4.16A | SKILLS IN RELATION TO JOB REQUIREMENTS UPON GRADUATION | 69 |
| FIGURE 4.16B | SKILLS IN RELATION TO JOB REQUIREMENTS UPON GRADUATION (4.16A by region of MET) | 70 |
| FIGURE 4.17A | SELF-ASSESSMENT OF THE NECESSARY SKILLS CURRENTLY POSESSED | 71 |
| FIGURE 4.17B | SELF-ASSESSMENT OF THE NECESSARY SKILLS CURRENTLY POSESSED (4.17A by region of MET) | 71 |
| FIGURE 4.18A | PERCENTAGE OF OUTDATED KNOWLEDGE & SKILLS | 72 |
| FIGURE 4.18B | PERCENTAGE OF OUTDATED KNOWLEDGE & SKILLS (4.18A by region of MET) | 73 |
| FIGURE 4.19A | LIKELIHOOD OF THE SKILLS BECOMING OUTDATED IN THE NEXT FIVE YEARS | 73 |
| FIGURE 4.19B | LIKELIHOOD OF THE SKILLS BECOMING OUTDATED IN THE NEXT FIVE YEARS (4.19A by region of MET) | 74 |
| FIGURE 4.20A | NEED FOR FURTHER TRAINING DUE TO TECHNOLOGICAL PROGRESS AND NEW DEVELOPMENTS | 75 |
| FIGURE 4.20B | NEED FOR FURTHER TRAINING DUE TO TECHNOLOGICAL PROGRESS AND NEW DEVELOPMENTS (4.20A by region of MET) | 76 |
| FIGURE 4.21A | ROLE OF ADDITIONAL SKILLS IN JOB PERFORMANCE | 77 |

| | | |
|--------------|--|----|
| FIGURE 4.21B | ROLE OF ADDITIONAL SKILLS IN JOB PERFORMANCE (4.21A by region of MET) | 77 |
| FIGURE 4.22A | SKILLS RANKING FOR SEAFARERS BASED ON RESPONDENTS' EXPERIENCE | 78 |
| FIGURE 4.22B | SKILLS RANKING FOR SEAFARERS BASED ON RESPONDENTS' EXPERIENCE (4.22A by region of MET) | 79 |
| FIGURE 4.23A | EXISTENCE OF MISMATCH BETWEEN MET TEACHING MATERIAL AND INDUSTRY NEEDS | 79 |
| FIGURE 4.23B | EXISTENCE OF MISMATCH BETWEEN MET TEACHING MATERIAL AND INDUSTRY NEEDS (4.23A by region of MET) | 80 |
| FIGURE 4.24A | METHODS TO GAIN NEW SKILLS | 80 |
| FIGURE 4.24B | METHODS TO GAIN NEW SKILLS (4.24A by MET region) | 81 |
| FIGURE 4.25A | NAVIGATION SKILLS ONBOARD | 82 |
| FIGURE 4.25B | NAVIGATION SKILLS ONBOARD (4.25A by region of MET) | 82 |
| FIGURE 4.26A | DIGITALISATION SKILLS ONBOARD | 82 |
| FIGURE 4.26B | DIGITALISATION SKILLS ONBOARD (4.26A by region of MET) | 83 |
| FIGURE 4.27A | SAFETY SKILLS ONBOARD | 84 |
| FIGURE 4.27B | SAFETY SKILLS ON BOARD (4.27A by MET region) | 84 |
| FIGURE 4.28A | SUSTAINABILITY-QUALITY SKILLS ONBOARD | 85 |
| FIGURE 4.28B | SUSTAINABILITY-QUALITY SKILLS ONBOARD (4.28A by MET region) | 85 |
| FIGURE 4.29A | AUTOMATION SKILLS ONBOARD | 86 |
| FIGURE 4.29B | AUTOMATION SKILLS ONBOARD (4.29A by MET region) | 86 |
| FIGURE 4.30A | OPERATIONS SKILLS ASHORE | 87 |
| FIGURE 4.30B | OPERATIONS SKILLS ASHORE (4.30A by MET region) | 87 |
| FIGURE 4.31A | DIGITALISATION SKILLS ASHORE | 88 |
| FIGURE 4.31B | DIGITALISATION SKILLS ASHORE (4.31A by region of MET) | 89 |
| FIGURE 4.32A | SAFETY SKILLS ASHORE | 89 |
| FIGURE 4.32B | SAFETY SKILLS ASHORE (4.32A by region of MET) | 89 |
| FIGURE 4.33A | SUSTAINABILITY AND QUALITY SKILLS ASHORE | 90 |
| FIGURE 4.33B | SUSTAINABILITY AND QUALITY SKILLS ASHORE (4.33A by MET region) | 90 |
| FIGURE 4.34A | REMOTE OPERATIONS SKILLS ASHORE | 91 |
| FIGURE 4.34B | REMOTE OPERATIONS SKILLS ASHORE (4.34A by MET region) | 91 |

| | | |
|-------------------|---|-----|
| FIGURE 4.35 | EMPLOYABILITY OF MARITIME PROFESSIONALS AND STAKEHOLDERS | 94 |
| FIGURE 4.36A | PROPOSED AHP HIERARCHY FOR EMPLOYABILITY OF MARITIME PROFESSIONALS | 96 |
| FIGURE 4.36B | PROPOSED EXPANDED AHP HIERARCHY FOR EMPLOYABILITY OF MARITIME PROFESSIONALS | 97 |
| FIGURE 4.37 | A BASIC STATIC GAPS MONITORING MECHANISM | 100 |
| FIGURE ANNEX 2B.1 | AGE DISTRIBUTION OF 2019 PILOT SURVEY RESPONDENTS | 119 |
| FIGURE ANNEX 2B.2 | CREW ROLE DISTRIBUTION OF 2019 PILOT SURVEY RESPONDENTS | 119 |
| FIGURE ANNEX 3B.1 | LOCATION OF STUDIES OF RESPONDENTS | 127 |
| FIGURE ANNEX 3B.2 | GENDER OF RESPONDENTS | 127 |
| FIGURE ANNEX 3B.3 | AGE OF RESPONDENTS | 128 |
| FIGURE ANNEX 3B.4 | NATIONALITY OF RESPONDENTS | 129 |
| FIGURE ANNEX 3B.5 | ROLE OF RESPONDENTS | 130 |
| FIGURE ANNEX 3B.6 | TYPE OF VESSEL ON WHICH SERVING | 130 |
| FIGURE ANNEX 3B.7 | HAD YOU FILLED IN THE 2019 EUGENIDES FOUNDATION SURVEY? | 131 |
| FIGURE ANNEX 3D.1 | MOST COMMON VESSEL TYPES IN RESPONDENT'S COMPANY | 147 |
| FIGURE ANNEX 3D.2 | NUMBER OF SEAFARERS EMPLOYED IN RESPONDENT'S COMPANY | 148 |
| FIGURE ANNEX 3D.3 | YEARS OF YOUR EXPERIENCE IN THE MARITIME SECTOR | 148 |
| FIGURE ANNEX 5.1 | SELF-ASSESSMENT OF THE NECESSARY SKILLS CURRENTLY POSSESSED - QUARTILES | 156 |
| FIGURE ANNEX 5.2 | NAVIGATION SKILLS ON BOARD - QUARTILES | 156 |
| FIGURE ANNEX 5.3 | DIGITALISATION SKILLS ON BOARD – QUARTILES | 157 |
| FIGURE ANNEX 5.4 | SAFETY SKILLS ON BOARD - QUARTILES | 157 |
| FIGURE ANNEX 5.5 | SUSTAINABILITY – QUALITY SKILLS ON BOARD - QUARTILES | 158 |
| FIGURE ANNEX 5.6 | AUTOMATION SKILLS ON BOARD - QUARTILES | 158 |
| FIGURE ANNEX 5.7 | OPERATIONS SKILLS ASHORE - QUARTILES | 159 |
| FIGURE ANNEX 5.8 | DIGITALISATION SKILLS ASHORE - QUARTILES | 159 |
| FIGURE ANNEX 5.9 | SAFETY SKILLS ASHORE - QUARTILES | 160 |
| FIGURE ANNEX 5.10 | SUSTAINABILITY AND QUALITY SKILLS ASHORE - QUARTILES | 160 |
| FIGURE ANNEX 5.11 | REMOTE OPERATIONS SKILLS ASHORE - QUARTILES | 161 |

LIST OF TABLES

TABLE 3.1

COMMONALITY OF VIEWS OVER MAIN FOCUS GROUP

43

LIST OF ABBREVIATIONS

| Abbreviation | Definition |
|--------------|--|
| AHP | Analytic Hierarchy Process |
| BIMCO | Baltic and International Maritime Council |
| CEDEFOP | European Centre for the Development of Vocational Training |
| CoCs | Certificates of Competency |
| DMA | Danish Maritime Authority |
| DX.X | Deliverable X per Work Package X |
| EACEA | European Education and Culture Executive Agency |
| ECVET | European Credit system for Vocational Education and Training |
| ECSA | European Community Shipowners' Associations |
| ECTS | European Credit Transfer and Accumulation System |
| EEA | European Economic Area |
| EF | Eugenides Foundation |
| EMSA | European Maritime Safety Agency |
| EQF | European Qualifications Framework |
| ESCO | European Skills, Competences, Qualifications and Occupations |
| ETF | European Transport Workers' Federation |
| ETO | Electrotechnical Officer |
| EU | European Union |
| GDP | Gross Domestic Product |
| GHG | Greenhouse Gases |
| HQ | Headquarters |
| HSBA | Hamburg School of Business Administration |
| IAPP | International Air Pollution Protection |
| ICT | Information and Communications Technology |
| ID | Identification |
| IIoT | Industrial IoT |
| IMO | International Maritime Organization |
| IoP | Internet of People |
| IoT | Internet of Things |
| ISM | International Safety Management (Code) |
| IT | Information Technology |
| LNG | Liquefied Natural Gas |
| LPG | Liquefied Petroleum Gas |

| | |
|----------------------|--|
| MARPOL | The International Convention for Prevention of Marine Pollution For Ships |
| MCDM | Multiple-Criteria Decision-Making |
| MET | Maritime Education and Training |
| MLC | Maritime Labour Convention |
| MTS | Maritime Training Centre |
| NW | North-western |
| OWS | Oily Water Separation |
| S.E.A.B.AN.T. | Shipping Employability AHP Based Anticipating Tool |
| ST.E.ME.T | Strategic Evaluation MET Tool |
| STC Group | The Shipping and Transport College Group |
| STCW | Standards of Training, Certification and Watchkeeping |
| STRA.D.L. | Strategy Direction Location |
| T.X.X | Task X.X |
| TMSA | Tanker Management Self-Assessment |
| TOPSIS | Technique for Order of Preference by Similarity to Ideal Solution |
| Trans.I.T. | Transfer International Tool |
| VET | Vocational Education and Training |
| WP | Work Package |

1. Introduction: the state of play in a changing setting

1.1.1 Employability, skills gap and needs in shipping: the SkillSea perspective

The ultimate goal of SkillSea is to provide a forward-looking strategy and a workable toolbox for future-proof skills of maritime professionals, facilitating labour mobility while also enhancing the attractiveness of the sector (cf. INSET 1.A). In this regard, WP3 deliverables integrate strategic aspects of the project with field results and relevant tools proposed. Following the strategy plan framework report D3.1, strategic directions and tools have been drafted on internationalised strategies and internationalisation tools for Maritime Education and Training (MET)¹ and on the strategic evaluation of MET².

The D3.3 report focuses on anticipating skills needs and measuring related gaps. This is done in the context of enhancing employability of maritime professionals, since securing and improving employability passes through the match of skills acquired to the skills to be required. Mechanisms and tools to anticipate these have been considered by the SkillSea Strategy Plan Framework as a substantial legacy of the project³.

INSET 1. A

“SkillSea will provide a concrete, sustainable solution for the qualitative and quantitative mismatch between demand for and supply of labour, will increase labour mobility within the sector (horizontal, vertical and geographical) and enhance attractiveness of the sector. SkillSea follows the approach of skills needs identification (current, medium term and long-term) design and delivery of VET, the development of strategy as well as stakeholder mobilisation and awareness raising as sustainable implementation.”

SkillSea project submission, p.3 of

¹ SkillSea (2020), *Internationalised strategies in MET (D3.4)*, June 2020.

² SkillSea (2020), *Measuring evaluation strategies in MET (D3.2)*, December 2020.

³ Cf. Chapter 4 of SkillSea (2020), *Strategy Plan Framework (D3.1)*, June 2020, section 4.5.2.

1.1.2 Employability as an evolving concept: anticipating needs and measuring gaps

Employability as a function of knowledge-related and person-related skills is a relative concept. As knowledge evolves, employability follows and can thus be conceived as an evolving concept as well. Along with evolving needs⁴, the nature of employment has also changed⁵ and the concept of “jobs for life” has been replaced by more transient and temporary work patterns⁶. The emergence of “boundaryless careers”, with the employee as an employer-independent identity⁷ changing employers, professions within a wider sector or even sectors altogether⁸, has altered the composition of key skills required.

Within an evolving concept of employability and career, the onus has shifted substantially to the need for individuals to constantly accumulate professional competences and acquire skills⁹ in a lifelong prospect¹⁰, aided by the possibilities of lifelong learning¹¹. In this context, and in more recent years, the term employability¹² has been used to imply increasingly “the individual’s employability skills and attributes”¹³. Skills emerge thus at the core of the employability concept and the gap between skills acquired and skills required becomes a focal point to address and – eventually – to redress in an era of rapid technological and regulatory developments such as those taking place in the maritime industry¹⁴.

With one of the ultimate goals of D3.3 being to anticipate skills needs in a dynamic perspective, gaps need to be monitored as they are created and at appropriate intervals. Intervals followed in the European Centre for the Development of Vocational Training (Cedefop) skills and jobs survey cannot be matched as the

⁴ Nilsson, S. & Ellström, P.E. (2012). Employability and talent management: challenges for HRD practices. *European Journal of Training and Development*, 36(1), 26-45. Available at https://www.researchgate.net/publication/242348477_Employability_and_talent_management_Challenges_for_HRD_practices, last accessed June 15, 2020.

⁵ Hillage, J. & Pollard, E. (1998). Employability: Developing a framework for policy analysis. Research report RR85. Department for Education and Employment. UK. Available at <https://vital.voced.edu.au/vital/access/services/Download/ngv:40352/SOURCE2?view=true>, last accessed June 15, 2020.

⁶ Nilsson & Ellström (2012), op.cit.; Hillage & Pollard (1998), op.cit.

⁷ Defillippi, R.J. & Arthur, M.B. (1994). The boundaryless career: a competency-based perspective. *Journal of Organizational Behavior*, 15(4), 307-324. Available at https://www.researchgate.net/publication/242506242_Boundaryless_contexts_and_careers_a_competency-based_perspective, last accessed June 15, 2020.

⁸ Forrier, A. & Sels, L. (2003). The concept employability: a complex mosaic. *Int. J. Human Resources Development and Management*, 3(2), 102-124. Available at https://www.researchgate.net/publication/228364905_The_concept_employability_A_complex_mosaic, last accessed June 15, 2020.

⁹ Defillippi & Arthur (1994), op.cit.

¹⁰ Dacre Pool, L. & Sewell, P.J. (2007). The key to employability: developing a practical model of graduate employability. *Education+Training*, 49(4), 277-289. Available at https://www.researchgate.net/publication/235260791_The_key_to_employability_Developing_a_practical_model_of_graduate_employability, last accessed June 15, 2020.

¹¹ Cf. Nilsson & Ellström (2012) op.cit. and Forrier, A. & Sels, L. (2003), op.cit. It must be noted that the role of lifelong learning has been upgraded in the process to an essential tool for providing skills in order to secure employability.

¹² With the too frequent use being criticised. Cf. McQuaid, R.W. & Lindsay, C.D. (2005). The concept of employability. *Urban Studies*, 42(2), 197-219. Available at http://eprints.whiterose.ac.uk/50721/1/concept_of_employability_final.pdf, last accessed February 2021.

¹³ Ibid.

¹⁴ Cf. SkillSea (2020), *Strategy Plan Framework. (D3.1)*, June 2020 and *Current skills needs (Reality & Mapping). (D1.1.2)* and *Future Skills and competence needs (Possible future developments). (D1.1.3)* and *Skills and Competence GAP between current and future needs (D1.2.1)* and *Identification of mismatches on a structural basis (D1.2.2)* and *Impact on occupational profiles (D1.2.3)*.

entire duration of the SkillSea project is 48 months. By the same token, anticipating skills through a purely *quantitative* (as in *econometric*) approach requires lengthy time-series unavailable at this stage of a pilot approach to shipping initiated by the sectoral blueprint¹⁵. Nevertheless, the monitoring of skills and gaps perceptions can prove valuable even in shorter intervals; this is especially so in the aftermath of the Covid-19 pandemic in the context of social distancing rules, and against the background of accelerating trends in new technology and automation¹⁶.

1.1.3 MET, SkillSea and employability: a definition and an alliance in perspective

In the SkillSea perspective¹⁷, a definition of the term employability as “the capacity to move self-sufficiently within the labour market to realise potential through sustainable employment”¹⁸ fits the project’s focus while emphasising the all-important and desired aspect of the sustainability of employment. However, in transitional times this sustainability depends on the following of trends and on emphasising skills which support adaptation and evolution of the skillset itself. Surveys and further investigation of employability and gaps related trends – and perceptions of the latter – have been used in this interim deliverable where appropriate to enable gaps to be measured, to relate these to employability and to devise the basic elements of a mechanism to assist the measurement of gaps highlighting skills needs for the future. This is the focus of the present deliverable, along with a tool to assist MET stakeholders to measure employability in a dynamic perspective.

The rest of the structure of this interim D3.3. report is Chapter 2 summarises the state of play in terms of future-proof skills to enhance employability in the context of change in the shipping scene globally¹⁹ including input from the analysis of the relevant SkillSea WP1 deliverables. The third chapter discusses the results of the pilot survey and of the industry and workforce focus groups conducted by the WP3 D3.3 team. The ensuing design and the results of the enhanced questionnaires of the European-wide survey among employers and employees are discussed in the fourth chapter, which includes the initial design of the Shipping Employability AHP Based Anticipating Tool (S.E.A.B.A.N.T.). The final fifth chapter summarises the proposed framework for anticipating skills needs and for formulating a future gaps measurement mechanism under the SkillSea project, and the relevant steps towards the final 3.3. report.

¹⁵ Cf. CEDEFOP (2017a). Skills anticipation: looking to future: skills anticipation can be a powerful policy tool for decision-making. European centre for the development of vocational training. Available at https://www.cedefop.europa.eu/files/9124_en.pdf, last accessed, April 3, 2021 and European Commission (2018). A Blueprint for Sectoral Cooperation on Skills (Wave II) – Maritime Shipping. Available at <https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=8092&type=2&furtherPubs=no>, last accessed, April 4, 2021.

¹⁶ Boston Consulting Group. Shipping industry (2021). Available at <https://www.bcg.com/en-gr/industries/transportation-travel-tourism/center-digital-transportation/shipping>, last accessed April 15, 2021.

¹⁷ For the variety of alternative meanings cf. Nilsson & Ellström (2012), op.cit.; Dacre Pool & Sewell (2007), op.cit.; McQuaid, R.W. & Lindsay, C.D. (2005), op.cit.; Forrier & Sels (2003), op.cit.; Harvey, L. (2001). Defining and measuring employability. *Quality in Higher Education*, 7(2), 97-109. Available at [https://www.qualityresearchinternational.com/Harvey%20papers/Harvey%202001%20Defining%20and%20measuring%20employability%20QHE7\(2\).pdf](https://www.qualityresearchinternational.com/Harvey%20papers/Harvey%202001%20Defining%20and%20measuring%20employability%20QHE7(2).pdf), last accessed June 15, 2020; Hillage & Pollard (1998), op.cit. See also for a synopsis of stages of development of employability McGrath, S. (2009). What is employability. *Learning to support employability project paper*, 1, 15.

¹⁸ Starting part of the definition in Hillage, J. & Pollard, E. (1998). *Employability: Developing a framework for policy analysis*. Research report RR85. Department for Education and Employment. UK, p.xi.

¹⁹ Cf. for a concise statement, Australian Industry Standards (2020). *Skills Forecast. (Maritime)*. Available at <https://www.australianindustrystandards.org.au/wp-content/uploads/2020/08/MAR-SF-FULL-2020.pdf>, last accessed April 11, 2021.

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2. Shipping sector trends & impact on measuring gaps: a dynamic anticipation of skills employability

2.1 Employability and shipping trends: paradigm shift or transition as usual?

As analysed in precursor SkillSea reports²⁰, the current shipping scene is characterised by new trends with a large degree of uncertainty²¹ and the coexistence of the hitherto dominant trends with the emerging ones. An example of this transitional state is the development of alternative fuels and engine-types²². Although there are strong candidates for a dominant alternative, it is not yet clear which will become central to the emerging paradigm and thus define it. The appearance by early 2021 of new commercial alternatives to LNG, such as ammonia²³, serves as a warning against forecasting or precluding winners. However, as new trends lead to new requirements for skills, the monitoring of gaps through an initial and subsequent assessments is of critical importance for maintaining employability (cf. Figure 2.1)

Although transitional periods²⁴ do pose additional difficulties in assessing which trends will prevail and which new skills will enhance employability, they do create the need to focus on:

- strategies for achieving a faster and flexible bridging of gaps and
- mechanisms for assessing the emergence of new requirements for maintaining employability and mobility of maritime professionals.

²⁰ Cf. SkillSea (2020). D1.1.3 *Future Skills ...*, op.cit, and SkillSea (2020). D1.2.1 *Skills and Competence...*, op.cit.

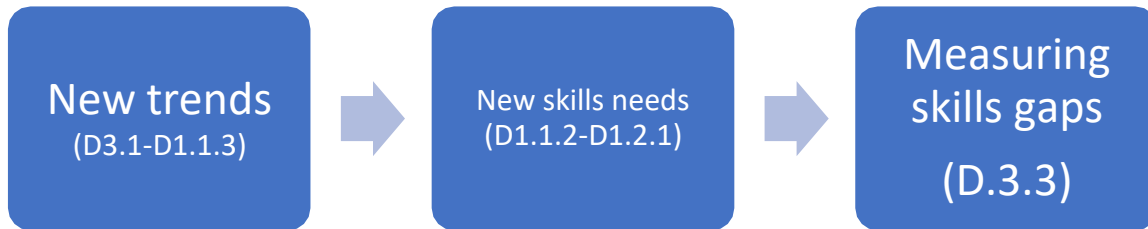
²¹ Cf. Boston Consulting Group. Shipping industry (2021), op.cit.

²² Dixon, G. (2021). Early adopter: Maersk to run first carbon-neutral ship by 2023 in methanol plan. Available at <https://www.tradewindsnews.com/technology/early-adopter-maersk-to-run-first-carbon-neutral-ship-by-2023-in-methanol-plan/2-1-964306> last accessed February 17, 2021.

²³ Maersk (2021). Maritime industry leaders to explore ammonia as marine fuel in Singapore. Press release. Available at <https://www.maersk.com/news/articles/2021/03/10/maritime-industry-leaders-to-explore-ammonia-as-marine-fuel-in-singapore>, last accessed April 8, 2021.

²⁴ For shipping this has been the case also of the early years of paradigm succession in the past. There have been two major paradigm shifts in the post-sail era: the one - marking the end of the era of sail ushered in through the introduction of steamships in the early 19th century – was accompanied by the use of coal and then of diesel engines and the use of oil as fuel. Neither of these major paradigm shifts was instant with different types of propulsion systems and alternative fuels persisting or emerging and later subsiding before the finally new dominant ones. For a quick overview cf. Thanopoulou, H., Theotokas, I., & Constantelou, A. (2010). Leading by Following: Innovation and the Postwar Strategies of Greek Shipowners. *International Journal of Maritime History*, 22(2), 199-225 mentioned in SkillSea (2020), *Strategy Plan Framework*. (D3.1), op.cit., Chapter 1.

FIGURE 2.1
MEASURING SKILLS GAPS FOR ENHANCING EMPLOYABILITY



In this respect, the current deliverable took into account the findings of WP1 – focused on current and future skills – in the form of deliverable reports (completed or at the stage of an advanced draft) and through an organised consultation and coordination joint workshop between WP1 and WP3 packages in early 2021.

2.1.1 WP1 findings on current and future skills and strategic directions: a summary

SkillSea deliverable report D3.1, Strategy Plan Framework²⁵ proceeded to a summary of skills and gaps related reports of the SkillSea deliverables D1.1.2 and D1.1.3 – which dealt with current and future needs – and of an earlier draft of D1.2.1, the deliverable more directly relevant to this D3.3. report as focusing on skills and competence gaps between current and future needs. In this first set, D1.1.2 highlighted among current skills:

- a. problem solving
- b. decision-making
- c. teamwork
- d. responsibility

The D1.1.3 report identified three major trends shaping skills: sustainability; digitalisation; and collaboration of clusters and highlighted transversal skills and softs skills – including leadership, people management, and teamwork – as essential for enabling seafarers to move into other positions more easily in shipping or related industries.

The next set of WP1 deliverables, D1.2.2. *Identification of mismatches on a structural basis* and D1.2.3 *Impact on occupational profiles* (cf. Figure 2.1) is equally relevant and precursor to this report, along with D1.1.2.1 which indicates that gaps assessed through differences in skills needs assessed through D1.1.2 and D1.1.3 are expected to grow. D1.2.1 identified seven areas of skill deficiencies.

²⁵ SkillSea (2020). *Strategy Plan Framework. (D3.1)*, op.cit., Chapter

- a. These areas include:
- b. Current shortage of maritime professionals
- c. Mobility issues
- d. Communication issues
- e. Core skillset for transition from sea to land
- f. Digital skills
- g. Transversal skills
- h. Green skills

D1.2.1 also proposes measures for bridging these gaps, which include higher standards of training and on-demand training. The D1.2.1 analysis suggests as the most important study areas for the shipping industry:

- a. maritime economics and operations
- b. shipping law
- c. ship technology

D1.2.1 also proposes coordinated actions by WP2, WP3, and WP5, on the gaps issue.

D1.2.2 compares the different levels and lengths of training programmes in Europe and makes recommendations for the development of the identified skills needs by MET institutions. The report also identifies present and future shortfalls in the skills required by the STCW Convention. The current need for skills is seen to be particularly higher than the STCW base requirements in terms of:

- a. computer literacy
- b. leadership
- c. maritime law
- d. teamwork

The same deliverable suggests that the future skills needed at highest competence level are markedly higher, since they involve digital, green, and transversal skills not currently included under STCW provisions. Moreover, the D1.2.2 report indicates that the needs for competences at the highest competence standard are growing at a much faster rate than the baseline. This is expected to widen the gap between present and future skills needs in the next 10 years. Finally, D1.2.2 focuses on differences between the implementation of STCW requirements and recommendations across different states, which has led shipping companies to set up their own training schemes and even academies. It has to be noted at this point that national implementation of STCW requirements will differ between countries as national educational systems differ and the STCW requirements have to be fitted into other national requirements.

D1.2.3 confirms the importance of digital, green, and management skills to perform at the highest competitive standard and outlines future occupational profiles and career paths. The report points out that transversal skills can encourage the transition from sea to land and that career paths from working at sea

to other occupations should be clear in order to attract young professionals and overcome key challenges of horizontal mobility, such as lack of recognition of maritime qualifications and insufficient formal training. The D1.2.3 report concludes that occupational profiles – although not expected to change significantly in the future – will become more specialised, requiring more transversal and horizontally wider skills from maritime professionals.

2.1.2 From assessment to feedback dynamics: the joint WP1-WP3 Workshop

The workshop between WP1 and WP3 took place, in virtual form due to Covid-19 restrictions, on 22 January 2021. The agenda included three items:

- a. Challenges in assessing current and future skills until now: validating the summary feedback transpiring from the current WP1 deliverables.
- b. Securing a seamless transition from the WP1 to the WP3 Gap deliverables to avoid overlapping.
- c. Explaining the gaps monitoring mechanism proposal underway to be completed by the time of the final D3.3. report at the end of the project.

In the context of the first agenda item, the WP3 team prepared a recap of the key findings of D1.2.1, D1.2.2 and D1.2.3 – essential as an input in the analysis of D3.3 – and a copy was shared with WP1 before the meeting. In the workshop, the moderator described the key points of that summary to WP1 participants and obtained confirmation that the summary of D1.2.2 seemed satisfactory, with the added remark that high level in the highest competence was identified as essential and worth promoting to the IMO. In terms of D1.2.3, it was suggested that innovation is referred to, as D1.2.2 makes it clear that there is a shortfall in innovation and entrepreneurship skills amongst seafarers. Also, it was agreed that suggestions for future actions of WP3 in D 1.2.1 were to be further discussed between the two packages.

In the discussion of the second agenda item, WP1 representatives elaborated on certain parts of D1.2.1, D1.2.2 and D1.2.3. The following takeaways arose from the questions and answers that followed:

WP1 pointed out that EU-wide standards of proficiency in language skills for people working in the maritime industry should be considered. The importance of checking the requirements of STCW in that regard was emphasised.

The issue of cross-cultural management will be analysed further as a number of other issues arising to be further elaborated in the final form of WP1 deliverables.

In the discussion of the third agenda item, the moderator described the key elements of the mechanism proposal as drafted for D3.3. The participants generally provided positive feedback, while points raised included the thematic areas of the future working groups and the need to handle the mechanism at a consortium level as the tool develops.

2.2 Building on findings: strategic challenges for measuring gaps

Section 2.2. reviews shipping-specific considerations for approaching issues such as gaps measurement for enhancing employability, on the basis of which the survey design was drafted as a first sectoral approach at an EU/EEA-wide level.

2.2.1 Employability, technology, sustainability, and gaps scenarios

Digitalisation and sustainability are two trends which require different types of skills. The variety of skills emerging as key in a new paradigm is not by itself a major impediment in skills updating or for upskilling in general. The main difficulties involving the anticipation and measurement of gaps arise from the co-existence of two major trends at a rather early stage – such as sustainability and digitalisation and especially, in the case of the latter, with Big Data and analytics coming into play recently. As a result, there can be only a vague estimate of a timeline of their course towards maturity and for the impact of gaps on employability. Estimates can be based only on best practices from other sectors. Most of the latter, however, have few similarities with shipping. This lack of similarity does not exempt industries linked to shipping, or other transport industries – with the aviation industry being one example where skills required also include crew responses to external natural challenges. Offshore oil and gas platforms are one of the very few activities which share the remote connection from an open sea location with shore management. Still, distance from operational HQs, long duration of continuous service and irregular access to shore facilities are three characteristics which are unique for most of the maritime professionals involved in the carriage of international trade, which constitutes about 95% of global tonnage.

Estimating the time horizon of challenges which put pressure on existing skills, creating gaps, is therefore even more important for designing remedial action. Such action could be through an educational solution based on an advanced toolbox package, such as the one proposed by WP2²⁶ while modern delivery methods could play a central role in upskilling or reskilling educational packages. However, the level of uncertainty is currently high and not all predictions about digitalisation, for instance, seem currently to have come through – as noted by industry and maritime media²⁷. In light of this, a mechanism to monitor gaps has to take into account the baseline status quo, be this a fast-changing one, and allow for scenarios of the speed of new technology applications and of introduction of further aspects of sustainability.

2.2.2 Assessing shipping employability in the light of skill types and current change

There are different levels of sector-specific skills required for serving at sea; SkillSea focuses on active maritime professionals with sectoral (technical) qualifications, which – although of great diversity among EEA member countries, as of their EQF equivalent – can be assimilated as starting from EQF level 4 upwards²⁸. While traditionally there has been mobility from onboard to onshore professions, there have been no educational packages which can enhance skills relevant to ship and shore while strengthening the

²⁶ Cf. SkillSea submission and <https://www.skillsea.eu/index.php/about/work-packages-overall-structure/work-package-2-future-proof-education-and-training-in-brief>.

²⁷ Cf. Lloyd's List (2021). Digitalization and data. Available at https://lloydslist.maritimeintelligence.informa.com/Special-report-Digitalisation-and-Data?utm_source=UNCTAD+Transport+and+Trade+Facilitation+Newsletter&utm_campaign=94e873b630-EMAIL_CAMPAIGN_2017_09_18_COPY_01&utm_medium=email&utm_term=0_f6141a63dd-94e873b630-53687417, last accessed March 18, 2021. The 2021 version of the SkillSea (2020), D3.2 *Measuring evaluation strategies in MET* report cited previously discusses more extensive scenarios related to the most notable trends.

²⁸ Cf. Annex 6 for reference to the EQF framework.

mobility of maritime professionals across the industry. Nevertheless, both types of employment within the industry include skill-intensive jobs requiring higher degree of key competences including (as corroborated by WP1 findings):

- foundation skills – such as literacy, numeracy, ICT
- technical – or sectoral – skills
- transversal or soft skills – such as communication, problem-solving, planning, teamwork

An additional element to be taken into account when measuring gaps in sectoral skills is that minimum requirements for sectoral skills onboard are covered internationally by the provisions of the model STCW/IMO courses. The particular regime in shipping under which technical competences are implemented and certified at national level by flag state authorities is one which could be deemed to introduce a benchmarking problem for gaps measurement and monitoring, as competences can still differ between seafarers depending on their national MET education.

In this context of duality, the approach of both the 2019 pilot survey and of the full 2021 survey conducted in the context of the present report remained as uncomplicated as possible to aid the highest collection of potential. The D3.3 mission – at an exploratory level in 2019 and at a full scale in 2021 – sought to solicit employers' and employees' perceptions on a number of skill gaps and employability-related issues and to obtain a baseline estimate of seagoing maritime professionals who think that their skills are ranked lower or are barely matched to the level needed to do their job. The exercise had to take into account the specific traits of maritime employment but also to strive not to deviate greatly from the Cedefop's European skills and jobs survey²⁹ approach, while also considering skills which have been found essential for shipping company employability³⁰. This is essential in a mobility perspective across the sector in a sea to shore perspective, as current trends towards increasing automation and economies of scale may induce one more wave of lowering crew requirements, while internationally training is sought for various reasons including upskilling and reskilling³¹. The caveat of retraining³² difficulties remain in this context even more of a challenge due to the variety and number of sectoral competences required.

²⁹ For more on the 2014 and the 2021 surveys cf. <https://www.cedefop.europa.eu/en/events-and-projects/projects/european-skills-and-jobs-survey-esjs>

³⁰ Cf. Chen, P. S. L., Cahoon, S., Pateman, H., Bhaskar, P., Wang, G., & Parsons, J. (2018). Employability skills of maritime business graduates: industry perspectives. *WMU Journal of Maritime Affairs*, 17(2), 267-292 and Han, T. & Li, T. (2015). Applying the Rasch model to construct the shipping industry employability indicators. *Journal of Marine Science and Technology*, 23(5), 741-747. Related skills mentioned in detail comprise: computer literacy; document processing ability; accuracy, morality and emotional management; English proficiency of shipping terms-English language; active working attitude and positive group interaction; analytical thinking; learning of job-related industrial environment and development; innovative capability/creative thinking & intuition and forecasting; international commercial manners and literacy; knowledge of international trading documents & import and export procedures.

³¹ Australian Industry Standards (2020). *Skills Forecast. (Maritime)*. Available at <https://www.australianindustrystandards.org.au/wp-content/uploads/2020/08/MAR-SF-FULL-2020.pdf>, last accessed April 11, 2021.

³² Cf. CEDEFOP (2019). Skillset AND match. Issue 16. Available at https://www.Cedefop.europa.eu/files/9138_en.pdf, last accessed February 23, 2021. (Interview of M.Handel by R.Voudouri).

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3. Validating gaps' size: industry and workforce views

3.1 Survey ID of the 2019 pilot survey on skills mismatches (perceptions)

The pilot survey presented and analysed in this chapter was addressed to seafarers in order to identify the skills that arise from the trends and drivers of the shipping industry's expectations. This guiding exploratory survey was conducted from 14/03/2019 to 22/04/2019, with a total of 419 responses received. The latter were anonymous and emanated from a multinational contingent of seafarers among the crews of two very large shipping companies owned by EU-based interests (cf. Annex 2B)³³. A parallel survey addressed to employers yielded too few answers to be exploitable statistically but proved valuable in informing the D3.3 team of the measure of difficulties to secure a substantial number of responses on the employers' side, where the population targeted is much smaller than that of employees. The full survey questionnaire is appended in Annex 2A.

For the 2019 survey, it should be noted that for simplification purposes, the notation used in the analysis to distinguish results by region of respondents is "EEA" and "Others" – a notation, which is nevertheless also factually correct, as EEA includes all EU countries. The input from this survey, especially from responses to the employees' questionnaire which explored general perceptions of gaps and potential correlations of these with perceived gaps in MET-related aspects, also proved valuable for the preparation of the EU/EEA-wide survey which followed in early 2021.

3.2 Findings of the 2019 pilot survey on skills mismatches

The first question of the survey sought to explore the respondents' perspective on the effectiveness of METs in cultivating desired skills. Responses suggest that the majority do feel they are indeed qualified – or over-qualified – for the jobs they pursue, with 48.2% stating that their skills match the job requirements and another 13.6% stating that their skills exceed requirements (cf. Figure 3.1A). However, it should be noted that more than one-third (38.2%) of respondents stated that they fall short of the expected skills.

It is also worth noting that the percentage of EEA seafarers who feel that their skillset is below their job requirements is much higher than that of non-EEA respondents (48.6% versus 32.6%), suggesting a markedly stronger perception of skills gaps among the former group (cf. Figure 3.1B).

³³ The 2019 pilot survey link to the employees' questionnaire was distributed through two large European-owned shipping companies owning and managing (by order of combined importance of fleets managed), tanker, dry bulk, container, and LNG/LPG tonnage. Responses were not equally split between respondents from each company. With respondents' ages starting at 21, the age group with the largest number of participants was the 28 – 35, with 33.4% of respondents, followed by the 43 – 48 age group with 18.4% and the 36 – 42 with 16.7%. On that basis and on the basis of post held most had possibly several years of experience on board. For more survey demographics cf. Annex 2B.

FIGURE 3.1A

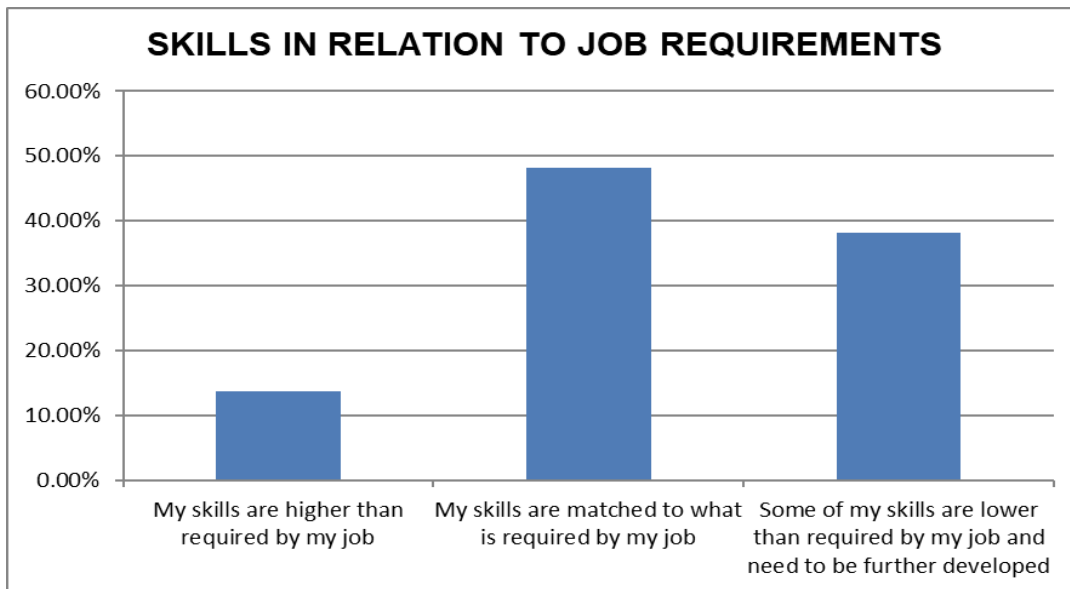
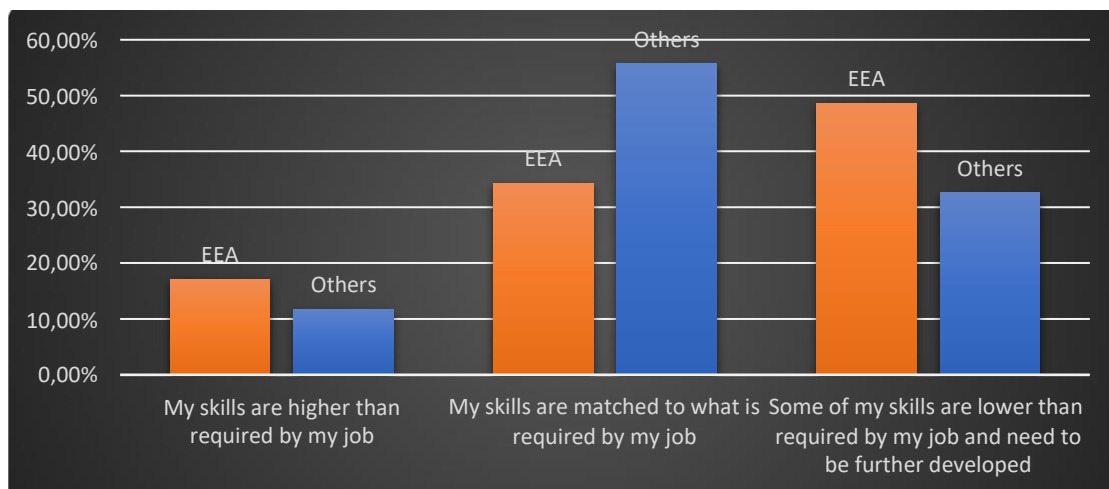


FIGURE 3.1B

FIGURE 3.1A BY AREA 2019 (EEA-OTHERS)



The next question aimed to quantify the perception of the level of skills that maritime professionals possess by their own judgement. Figure 3.2A illustrates that over 70% of respondents give their skills a rating of 80 out of 100 and above. Thus, it appears that a significant percentage of graduates feel confident with their skillset. There seems to be some discrepancy at this point as in responding to Question 1 only 61.8%

reported that their skills are either matched with or higher than their job requirements. It could be argued that the differences are caused either by differences in perception among respondents of what exactly each rating represents, or that gaps of the order of 15-20% in the match of skills with job requirements are considered significant. In terms of regional breakdown, however, 24.9% of respondents outside EEA and 27.4.6% of EEA respondents give a rating below 80 – with the difference indicating a partial alignment with the findings of Question 1, according to which EEA seafarers are more concerned with the lack of necessary skills.

FIGURE 3.2A

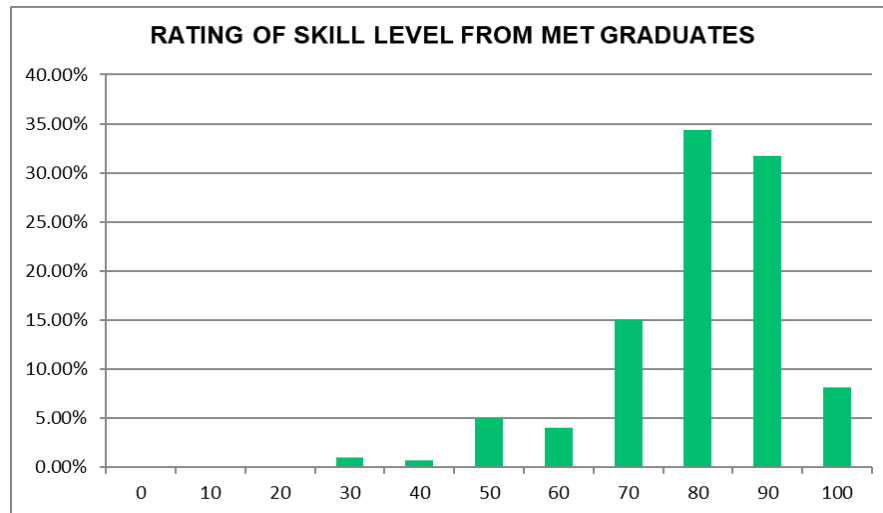
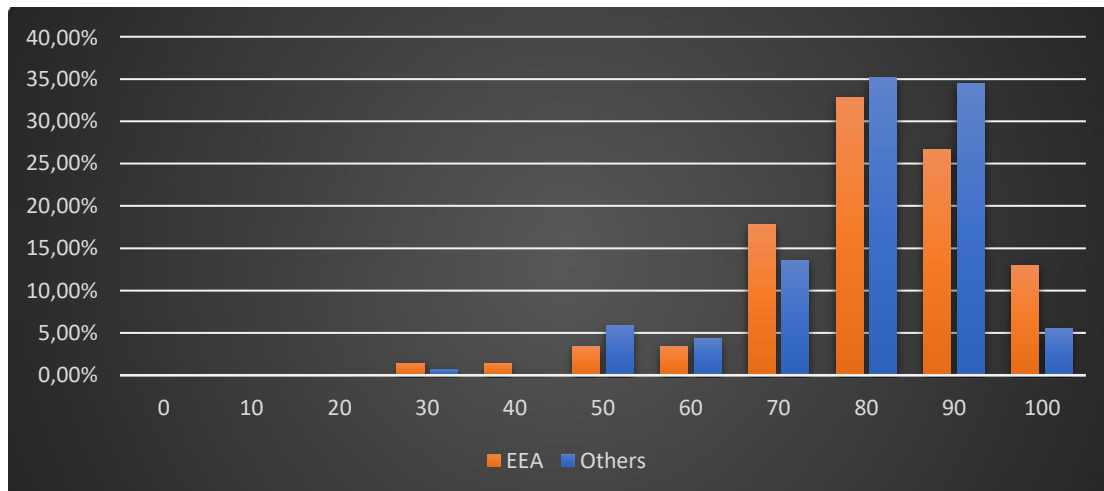


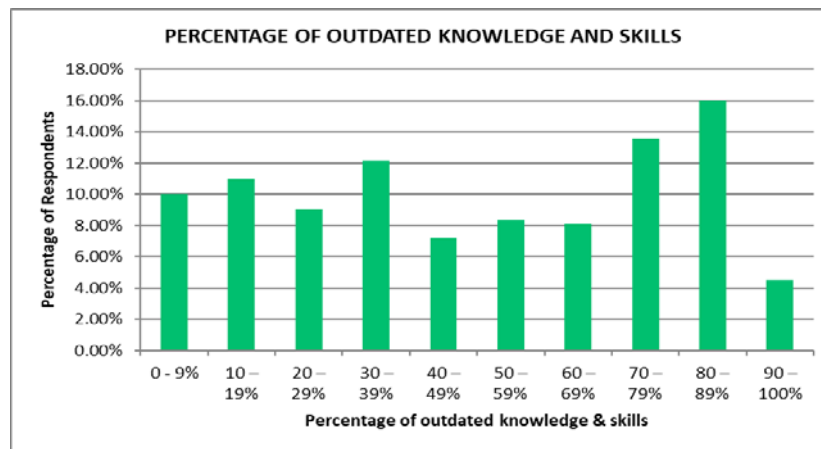
FIGURE 3.2B

FIGURE 3.2A BY AREA 2019 (EEA-OTHERS)



However, responses to Question 1 were corroborated by responses to Question 3 investigating the extent to which skills and knowledge of seafarers have become obsolete, according to their own perception. Figure 3.3A shows that there are diverse opinions on that. However, a striking 51.6% of respondents indicate that more than half of their skills and knowledge – acquired as a rule mostly through MET and complemented by eventual further training – is outdated. This may suggest that for the majority of employees surveyed syllabi and teaching resources may not be in sync with recent trends in the maritime industry; this is along the lines of what has been identified already in SkillSea WP1 reports. Interestingly, while the skills gap was more evident in EEA responses (cf. Figure 3.1A), the percentage of respondents outside EEA reporting that more than 70% of their skills and knowledge were outdated was much higher than that of EEA respondents, 45.4% versus 13.0% (cf. Figure 3.1B)³⁴.

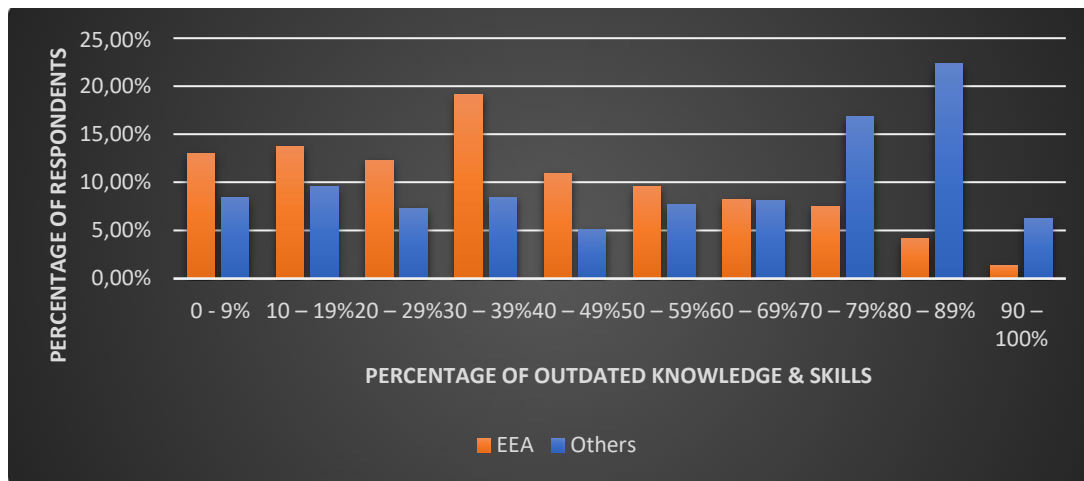
FIGURE 3.3A



³⁴ In a further statistical exploration perspective, it is anticipated that in the final D3.3 (in M48 of the project) a model including the influence of sample occupational demographic data will be also elaborated.

FIGURE 3.3B

FIGURE 3.3A BY AREA 2019 (EEA-OTHERS)



Question 4 focuses on the anticipation by respondents of their skills obsolescence – an aspect directly related to the speed of the creation of gaps. The current dynamic nature of the shipping industry is implicitly recognised by more than 30% of the respondents, who find it moderately likely or very likely that several of their skills will be outdated in the next five years. This finding underlines the need to devise appropriate material and delivery to enable skills to be aligned with new and emerging needs. Figure 3.4B indicates a regional match in the assessment of a rather high probability but non-EEA respondents seem slightly more concerned that there is a very high likelihood that several of their skills might become outdated in the next five years, with 8.4% finding the scenario very likely (against 4.1% of EEA respondents), with only 4.4% (compared with 8.2% of EEA respondents) finding the scenario very unlikely.

FIGURE 3.4A

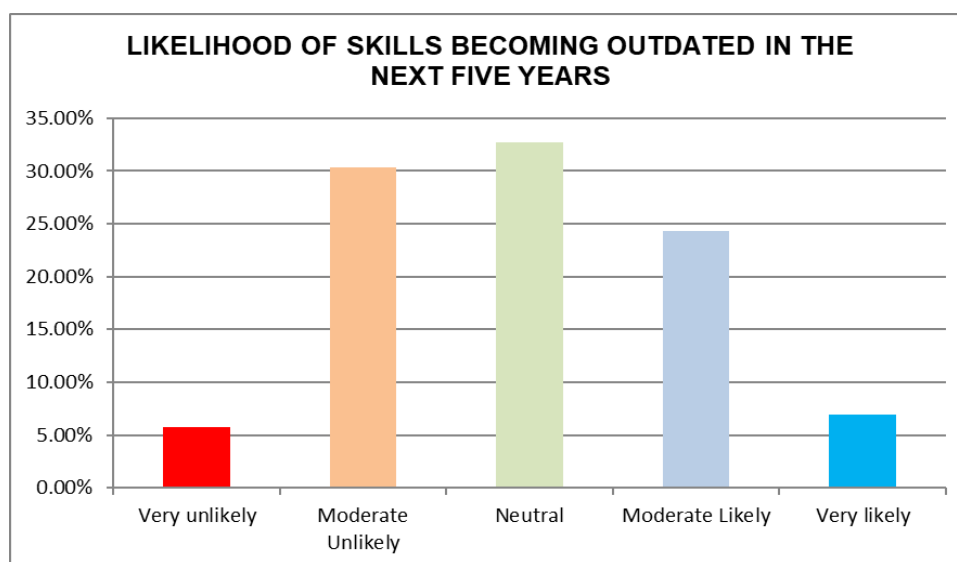
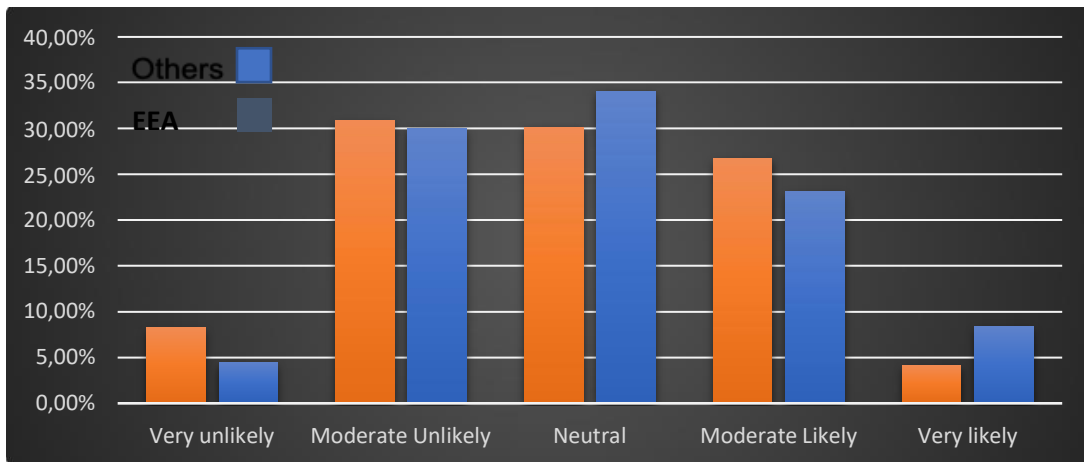


FIGURE 3.4B

FIGURE 3.4A BY AREA 2019 (EEA-OTHERS)



One of the key findings of WP1 of SkillSea is that technological changes have a transformative impact on the required skills of seafarers. In that context, Question 5 explores the perception of the need for further training to keep up with technological progress. Among survey participants 83.5% agree or strongly agree that further training is needed, suggesting a requirement for more comprehensive and focused training programmes that will upgrade their skills. EEA and non-EEA survey responses are in general rather aligned, with small but not one-directional discrepancies (cf. Figure 3.5B).

FIGURE 3.5A

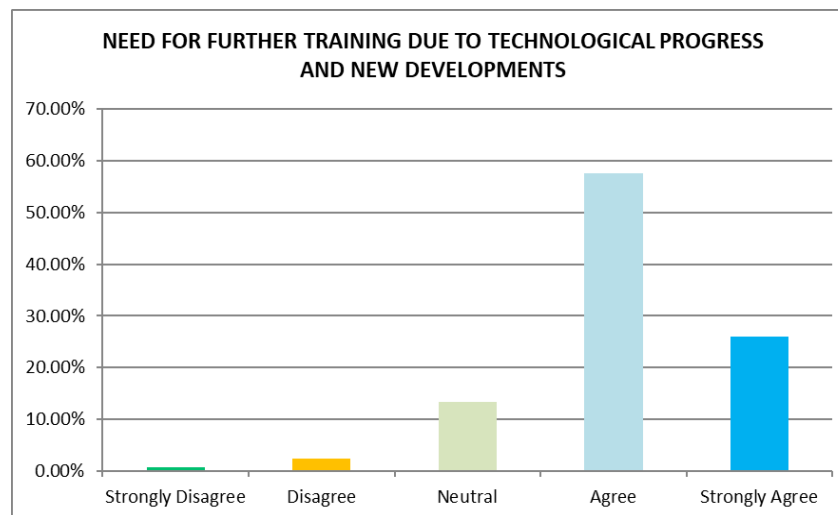


FIGURE 3.5B

FIGURE 3.5A BY AREA 2019 (EEA-OTHERS)

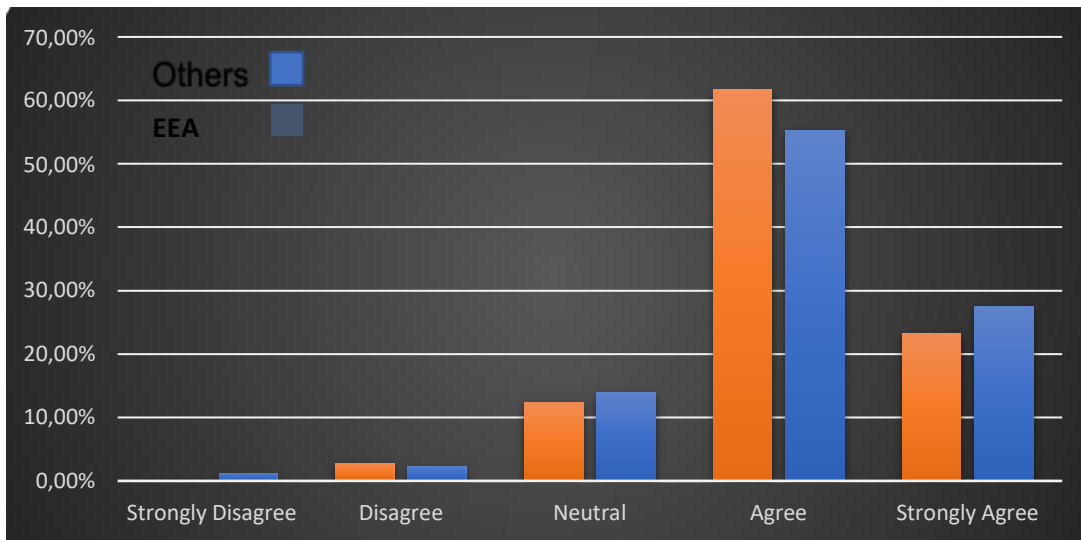


Figure 3.6A confirms the connection between skills and job performance. In the case of the sixth question of the survey, 84.0% of respondents agree or strongly agree that the possession of additional skills would significantly enhance their performance. Overall, this demonstrates the strong perception of the importance of skills development. The percentage of non-EEA responses agreeing or strongly agreeing that additional knowledge and skills would improve performance (88.3%) is significantly higher than the respective percentage among EEA respondents (76.0%) with, notably, 37.4% of non-EEA respondents (versus 17.1% of EEA) strongly agreeing (cf. Figure 3.6B).

FIGURE 3.6A

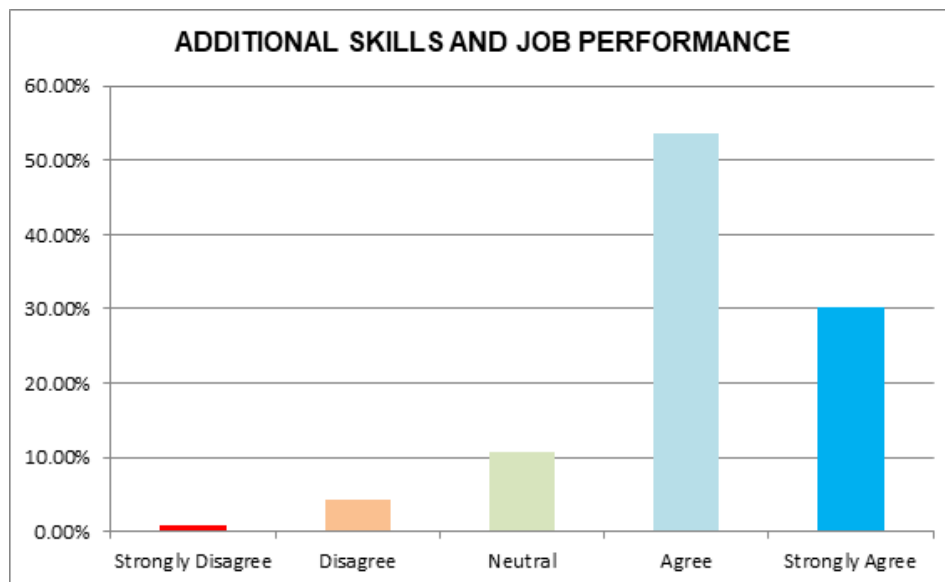
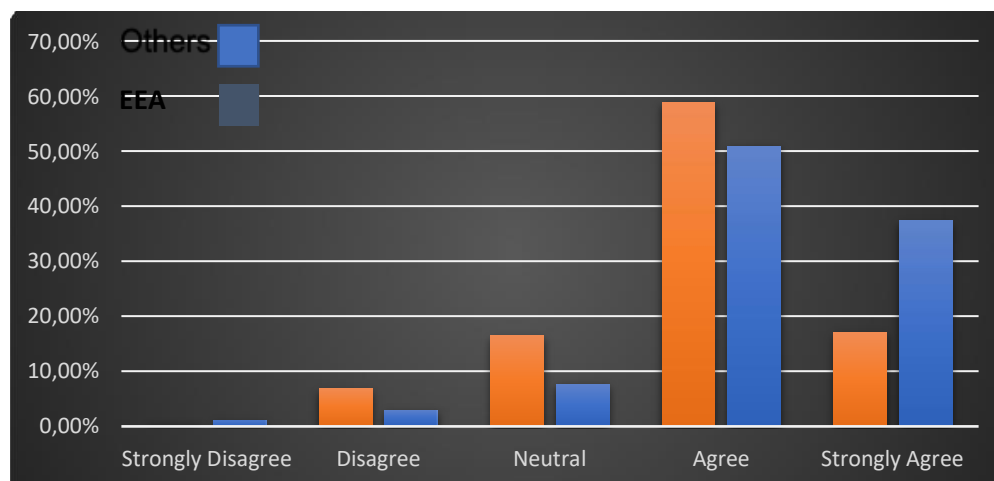


FIGURE 3.6B

FIGURE 3.6A BY AREA 2019 (EEA-OTHERS)



Question 7 aimed to classify skills in order of importance based on the perceptions of maritime professionals. Figure 3.7A presents the evaluation of skills by respondents on a 1–5 scale, with “1” corresponding to the most important skill and “5” to the least important. According to the survey findings, the most essential skills are leadership and management, with an average score of 1.76. Second in order of importance are automation skills, with an average score of 2.03. Based on average scores, the third most important category is transdisciplinary skills, with an average score of 2.13. This reflects the realisation that shipping is part of complex supply chains, requiring the ability to understand the dynamics of other sectors which are directly or indirectly related to shipping. It might also reflect the desire of seafarers to gain knowledge and understanding of other sectors with the aim to improving their employability. The two remaining skill categories – green shipping (average score: 2.27) and data analytics and cyber-security skills (average score: 2.53) – may have received a lower average ranking, but this does not understate their importance. They are also perceived as quite significant by respondents, reflecting the fact that maritime professionals are anticipating (though perhaps not fully) the impact of the two megatrends in the shipping industry – sustainability and digitalisation, as revealed by WP1 reports (cf. Chapter 2). The responses of EEA and non-EEA survey participants are aligned as they both rank leadership and management, automation, and transdisciplinary skills as the three most essential skills in the same order of importance, despite minor differences in average scores assigned by EEA respondents and non-EEA respondents across all skills of the survey (cf. Figure 3.7B).

FIGURE 3.7A

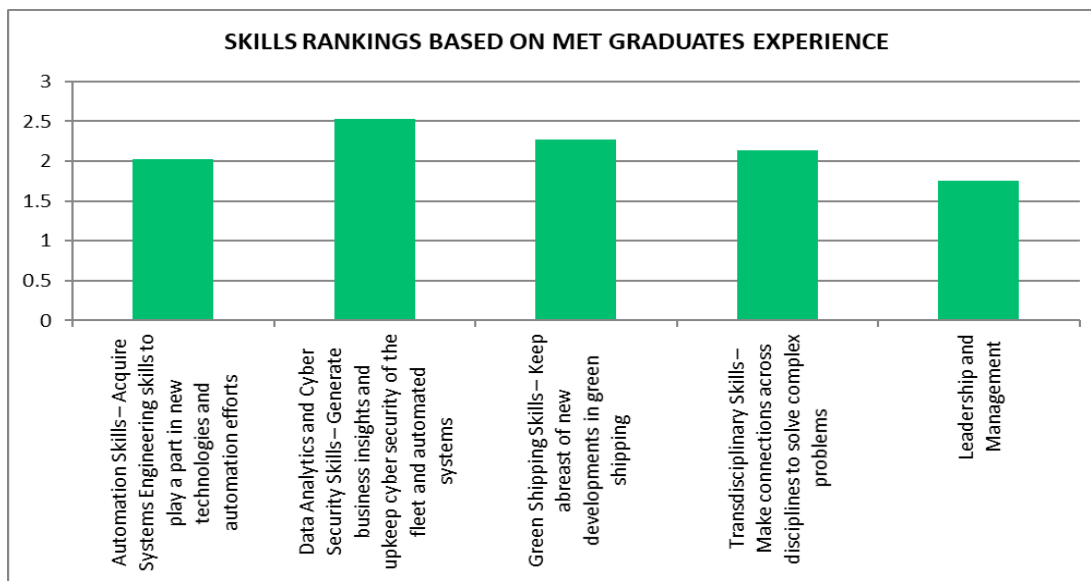


FIGURE 3.7B

FIGURE 7A BY AREA (EEA-OTHERS)



Figure 3.8A reveals that MET material is not deemed fully pertinent for the new era of shipping as 44.9% of respondents agree or strongly agree that there is a significant mismatch, and another 31.0% are neutral, with percentages pointing to one main reason for gaps in the full set of necessary skills. EEA responses indicate the existence of a mismatch more powerfully – with 57.5% agreeing or strongly agreeing – than non-EEA responses, with the respective percentage of 38.1% being substantially lower (cf. Figure 3.8B).

FIGURE 3.8A

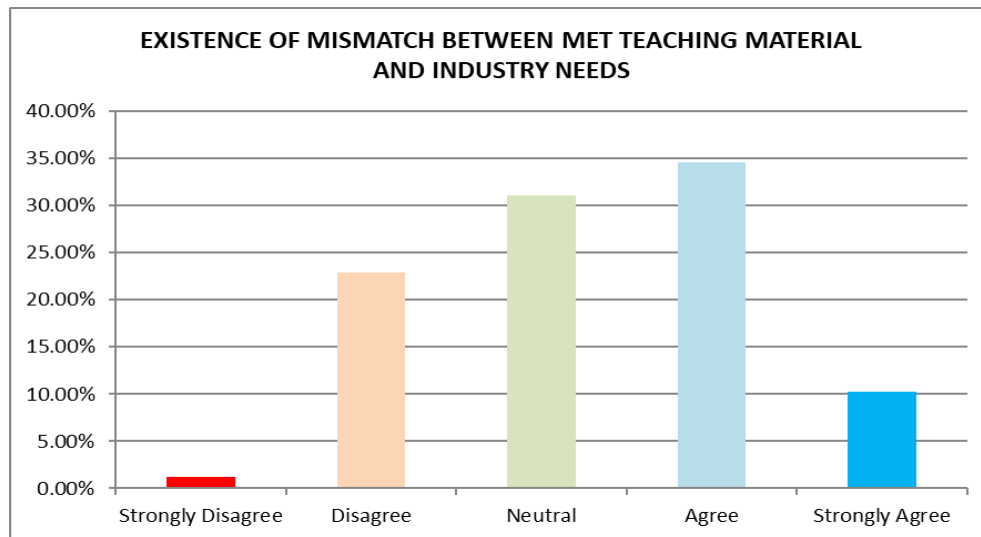
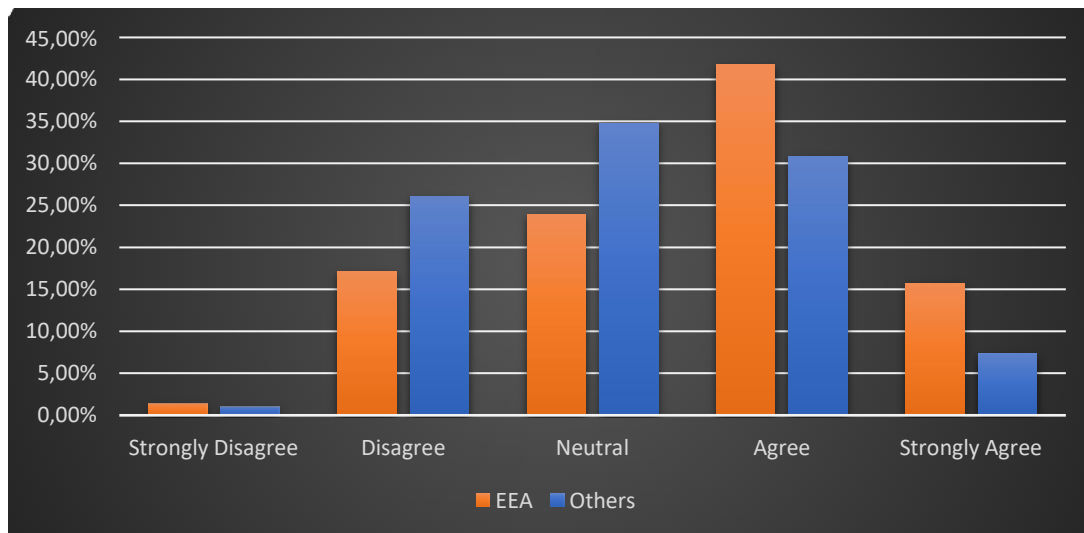


FIGURE 3.8B

FIGURE 8A BY AREA 2019 (EEA-OTHERS)



Question 9 solicited the view of participating seafarers on new skills acquisition, with 62.8% of respondents considering on the job training as the most appropriate method for building new skills, while 26.7% opted for mentorship. Surprisingly, only 7.4% believe that online training courses can help them develop the necessary skills. Differences of perception do not vary significantly among EEA responses and others (cf. Figure 3.9A, Figure 3.9B).

FIGURE 3.9A

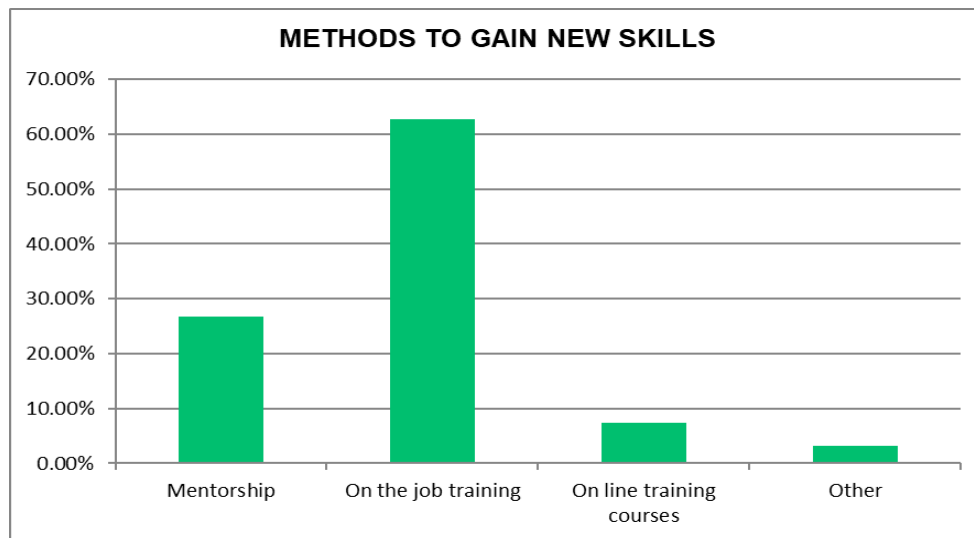
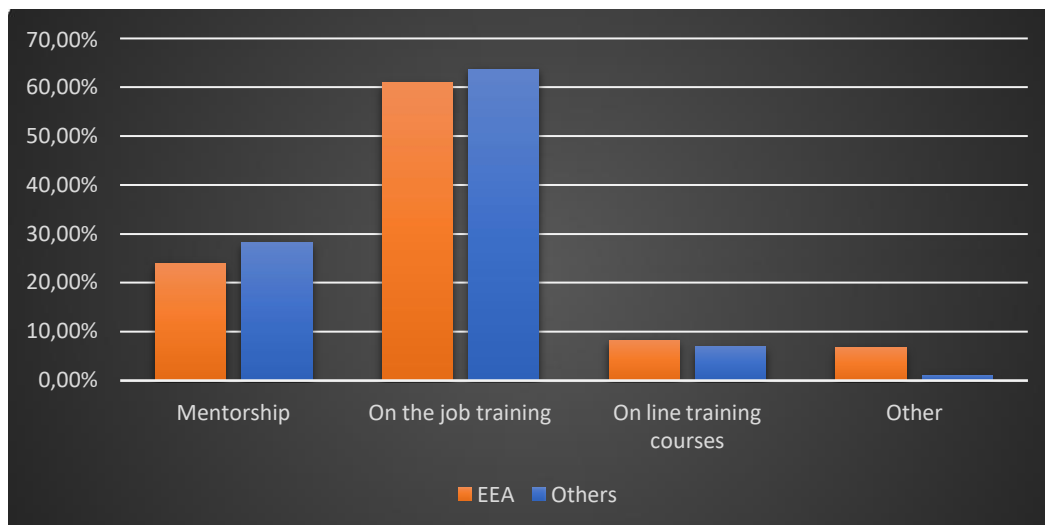


FIGURE 3.9B

FIGURE 9A BY AREA 2019 (EEA-OTHERS)



The most realistic way of building an up-to-date skillset on an ongoing basis is through investment in lifelong learning (UNESCO, 1996, p.100; European Commission Study Group, 1997, pp.107, 108; Ates & Alsai, 2012). Figure 3.10A suggests that the vast majority of seagoing maritime professionals participating in this exploratory pilot study endorse this educational approach, as 53.2% agree and 36.5% strongly agree with lifelong learning. No significant regional variations are indicated in Figure 3.10B, as the sums for the last two columns (agreeing and strongly agreeing) are closely aligned.

FIGURE 3.10A

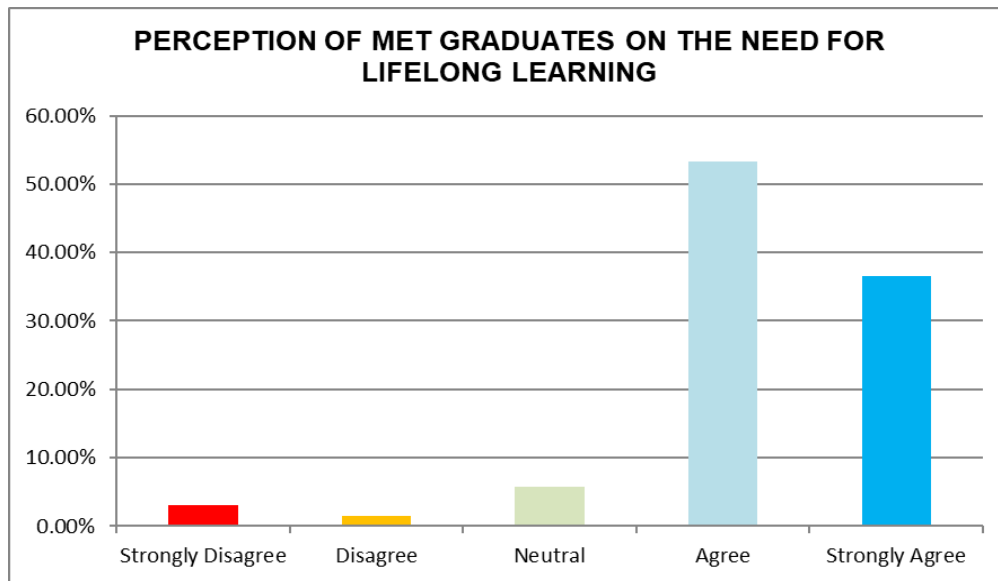
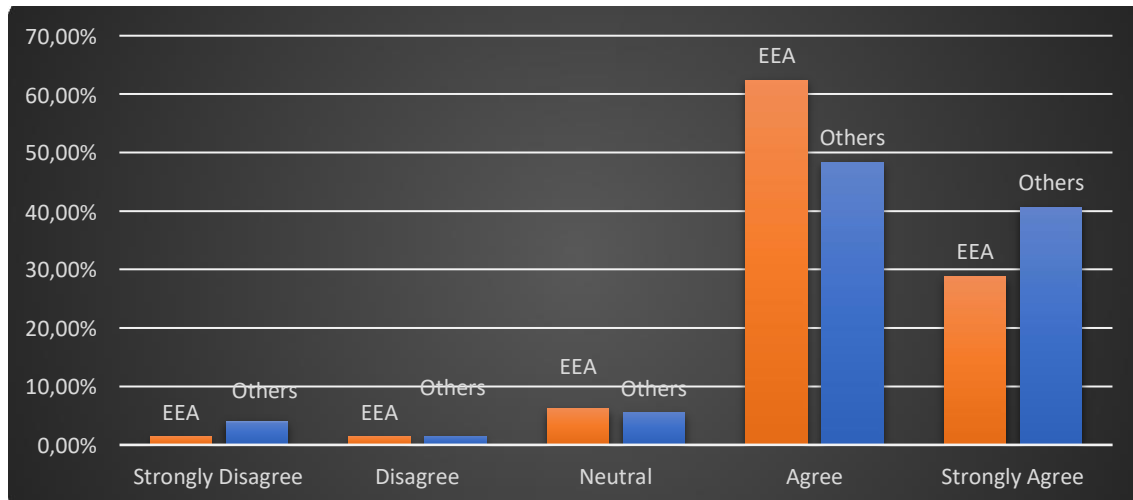


FIGURE 3.10B

FIGURE 10A BY AREA 2019 (EEA-OTHERS)



3.3 Conclusions from the 2019 pilot survey on skills mismatches

- While the majority of maritime professionals responding to the pilot survey stated that when they graduated they were sufficiently qualified or even over-qualified for their jobs, a significant percentage felt under-skilled, and three out of 10 respondents are worried that their current skills will become outdated in the next five years.
- More than half of the respondents indicate that over 50% of the skills and knowledge is outdated. This calls into question more than just the taught material or the teaching resources, although a large percentage of respondents share the view that the taught material is not fully pertinent for the new era of shipping. New courses and new learning outcomes could bring MET curricula into alignment with what the industry requires. However, this may also suggest that following an upskilling path through lifelong learning is the way forward.
- Most of the respondents confirm the tight connection between skills and job performance, stating that additional skills would make them more accomplished.
- According to respondents, the most essential skills in order of importance are those in leadership and management, automation, transdisciplinary skills, green shipping, and data analytics and cyber-security. This ranking is based on average scores.
- The majority of survey participants agree or strongly agree that further training is needed for skills acquisition. However, six out of 10 give precedence to “on the job” training over mentorship and online courses. This could be attributed to the current image of maritime education, which could potentially change through a comprehensive educational strategy at a European level. Increased access to high-speed internet facilities onboard could assist in the acquisition of skills.
- Lifelong learning is an appropriate method to address skills gaps and keep seafarers abreast of new developments in the maritime industry. The vast majority of respondents are recorded as receptive to this educational approach. However, it should be noted that online provision was ranked low in this exploratory survey.

3.4 Industry and workforce validation of assessed gaps: focus group organisation

Within the framework of WP3, a combined team from two WP3 partners³⁵ conducted three focus-groups seeking to obtain the opinions and views of participants in a structured and useful way for the needs of the project, as well as for policy support.

The use of focus groups in problems and research questions of social sciences is discussed thoroughly in the literature (Wilkinson, 1998). From a methodological point of view, focus groups, as a group interview involving a small number of demographically similar people, provide a solid basis for the analysis of reactions and of the provided feedback. Moreover, focus groups can be combined with quantitative methodological approaches³⁶ circumventing the inherent limitations of qualitative methodological patterns, hence enabling researchers to address controversial problems or issues with conflicting goals (Nyumba,

³⁵ Eugenides Foundation (EF) and Hamburg School of Business Administration (HSBA).

³⁶ Cf. Tobias O., N., Kerrie, W., Christina J., D., & Nibedita, M. (2018). The use of focus group discussion methodology: Insights from two decades of application in conservation. *Methods in Ecology and Evolution*, 9, 20-32.

Wilson, Derrick, & Mukherjee, 2018). In the context of the current interim report, the team used focus groups as a solely qualitative methodological tool.

The goal of the late 2020 focus groups was to evaluate the future-proof MET provision strategic directions from the vantage point of employability of the maritime professionals they educate.

Three distinct focus groups were held, with the initial division in regional groups intended to facilitate logistics, but all sessions were conducted online due to Covid-19 restrictions across many European countries at the time these were convened:

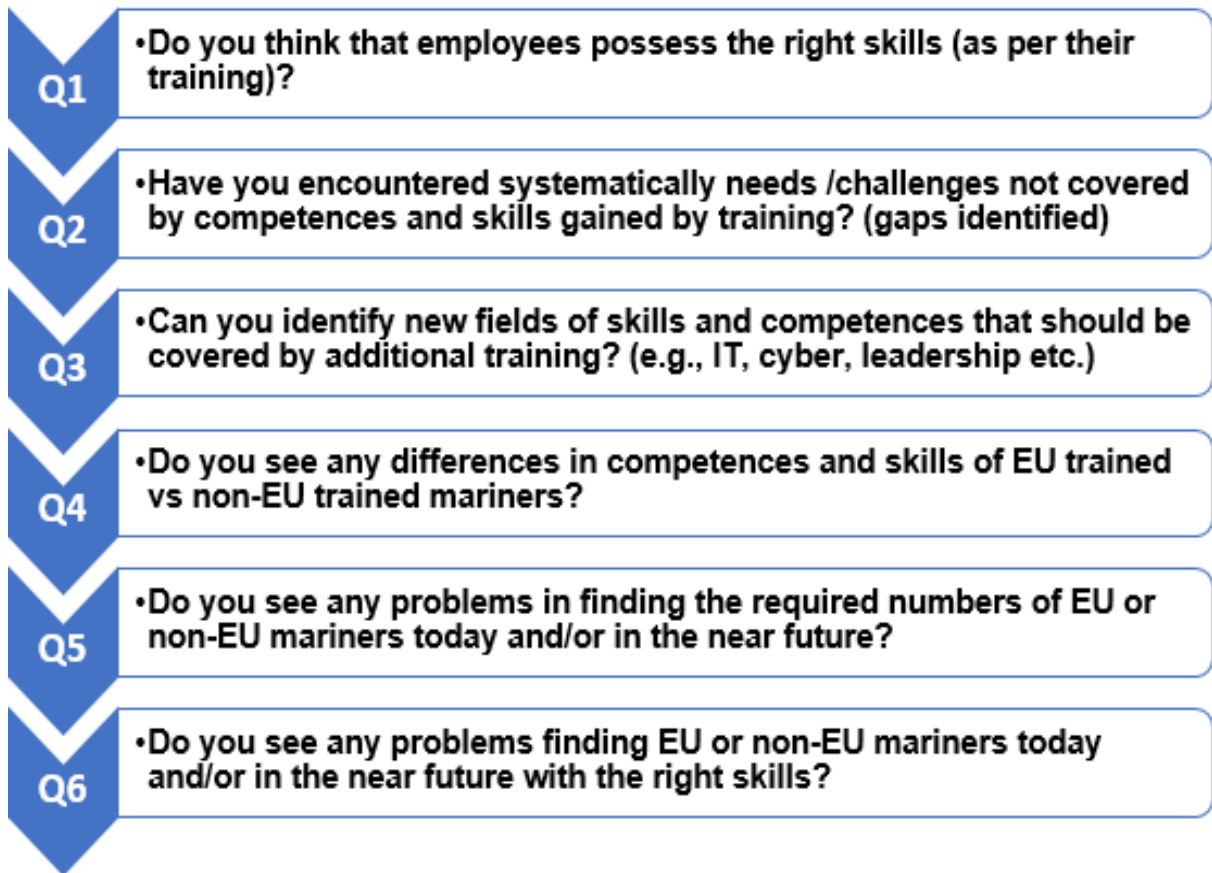
1. The employers' discussion on 12 November 2020
2. The employees' discussion on 13 November 2020
3. A combined employers' and employees' discussion on 16 November 2020

Participants in the three focus groups were from a total of 11 EU-EEA countries (cf. Annex 4A), all of them having received invitations circulated through the channels of the two stakeholder associations within SkillSea (ECSA, ETF) which had been drafted by the WP3 HSBA-EF team and practically all were senior/expert members of either maritime companies or associations of employers and employees. Discussions were moderated by HSBA and EF moderators; in all discussions, representatives of the social partners, ETF and ECSA, were invited to – and did – participate.

Focus group discussions were recorded for further use by the SkillSea research teams, with the consent of participants, who were informed accordingly on this as well as that the files will be available only as far as required for verification purposes by the funding authority or to SkillSea relevant WP leaders for further research. It should be noted that for the purpose of any such communication sensitive information or anything that could spark controversies over regional, national, and other interests, is blanked out. Therefore, the terms, “my organisation”, “our country”, “our business cluster”, etc, replaced national identities or affiliations. None of the analyses in the sections which follow is a verbatim reproduction of the recordings (a verbatim reproduction is available to the ERASMUS funding Agency for verification purposes upon request). Section 3.3.4. presents the focus groups' findings in a summary form. The three focus groups – North-western and Eastern Europe employers, North-western and Eastern Europe employees and the combined employee-employer Southern Europe Group – received the same set of six questions listed in Figure 3.11.

FIGURE 3.11

QUESTIONS TO FOCUS GROUPS



3.4.1 The perspective of the employers: NW and Eastern Europe focus group analysis

The first discussion with (North-western and Eastern Europe, employers) resulted in the following points of interest:

1. The instrument of STCW is still fitting its original purpose. It is a basic, yet sufficient instrument.
2. Education in general – although not specifically MET – is the key for mobility, as it enhances employability. Generally, the better an employee is educated, the more flexible she/he can be in the labour market.
3. New technological skills are identified, in particular:
 - a. competency and skills in understanding the operation and security of digital systems

- b. skills related to autonomous shipping³⁷
- 4. Along with the technological skills, the need to enhance soft skills was also highlighted. These skills relate to:
 - a. Safety culture
 - b. Awareness of environmental issues

Both areas fall under sustainability, which emerges thus as a focus for MET strategic directions (cf. SkillSea D3.2³⁸).

- 5. The potential and expected growth of the Blue Economy has already attracted the interest of employers and of the maritime industry, especially in some countries³⁹. This implies an increased need for employees with an engineering background and also strengthens mobility among sectors and segments.

3.4.2 The employees' perspective: NW and Eastern Europe focus group analysis

The discussion within the North-western and Eastern Europe employees' focus group is summarised as follows:

- 1. Shore-based training of future mariners is generally sufficient, nevertheless cadets do not enjoy the same opportunities or the same level of training onboard the ship. Apparently, and as anticipated, diverse management cultures, operational needs and trades culminate in diverse levels of training quality onboard. This is an issue and a solid mentoring process or function, or culture was suggested, aiming at alleviating any gaps in training to ensure the acquisition of the right skills and safety culture by all cadets.
- 2. Additionally, the issue of providing training - ashore and onboard – for ratings (not officers) among crew members was also noted.
- 3. In combination with point 1 above, the role of employers in the quality of MET is also stressed. It is emphasised that it is not possible to train all students for all possible cases in any MET facility, therefore these gaps should be addressed onboard. It is also stressed that employees should also be responsible for the outcome of the training function, as this relates directly to their re-employment chances and generally their employability.

³⁷ The term "autonomous shipping" is not necessarily linked to the proposed definitions by member states of the IMO; it is understood as shipping that is less dependent on the number of crew onboard yet more dependent on shore-based remote operations centres or facilities.

³⁸ SkillSea (2020). D3.2. Measuring evaluation strategies for MET.

³⁹ As it transpired this is especially the case of Norway.

4. Regarding the skills and competences that should be covered by additional training, the following points were highlighted:
 - a. Digital and soft skills are identified as an issue
 - b. There is an issue in general with what has been termed as the “21st century skills” which include but are not limited to digital skills ⁴⁰
5. The issue of reporting data and information from the ship to the shore using modern technology and means, such as satellite communications, has also emerged. This issue is closely related and relevant to the technical means onboard, as well as with the digital skills possessed by the teams onboard and ashore.
6. Last but not least, the issue of the contribution of the maritime cluster to the national economy was stressed. As an example, the direct contribution of the maritime cluster in the Netherlands is estimated close to 0.3% of the GDP, yet the magnifier effect and the synergies to other clusters and sectors is not reflected in this figure; hence the impact of the cluster to the national economy should be considered in a broader context.

The employees' focus group also resulted in constructive suggestions to render the sector attractive to young people. Participants highlighted the need to attract and educate more seafarers with engineering skills and background, a set of competences that can enhance the mobility among sectors, on- and off-shore tasks, and foster operations of the Blue Economy spectrum. Furthermore, the importance of the “word of mouth” (the encouragement to join the marine profession from social circles such as family, relatives, friends, and community) was highlighted. This social factor should be taken into account when considering the promotion of the sector to young professionals.

3.4.3 A combined industry-workforce perspective through the Southern Europe group

The last focus group discussion revolved more freely⁴¹ intending to identify topics not ascertained by the previous groups (see above sections 3.3.1 and 3.3.2). The following points emerged in the discussion, with wider policy points not discussed further as irrelevant to the SkillSea mission.

1. Demand and supply of labour force:
 - a. Open registries: participants stressed that the operation of open registries distorts labour market policies of national registries. The participants noted that monitoring the quality of delivered MET and the proper certification of skills and competences of mariners is a task of the state issuing relevant certificates and not currently taken an issue taken up by EU policy.

⁴⁰ There is no widely agreed definition of 21st-century skills; the approach of the glossary of educational reform by Great Schools Partnerships is considered in a text by Education Reform. Available in <https://www.edglossary.org/21st-century-skills/>, last accessed April 15, 2021.

⁴¹ Some broader policy points raised were not discussed further as not relevant to the SkillSea mission.

- b. Reported shortage of mariners: although various sources, such as BIMCO, report a shortage of seafarers, participating employers in this combined focus group clearly stated that they can find seafarers to cover their needs, subject to market terms and conditions.
- 2. Digitalisation – the fourth industrial revolution: although not clearly stated by name, the four design principles identified as integral to Industry 4.0 were considered, namely:
 - a. Interconnection
 - b. Internet of Things (IoT), closely related to digital skills and autonomous shipping requirements, considered in the previous focus groups
 - c. Industrial IoT (IIoT), with a special interest for marine/maritime applications, such as marine installations and equipment
 - d. Internet of People (IoP), a field that could improve team management, as prescribed in STCW and Bridge and Engine Team Management schemes
 - e. Decentralised yet accountable and traceable decisions, a key issue considering the provisions of the ISM Code.
- 3. Green skills: carbon-free shipping and operations, considering also the 2050 targets⁴².
- 4. Blue Economy: considering this relatively new field of economic activity as well as the six principles set out in official EU documentation), which target – amongst others – proximity to services, efficiency, profitability, optimisation, and systemic change⁴³, the requirements of the labour market increase and expand the current set of skills and competences of maritime professionals. It must be noted that the Blue Economy is significant in view of the potential outlet for a career change and is also associated with transferable skills.
- 5. Other issues:
 - a. Demographics and shortage of seafarers: participants considered this point indifferent given that the majority of mariners employed currently are non-EU nationals. However, it should be noted that strengthening the European maritime skills base and the promotion of maritime careers cannot ignore regional imbalances, although these can be smoothed through the international mobility of seafarers on a global – beyond just the European – scale.
 - b. Retention: the issue of attention to retention in relation to the countries of origin of seafarers was reported – an issue suggesting the potential of suitably targeted retention strategies. This is a significant point, especially as SkillSea's mission is also about strengthening the European skills base and promoting this career path – an issue particularly important for new entrants.
 - c. Education and MET: this issue has been identified as a means of job protection, particularly as an element that can counter labour cost considerations, thus giving precedence to more costly but better trained maritime professionals.

The areas identified and the degree of shared identification of issues – also showing any regional split of views expressed from either the employer or employee side – are presented through visualisation in Table 3.1 next.

TABLE 3.1
COMMONALITY OF VIEWS OVER MAIN FOCUS GROUP TOPICS

| TOPICS | NWEur. | S.Eur. |
|---|--------|--------|
| Possession of right skills | | |
| Skill gaps between EU and non-EU trained mariners | | |
| Blue Growth - Blue Economy | | |
| New skills - 4 th revolution | | |
| Gaps in competence and skills | | |
| Qualitative and quantitative mismatch in demand-supply of seafarers | | |
| STCW – need for update | | |
| Cooperation between schools and shipowners | | |
| Training on-board (practice and theory) | | |
| Training in the new equipment | | |
| Promotion of the Shipping Industry (ambassadors) | | |
| Flags and CoCs | | |
| Lack of Engineers | | |
| Mobility amongst shipping sectors | | |

Blue = raised by the employee side Yellow= raised by the employer side Green=commonly raised by both sides

⁴² For recent developments on IMO Strategy on GHG, cf. IMO (2020) <https://www.imo.org/en/MediaCentre/PressBriefings/pages/36-ISWG-GHG-7.aspx>, last accessed April 10, 2021.

⁴³ More information and sources on Blue Economy and blue growth are available in https://ec.europa.eu/maritimeaffairs/policy/blue_growth_en

⁴⁴ As per the 2020 Report of EMSA, 62% of the mariners, are non-EU nationals. Cf. EMSA (2020). Economic Value of the EU Shipping Industry. Oxford Economics, p.13. Available at <https://www.ecsa.eu/sites/default/files/publications/Oxford%20Economics%20-%20The%20Economic%20Value%20of%20EU%20Shipping%20-%20Update%202020.pdf>, last accessed April 10, 2021.

Through the focus groups, the following points emerged as common ground across the employment social partners as shown in Table 3.1 and across the two regional groups: *Possession of the right skills* and *Gaps of competence in skills* being at the core of employability and of the assessment and measurement of skills, respectively. Moreover, the following points attracted – at varying degrees – significant agreement:

1. *Training:*

1.A. Employers and employees noted that the current instruments in place, namely STCW and MLC 2006, are sufficient and largely still serve their purposes.

1.B. Training onboard is considered as an issue that needs attention. Current problems in the MET framework might originate from other levels of education and equally need further consideration. The need to better coordinate onboard training, as currently dictated in the STCW framework, is also evident. This is also an excellent example of the triangular nature of MET, where maritime training centres (MTCs), employers and employees should address the problem in an efficient and responsible way.

1.C. Finally, the global market is not experiencing severe demand and supply gaps in terms of numbers of maritime professionals, at large attributed to the use of open registries.

2. *New skills and competences required:*

2.A. Digital skills and competences along with 21st century skills should be introduced in the current framework. This is a complicated yet necessary task due to the continuous progress of related technologies. The advent of autonomous operations as well as the “greening” of shipping require new sets of skills of both onboard and shore-based teams.

2.B. The Blue Economy is already attracting the attention of employers and employees and can level imbalances in the demand and supply pattern of the labour markets in case of an increased automation scenario. Nevertheless, the Blue Economy demands professionals with an engineering background. Engineers enjoy higher flexibility in the labour markets.

3. *Potential future directions:*

3.A. The possible solution to the problem of attracting more young professionals through the activation of “social circles” to encourage “life and work at sea” was not thoroughly discussed, yet it is considered as a constructive remark and one which implies the involvement of educational establishments at pre-MET stages.

3.B. Another constructive suggestion for retaining professionals onboard, and to increase their satisfaction with their career path and life at sea, is the introduction of mentoring. This function could be developed either within the company (employer) or by the MTC or even from regional, national, or European institutions, such as federations of seafarers (employees).

3.C. Better monitoring of training procedures is feasible by using modern technology onboard.

3.D. The introduction of Blue Economy topics and technologies in the MET framework could enhance flexibility in the labour market as well as retention levels.

3.4.4 Summary takeaways from the 2020 focus groups and policy implications

1. Blue Economy:

- a. The advent of the Blue Economy as well as its significance in the GDP of specific member states and of the EU as a whole requires a smooth bridging from the current pure maritime and marine educational framework and content to the future “Blue Economy”. This new educational content focuses on:
 - a. Digitalisation
 - b. Sustainability
 - c. Life-cycle approach of assets and in the labour market.
- b. This transition to the “Blue Economy” framework results in the need for more engineering subjects in related curricula as key for the mobility of labour. This is compatible with the current employment of former naval officers in European shipping companies and maritime enterprises.
- c. Besides the content of the education that naturally advances and evolves from the subset of marine and maritime to the superset of the Blue Economy, a similar, comparable evolution in the institutional framework and soft infrastructure of MET is necessary for them to adapt to the new reality and to expand focus from the “ship” to the “ocean”.

2. Digital skills:

- a. It is necessary to include digital and IT skills in the current curricula and, if possible, as integral parts of the STCW training. Such a development safeguards the update of the STCW Convention to the new market conditions and safety requirements.
- b. The set of skills and competences should be well defined, and this is a challenging task. A wide range of skills can be covered under the term IT skills – for example, from desktop work to automation, from operation to maintenance and repair, and from understanding to

designing software. This is not a new challenge in engineering/science related fields, yet it needs to be correctly addressed.

- c. In addition to the above point, it is debatable if skills and competences should be system and manufacturer agnostic. In the past, MET was manufacturer agnostic, yet currently training and certification in systems and products provided by specific manufacturers and vendors is required in the market. This aspect contributes to the complexity of the task of defining the educational content.

3. Green awareness and understanding:

- a. As in the case of IT above, it is necessary to define the educational main goal and objectives. So far, environmental protection has been reflected in STCW modules in the form of procedures and limitations – for example, the operation of oily-water separation (OWS) equipment and the discharge of less than 15ppm, as per Reg15 of Annex I of MARPOL, or in the form of certification, such as the current conditions for granting a certificate, for example, the International Air Pollution Protection (IAPP) Certificate. In short, training is strictly focused on operations and certification as per the requirements of the instruments, therefore it is solely focused on the “how”. Nevertheless, the outcome of the focus groups also suggests an understanding of the “why” – such as understanding of the wider need and policy to decarbonise, and to “green” and protect the oceans. Training focused on “why” enables the mobility of labour and shifts training from equipment-oriented and therefore from manufacturer-specific content and application to system and systems objective driven. This shifting from “how” to “why” also implies a higher educational background of the trainees, nevertheless it definitely enhances their mobility potential.
- b. Along with the need to expand and deepen the educational content to a new direction, MTC/MET establishments face the necessity of training their trainers for the new challenges or cooperating with other formal education facilities, such as maritime-oriented universities, in order to jointly develop and offer the new content.
- c. Last but not least, as greening is closely linked to the needs of the market and generally of the Blue Economy, this new educational content should be discussed and agreed with the social partners, such as associations of employers and employees, and manufacturers. As a next step, member states can submit proposals in the IMO for the update and harmonisation of STCW in this field.

4. Soft skills with a focus on safety culture:

- a. In contrast to the above issues, where external developments, such as technology and regulation dictate the educational needs, resulting in “hard” skills, the development of soft skills depends heavily on subjective and personal attributes of the employees. Considering the requirements and the experiences gained from their application, soft skills in this case might be defined as a balanced mix of:
 - a. Creative thinking
 - b. Conflict resolution
 - c. Networking
 - d. Time management
 - e. Teamwork
- b. Unlike hard skills, soft skills are not an easy area of formal training, and it is very hard to evaluate them or measure the impact of training. Experience suggests that soft skills are gained in the working environment, where their impact is better evaluated. In this regard – and considering the progress made to convey the safety culture in operations – it is suggested that on-the-job-training procedures on safety and soft skills should be considered as part of the safety management procedures of the ship and company, as per the current ISM provisions. Bearing in mind that employers do not necessarily possess capacity or experiences in developing these procedures, it is advisable to consider cooperation with MTC and MET specialists in the development of this content.
- c. Member states may promote the above solution, which advances and necessitates cooperation among stakeholders, in the form of a recommendation under national rules and provisos or, even further, at IMO level.

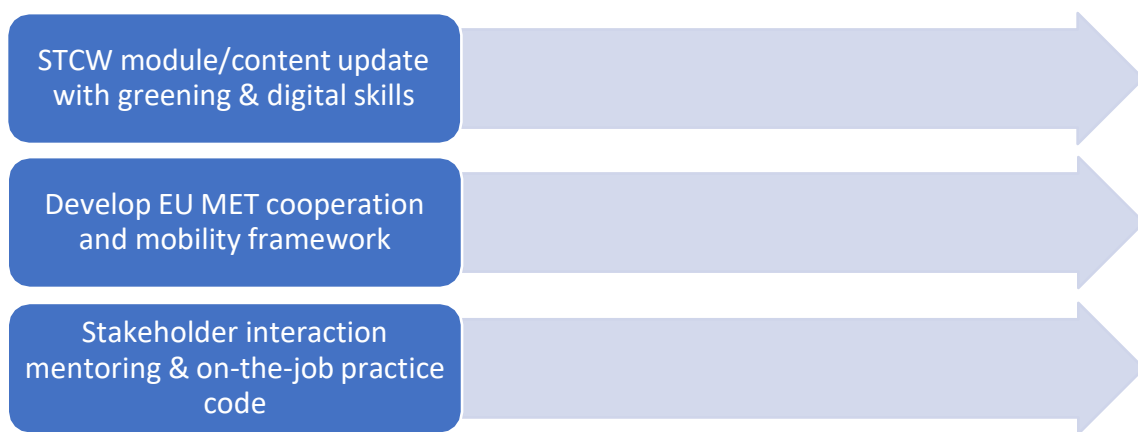
5. MET strategic considerations:

- a. The discussions in the focus groups imply that MTC/MET establishments should undertake a more active role in guiding and updating the skills of mariners. A suggestion – streamlined with the offering of leading educational institutions worldwide – is the function of mentoring. A well-structured and supported mentoring function seems to act as catalyst for the retention of mariners in this labour market.

- b. Mentoring also implies an active feedback procedure from the various stakeholders engaged, as well as active interaction with the local communities. Thus, the societal benefit is magnified, as the interaction of MTC and MET providers with the community and groups of employers and employees, for mentoring and attraction of young professionals, becomes an embedded feature, if not institutionalised.

FIGURE 3.12

GUIDING ROADMAP TO ENHANCE EMPLOYABILITY OF MARITIME PROFESSIONALS



As summarised in Figure 3.12 above, the aforementioned observations pave the way for further cooperation among stakeholders on an eventual guiding roadmap from “pure maritime” to “blended blue”, and also among EU and IMO member states to coordinate actions in order to:

- Update STCW models and content, addressing the needs of greening and digital skills while taking into account the necessity of competences and skills certification.
- Develop a new institutional framework for MET in the EU that promotes cooperation and mobility, as well as fostering the shift from “maritime” to “blue”.
- Encourage interaction and communication among stakeholders through regulation on efficient and effecting mentoring and on-the-job practice.

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4. Measuring gaps: a dynamic anticipation of skills

4.1 Expanding on the 2019 survey dimensions: the 2021 survey design

4.1.1 Survey planning and the impact of the 2020-2021 Covid-19 pandemic on shipping

The outbreak of Covid-19 affected international shipping even earlier than the declaration of the wave of infections as a pandemic by the World Health Organisation in March 2020. This was due to the very large share of Chinese ports and terminals in world trade and the lockdown imposed in China in February that year. Travel restrictions imposed thereafter across the world hampered crew changes and repatriation to the point of the situation being described as a “humanitarian, safety and economic crisis” by the IMO⁴⁵. The major upheaval created through travel and related quarantine restrictions resulted in an unprecedented situation of pressure on personnel onboard which led to stakeholder bodies, representing employers and employees, together with IMO, embarking on a worldwide mission to facilitate procedures to alleviate crews in service as well as to allow access to income by replacement crews in waiting.

In these circumstances, the months following the international lockdown were deemed unsuitable for receiving survey responses, if any were to be provided amidst the obvious pressure on all seafarers. Thus, the initial mid-2020 survey was rescheduled for the early months of 2021. This proved not to be a large setback as the impact of Covid-19 highlighted a number of trends that had emerged already⁴⁶.

4.1.2 Adapting the survey to a changing setting: the 2021 questionnaire

The 2021 questionnaire was distributed against the background of exceptional shocks, such as the Covid pandemic, and also at the stage of an ongoing and rapid introduction into shipping of various innovations, including those related to propulsion, fuel, and of advanced new management techniques based on digitalisation,⁴⁷ under an increasing focus and action on sustainability issues. The questionnaire content sought to focus on assessing gaps in sectoral skills which a number of active maritime professionals might not be aware of unless they had been confronted by changes in working practices onboard, probably preceded by in-house training.

In view of the ongoing trends, additional questions were introduced to those of the 2019 pilot questionnaires addressed to employers and employees (cf. Annex 3.A and Annex 3.C) which had sought to assess the evolution of the perception of gaps from the perspective of the employers and of maritime professionals at sea.

The survey questionnaires included a number of questions allowing the potential further mining of the survey data through various correlations. Designed similarity was introduced where possible to enable the results from the surveys of employers and employees to be compared and contrasted⁴⁸.

⁴⁵ CIMO (2021), Crew changes: humanitarian, safety and economic crisis at <https://www.imo.org/en/MediaCentre/HotTopics/Pages/FAQ-on-crew-changes-and-repatriation-of-seafarers.aspx>, last accessed April 1, 2021.

⁴⁶ Trends such as the use of drones for instance had been included in the mid-January interim D3.1 SkillSea report.

⁴⁷ See all SkillSea WP1 deliverable reports and the WP3 report SkillSea (2020), *Strategy Plan Framework. (D3.1)*, op.cit.

⁴⁸ To be further presented in the final D3.3.

The three main aims of the two surveys were common:

1. To assess potential impediments to employability and mobility of maritime professionals
2. To gauge the perceived resilience of skills
3. To assess perceived gaps in a measurable way

Key skills and sectoral competences were included in the surveys, with appropriate grouping and suitable percentage brackets to measure mismatches and gaps in general, not deviating too much from similar European surveys.⁴⁹

4.1.3 Adapting to a changing setting: the ID of the 2021 surveys

The 2021 questionnaire was distributed through all WP3 Leader (EF⁵⁰) and SkillSea (cf. Annex 3E) industry and specialised media channels between January and March 2021. Special Survey Monkey links were sent to the two European companies, which had participated in the exploratory 2019 study through questionnaires sent to their crews. In the case of the latter, although normally varying substantially between the two survey years, they were asked through one additional final question about participation in the 2019 survey. This was in the quest for comparative data on the evolution of perceptions of gaps which could assist the mining for statistical trends to support the creation of a gap's measurement mechanism in the final D3.3 report.

A total of 1,206 responses were received from the employees' side – onboard or on leave – and 41 responses on the employers' side, an expected discrepancy due to the much smaller number of EU-EEA shipping companies compared to ships and crew members, even if only EU-EEA crews are considered. (Survey demographics for each questionnaire and stakeholder category are included in Annex 3B for the employees' survey and in Annex 3D for the employers' survey).

Notable traits on the employee side were the very low participation of women, although marginally improved compared with the 2019 exploratory survey, and the very large participation of crews serving on oil tankers and other specialised carriers in the oil, gas, and chemical trades. Possible reasons include the high response among crews of the two-pilot participating European companies, with a tonnage structure oriented mostly towards the liquid-bulk sector. Special quality procedures, such as the Tanker Management Self-Assessment (TMSA) with a large component of survey questionnaires, and additional quality and safety layers in the carriage of liquid and often dangerous cargoes, may also increase the response rates of maritime professionals onboard such vessels.

Also, in the employees' survey, location of MET studies and respondents' nationalities by region almost overlap, with 39.7% of respondents being non-European nationals and 41.6% of respondents having studied in a non-European MET⁵¹. Relevant regional data legends have been kept in most Figures as EEA

⁴⁹ Cf. Cedefop publications and sites in the references of Chapter 4 as well as Mane, F., & Corbella, T. (2017). Developing and running an establishment skills survey: guide to anticipating and matching skills and jobs: volume 5. ETF/Cedefop/ILO report. Luxembourg: Publication Office of the European Union.

⁵⁰ EF = Eugenides Foundation initials throughout the SkillSea documents.

⁵¹ Although some possible exchange between geographical groups of nationals and schools may be present. In general, there is a 5.9% discrepancy between the all-European and EU shares of respondents on the basis of nationalities of maritime professionals so European MET does not coincide entirely with EU-EEA MET by definition.

and others, as per the 2019 exploratory survey, although their nationality was the available basis for regional comparison. The EEA notation hopefully allows the reader an easier reference to the pilot survey and a shorter description instead of Graduates of European METs and non-European METs. Nevertheless, whether explicit in the graphs or through the short EEA notation, it is noted at the start of the relevant survey that in Figures with a regional distribution are made on the basis of the geographical location of METs of the responding maritime professionals, unless otherwise implied. On the employers' side, it is noted that a majority of respondents had a long industry experience and that a substantial percentage – over 40% – among the respondents from this group surveyed belonged in the large maritime companies' group.

4.2 Results of the 2021 survey: emerging directions

In this section the results from the employers' and the employees' surveys are presented. The presentation of the two sets of results from the surveys conducted has been adapted visually to secure an easy identification of main findings. Complete uniformity of the graphical representations has therefore taken second place, with a number of Figures being grouped by colours and design so as to constitute a more distinct group.

4.2.1 Provisional results of the 2021 survey: emerging trends

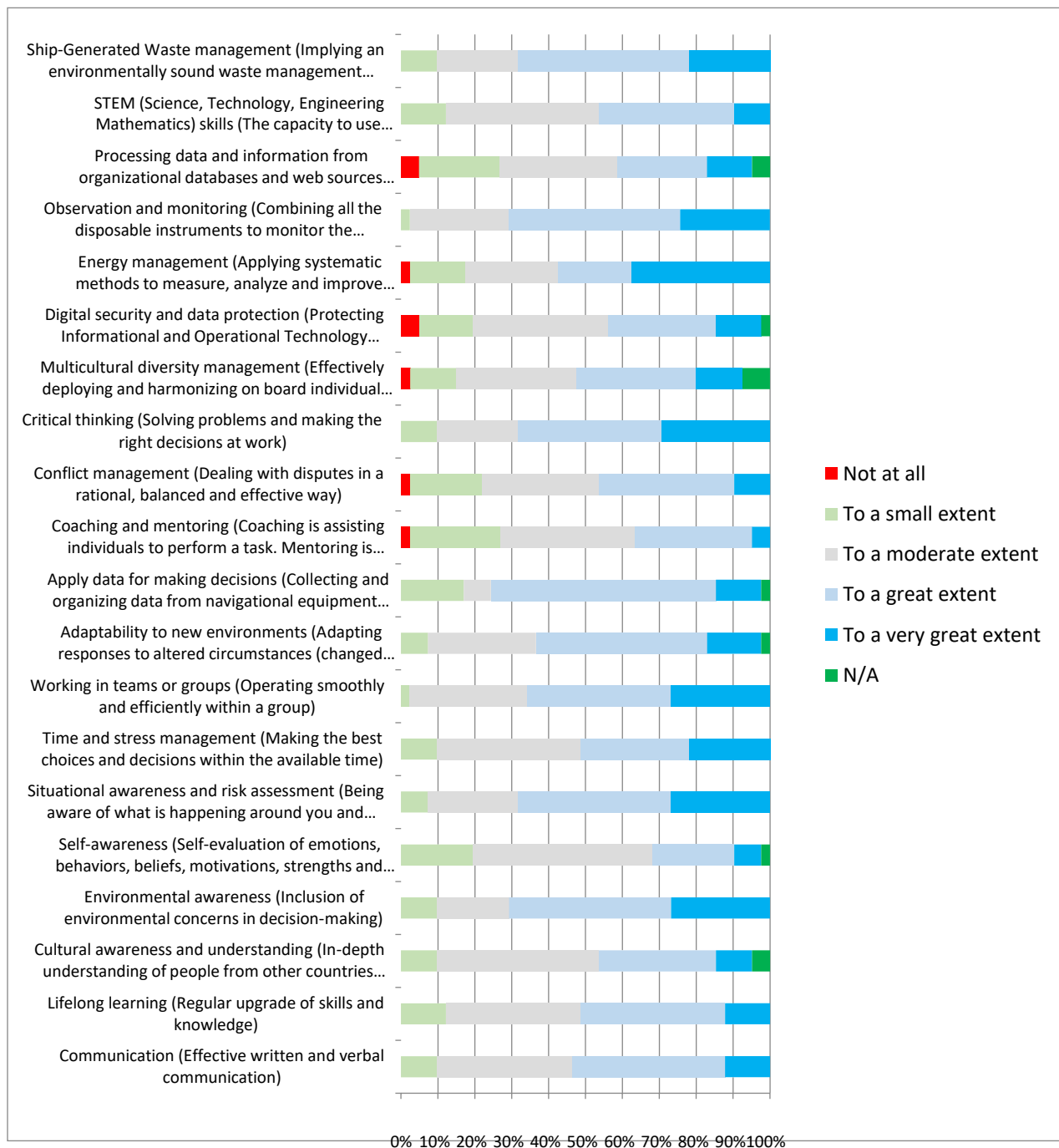
The first question in the employers' questionnaire targeted perceptions of the employers who participated in the 2021 survey related to the level of the main skills that Deck officers, Engineer officers and Electrotechnical officers (ETO) currently possess.

The results shown in Figure 4.1 indicate that the top skills these officers are perceived to possess at a high or very high level comprise decision-making using data. The other two higher evaluation levels, amounting to 73.2%, were observation and monitoring – combining all the available instruments to monitor the navigation of the ship or the engine performance – adding similarly to 70.7%, and environmental awareness (70.7%).

Other current officer skills that received either a high or a very high rating from a significantly large percentage of respondents include situational awareness and risk assessment (68.3%), critical thinking (68.3%), and ship-generated waste management, with the two higher ratings adding up to 68.3%.

Skills which were found through this first question of the questionnaire to be to be possessed at an insufficient level – or to be almost completely absent – included data processing and information from organisational databases and web sources (with the high ratings adding up to only 26.8%), coaching and mentoring (26.8%), and conflict management (22.0%).

FIGURE 4.1
EXTENT OF SKILLS POSSESSION BY OFFICERS



The employers' assessment about the level of skills required from seafarers in order to exercise their duties is presented in Figure 4.2⁵². On a scale of 0-100 more than half of the respondents assigned a score of 80 or above, with the vast majority assigning 80 – indicating that the maritime industry requires very high skills from seagoing maritime professionals.

⁵² Two responses were discarded as being carried by not filling into a numeric and only into the "other" box provided.

FIGURE 4.2
LEVEL OF SKILLS REQUIRED

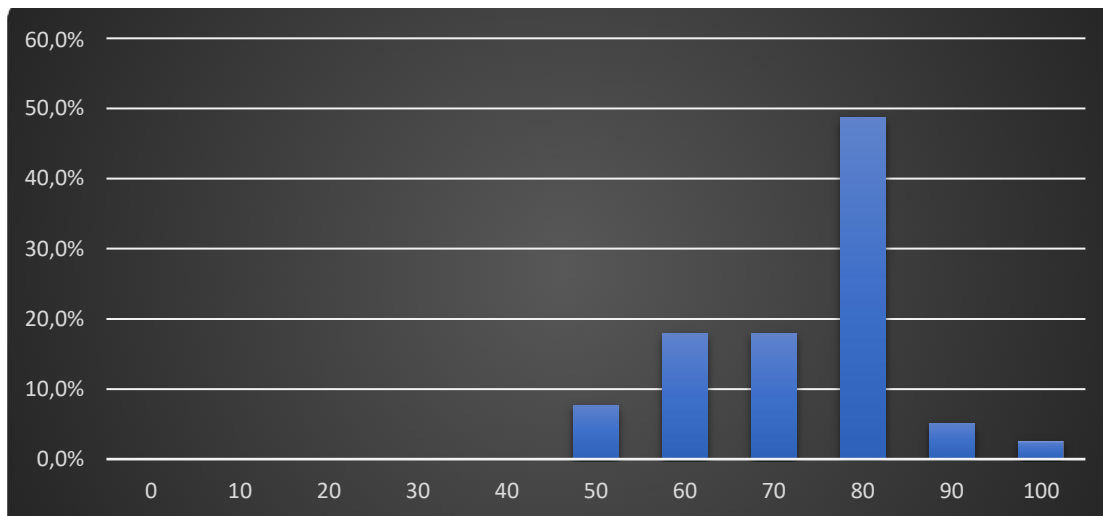
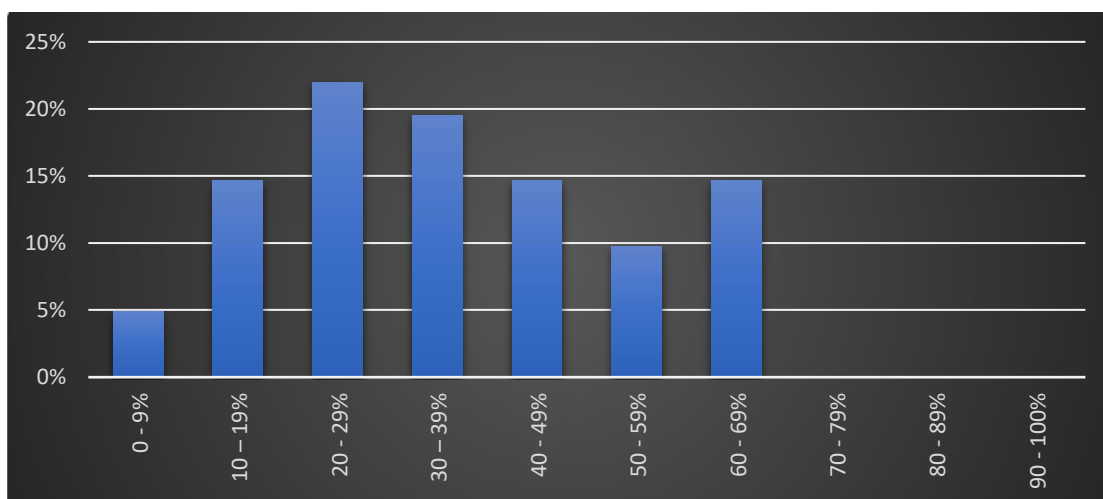


Figure 4.3 illustrates that from the employers' perspective a significant percentage of the current knowledge and skills of maritime professionals is deemed to be outdated.

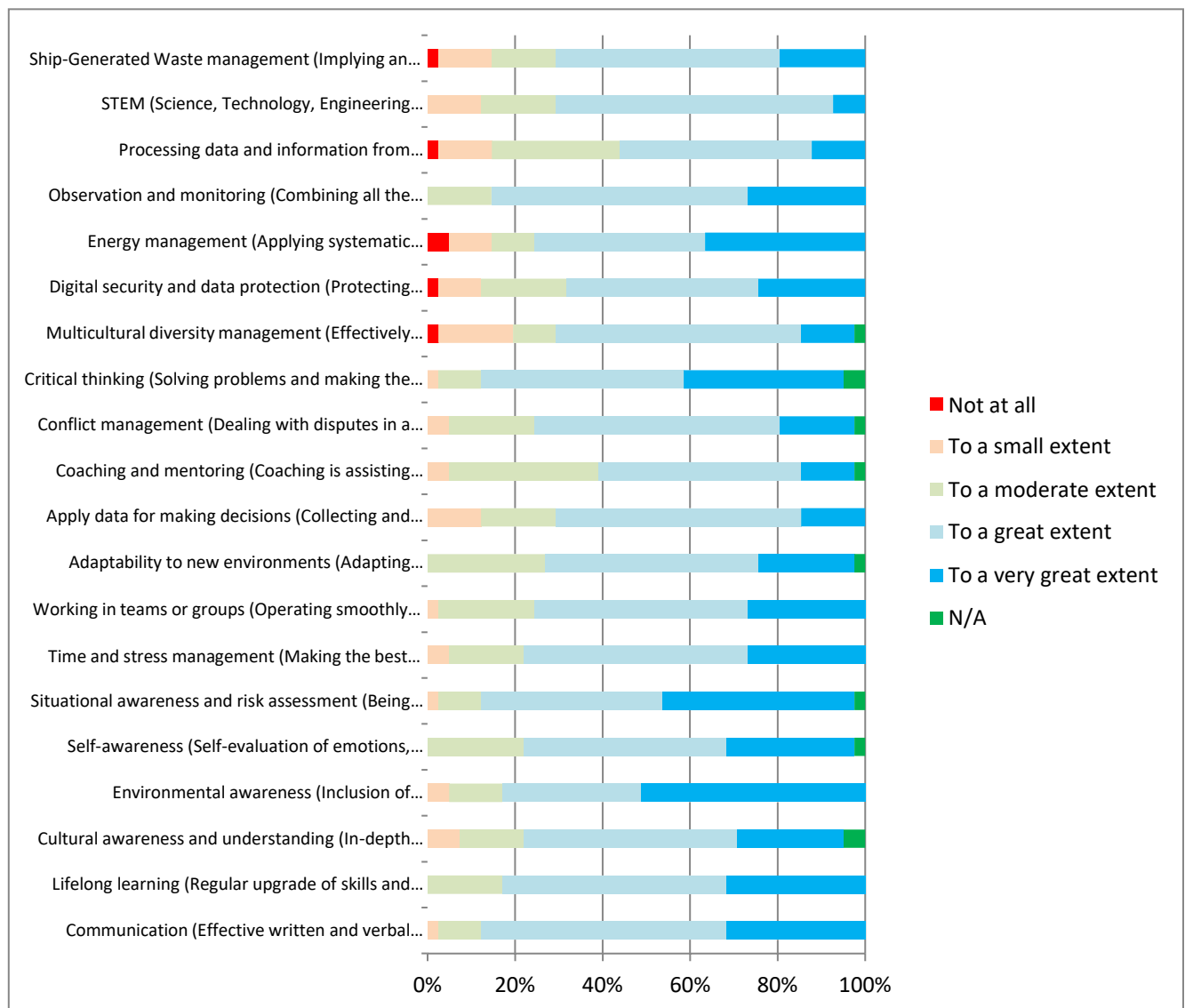
FIGURE 4.3
PERCENTAGE OF OUTDATED KNOWLEDGE AND SKILLS



The perceptions of the employers about the skills they require from deck officers, engineer officers and electrotechnical officers (ETO) are presented next in Figure 4.4. The results indicate that the top three skills demanded from maritime professionals onboard – with the following percentages being the sum of ratings to a great or very great extent – are communication (87.8%), situational awareness and risk assessment (85.4%), and observation and monitoring (85.4%). Other skills that received a high or very high rating from

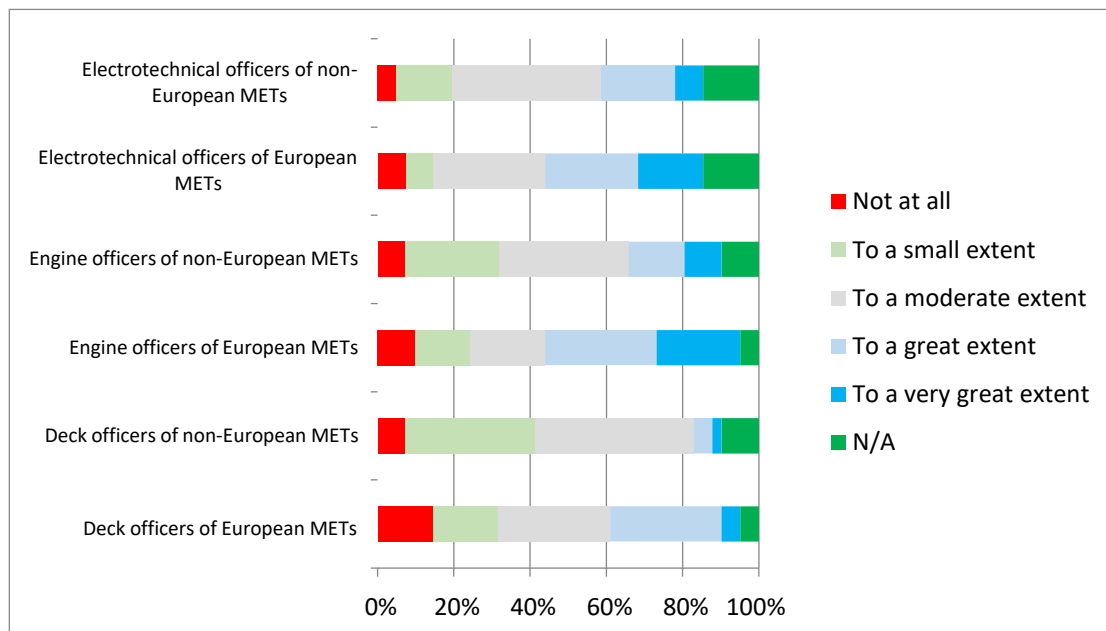
a significantly large percentage of respondents include environmental awareness (82.9%), critical thinking (82.9%), and lifelong learning (82.9%). It is worth noting that skills related to the emerging trends of sustainability and digitalisation, such as environmental awareness, which tops the list of skills demanded to a very great extent (51.22%), had some of the highest ratings.

FIGURE 4.4
DEMAND FOR SKILLS



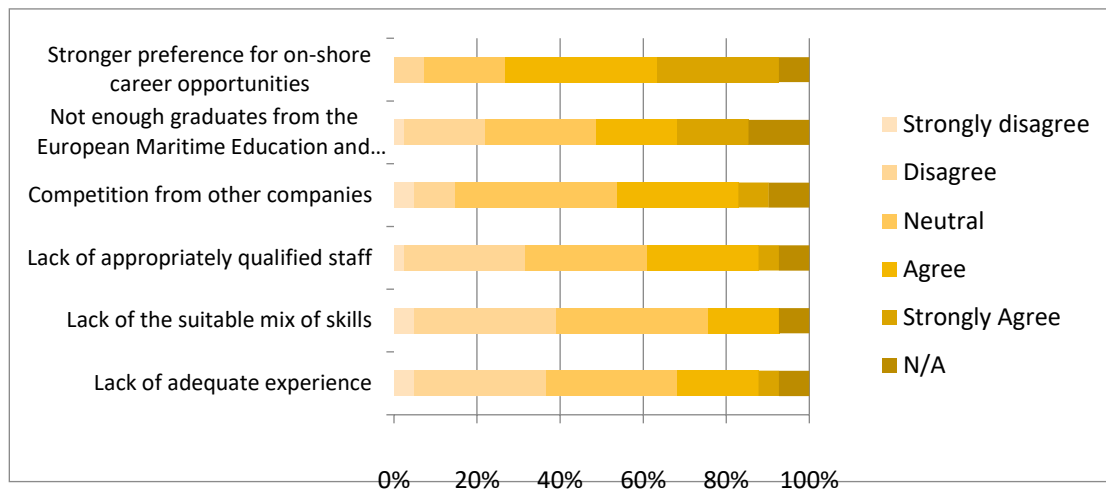
In terms of recruitment difficulty, on the one hand employers identified a high or very high degree of difficulty in recruiting European educated and trained officers of all types – especially engineer officers (51.2%) and electrotechnical officers (41.5%). On the other hand, the responses displayed in Figure 4.5 show that it is generally easier to recruit officers trained by non-European METs.

FIGURE 4.5
DIFFICULTIES IN RECRUITING OFFICERS



The next question sought to identify the causes of the difficulty in recruiting officers who graduated from European METs. The perspective of the employer survey respondents is illustrated in Figure 4.6 – they agree or strongly agree that the main barriers include the preference for onshore career opportunities (65.9%), the competition with other companies (36.6%), and the lack of sufficient graduates from European METs (36.6%). Most importantly for the focus of this survey, the respondents' answers indicate that the lack of appropriate qualifications is another important barrier (31.7%). However, barely 17% agree that the right mix of skills is a major barrier.

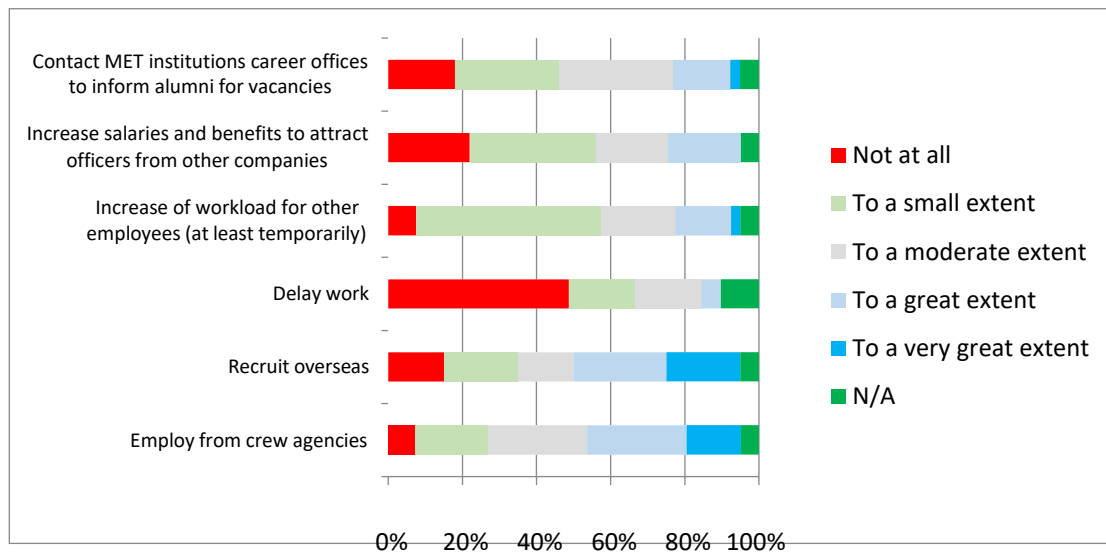
FIGURE 4.6

BARRIERS IN RECRUITING SHIP OFFICERS WHO GRADUATED FROM EUROPEAN METs

Under the assumption of facing recruitment difficulties, the employers were asked to assess the likelihood of adopting a specific mitigation strategy. Figure 4.7 illustrates their responses, according to which the most likely strategies are overseas recruitment, which was selected as likely or very likely by 45.0% of respondents, and employment by crew agencies, which was selected by 41.5%. The remaining strategies (such as delaying work, increasing the workload of other employees, increasing salaries and benefits to attract officers from other companies, and collaborating with MET career offices) were less popular to respondents, as the largest percentage rated them as unlikely or to a small extent likely.

FIGURE 4.7

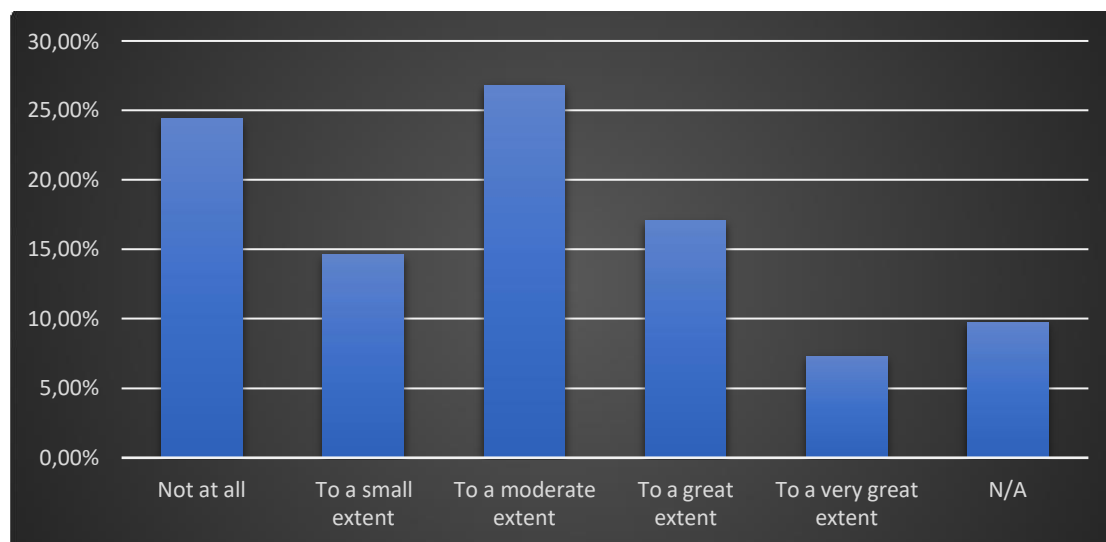
LIKELIHOOD OF SPECIFIC STRATEGIES IF FACED WITH DIFFICULTIES IN FILLING VACANCIES



The impact of European MET reputation on recruitment of young seafarers is ambiguous; while 24.5% of respondents assess the impact as high or very high, there is another 39.0% that assess it as low or non-existent (cf. Figure 4.8).

FIGURE 4.8

IMPACT OF EUROPEAN MET REPUTATION ON RECRUITMENT OF GRADUATES



Employers were asked next to assess the level of preparation of fully skilled seafarers by European METs. Figure 4.9 shows that 53.7% of respondents assigned an above-average rating and 7.3% an excellent rating.

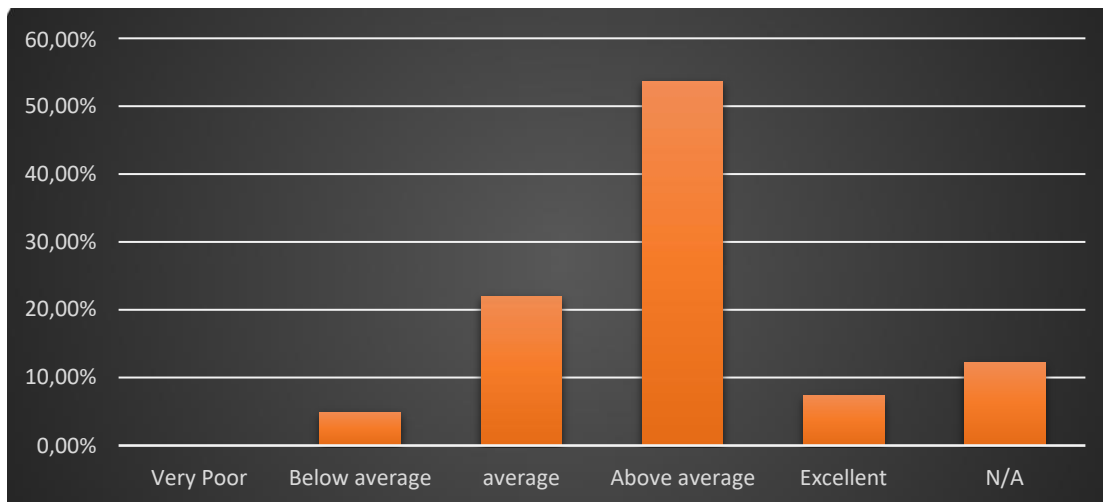
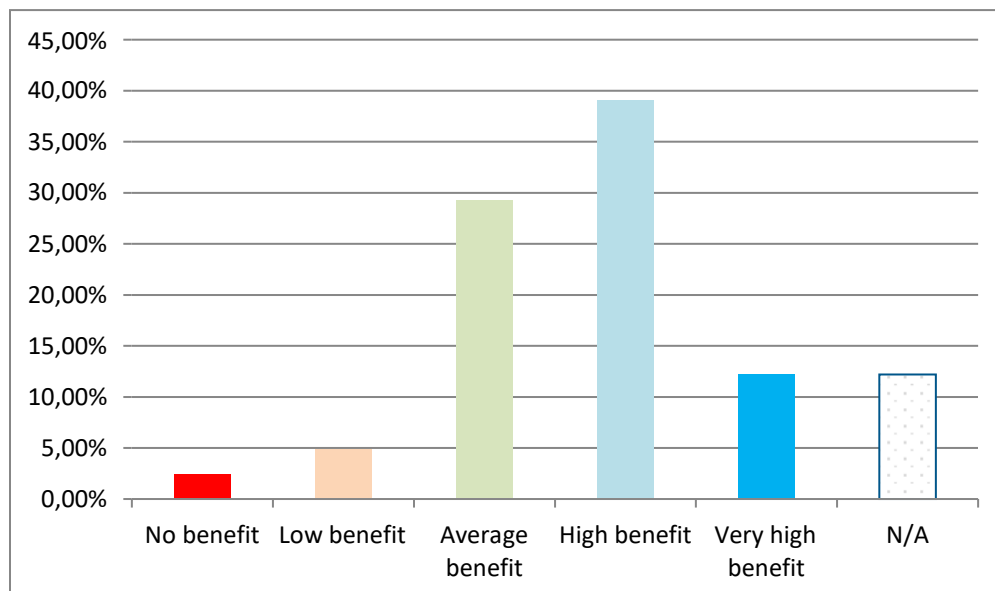
FIGURE 4.9**LEVEL OF PREPARATION OF FULLY SKILLED SEAFARERS BY EUROPEAN METs**

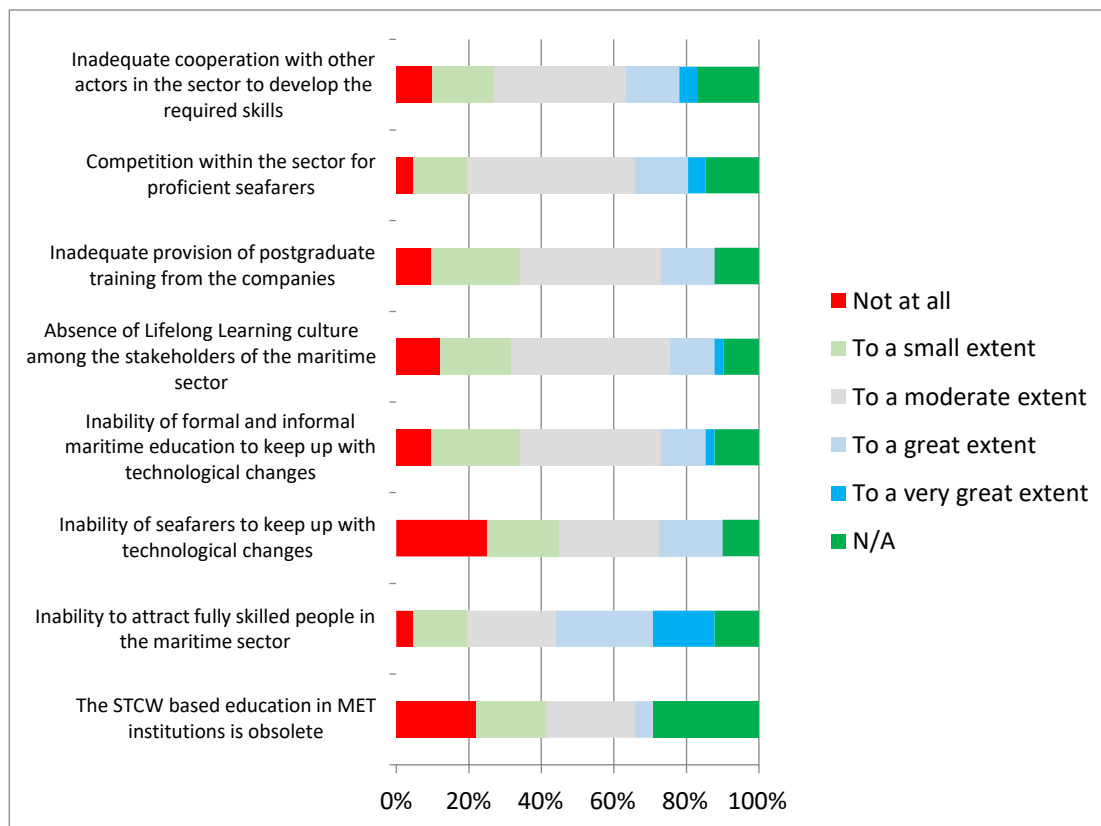
Figure 4.10 shows that respondents believe that shipping companies could generally benefit from a potential collaboration with European METs. Over 50% of respondents expect high or very high benefits.

FIGURE 4.10**POTENTIAL BENEFITS OF****COLLABORATION BETWEEN SHIPPING COMPANIES AND EUROPEAN METs**

To further explore the issue of adequacy of skills, the survey sought responses on the possible causes of shortage of well-trained graduates from European METs.

As it is illustrated in Figure 4.11, the respondents believe that the shortages could be attributed – to a high or a very high degree – to an inability to attract fully skilled people in the maritime sector (43.9%), competition within the sector for proficient seafarers (19.5%), inadequate cooperation with other actors to develop the required skills (19.5%), and the inability of seafarers to keep up with technological changes (17.5%).

FIGURE 4.11
CAUSES OF SHORTAGES OF WELL-TRAINED GRADUATES OF EUROPEAN MET COURSES



The next question addressed the perceptions of employers about the degree to which the skills of the current maritime professionals can cover for the future needs **on-board** ships over the next five years. The findings are presented through Figures 4.12A – 4.12E.

Employer perceptions on the five-year resilience of the skills in question were categorised into three levels, with Low corresponding to a 0%-30% rating, Medium to 30%-60%, and High to 60%-100%. Figure 4.12A shows the responses on the future five-year resilience of current navigation skills on-board. Ranking in the range of High amounted to 73.2% while ranking in the range of Low had the lowest value, equal only to 2.4% of responses showing that in that area the medium-term resilience is deemed rather strong.

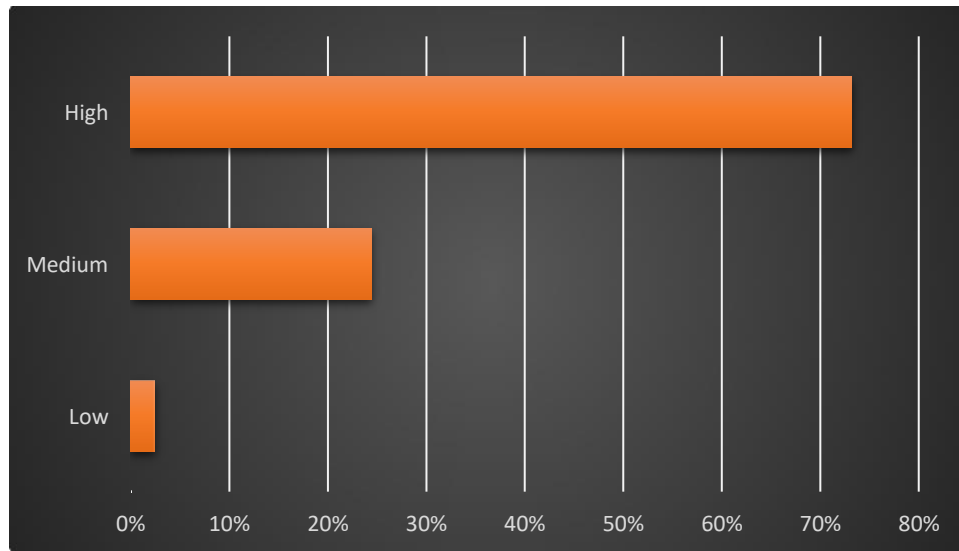
FIGURE 4.12A**FIVE-YEAR RESILIENCE OF NAVIGATION SKILLS ONBOARD**

Figure 4.12B shows the perceived five-year resilience of the current digitalisation skills onboard. Markedly - and unlike the case of navigation skills - in this case the greatest group of responses is in the Medium range (48.8% of respondents) while the ratings in the Low range corresponded to 14.6% of responses showing the need for strengthening these skills.

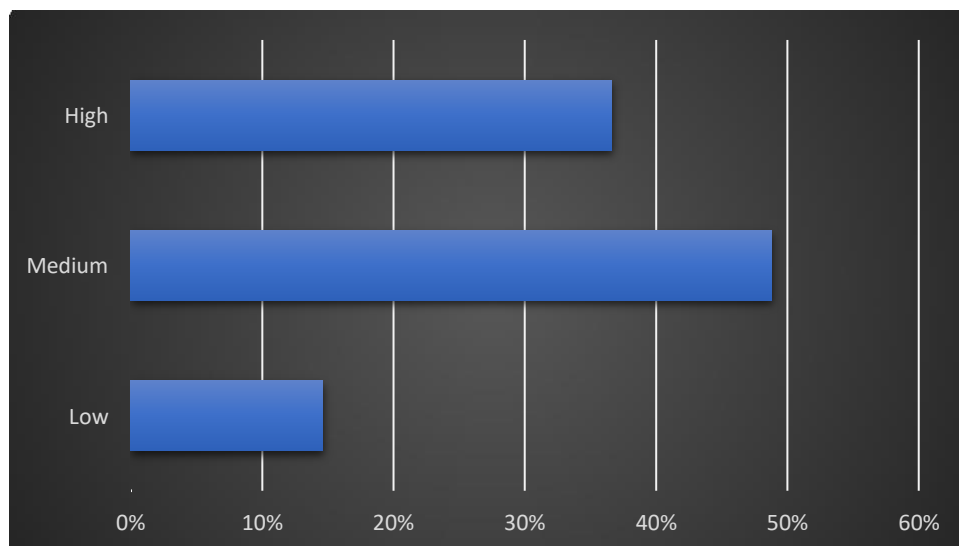
FIGURE 4.12B**FIVE-YEAR RESILIENCE OF DIGITALISATION SKILLS ONBOARD**

Figure 4.12C, next, shows the five-year resilience of current safety skills onboard. High was highest ranked (73.2%), with Medium representing 24.4%, and Low accounting for just 2.4%. These responses – with a

similar profile to the navigation skills on-board - suggest an equally high “vote of confidence” in the medium-term resilience of current safety skills on-board.

FIGURE 4.12C

FIVE-YEAR RESILIENCE OF SAFETY SKILLS ONBOARD

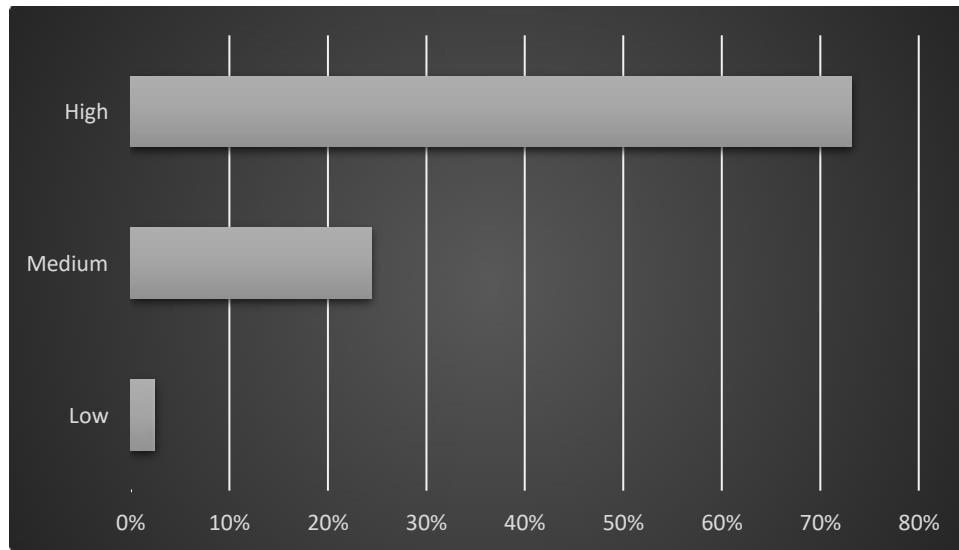


Figure 4.12D, shows the ratings of the five-year resilience of current sustainability-quality skills on-board. High was top ranked (56.1%), while Medium follows with a considerable 36.6% and Low with 7.3%. These findings also suggest a strong overall evaluation of the future resilience of these skills, although not as strong as in the case of safety or on-board navigation skills.

FIGURE 4.12D

FIVE-YEAR RESILIENCE OF SUSTAINABILITY-QUALITY SKILLS ONBOARD

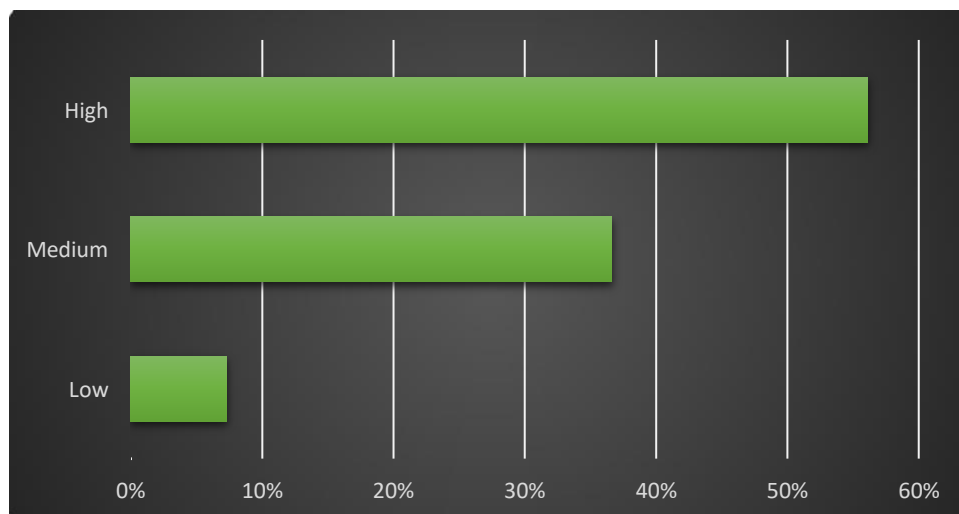
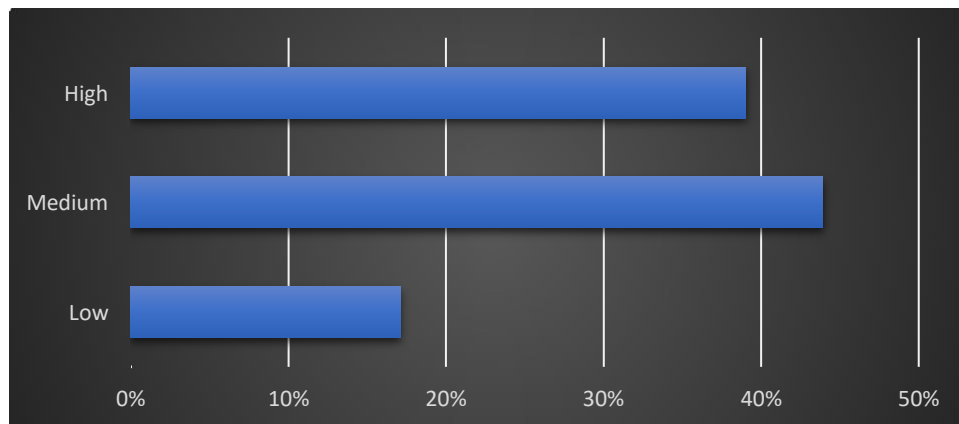


Figure 4.12E, next, shows the perceived five-year resilience of current automation skills onboard. In this case, Medium was ranked highest (43.9%) while Low has the lowest value (17.1%). This shows eventually a lower degree of confidence in the resilience of these skills in the context of increasing automation.

FIGURE 4.12E
FIVE-YEAR RESILIENCE OF AUTOMATION SKILLS ONBOARD



Figures 4.13A – 4.13E display the perceptions of employer survey participants on the degree of five-year resilience of current maritime professionals' skills for covering future needs **ashore**. These were categorised again into three levels, Low corresponding to a 0%-30% rating, Medium to 30%-60%, and High 60%-100%. Figure 4.13A shows perceptions of future resilience of current operations' skills ashore. High was ranked top (61.0%) with the substantial share of 39% in the Medium range showing a certain degree of uncertainty although Low equals to 0.0%.

FIGURE 4.13A
FIVE-YEAR RESILIENCE OF OPERATIONS SKILLS ASHORE

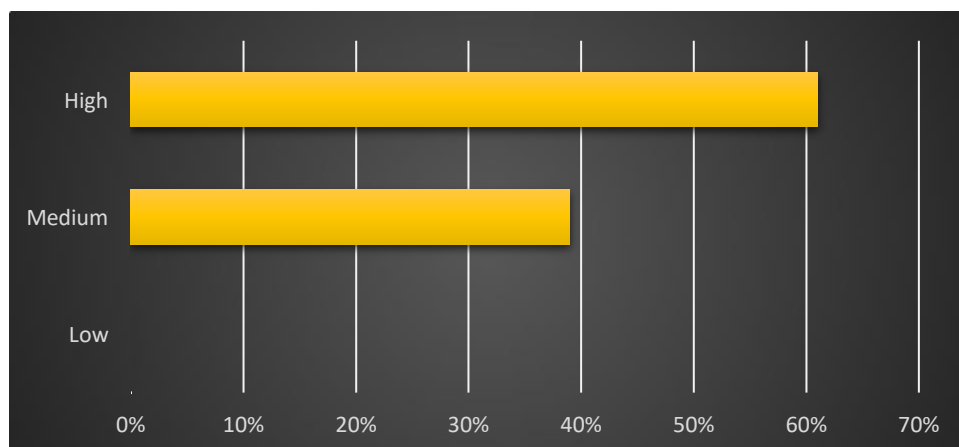


Figure 4.13B shows employers' perception on the five-year resilience of current digitalisation skills ashore. The Medium range was highest ranked (39.0%), while Low equals 12.2%; thus, result is similar to what was observed - later in the survey - in responses to the question referring to sustainability and quality skills ashore; these results, as well as that next one, suggest that indeed the two main trends in motion, digitalisation, and sustainability, are the ones concerning the employer side the most in terms of their resilience.

FIGURE 4.13B
FIVE-YEAR RESILIENCE OF DIGITALISATION SKILLS ASHORE

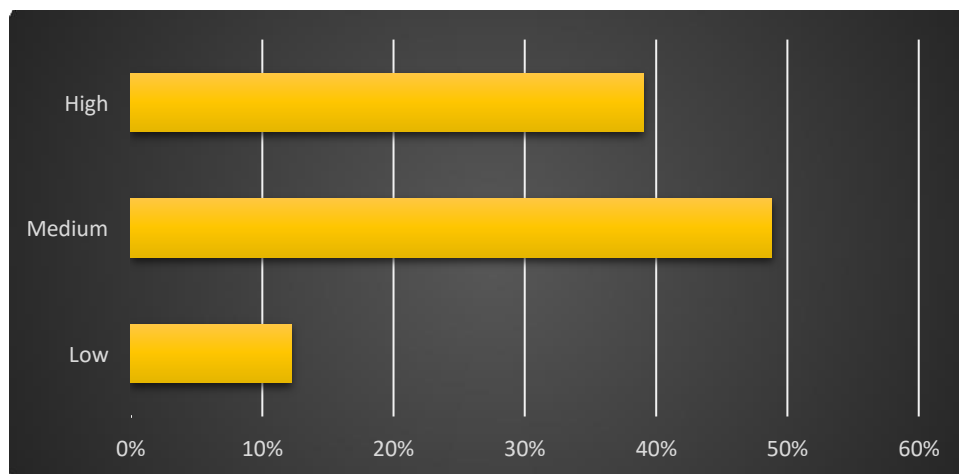
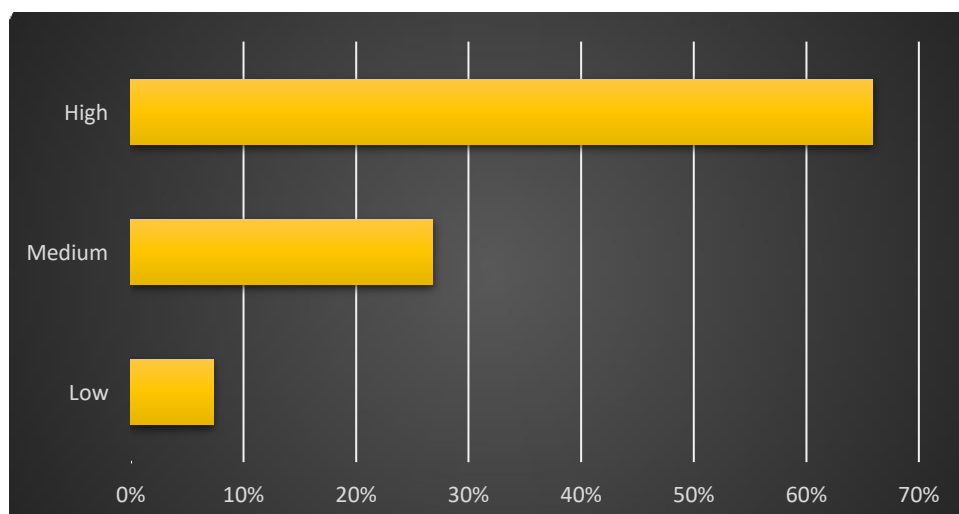


Figure 4.13C, next, shows the five-year resilience of current safety skills ashore. High was top ranked (65.9%) while Low has the lowest value among the three rating brackets, equal to 7.3%.

FIGURE 4.13C
FIVE-YEAR RESILIENCE OF SAFETY SKILLS ASHORE



This range of responses shows a high level of confidence for the future resilience of this type of skills similar to this for safety skills on board (cf. Figure 4.12C above). Figure 4.13D shows the five-year resilience of current sustainability-quality skills ashore. High is top-ranked (56.1%), with Medium at 31.7% while Low is equal to 12.2%; these results - as percentages recorded – place the evaluation of respondents in the middle of non-optimistic ratings obtained for the skills ashore were surveyed through this survey in relation to their future resilience.

FIGURE 4.13D
FIVE-YEAR RESILIENCE OF SUSTAINABILITY-QUALITY SKILLS ASHORE

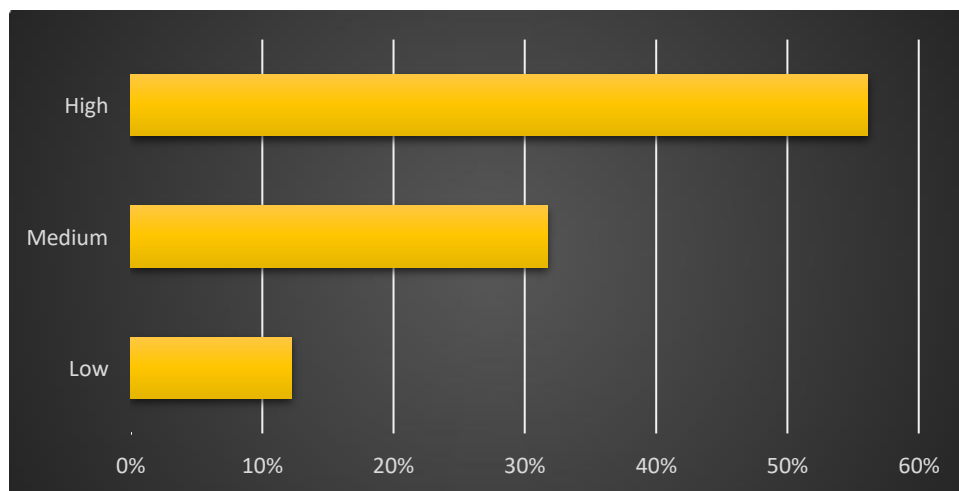
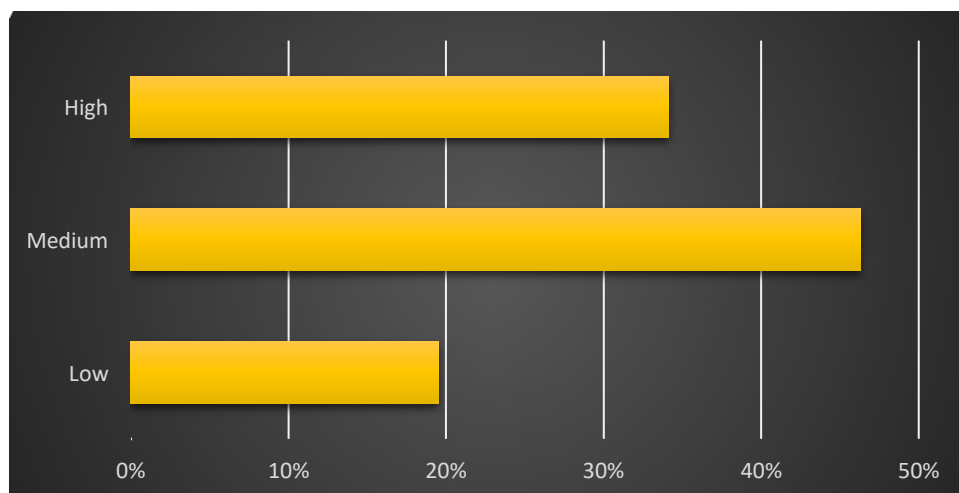


Figure 4.13E shows the results for current remote operations skills ashore. Medium is rated highest (46.3%) while Low has a value equal to 19.5%, which, although being the lowest in terms of the three, is the highest percentage recorded for all skills ashore in terms of future resilience.

FIGURE 4.13E
FIVE-YEAR RESILIENCE OF REMOTE OPERATIONS SKILLS ASHORE

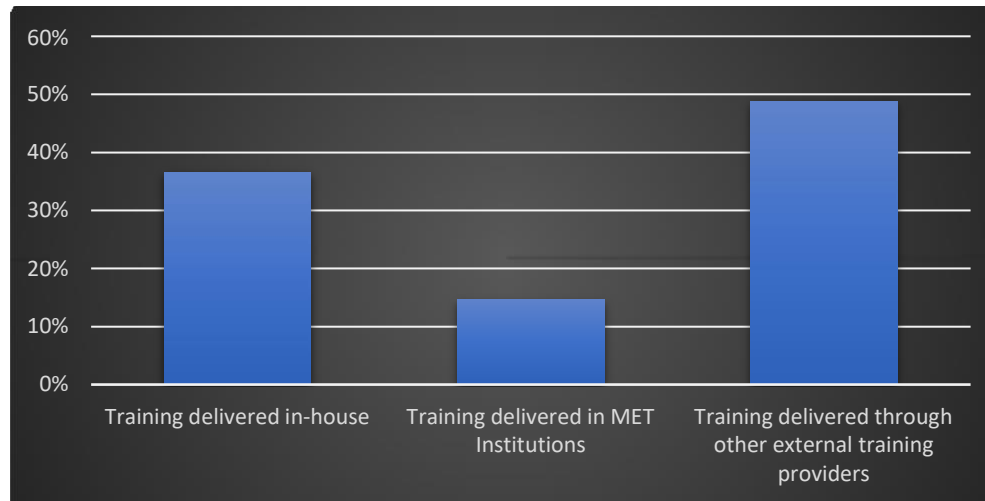


In terms of training methods for crews already employed, the survey results presented in Figure 4.14 show that its outsourcing to third party training providers is the most usual training strategy.

More specifically, 48.8% of the employers who participated in the survey responded that the training of their seafarers is delivered through other external training providers, with 36.6% responding that the training is delivered in-house and only 14.6% stating that such training is delivered in METs.

FIGURE 4.14

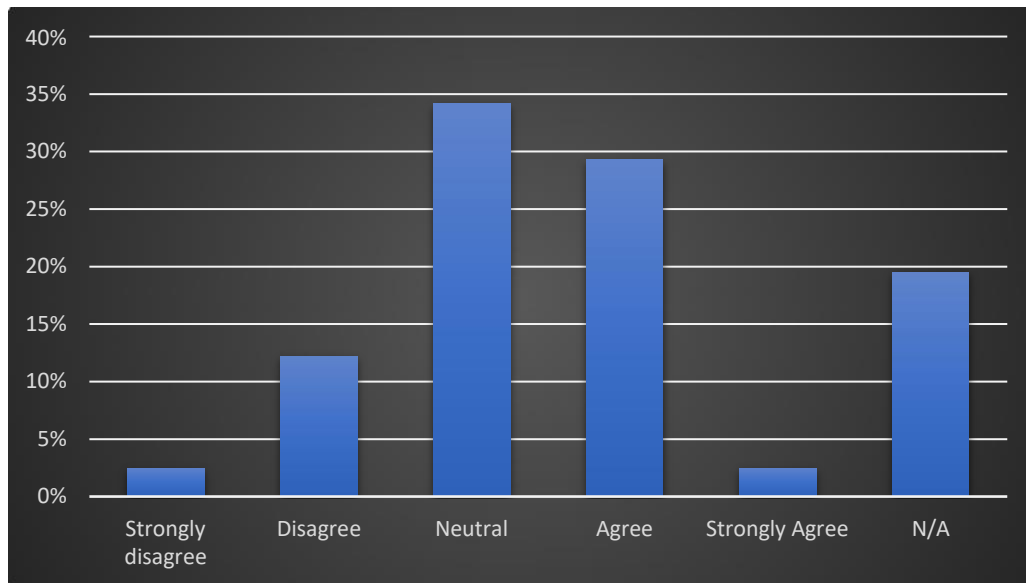
**THE MOST USUAL TRAINING STRATEGY FOR ONBOARD MARITIME PROFESSIONALS
FOLLOWED BY RESPONDENT'S COMPANY**



Finally, as shown through Figure 4.15 next, while three out of ten respondents agree or strongly agree that the current cooperation between shipping companies and MET career offices for recruiting officers is very satisfactory, a slightly larger group of respondents – corresponding to 34.2% of the total – declare themselves neutral on the statement, as shown by the distribution of responses. It must be noted that a non-negligible percentage of around 15% stated that they disagreed or strongly disagreed with the statement a finding which is indicating that there is significant room for improvement between shipping companies and MET career offices in terms of cooperation on recruiting officers .

FIGURE 4.15

DEGREE OF AGREEMENT THAT THE COOPERATION BETWEEN SHIPPING COMPANIES
AND EUROPEAN METs CAREER OFFICES FOR RECRUITING IS VERY SATISFACTORY



Conclusions from the 2021 employers' survey

- According to employers, the top skills that seagoing maritime professionals currently possess to a high degree include *decision-making using data, observation and monitoring the navigation of the ship or the engine performance, and environmental awareness*. They observe skills gaps mainly in the areas of *data processing and information from organisational databases and web sources*, the area of *coaching and mentoring*, and in *conflict management*.
- The employers' survey indicated that a significant percentage of the knowledge and skills acquired through maritime education and training is perceived as outdated.
- The skills employers demand the most from their seafarers include (in order of importance) *communication, situational awareness and risk assessment, and observation and monitoring*. Other skills that received a high or very high rating from a significantly large percentage of respondents include *environmental awareness, critical thinking, and lifelong learning*, with *environmental awareness* scoring the highest as a top-rated skill in the related question.

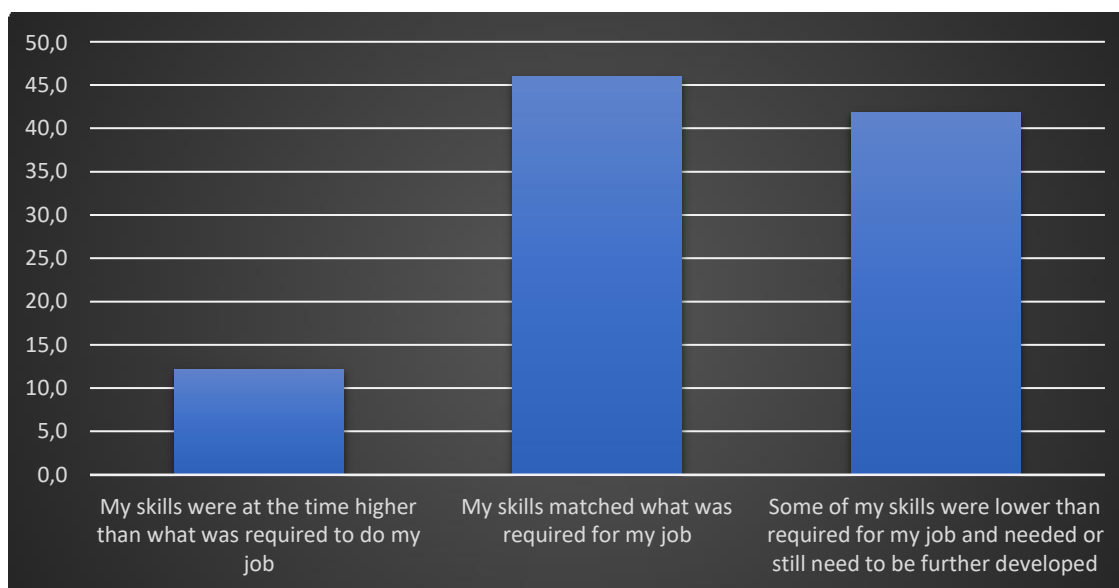
- There are significant difficulties in recruiting ship officers who graduated from European METs. The main reasons are preference for shore-based career opportunities, competition with other companies, and the lack of sufficient graduates from European METs. The lack of appropriate qualifications is another important barrier.
- The most popular employers' strategies for overcoming recruitment difficulties are overseas recruitment and employment through crew agencies.
- Outsourcing to third party training providers is the most used training strategy. Continuous training by METs came third after in-house training.
- There is not a clear verdict or consensus among employers on whether or not the reputation of European METs affects the recruitment of young seafarers. However, the level of preparation of fully skilled seafarers by European METs is assessed positively by the majority of respondents. The survey results indicate also that shipping companies are good candidates to benefit from a potential collaboration with METs as there seems to be plenty of scope for improvement in the specific area of officer recruitment.
- The main causes of a shortage of well-trained graduates of European METs include the inability to attract fully skilled people in the maritime sector, competition for proficient seafarers, inadequate cooperation with other actors to develop the required skills, and – most markedly in the context of the SkillSea mission – a general difficulty in seafarers keeping-up with technological changes on the basis of current skills.
- According to the majority of employers, the skills of current maritime professionals will cover the future needs onboard ships over the next five years to a high degree for skills such as navigation and safety, and for sustainability-quality, but not for digitalisation and automation skills.
- According to the majority of employers will the skills of current maritime professionals cover the future needs ashore the coming five years on safety, operations, sustainability, and quality to a high degree. However, the corresponding degree of future resilience for skills in remote operations and digitalisation is recorded to be in the medium and not in the high range.

Results of the 2021 employees' survey: emerging trends

This section includes the analysis from the employees' survey and – wherever required – an analysis of questions by MET location (non-European METs and European METs). More detailed analysis of the data is presented in a number of the Figures which follow; where - instead of categorisation by MET location - “EEA” and “Others” is used this division is practically equivalent as non-European MET studies and origin largely coincide according to the survey demographics (cf. Annex 3B and 4.1.3 earlier in this Chapter).

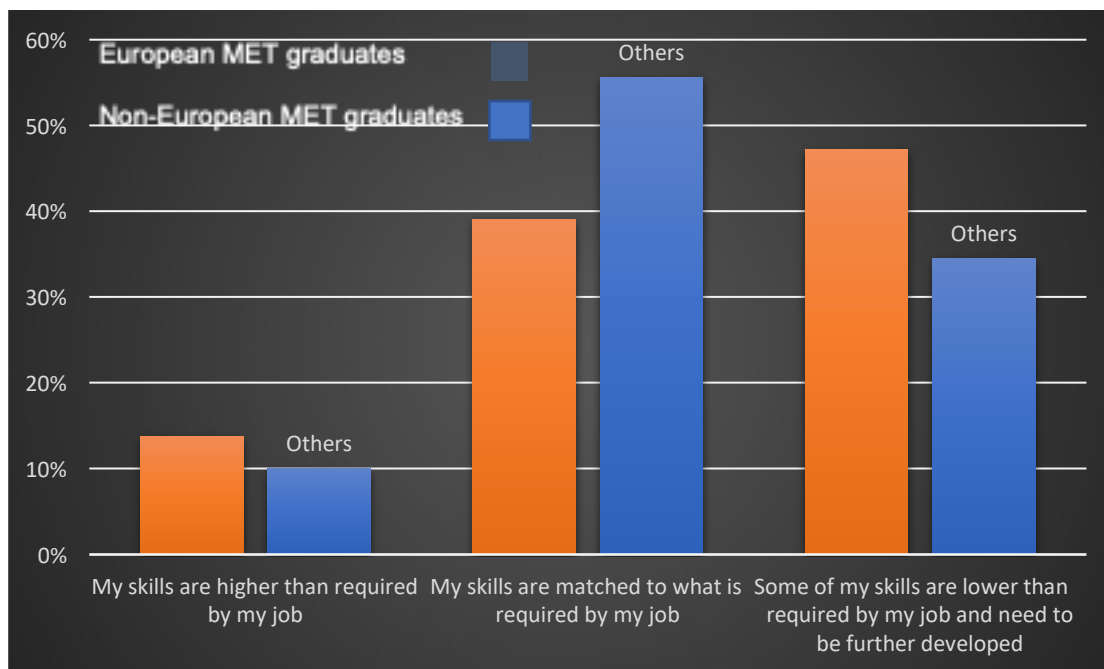
The survey questionnaire for seagoing maritime professionals starts with a question on the general assessment of the level of their skills gaps. As shown in Figure 4.16A, the responses in relation to the capacity of their skills upon MET graduation indicate that a large percentage feel that their MET education helped them build skills that meet their current job requirements (45.9%), or even exceed them (12.2%). However, a significant and almost equal percentage (41.9%) responded that some of their skills are lower than required for their job requirements. This distribution of responses is aligned with the results from the exploratory pilot survey of 2019 (cf. Figure 3.1A, in Chapter 3).

FIGURE 4.16A
SKILLS IN RELATION TO JOB REQUIREMENTS UPON GRADUATION



In terms of the perceptions of maritime professionals, European-MET graduates feel that their skillset does not match the job requirements more than non-European MET respondents (47.2% versus 34.5%); this indicates either a stronger perception of skills gaps among the former group or greater gaps in European MET education. Again, these findings are in line with those in the 2019 pilot survey (cf. Figure 3.1B).

FIGURE 4.16B
SKILLS IN RELATION TO JOB REQUIREMENTS UPON GRADUATION
(4.16A by region of MET)



Next, survey participants were asked to provide a self-assessed measure of their own skills in relation to what is required by their current job. Their perceptions were categorised into three levels, with low corresponding to a 0%-30% rating, medium 30%-60%, and high 60%-100%, as defined throughout both surveys and throughout this report.

Figure 4.17A below presents the related results. The large majority of the respondents, equal to 84.7% self-assess their current skills as high, against 13.0% as medium, and only 2.2% as low. Respondents outside EEA seem more confident with their current skills compared with the EEA respondents, as 91.2% of them assigned a high score, versus 80.1% in the case of EEA (cf. Figure 4.17B). Also, in Annex 5 the Figure Annex 5.1 is a boxplot displaying the distribution of data through their quartiles. The first quartile (25th percentile) corresponds to a 70% score, whilst the third quartile (75th percentile) to 90%.

FIGURE 4.17A

SELF-ASSESSMENT OF THE NECESSARY SKILLS CURRENTLY POSESSED

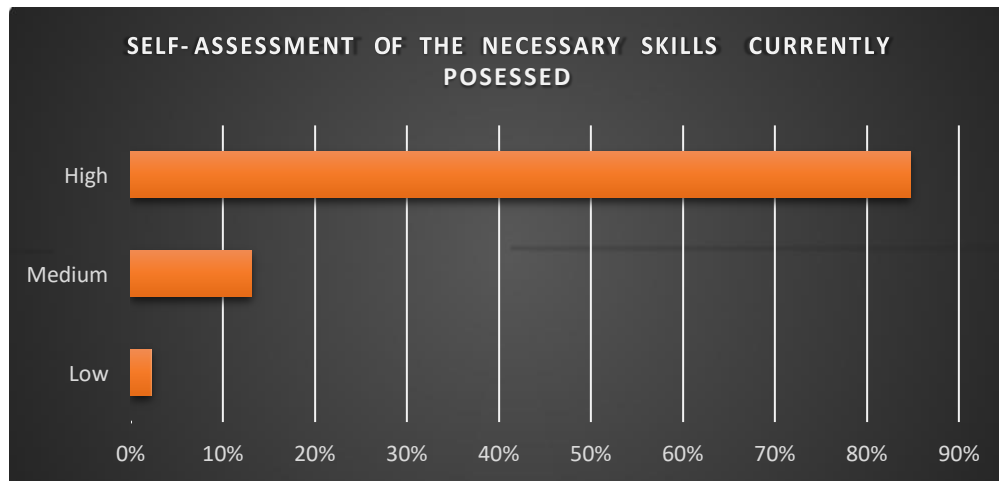
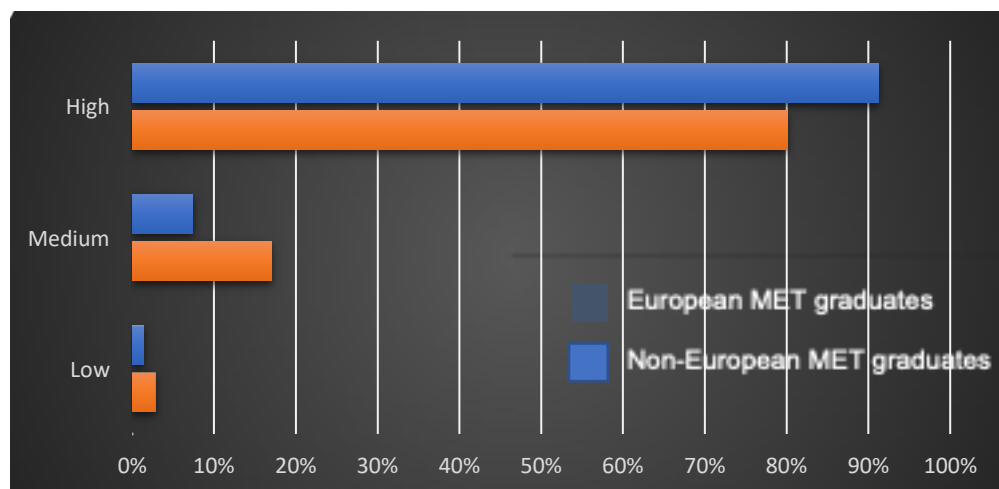


FIGURE 4.17B

SELF-ASSESSMENT OF THE NECESSARY SKILLS CURRENTLY POSESSED

(4.17A by region of MET)

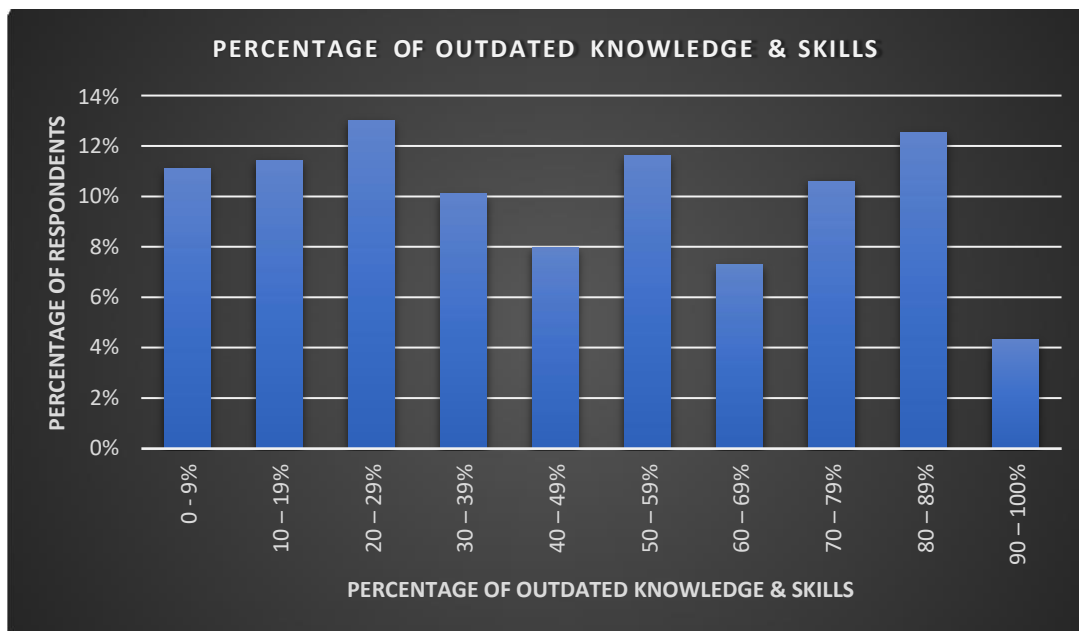


The next survey question explored the extent to which skills and knowledge of seafarers have become obsolete, according to their own perception.

Figure 4.18A shows diverse opinions, with a cumulative 46.4% of respondents indicating that more than half their skills and knowledge – acquired as a rule mostly through MET and complemented by eventual further training – is outdated. A similar pattern of responses was also observed in the 2019 pilot survey (cf. Figure 3.3A).

The results are aligned with those obtained in the previous question on the general assessment of skills related to job requirements.

FIGURE 4.18A
PERCENTAGE OF OUTDATED KNOWLEDGE & SKILLS



Interestingly, while the respondents' perception of the skills gap was somewhat more pronounced in the case of European MET-trained respondents (cf. Figure 4.17B), the percentage of non-European MET respondents reporting that more than 60% of their skills and knowledge were outdated was much higher than that of European MET graduates responding, 47.9% versus 25.5% (cf. Figure 4.18B next).

FIGURE 4.18B
PERCENTAGE OF OUTDATED KNOWLEDGE & SKILLS
 (4.18A by region of MET)

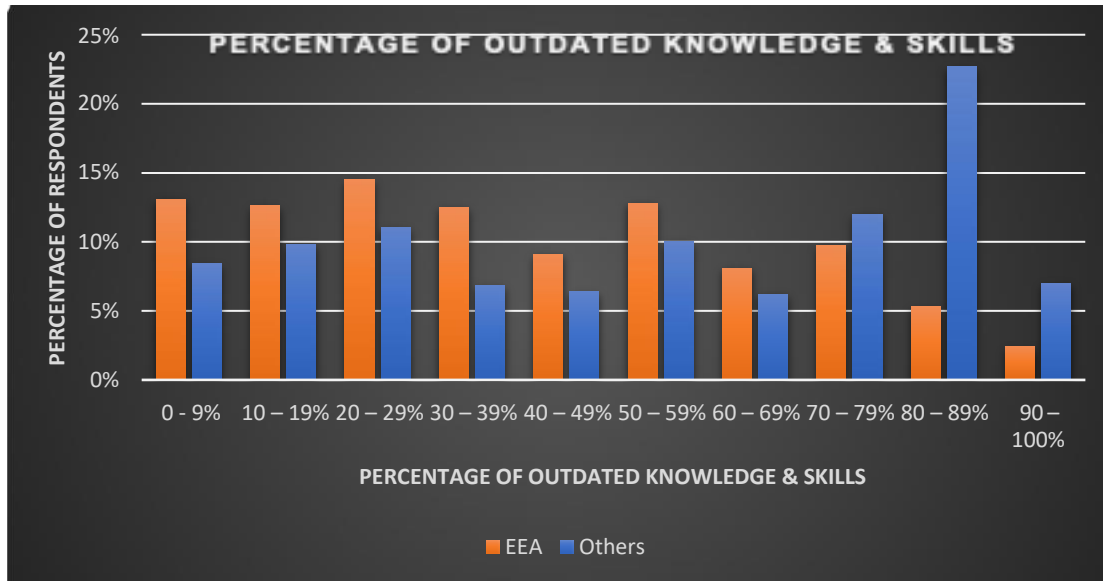


Figure 4.19A focuses on the likelihood of skills obsolescence in the next five years, an aspect directly related to the speed of the creation of significant skills gaps. In the 2021 survey, 34.7% of respondents viewed this risk as moderately or highly likely, while only 13.7% considered it very unlikely. Again, the distribution of responses closely matches the distribution observed in Figure 3.4A of the 2019 pilot survey.

FIGURE 4.19A
LIKELIHOOD OF THE SKILLS BECOMING OUTDATED IN THE NEXT FIVE YEARS

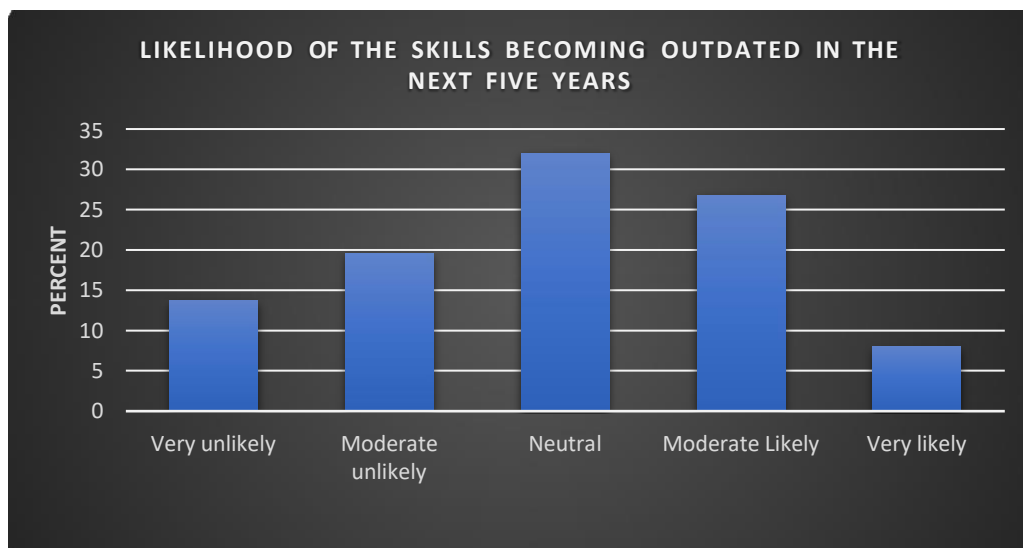
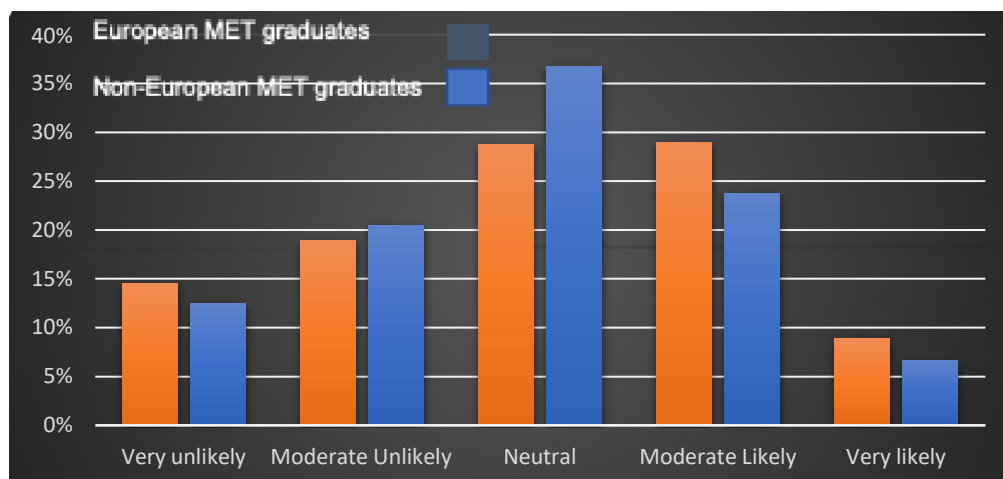


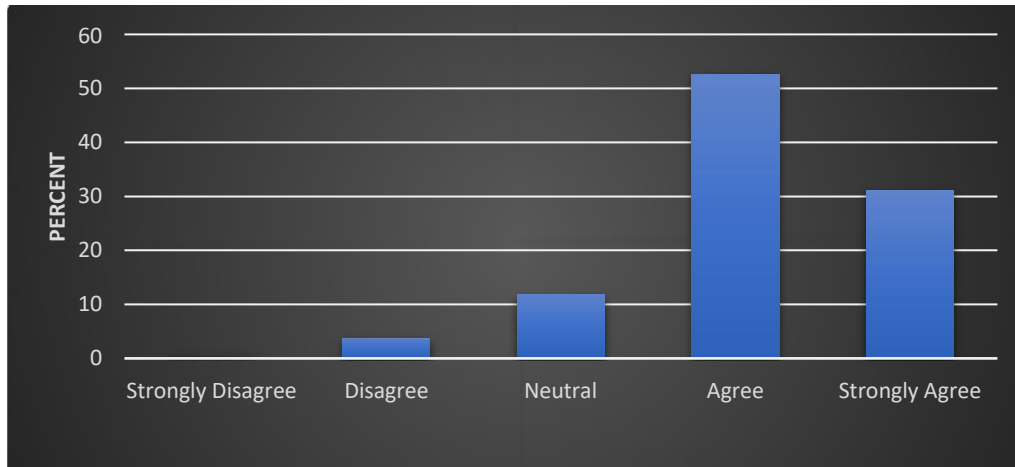
Figure 4.19B indicates a regional match in the assessment of a rather high probability of skills becoming outdated within the next five years. Graduates of European METs seem only slightly more concerned that there is a very high likelihood that several of their skills might become outdated in the next five years, with 8.9% finding the scenario very likely (vs. 6.6% of non-EEA respondents). However, a higher percentage of European MET graduates responding – 14.5%, compared with 12.5% of non-European MET respondents – finds such a scenario very unlikely.

FIGURE 4.19B
LIKELIHOOD OF SKILLS BECOMING OUTDATED IN THE NEXT FIVE YEARS
(4.19A by region of MET)



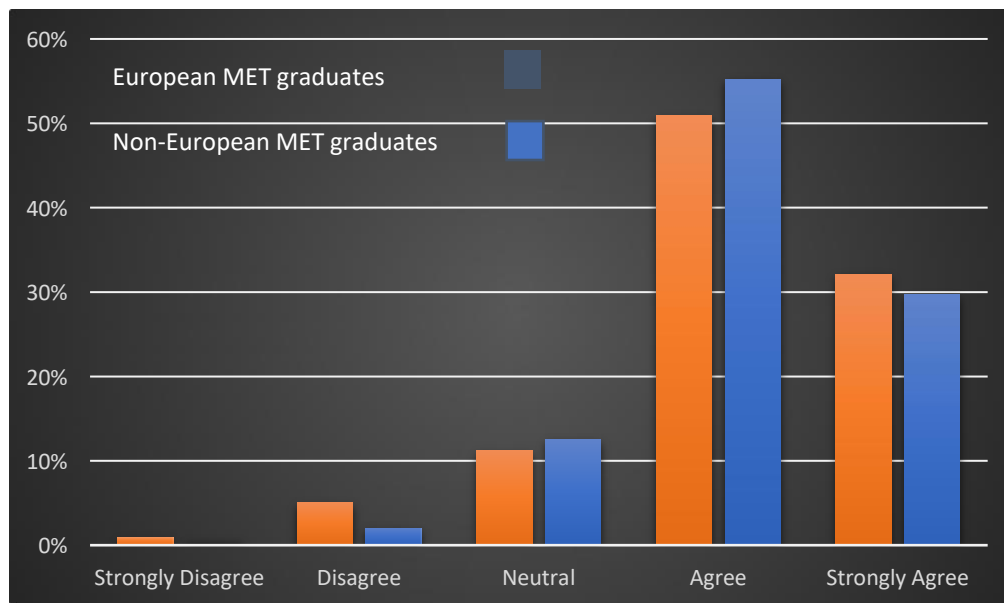
The need for more training due to rapid technological changes in the maritime sector is illustrated in Figure 4.20A, as 83.7% of respondents agree or strongly agree that further training is needed.

FIGURE 4.20A
NEED FOR FURTHER TRAINING DUE TO TECHNOLOGICAL PROGRESS AND NEW DEVELOPMENTS



Approximately the same percentage was also recorded in the 2019 pilot survey (cf. Figure 3.5A in Chapter 3). Overall, these findings reveal the need for more comprehensive and focused training programmes that will upgrade the skills of maritime professionals. Related European MET-trained and non-European MET trained survey responses are in general rather aligned, with just small and not one-directional discrepancies (cf. Figure 4.20B).

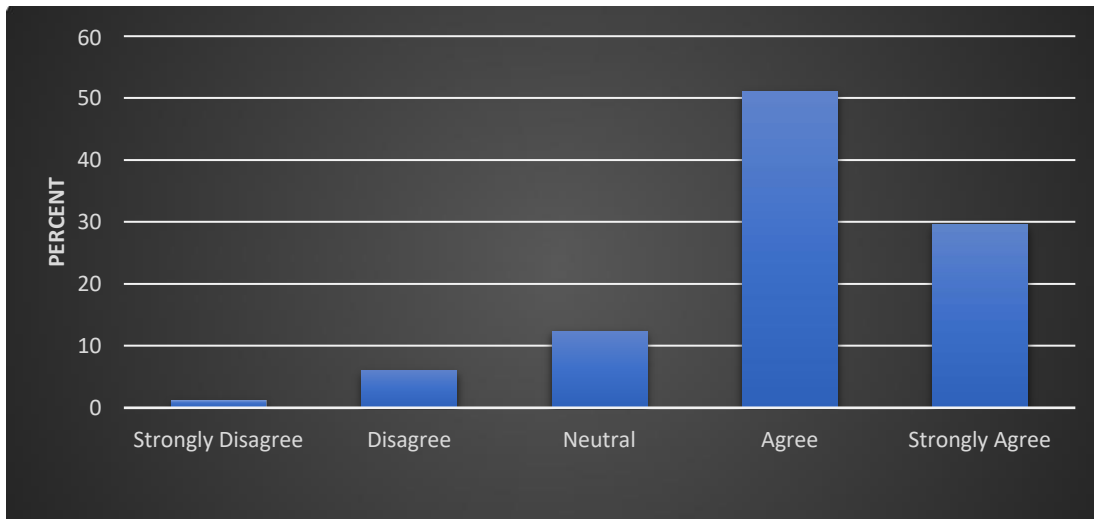
FIGURE 4.20B
NEED FOR FURTHER TRAINING DUE TO TECHNOLOGICAL PROGRESS AND NEW
DEVELOPMENTS
(4.20A by region of MET)



The results shown in Figure 4.21A further confirm a well-established perceived connection between skills and job performance among seafarers. More specifically, 80.5% of respondents agree or strongly agree that the possession of additional skills would significantly enhance their performance, an issue strongly related to self-assessed employability and its potential increase through learning initiatives suitable for – and attractive to – maritime professionals.

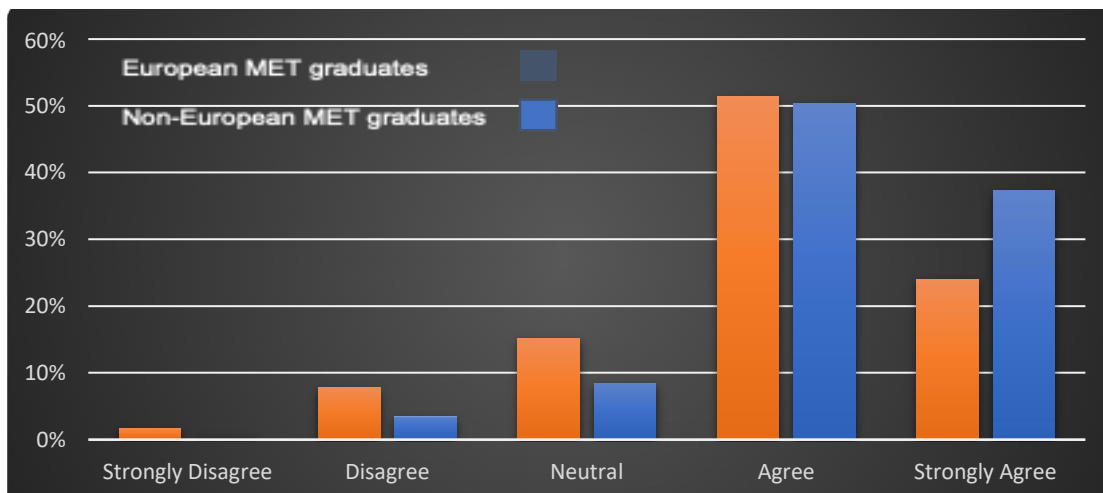
Results for this question are consistent with the relevant findings of the 2019 pilot survey, although in that case the respective percentage was slightly higher (84.0%) (cf. Figure 3.6A).

FIGURE 4.21A
ROLE OF ADDITIONAL SKILLS IN JOB PERFORMANCE



The percentage of non-European MET-trained respondents agreeing or strongly agreeing that additional knowledge and skills would improve performance (87.7%) is significantly higher than the respective percentage among European MET-trained respondents (75.4%) with, notably, 37.3% of non-European MET trained respondents (versus 24.0% of European MET-trained) strongly agreeing (cf. Figure 4.21B).

FIGURE 4.21B
ROLE OF ADDITIONAL SKILLS IN JOB PERFORMANCE
(4.21A by region of MET)

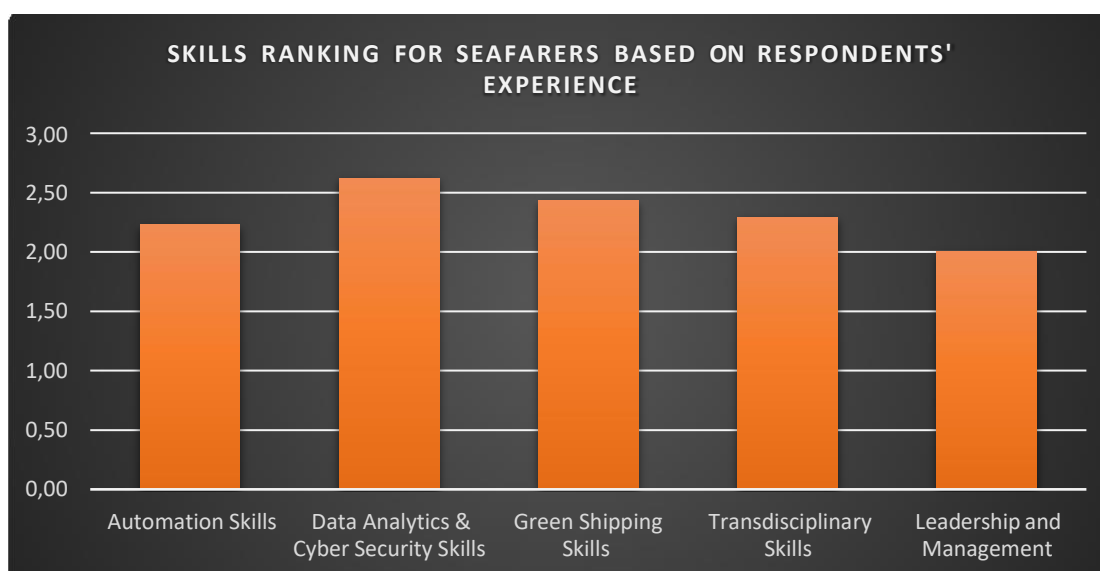


Next in the questionnaire, skills were classified by respondents to gauge their perceptions of the importance of the skills listed in the relevant question.

Figure 4.22A presents the ranking of skills by respondents through a 1-5 scale, with “1” corresponding to the most important skill and “5” to the least important. According to the survey findings, the most essential skills are revealed to be leadership and management, with an average score of 2.00. Second in order of importance are automation skills, with an average score of 2.23. Based on average scores, the third most important category is transdisciplinary skills, with an average score of 2.29. The two remaining categories – green shipping skills (average score 2.43) and data analytics and cyber-security skills (average score 2.62) – may have received a lower average ranking, but this does not understate their importance. Values recorded reveal them to be perceived as quite significant by respondents, reflecting the fact that maritime professionals are anticipating to a certain extent the impact of the two megatrends in the shipping industry – sustainability and digitalisation (see WP1 reports). This order of importance is also consistent with the ranking that arose from the 2019 pilot survey (cf. Figure 3.7A). The responses of European MET-trained and the other survey participants are aligned, as they both rank leadership and Management, automation, and transdisciplinary skills as the three most essential skills and in exactly the same order of importance.

FIGURE 4.22A

SKILLS RANKING FOR SEAFARERS BASED ON RESPONDENTS' EXPERIENCE



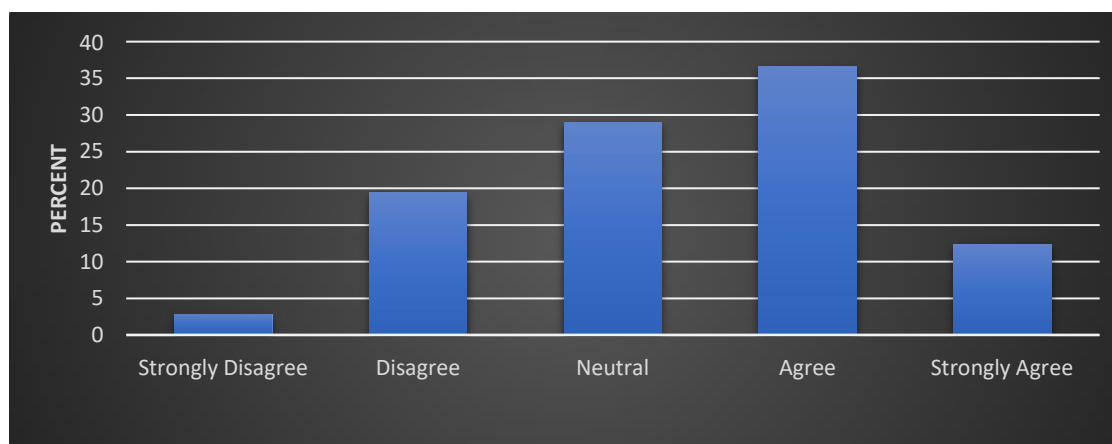
The average scores assigned across all skills of the survey by respondents trained in European METs are slightly higher than those assigned by respondents trained elsewhere (cf. Figure 4.22B).

FIGURE 4.22B
SKILLS RANKING FOR SEAFARERS BASED ON RESPONDENTS' EXPERIENCE
 (4.22A by region of MET)



Crucially for the mission of this deliverable report, the next Figure, 4.23A, reveals that MET educational material is not perceived by respondents as fully pertinent for the new era of shipping. A most significant 48.9% agree or strongly agree that there is a significant mismatch between what is taught in METs and what the industry needs, and another 28.9% are neutral. Those large percentages point to one of the eventual main reasons for gaps in the full set of necessary skills. The distribution of responses is fully consistent with the 2019 pilot survey.

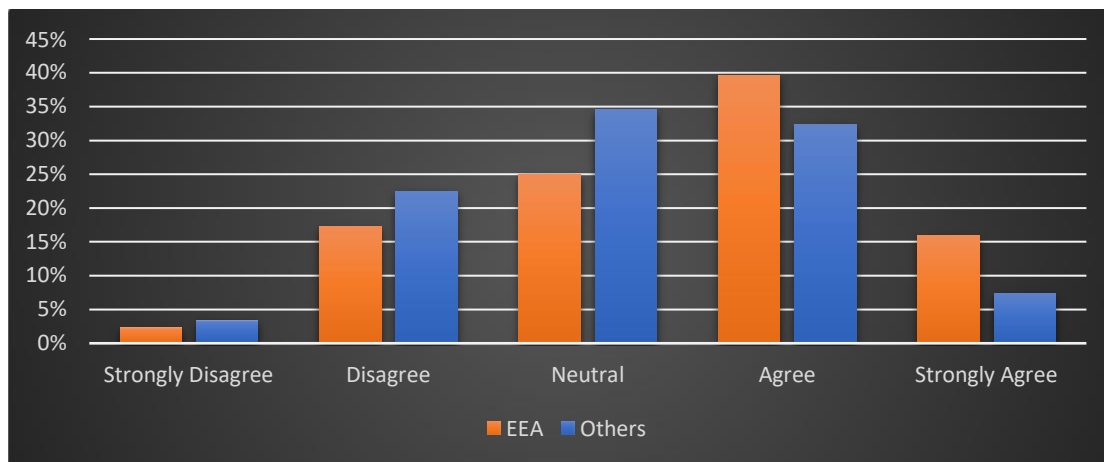
FIGURE 4.23A
EXISTENCE OF MISMATCH BETWEEN MET TEACHING MATERIAL AND INDUSTRY NEEDS



In terms of regional breakdown of this perception, responses of maritime professionals trained in European METs indicate the existence of a mismatch more powerfully – with 55.5% agreeing or strongly agreeing – than among those trained in non-European METs, of whom the respective percentage of 39.7% is substantially lower (cf. Figure 4.23B).

FIGURE 4.23B

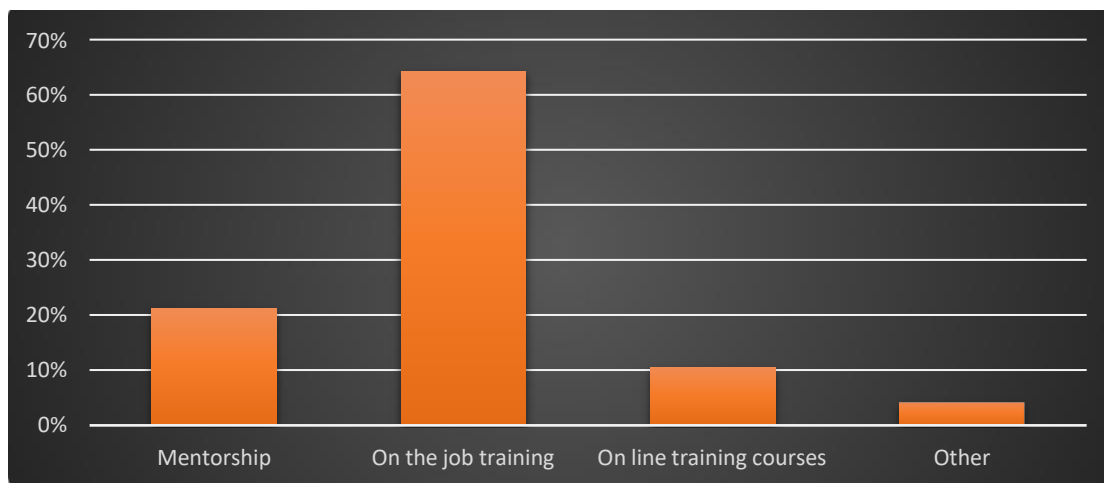
EXISTENCE OF MISMATCH BETWEEN MET TEACHING MATERIAL AND INDUSTRY NEEDS
(4.23A by region of MET)



The perceptions of participating seafarers about the key methods to acquire new skills are presented in Figures 4.24A and in 4.24B by region. The majority of them, equal to 64.3%, view on the job training as the most appropriate method for developing new skills, while 21.2% selected mentorship. Only 10.4% believe that online training courses can help them develop the necessary skills.

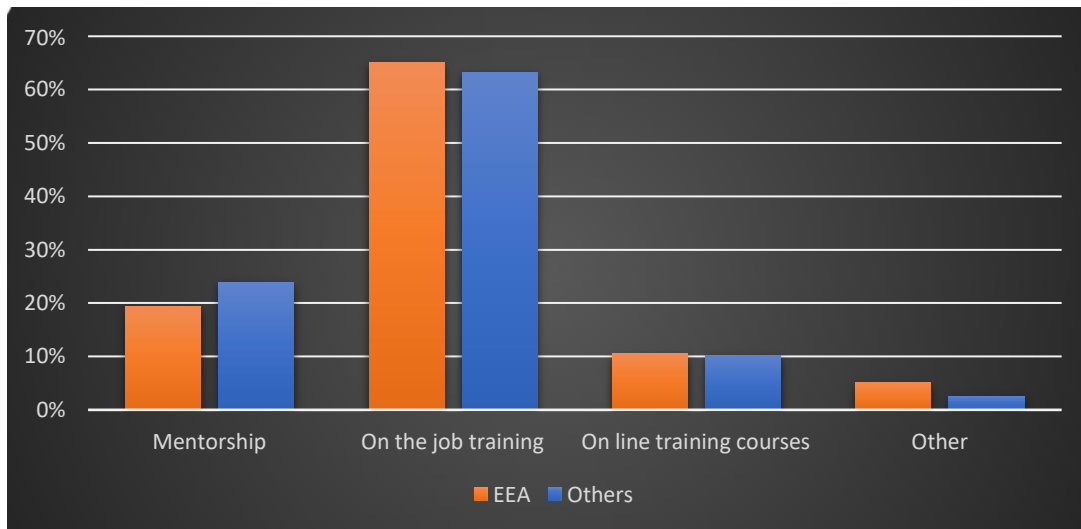
FIGURE 4.24A

METHODS TO GAIN NEW SKILLS



The distribution of responses is fully consistent with the 2019 pilot survey. Finally, the differences of perception do not vary significantly among European MET-trained respondents and others.

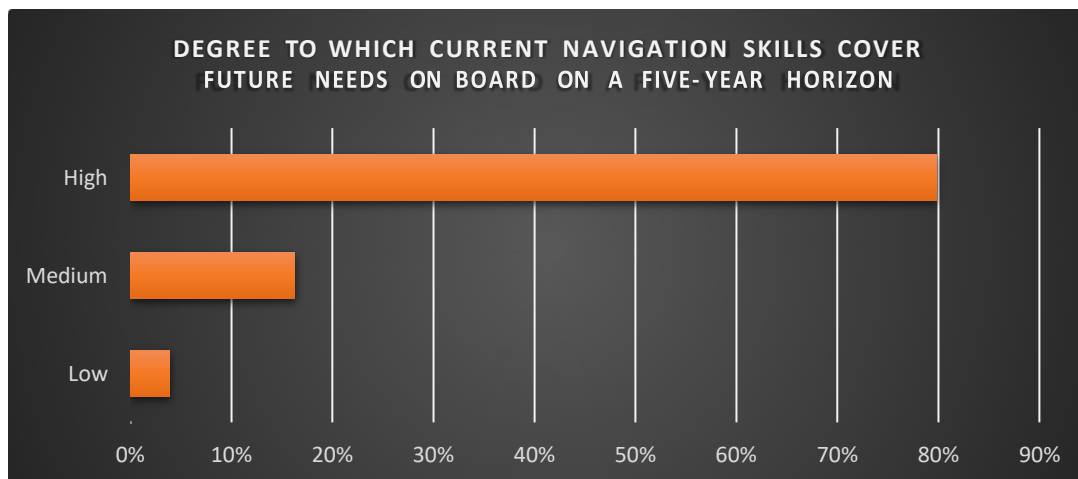
FIGURE 4.24B
METHODS TO GAIN NEW SKILLS
(4.24A by MET region)



Figures 4.25A-4.25B display the perceptions of maritime professionals who participated in the survey about the degree to which each of the key skills they currently possess will cover the future needs on board ships over the next five years. Their perceptions were categorised into three levels, with Low corresponding to a 0%-30% rating, Medium to 30%-60%, and High to 60%-100%. Figure 4.25A, below, shows results for current navigation skills. High is top ranked with 79.8% while Low has a very low value, equal to 3.9%.

FIGURE 4.25A

NAVIGATION SKILLS ONBOARD

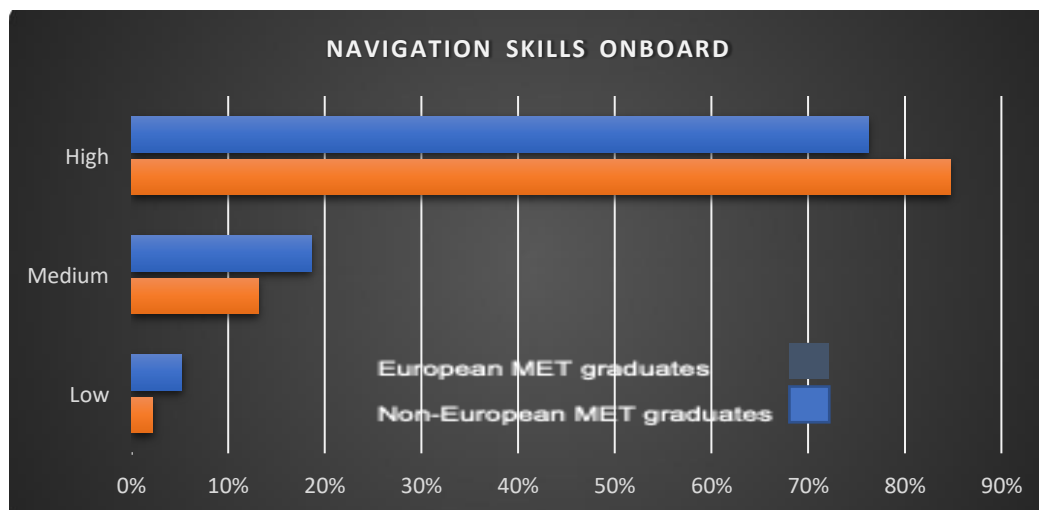


Non-European MET respondents identify for themselves higher navigation skills compared with the levels identified by graduates of European METs (84.7% versus 76.2%) (cf. Figure 4.25B).

FIGURE 4.25B

NAVIGATION SKILLS ONBOARD

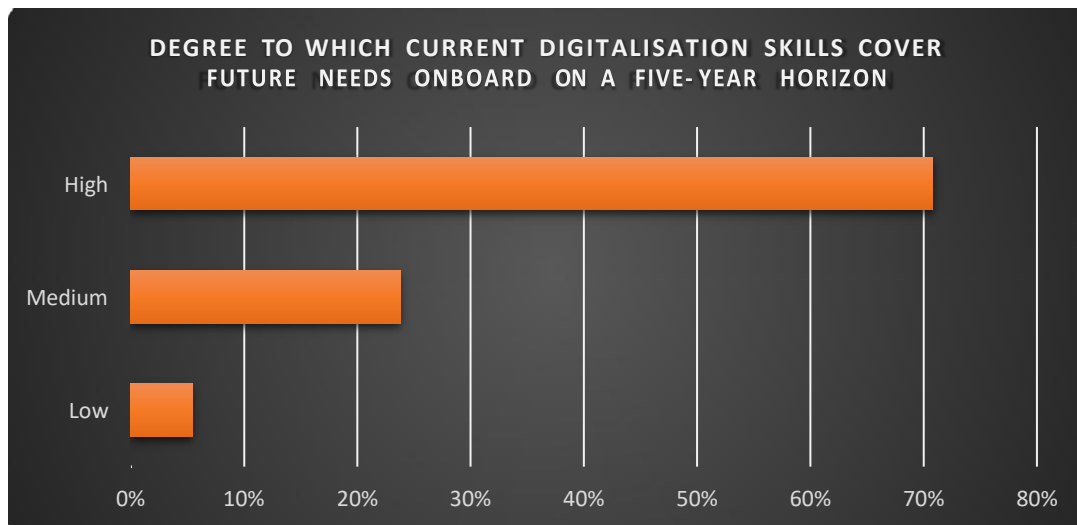
(4.25A by region of MET)



Moreover, in Figure Annex 5.2 the first quartile (25th percentile) corresponds to a 70% score, whilst the third quartile (75th percentile) to 90%. Figure 4.26A, below, shows the current digitalisation skills. In terms of responses, High is markedly in the lead with 70.8%, while Low has a very low value equal to 5.4% and Medium represents 23.8%.

FIGURE 4.26A

DIGITALISATION SKILLS ONBOARD



Respondents with non-European MET training identify for themselves higher digitalisation skills compared with what is identified by those trained in European METs (83.6% versus 61.6%) (cf. Figure 4.26B). And in Figure Annex 5.3 the first quartile (25th percentile) corresponds to a 60% score, whilst the third quartile (75th percentile) to 90%.

FIGURE 4.26B

DIGITALISATION SKILLS ONBOARD

(4.26A by region of MET)

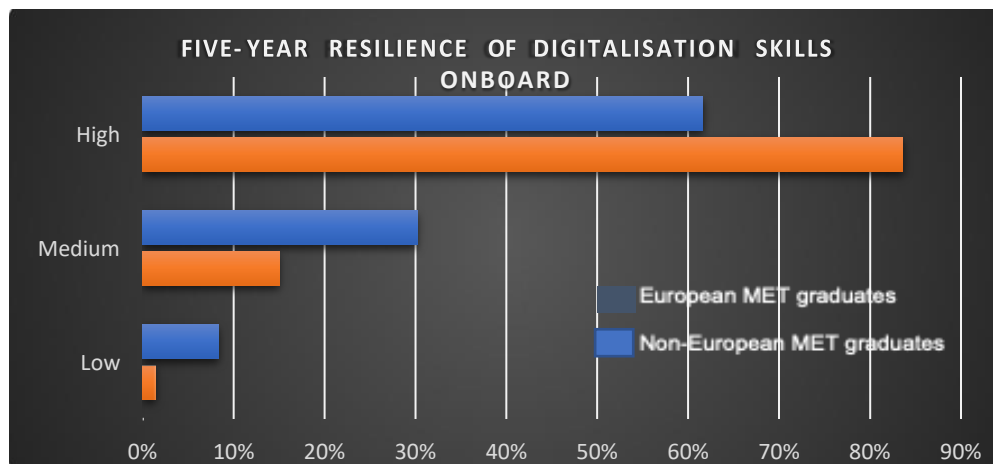


Figure 4.27A shows the current safety skills. High is top ranked with 86.6% while Low has a very low value, equal to 1.7%. Respondents who are graduates from non-European METs identify for themselves higher safety skills compared with the levels identified by those trained in European METs (92.2% versus 82.6%) (cf. Figure 4.27B). Also, in Figure Annex 5.4 the first quartile (25th percentile) corresponds to an 80% score, whilst the third quartile (75th percentile) to 100%.

FIGURE 4.27A

SAFETY SKILLS ONBOARD

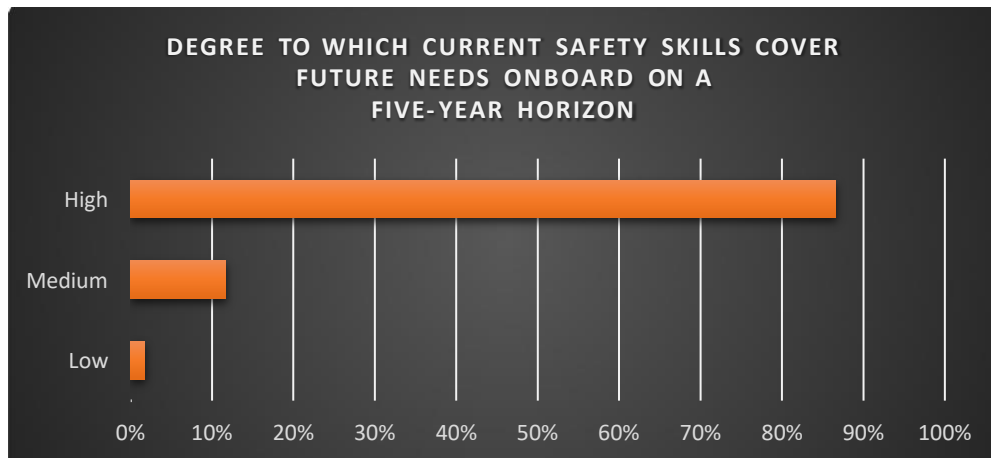


FIGURE 4.27B

SAFETY SKILLS ONBOARD

(4.27A by MET region)

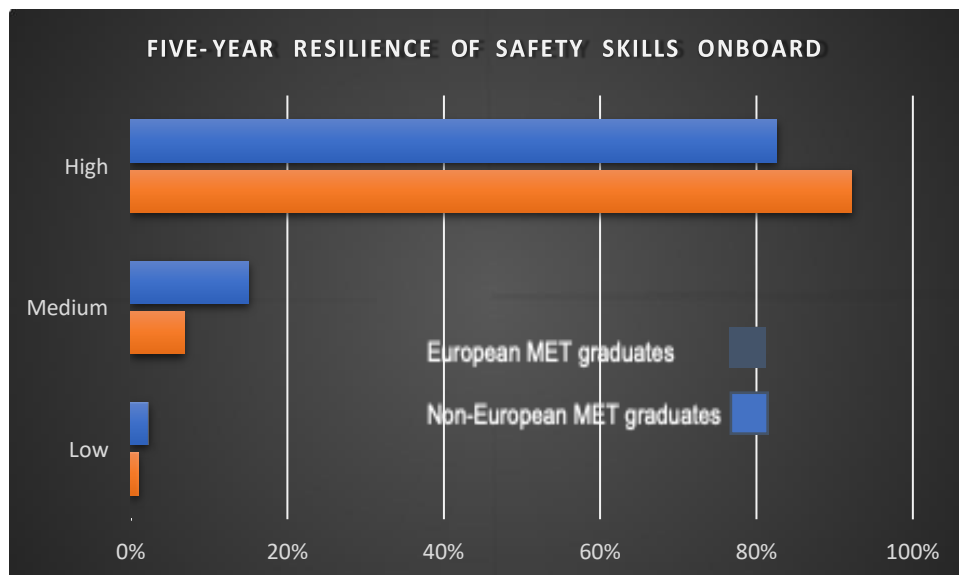


Figure 4.28A shows the perception about the five-year resilience of current sustainability-quality skills. High is ranked top, with 77.8%, while Low has the lowest value, equal to 3.6%. Respondents who are graduates of non-European METs identify for themselves higher sustainability-quality skills compared with the levels identified by respondents trained in European METs (88.2% versus 70.4%) (cf. Figure 4.28B).

FIGURE 4.28A

SUSTAINABILITY-QUALITY SKILLS ONBOARD

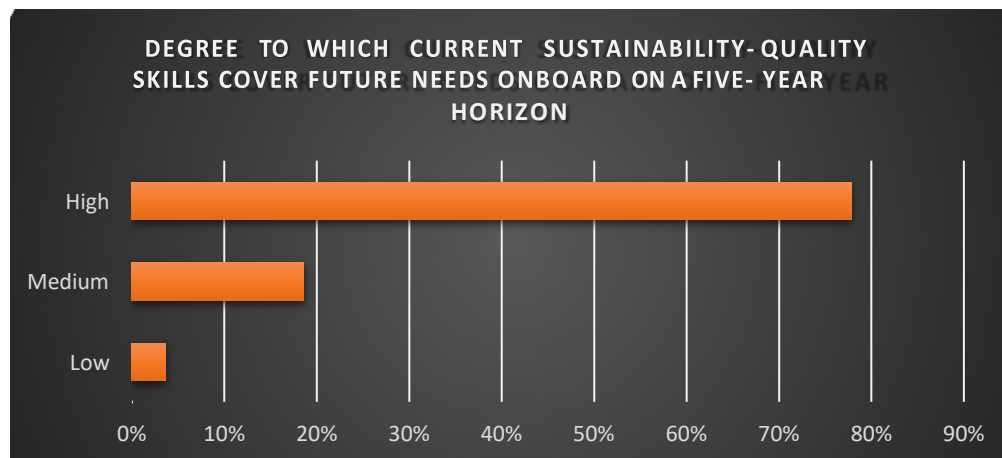
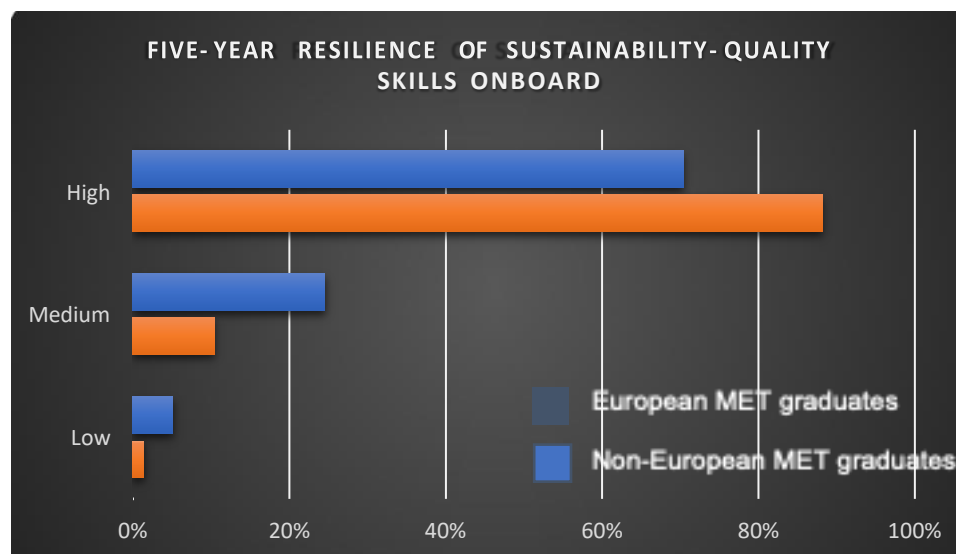


FIGURE 4.28B

SUSTAINABILITY-QUALITY SKILLS ONBOARD

(4.28A by MET region)



Additionally, in Figure Annex 5.5 the first quartile (25th percentile) corresponds to a 70% score, whilst the third quartile (75th percentile) to 90%. Figure 4.29A, below, shows the current automation skills. High is top ranked with 70.7% while Low has the lowest value among the three ratings, equal, however, to 6.3% with the second strongest level (following the 23.8% recorded in the case of digitalisation) of medium with 23%. Non-European MET graduates identify for themselves higher automation skills compared with the levels identified by European MET graduates (84.2% versus 61.1%) (cf. Figure 4.29B). And, in Figure Annex 5.6 the first quartile (25th percentile) corresponds to a 60% score, whilst the third quartile (75th percentile) to 90%.

FIGURE 4.29A

AUTOMATION SKILLS ONBOARD

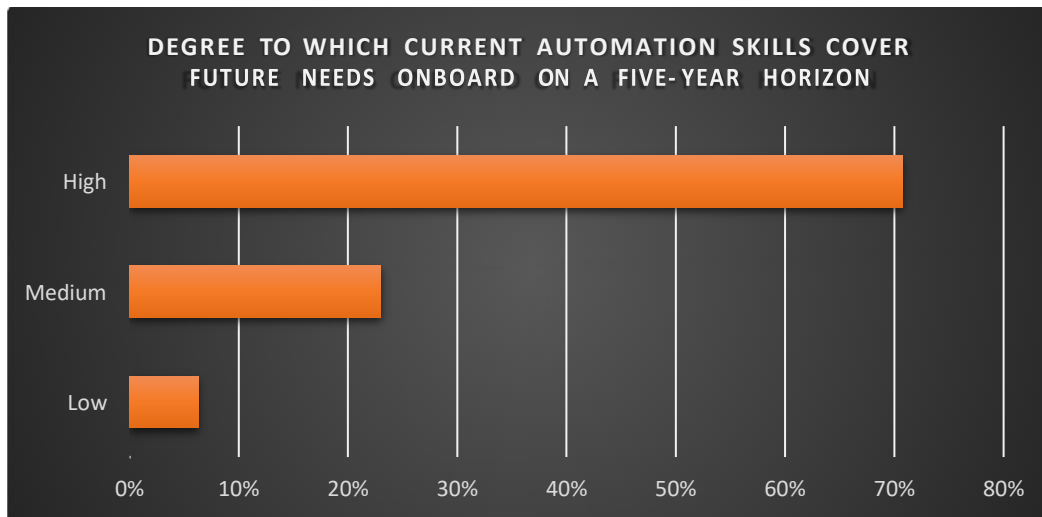
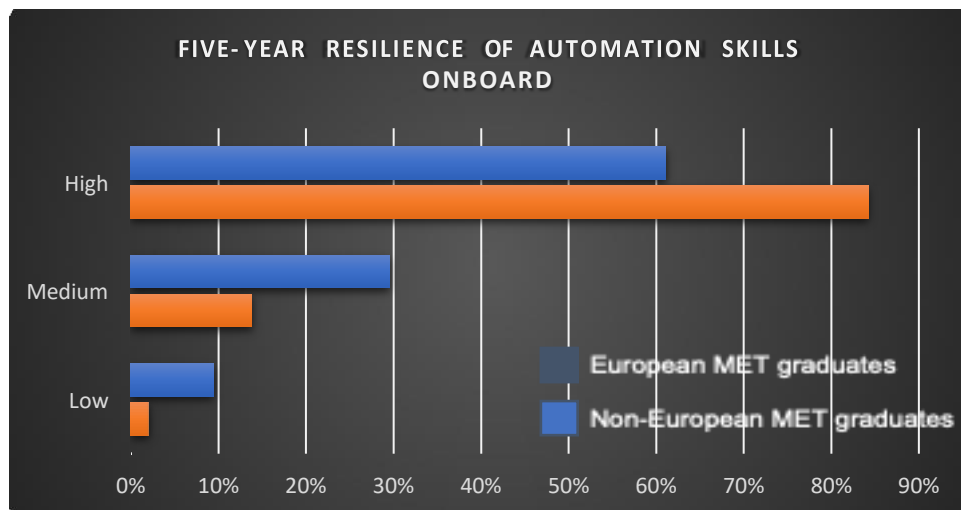


FIGURE 4.29B

AUTOMATION SKILLS ONBOARD

(4.29A by MET region)



Figures 4.30A – 4.30B display the perceptions of maritime professionals who participated in the survey about the degree to which each of the key skills they currently possess will cover the future needs ashore over the next five years. Again, their perceptions were categorised into three levels, with Low corresponding to a 0%-30% rating, Medium to 30%-60%, and High to 60%-100%.

Figure 4.30A shows the current operations skills. High is ranked top, with 74.4%, while Low has the lowest value, equal to 4.6%. Non-European MET graduates identify for themselves higher operations skills compared with European MET graduates (84.0% versus 67.6%) (cf. Figure 4.30B). In Figure Annex 5.7 the first quartile (25th percentile) corresponds to a 60% score, whilst the third quartile (75th percentile) to 90%.

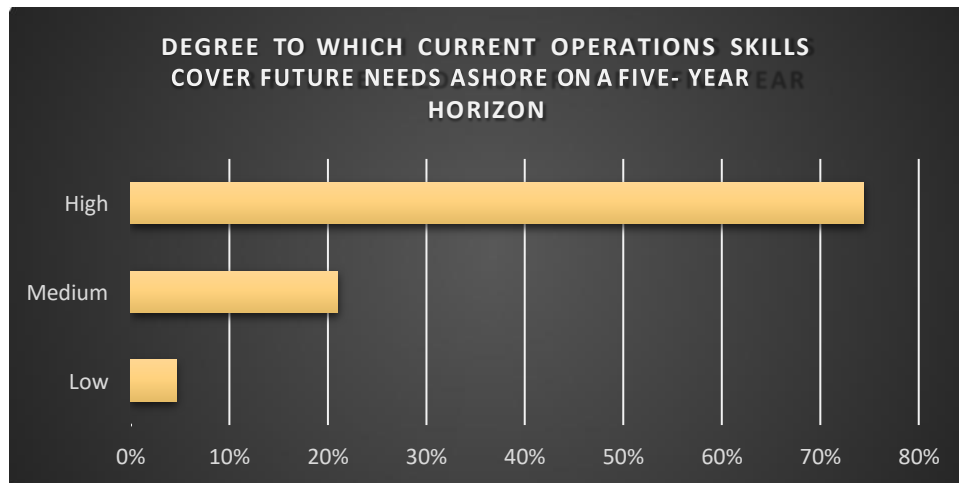
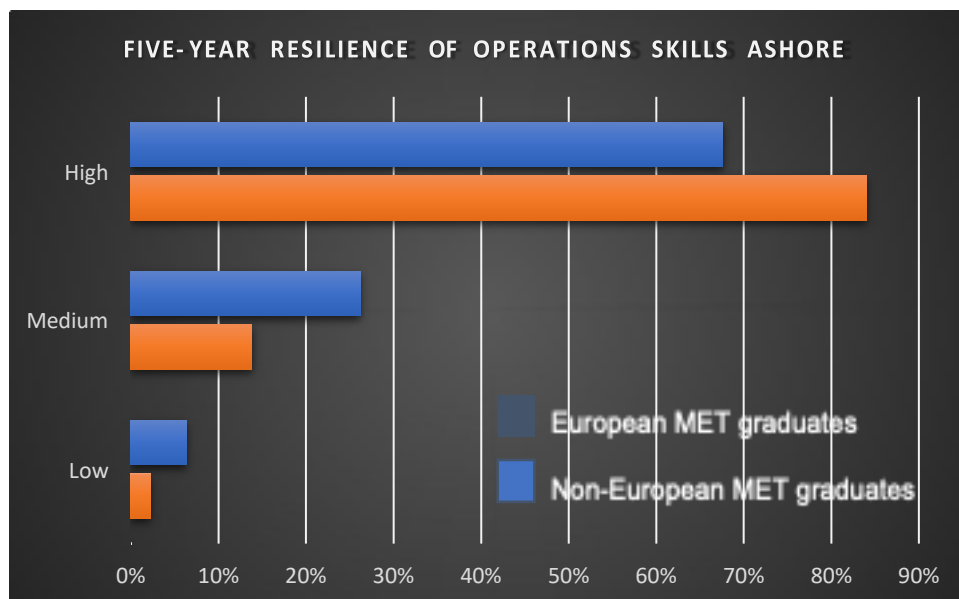
FIGURE 4.30A**OPERATIONS SKILLS ASHORE****FIGURE 4.30B****OPERATIONS SKILLS ASHORE****(4.30A by MET region)**

Figure 4.31A shows current digitalisation skills. High is ranked top with 70.2% while Low has the lowest value, equal to 4.8%. Medium is ranked higher than the 21% recorded for Operations with the value in the case of Digital skills being 25%. Respondents trained in non-European METs identify for themselves higher digitalisation skills compared with the levels identified by graduates of European METs (84.4% versus 60.0%) (cf. Figure 4.31B).

FIGURE 4.31A
DIGITALISATION SKILLS ASHORE

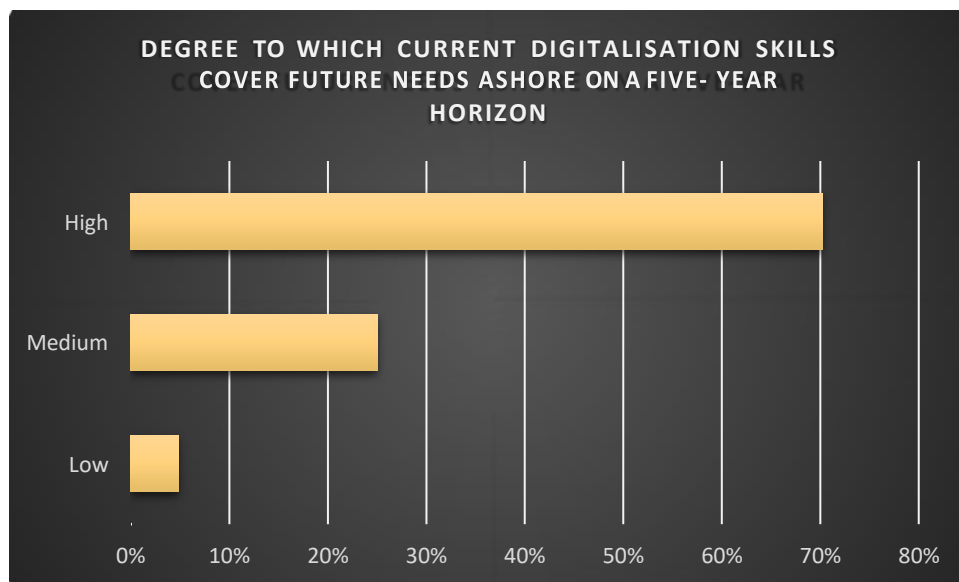
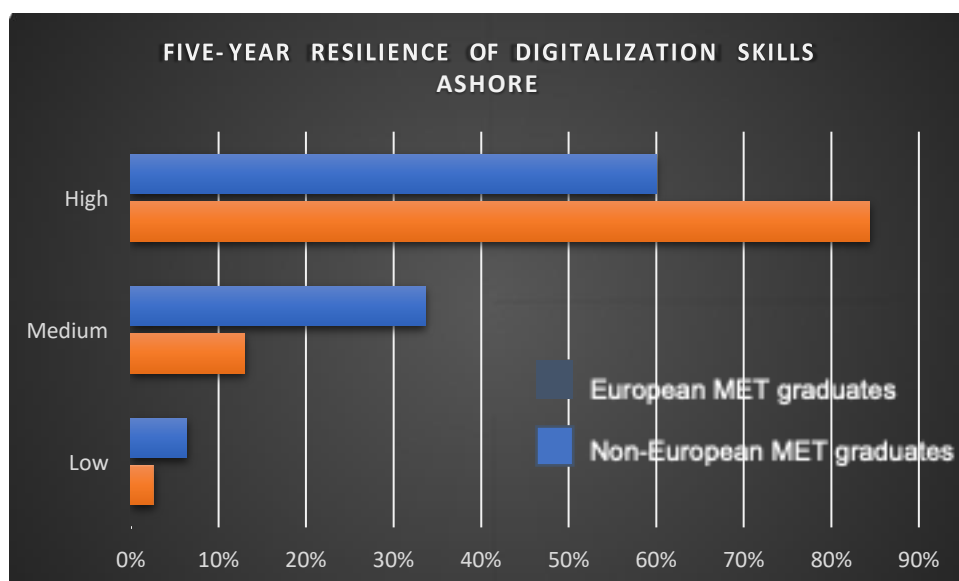


FIGURE 4.31B
DIGITALISATION SKILLS ASHORE
(4.31A by region of MET)



In Figure Annex 5.8 the first quartile (25th percentile) corresponds to a 60% score, whilst the third quartile (75th percentile) to 90%.

Figure 4.32A shows the current safety skills. High is ranked top, with 82.0%, while Low has the lowest value, equal to 3.0%, and with only 15% recorded for Medium. Non-European METs graduates identify for themselves higher safety skills compared with the levels identified by European MET graduates (91.0% versus 75.6%) (cf. Figure 4.32B).

FIGURE 4.32A
SAFETY SKILLS ASHORE

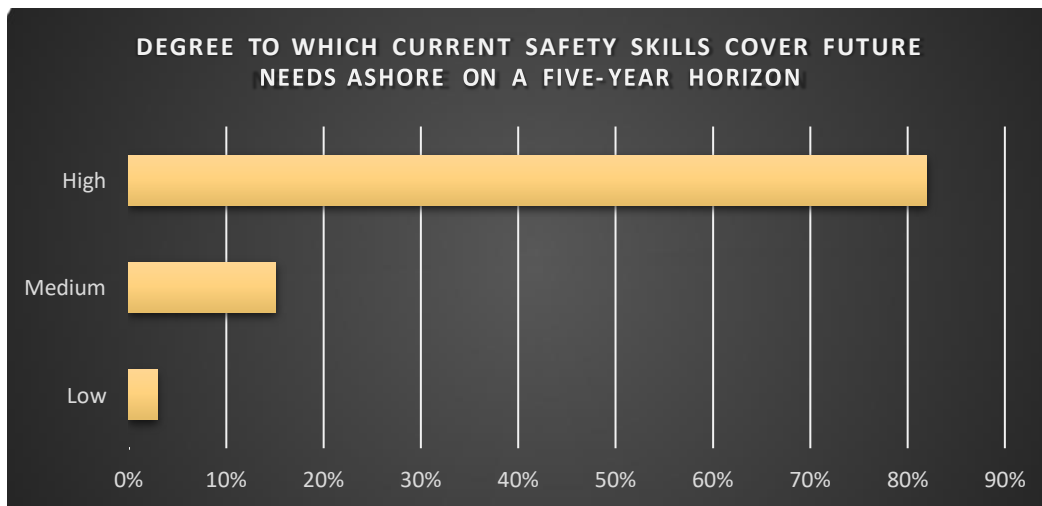
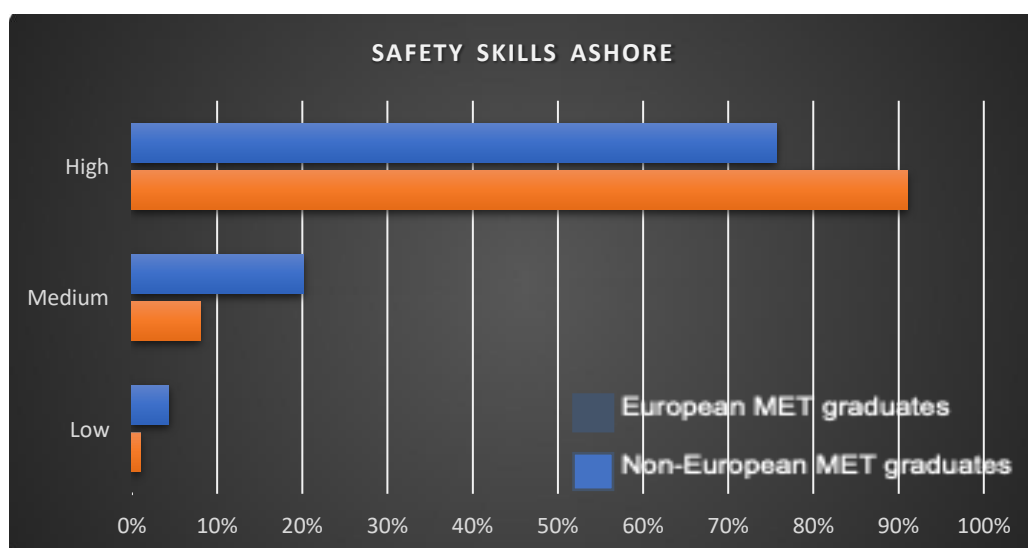


FIGURE 4.32B SAFETY SKILLS
ASHORE
(4.32A by region of MET)



In Figure Annex 5.9 the first quartile (25th percentile) corresponds to a 70% score, whilst the third quartile (75th percentile) to 100%.

Figure 4.33A shows the current sustainability-quality skills. High is ranked top with 75.4% while Low has the lowest value, equal to 4.3%, with a substantial 20.2% in the Medium range. Non-European MET graduates respondents identify for themselves higher sustainability-quality skills compared with the levels identified by those from European METs (86.8% vs 67.3%, cf. Figure 4.33B).

FIGURE 4.33A
SUSTAINABILITY AND QUALITY SKILLS ASHORE

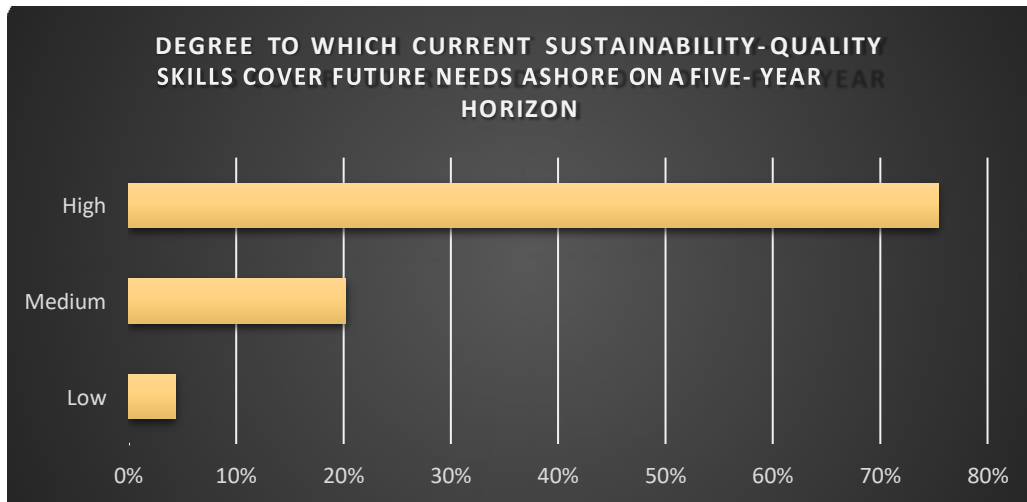
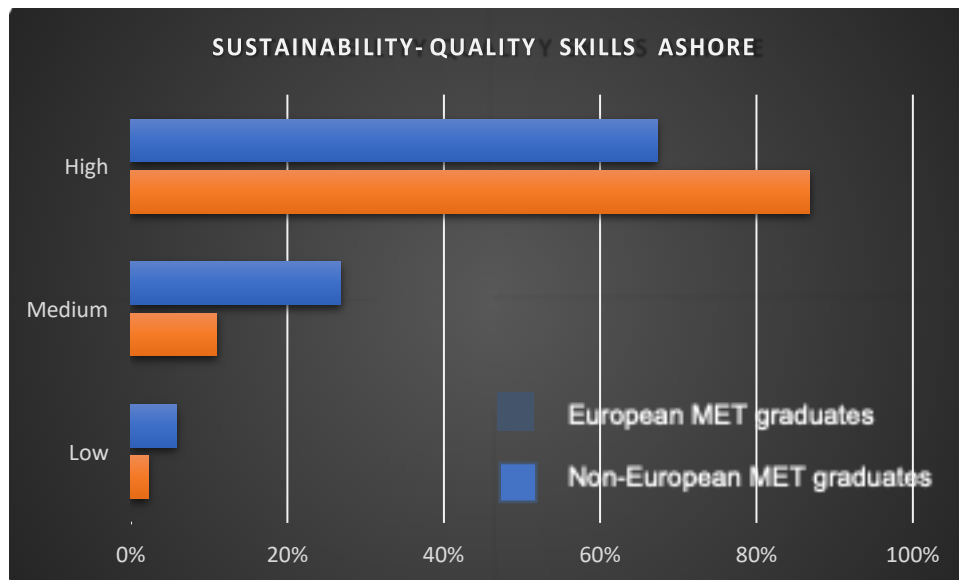


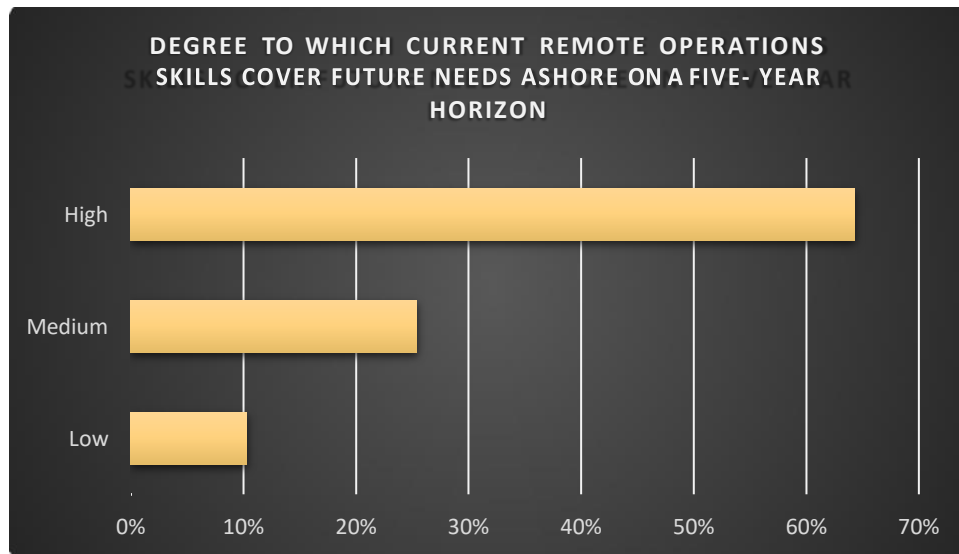
FIGURE 4.33B
SUSTAINABILITY AND QUALITY SKILLS ASHORE
(4.33A by MET region)



Also, in Figure Annex 5.10 the first quartile (25th percentile) corresponds to a 70% score, whilst the third quartile (75th percentile) to 90%. Figure 4.34A, below, shows the current remote operations skills. High is top ranked, with 64.3%, while Low has the lowest value, equal to 10.3%. However, in this case the highest Medium figure is recorded at 25.4%.

FIGURE 4.34A

REMOTE OPERATIONS SKILLS ASHORE



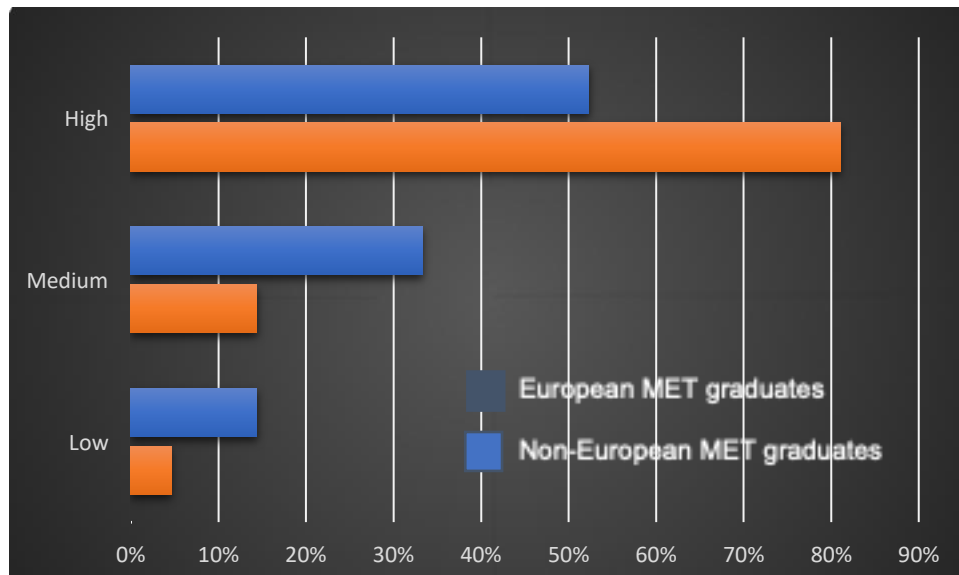
Non-European MET graduates among the respondents identify for themselves higher remote operations skills compared with the levels identified by European MET graduates (81.0% versus

52.3%) (cf. Figure 4.34B). Moreover, in Figure Annex 5.11 the first quartile (25th percentile) corresponds to a 50% score, whilst the third quartile (75th percentile) to 90%.

FIGURE 4.34B

REMOTE OPERATIONS SKILLS ASHORE

(4.34A by MET region)



4.2.2 Conclusions from the 2021 employees' survey

- The findings are consistent with the 2019 pilot survey and any minor discrepancies in the percentages do not significantly affect similarities in the distributions of responses. Overall, both the 2019 and 2021 results demonstrate a strong perception of the importance of skills development.
- While the majority of maritime professionals responding to the survey stated that their skills matched or exceeded their job requirements upon graduation, a significant percentage felt under-skilled. The percentage of the European MET graduates surveyed who feel that their skillset does not match the job requirements was significantly higher than this of non-European MET graduates.
- The self-assessment of employees indicates that most of them feel that they possess high skills. However, in a similar question, a significant number of respondents indicated that more than half of their skills and knowledge is outdated. The majority of respondents agree that further training is needed, whilst “on the job” training qualifies as the most appropriate method, based on the responses. In addition, a significant share of respondents identifies a mismatch between what is taught in METs and what is required of them onboard the ships they serve.
- Of particular interest for addressing employability issues is the emerging strong self-perception of respondents that skills and job performance are connected.
- According to the survey results, the most essential skills in order of importance are those in leadership and management; automation; transdisciplinary skills; green shipping; and data analytics and cyber-security. This ranking is based on average scores.
- According to the majority of employees, the current maritime professionals' skills will cover the future needs on board ships over the next five years to a high or moderate degree. This is a different picture from what transpired from the employers' survey, as for two of these skills – digitalisation and automation – the employers veered towards Medium as the prevalent rating of five-year resilience. According to the stated perception of maritime professionals onboard, all fall in the High range in the following descending order of perceived resilience: safety skills; navigation skills; sustainability-quality skills; automation skills; and digitalisation skills (for this ranking perceived “time-fragility” was calculated by adding Medium and Low ratings' percentages).
- According to the majority of employees, the current skills of maritime professionals can cover to a high degree the future needs ashore over the next five years: their assessment of skills' resilience is in descending order: safety; sustainability/quality; operations; digitalisation; remote operations. For

the last four of these skills there is a significant presence of Medium range rankings. However, this picture is different from what is ascertained through the employers' survey (cf. 4.2.1) as there Medium had the highest value with the difference being more marked in the case of the last two skills (cf. 4.2.2).

4.3 Monitoring skills for an evolving employability: the contribution of a tool

Based on the suggestions from the survey results analysed and on the takeaway results from the focus groups conducted and discussed earlier in the report, this final section of Chapter 4 presents the elements for a tool allowing an effective connection between anticipating skills and employability.

4.3.1 The contribution of an additional tool in the strategic toolkit of SkillSea WP3

The D3.3. mission can be supported and fulfilled by adding a multiple-criteria decision-making (MCDM) tool in the strategic toolkit of SkillSea which includes, in the context of reports D3.2 and D3.4, two AHP-based tools: a. the Strategy Direction Location (STRA.D.L.) tool which has been designed to facilitate strategic cooperation choices among options open to METs and b. the Transfer International Tool (Trans.I.T.), an exchange tool which uses fundamental ECTS/ECVET elements that are easily adaptable between levels and educational programmes. The SkillSea WP3 toolkit also includes a tool devised in the context of the D3.2 deliverable – the Strategic Evaluation MET Tool (ST.E.ME.T) for measuring evaluation strategies in a dynamic perspective and for steering educational content according to skills requirements.

In view of evolving skills, of assessed gaps and mismatches and of fast-evolving trends, adding a user-friendly employability tool in the context of D.3.3 may prove helpful at a strategic level. The potential contribution of such a tool may be mainly for MET and MET-related organisations of the sector, but it can also serve for any employability research or assessment purposes.

4.3.2 The essential steps for a usable MCDM shipping employability tool: S.E.A.B. AN.T.

The Shipping Employability AHP Based Anticipating Tool (S.E.A.B.AN.T.) concept is based on a proposed AHP⁵³ hierarchy (cf. Figure 4.35).

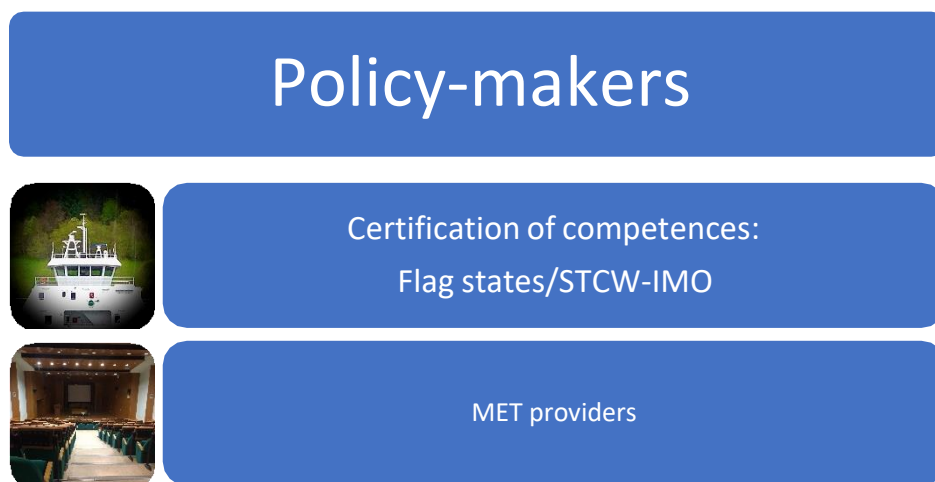
Employability – as the “skills & competences”⁵⁴ individual packages underlying it – can be expressed in a proxy form by the probability of employment candidates to fill a position but also to fulfil their targeted ambition to fill it. This probability is based largely on the level of the economic activity at each period, which is outside the power of members of the workforce, but also on the matching of the skills and competences of prospective employees to the requirements of the industry they address each time. In this perspective, employability is an issue directly concerning policymakers, education and training providers and prospective/current employees.

From the industry side, employability has its counterpart in recruitment, where workforce availability and matching of skills and competences with specific position requirements play the critical defining roles.

Employability becomes thus a critical aspect for the success of education and training providers and for policymakers responsible for relevant levels and types of education, as well as for certification bodies. It is also critical for MET providers, flag states, MET education countries as well as the IMO which is the relevant global maritime institution (cf. Figure 4.35).

FIGURE 4.35

EMPLOYABILITY OF MARITIME PROFESSIONALS AND STAKEHOLDERS



To align skills and competences packages with recruitment requirements involves decisions by individual stakeholders (or categories of stakeholders) such as those noted above and is of particular importance for defining the content of employability-enhancing educational packages for maritime professionals.

Decision-making can nowadays be assisted through the use of a multiple-criteria decision-making (MCDM) method. Among the existing range, and of their combinations, the Analytic Hierarchy Process (AHP) is a most suitable MCDM methodology for defining essential employability criteria and following their suitability through updates and industry-workforce consultation mechanisms. Other methodologies such as the Technique for Order of Preference by Similarity to Ideal Solution, (TOPSIS) can be combined with AHP. Nevertheless, the description of the S.E.A.B.A.N.T. tool in this interim report is based on a simplified AHP approach to be further developed through the 2022 focus groups and the further mining of the survey results, especially on the basis of results obtained on the labour market requirements.

⁵³ For the AHP as a user-friendly versatile multicriteria decision making method see Saaty, T.L. (2001) *The Analytic Network Process*, Saaty, T.L., (1994) *Fundamentals of Decision Making and Priority Theory with the Analytic Hierarchy Process*. First Edition, RWS Publications and Saaty, T.L., Forman, E.H. (2003). *The Hierarchon: A Dictionary of Hierarchies*. Volume V of the AHP Series, 3rd Edition, RWS Publications.

⁵⁴ On the EQF (European Qualification Framework) definition basis ESCO refers to skills as “the ability to apply knowledge and use know-how to complete tasks and solve problems”, to competences as “the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development” and knowledge as “the outcome of the assimilation of information through learning [...] to a field of work or study”. Cf. the relevant EQF definitions of the concepts as on the ESCO pages for skills, competences, and knowledge available at <https://ec.europa.eu/esco/portal/escopedia/Skill>, last accessed April 10, 2021, <https://ec.europa.eu/esco/portal/escopedia/Competence>, last accessed April 10, 2021, and <https://ec.europa.eu/esco/portal/escopedia/Knowledge>, last accessed April 10, 2021.

In summary, AHP is a MCDM method based on hierarchies and relative or absolute comparisons of the attributes of the alternatives. The structure of hierarchies permits the decomposition of decision-goals to criteria. This decomposition is a powerful way to help the human mind to cope with complexity and diversity.

The decision factors are organised in steps and levels of importance. Further to the advantages of breaking down a decision problem into criteria and sub-criteria, hierarchies may take qualitative properties and factors into consideration.

Once the hierarchy of a problem is set, then the decision-maker is concerned with weighting alternatives and criteria. First priorities for the main criteria, judging them for their relative importance, are established and then proceeding with the ranking of alternatives follows⁵⁵.

AHP has been thoroughly analysed and its essentials can be found in the publications of its pioneer Saaty (Saaty 1977, Saaty 1994, Saaty 2001)⁵⁶ and subsequent research. Selecting the

AHP as a suitable methodology for the S.E.A.B.AN.T. tool is based on:

1. AHP being a method based on relative and not absolute comparisons, whereby the relative importance among criteria is easy to define through user-friendly scales deployed while its foundations are compatible with modern understanding of human decision-making.
2. AHP is flexible when it comes to incorporating judgements and personal values in a logical way, which is valuable when dealing with problems which are characterised by unavoidable subjectivity – an issue that AHP attempts to limit by exposing the foundations of the decision through the breaking-down of criteria forming the ultimate decision/solution sought.
3. AHP provides a framework which allows group participation in decision-making, and therefore the criteria and their weights can be extracted through consensus and appropriate weighting of the opinion of the relevant each time decision-makers.
4. AHP has a long and successful record of applications to many problems of policymaking and assessment of impacts of various natures across industries and categories of decision-makers. The decision model is simple to construct, as well as being intuitive and in line with general thinking, and does not require specialised expertise from the users involved, only a simple software⁵⁷ to derive the values involved⁵⁸. The tool will be developed and validated through a dedicated related questionnaire with mock-employee profiles. Alternatives will be ranked during the early 2022 focus groups on the basis of further discussion on the results of surveys which will be available at that time.

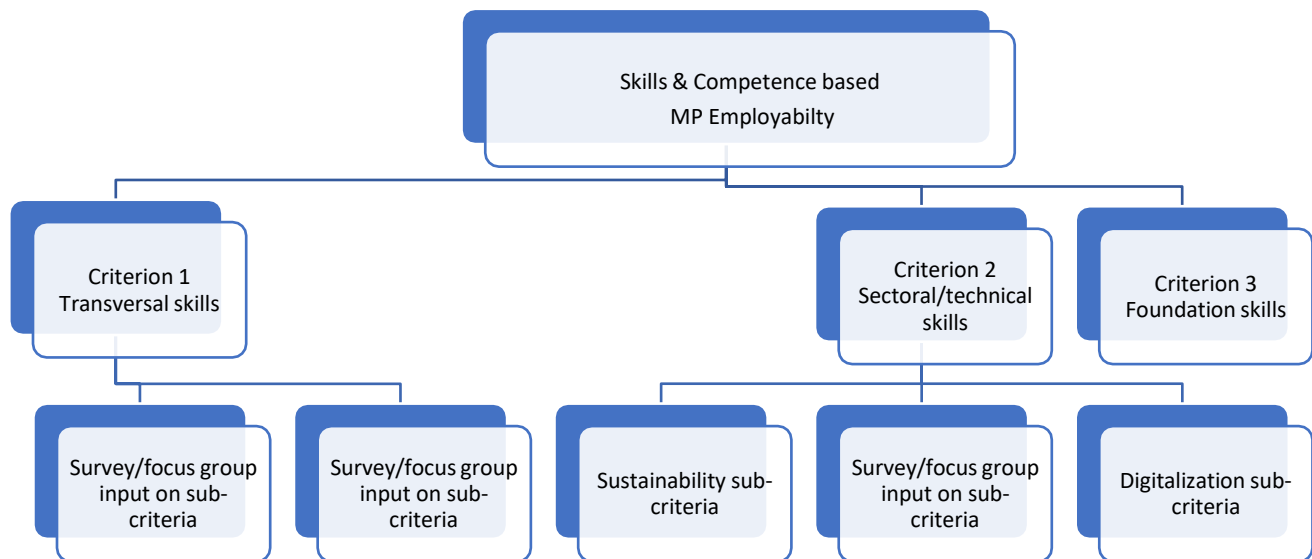
A proposed initial hierarchy forming the basis of the S.E.A.B.AN.T. tool is presented in Figure 4.36, below.

⁵⁵ The comparison matrices have specific mathematical characteristics, such as being reciprocal, and the diagonal elements are equal to unity.

⁵⁶ Cf. Saaty (2001), op.cit., Saaty (1994) op.cit and Saaty and Forman (2003), op.cit.

FIGURE 4.36A

PROPOSED AHP HIERARCHY FOR EMPLOYABILITY OF MARITIME PROFESSIONALS



Although this practical application of S.E.A.B.AN.T. is not the main aim for creating the tool, it will serve to show its functionality and versatility. In turn, this will enable S.E.A.B.AN.T. to be fully adapted and to serve as a self-assessment mechanism for MET institutions and reskilling/upskilling VET providers.

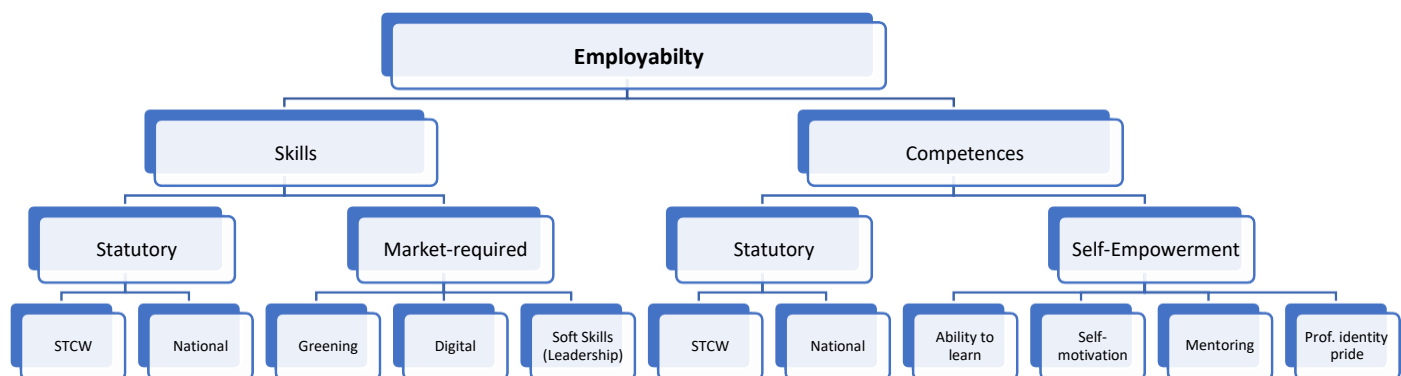
The early 2022 focus groups will provide both the testing ground and the development group of the tool's prototype, allowing for modifications in the proposed hierarchy in terms of number of layers and also of individual components as alternative, more detailed, hierarchies with more criteria layers – such as these displayed in Figure 4.26B – will be proposed alongside.

⁵⁷ There are also free software packages available on the internet.

⁵⁸ Saaty has presented the fundamental scale which is widely used in AHP applications and permits pair-wise comparisons.

FIGURE 4.36B

PROPOSED EXPANDED AHP HIERARCHY FOR EMPLOYABILITY OF MARITIME PROFESSIONALS



Considering the hierarchy in Figure 4.36B the following points should be highlighted at this stage:

1. This expanded hierarchy includes the statutory requirements, as per STCW and national legislation, as well as the “market-related” features that increase employability and reflect the needs of employers. On the one hand, the needs of employees are reflected in the “self-empowerment” set of attributes. In a nutshell, the level IV aspects of “greening”, “digital”, “soft skills” and “leadership” are features that serve primarily the needs of the operations and of the employers, as reflected in the analysis so far. On the other hand, the features of “ability to learn”, “self-motivation”, “mentoring” and “professional identity pride” do empower the employee with the beneficial role of this empowerment amidst change - being well documented⁵⁹.
2. This hierarchy implies interdependencies among criteria; thus, a more sophisticated numerical approach will be deployed. Dependencies related to the statutory framework, such as the STCW

⁵⁹ For empowerment and self-efficacy cf. Ozer, E. M., & Bandura, A. (1990). Mechanisms governing empowerment effects: a self-efficacy analysis. *Journal of personality and social psychology*, 58(3), 472. For more on this analytical framework cf. Bandura, A. (1986). Social foundations of thought and action. *Englewood Cliffs, NJ*, 1986 (23-28) also Bandura, A. (1988a). Perceived self-efficacy: Exercise of control through self-belief In J. P. Dawwalder, M. Perrez, & V Hobi (Eds.), *Annual series of European research in behavior therapy*, 2, 27-59 and Bandura, A. (1988b). Self-efficacy conception of anxiety. *Anxiety Research*, 1, 77-98.

at level IV, related to “statutory” at criteria level III or of “Skills” and “Competences” at level II are clear and known due to the intertwined approach of skills and competences as per STCW and should be considered in the 2022 validation rounds (focus groups). Nevertheless, there may be obscured dependencies, such as “digital” and “ability to learn” at criteria level IV requiring further attention.

3. This hierarchy does not include a “motivation” branch at this current stage. Although, motivation is necessary for humans to perform – including the motivation to get further educated and trained as mariners – the elements of motivation in this case might lead to ambiguous results when important elements, such as salaries, benefits and overall relationship with the employer are considered along with other types of motivation. At this interim stage, the set of elements related to motivation is provisionally omitted pending the 2022 focus groups findings.
4. Alternative hierarchies, along with the ad hoc questions for the validation/verification round of the 2022 focus groups plan, will be timely communicated and conferred with the social partners, aiming at achieving consensus and enriching the final hierarchy and the focus groups with updated information and diversity of approaches.

Until the submission of the final D3.3 deliverable, the alternative models of hierarchies outlined in this section will have yielded a final one to form the basis of the S.E.A.BA.N.T. tool. The process will also take into account the findings of other SkillSea deliverables – in particular of WP1 – as well as external input and research and developments in the field.

Similarly, the gaps measurement mechanism to be finalised by the final D3.3 submission is presented in the next section of this Chapter at an early stage of design for further consultation and elaboration during the completion of core WP3 tasks T3.2 (Development and Validation of Skills Strategy) and T3.3 (Development of a Viable Knowledge Sharing Tool) of SkillSea.

4.4 Gap measurement: a mission in motion

A gap measurement mechanism has been highlighted in the Strategy Plan Framework report D3.1 as a potential substantial legacy of SkillSea, although only in terms of its aim and function and not of practical details (cf. INSET 4.A).

INSET 4. A

"In view of earlier interim findings and of assessments by SkillSea work packages, the direction forward has been selected to be this of web service provided by the portal in the form of a Q&A page targeted at skills gaps. Input should safeguard anonymity, be cost-free and will consist of organised queries of new elements of technology or new shipping business practices and relevant answers in terms of already available educational and training packages. This web service would inform the ESCO platform while prospective students - along with Maritime

Important issues to be considered in the process of creating such a mechanism, with a view to its efficient contribution to gaps monitoring, are:

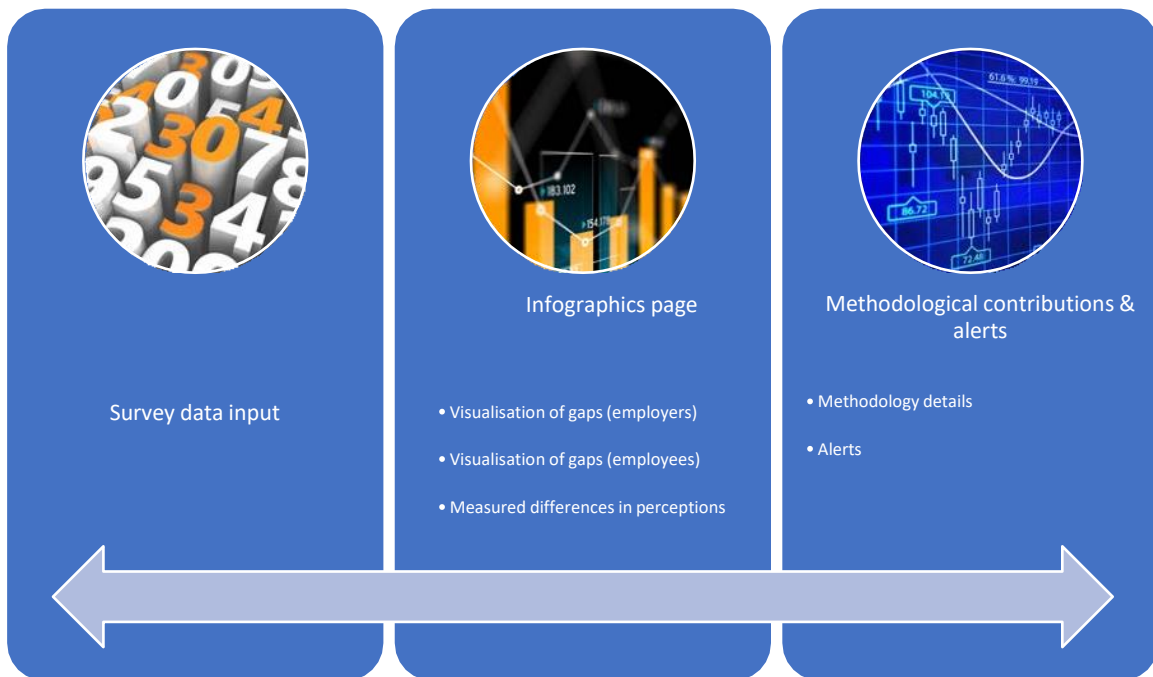
- a) Practical ways for stakeholder input
- b) Determining appropriate intervals for updates
- c) Effective and accessible – in terms of content and of disability access – visualisation/audio

The mechanism is currently planned to be based around the themes of questions 1,2, 3, 11 to 13 including the current form of the employers' 2021 questionnaire, the corresponding questions in the employees' questionnaire (cf. Annex 3C and Annex 3A respectively), and to include:

1. A graph format corresponding to the Cedefop skill gaps range of presentation formats for gaps graphs for other sectors.
2. Quantified simple expressions of the output of related questions assessed as per new input in the mechanism covering gaps. Such single indicators could be the *rate of increase* of the share of outdated skills and the measurement of gaps between employer and employee perceptions in matched questions in the current survey format.
3. A gaps "barometer" with bars showing the forecasted progression of the gap's deficit over a five-year horizon on the basis of current skills gap trends.

If resources beyond the life of SkillSea and project commitments cannot be drawn into the maintenance of the gaps monitoring dynamic mechanism, the legacy of the exercise may be a static prototype to serve as benchmark to feed further applied research. An initial basic representation of how the mechanism could be visualised is shown in Figure 4.37, below. However, this version in the present interim report is only indicative and subject to large variations.

FIGURE 4.37
A BASIC STATIC GAPS MONITORING MECHANISM



It is estimated that spreadsheet forms can cater for this, but that for the result to be automatically generated through an illustrating explanatory visualisation there will be a need for code writing as well.

In this context, some of the essential points to consider in the context of the feasibility exploration exercise will have to be:

- The existence or not of resources within the project to set up such a mechanism.
- The potential of the portal (D3.6), which is already functioning and currently under full development, to cater for such a mechanism; a consensus that any upgrade of the mechanism will follow the general portal upgrade provisions will also be required.
- The scale of the financial resources required and the potential permissions to be obtained from EACEA to finance the mechanism for at least one year before the process becomes automated.
- The potential tapping of residual non-absorbed SkillSea resources to secure maintenance within consortium funding margins, or alternatively the possibility of SkillSea/individual partners applying for further funding through other EU actions.

- The longer-term sustainability of such a mechanism within a 10-year horizon.
- The governance legacy for this mechanism – in any form agreed – so that maintenance or updates are appropriately managed and supported.

The functionalities of the mechanism will define the extent of the final mechanism and the resources required. These are expected to be fully defined and presented in the D3.3 report in the fourth and final year of the project as the complete design of mechanism details will be also informed by the developing long-term action plan of SkillSea involving stakeholders, elaborated through WP5, and will be combined with the full development of the portal.

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5. Conclusions: anticipating skills and gaps for employability

5.1 A skills and gaps monitoring perspective for an evolving shipping employability: interim report conclusions

The interim report conclusions are under the caveat of potential modification by additional data and developments. The extent to which this may occur depends on the speed of industry trends forming which would alter the intensity – or even the direction – of results associated with skills gaps and resilience suggested by the material available so far.

Overall, while the exact path of the value proposition for the industry of emerging shipping trends may be still uncertain⁶⁰, fast-paced developments – such as the emergence of new fuel regulations and new fuels and novel propulsion systems and aids – are already introducing new elements to sectoral skills while changing the importance of classic sectoral skills and enhancing others emerging as key for employability. However, a number of conclusions related to the central function of this interim report can be drawn with a greater degree of certainty:

According to the existing SkillSea input and the analysis and the D3.3 survey results, employability in shipping cannot be deemed as a static concept. Significant trends, such as digitalisation and sustainability, induce changes in the mix of skills and competences required from maritime professionals on board while – as industry perceptions revealed – higher competencies and skills ashore also evolve significantly under these influences.

The emerging assessment from the employers' survey is that a significant percentage of the knowledge and skills acquired through maritime education and training is currently outdated. As the pace of change accelerates – including under the exogenous impact of the Covid-19 pandemic on industry processes – this lag may turn into an ever-increasing gap. On the side of the employees' survey, a significant number of respondents corroborated that more than half of their skills and knowledge is outdated. It must be noted that the convergence of opinion in this particular area is significant and should be highlighted as a building block for sectoral-wide initiatives in the upskilling area.

Most importantly in the context of SkillSea goals, the survey of employees revealed that although the majority of maritime professionals responding stated that their skills matched or exceeded their job requirements upon graduation, a significant percentage felt under-skilled. The majority of respondents agree that further training is needed, while a significant share identify a mismatch between what is taught in METs and what the industry requires. Respondents confirm a strong self-perception of the connection between skills and job performance, which is of particular interest for addressing the employability issue effectively.

- Under the impact of fast-paced developments there is uncertainty on the medium-term five-year resilience of skills. According to employers, skills gaps exist currently mainly in the areas of *data processing and information from organisational databases and web sources*, the area of *coaching*

⁶⁰ For future prevailing fuel uncertainty cf. Adamopoulos, A. (2021) World Bank calls on policymakers to cut support for LNG bunkering. Available at <https://lloydlist.maritimeintelligence.informa.com/LL1136489/World-Bank-calls-on-policymakers-to-cut-support-for-LNG-bunkering>, last accessed April 19, 2020.

and mentoring, and in *conflict management*. In terms of the time-resilience of two future skills on board – digitalisation and automation – the employers' assessment veered towards Medium instead of High as the prevalent rating of five-year resilience. This was similarly the case for skills ashore in the areas of digitalisation and remote operations. The future resilience ratings by employees – albeit all falling in the High range – also ranked automation skills and digitalisation skills on board as the most “time-fragile”. Similarly, digitalisation and remote operations ashore were rated as the most “time-fragile” in terms of their five-year future resilience when adding Medium and Low percentages.

- Employers reported difficulties in recruiting officers from Europe or graduates from European METs and argued that this resulted in the use of crewing agencies and overseas recruitment. The main reasons stated for the non-availability of EU officers were preference for onshore career opportunities; competition with other companies; the lack of sufficient graduates from European METs; and inadequate cooperation with other stakeholders to develop the required skills. Of particular significance for the SkillSea remit was the finding that employers report a general difficulty in seafarers keeping up with technological changes.
- Upskilling and attractiveness of the sector thus emerge as central areas for action. On the basis of ad hoc information to be further collected and analysed, the final 3.3 report will include an analysis of competition outside the sector in order to support strategy proposals for increasing the sector's attractiveness. It will also further promote the use of the S.E.A.B.A.N.T. employability tool to assess areas where increasing attractiveness could be made possible by forging a stronger and improved image of maritime professionals in this technological era. On the positive side, the level of preparation of fully skilled seafarers by European METs is assessed positively by the majority of industry respondents. This is an issue to be further explored in the final D3.3 report; this deliverable will include a further survey to be conducted in early 2022 with the intention to correlate results with the time of graduation of maritime professionals surveyed on the basis of a suitably adapted version of the 2021 questionnaire. It is also clear that shipping companies would benefit from a potential collaboration with European METs.
- Finally, in terms of SkillSea directions for the educational toolbox under completion, employee survey results confirm the inclusion of leadership in the educational package content of WP2. As discussed earlier, the assessment of leadership in the survey places this transversal skill at the top of all the types of essential skills ranked.

Overall, when partial survey conclusions for the 2021 employees' survey are compared and contrasted with those from the 2021 employers' survey, there are general points of agreement and differences in perception

as well but is rather opportune that any differences recorded are more in the distribution of perceptions in terms of intensity and not in the direction of general assessments made through the surveys. It must be noted further that the 2021 findings are consistent with those of the 2019 pilot survey as far as the employees – where the sample was large enough for both to secure safe conclusions – are concerned, with minor discrepancies in the percentages not significantly affecting similarities in the distribution of responses either.

5.2 SkillSea, Cedefop gaps surveys and ESCO: the final D3.3 impact perspective

Next steps in the process of preparing the final D3.3 report for M48 of SkillSea also include:

- A. Cedefop and ESCO consultations will be sought for increasing impact and aligning – to the extent possible – the content and format of present and future information collected in the context of SkillSea to specifications that can make it more directly exploitable within their missions.
- B. In the maritime sector, the exact path of the value proposition⁶¹ of emerging trends in shipping may be still uncertain. However, the current degree of uncertainty may be lower until the end of the project, thus facilitating the D3.3 mission. The eventual repetition of the 2021 survey nearer to the end of the project will be considered, with eventual input from the relevant aforementioned EU organisations and mechanisms sought in this direction also.
- C. To keep one step ahead in monitoring skills gaps, a focus on trials and research – not yet implemented by industry – is also essential.

⁶¹ For the uncertainty of dynamics of shipping digitalization cf. Clayton, R. (2021). Digital solutions must make the value proposition much clearer. Available at <https://lloydslist.maritimeintelligence.informa.com/LL1136166/Digital-solutions-must-make-the-value-proposition-much-clearer>, last accessed March 18, 2021.

5.3 Key steps to the final D.3.3 report

Key issues which should be advanced or solved between this interim report and the submission of the final D3.3 deliverable are related to:

- Further statistical exploration of survey results.
- Finalisation of the role, form, and contribution of the S.E.A.B.AN.T. tool.
- Practical ways for stakeholder input to a gap monitoring mechanism.
- Effective and accessible – in terms of content and of alternative communication – visualisation/audio material for the gaps monitoring mechanism on the portal.
- The mechanism feasibility discussion within the context of SkillSea is expected to be ongoing; nevertheless, it will have to reach conclusions significantly before the time of the write-up of the final D3.3 report so that the outcome is included appropriately in the D3.7 deliverable on Key Strategy Findings.

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ANNEX 1: SKILLS-RELATED MARITIME EMPLOYABILITY RECENT LITERATURE

| By author(s): 2010-2020 | Technological change | Transversal skills (soft / core / basic) | Cross-sectoral skills | Sector-specific skills | Occupation-specific skills |
|---|----------------------|--|-----------------------|------------------------|----------------------------|
| Acomi, N. & Acomi, O. (2016). Diversification of seafarers' employability paths. European proceedings of social and behavioural sciences, 21-27. Available at https://rgu-repository.worktribe.com/preview/298877/ACOMI%202016%20Diversification%20of%20seafarers.pdf | | √ | √ | √ | √ |
| Chen, P. S., Cahoon, S., Pateman, H., Bhaskar, P., Wang, G. & Parsons, J. (2018). Employability skills of maritime business graduates: industry perspectives. WMU Journal of Maritime Affairs, 17(2), 267-292. Available at https://www.rdatasmania.org.au/client-assets/Employability%20skills%20of%20maritime%20business%20graduates.pdf | √ | √ | | | |
| Chen, P. S., Cahoon, S. C., Pateman, H., Bhaskar, P., Wang, G. & Parsons, J. (2017). Aligning the course learning outcomes of maritime business degrees with industry preferred skill sets to increase student employability in the onshore maritime industry. IAMU 2016 Research Project, 20160405. Available at http://ecite.utas.edu.au/124857 | | | | | |
| Daudi, L. (2018). Promoting Self-Responsibility: Learning from Australian Maritime Engineering Student and Alumni in Developing Employability Competencies. IOP Conference Series: Earth and Environmental Science, 175, 012224. Available at https://iopscience.iop.org/article/10.1088/1755-1315/175/1/012224/pdf | | √ | | | |
| Fan L., Fei J., Schriever, U. & Fan S. (2017). The communicative competence of Chinese seafarers and their employability in the international maritime labour market. Marine Policy, 83, 137-145. Available at https://www.sciencedirect.com/science/article/pii/S0308597X16308168 | | | | | |
| Han, T. & Li, T. (2015). Applying the Rasch model to construct the shipping industry employability indicators. Journal of Marine Science and Technology, 23(5), 741-747. Available at https://jmst.ntou.edu.tw/marine/23-5/741-747.pdf , last accessed on July 10, 2020. | | √ | √ | √ | √ |

| | | | | | |
|--|--|---|---|---|---|
| <p>Kabir, M. (2014). Enhancement of seafarers' employability through capacity building in maritime education and training (MET): a case study of Bangladesh. WMU Dissertations. 465. Available at http://commons.wmu.se/all_dissertations/465</p> | | √ | | | |
| <p>Orence, A. & Laquador, J. M. (2013). Employability of maritime graduates of Lyceum of the Philippines University from 2007-2011. International Journal of Research in Social Sciences, 3 (3), 142-157. Available at https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=bility+of+Maritime+Graduates+of+Lyceum+of+the+Philippines+University+from+2007+%E2%80%93+2011&btnG=</p> | | √ | √ | √ | √ |

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| ANNEX 2A : SKILLS OBSOLESCENCE 2019 PILOT SURVEY QUESTIONNAIRE |
|---|



EUGENIDES FOUNDATION

SKILLSEA (Futureproof Skills for the Maritime Transport Sector) - Skills Obsolescence

Dear Seafarer,

SKILLSEA (Futureproof Skills for the Maritime Transport Sector) is a new EU- funded ERASMUS+ (Sector Skills Alliance) project with an aim to develop strategies, to identify and meet the future skills needs of the maritime sector. The four-year project work was started in January 2019.

With this survey, according to the objectives of the project, we would like to identify the future skills arise from the trends and drivers of the Maritime Shipping industry's expectations. We would be grateful if you could share your views via a short questionnaire. Your views are valuable for the future skills of the European Maritime Shipping sector. It will take only 8-10 minutes to complete it. The information provided in the questionnaire will be used for research purposes to inform the project. Your responses will be completely anonymous and never analyzed or displayed individually.

Thank you for the time and the valuable input.

* 1. When you graduated and started your job in maritime sector, how would you best describe your skills in relation to what was required to do your job at that time?

- ☐ My skills are higher than required by my job
- ☐ My skills are matched to what is required by my job
- ☐ Some of my skills are lower than required by my job and need to be further developed

* 2. Think about the level of skills needed to do your job as well as possible. Please rate your own skills level. A rating "0" means you need to develop all skills and a rating of "100" means you have all skills.

- | | | |
|--------------------------|--------------------------|---------------------------|
| <input type="radio"/> 0 | <input type="radio"/> 40 | <input type="radio"/> 80 |
| <input type="radio"/> 10 | <input type="radio"/> 50 | <input type="radio"/> 90 |
| <input type="radio"/> 20 | <input type="radio"/> 60 | <input type="radio"/> 100 |
| <input type="radio"/> 30 | <input type="radio"/> 70 | |

* 3. What percentage of the knowledge and skills that you acquired during Maritime Education and Training (M.E.T.) is now out of date?

- ☐ 0 – 9% ☐ 40 – 49% ☐ 80 – 89%
☐ 10 – 19% ☐ 50 – 59% ☐ 90 – 100%
☐ 20 – 29% ☐ 60 – 69%
☐ 30 – 39% ☐ 70 – 79%

* 4. How likely or unlikely do you think it is that several of your skills will become outdated in next five years?

- ☐ Very unlikely ☐ Moderate Unlikely ☐ Neutral ☐ Moderate Likely ☐ Very likely

* 5. Technological progress has a significant impact on maritime sector. Please present your view regarding the following statement: **"Further training is needed because of new development in my field of work which could not be foreseen during my course of study"**.

- ☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

* 6. Please present your view regarding the following statement: **"I could do my job better if I had additional knowledge and skills"**.

- ☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

* 7. Based on your experience, please rank each of the following skills for seafarers with "1" being the most important and the "5" the least important skill:

| | 1 | 2 | 3 | 4 | 5 |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Automation Skills – Acquire Systems Engineering skills to play a part in new technologies and automation efforts | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Data Analytics and Cyber Security Skills – Generate business insights and upkeep cyber security of the fleet and automated systems | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Green Shipping Skills – Keep abreast of new developments in green shipping | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Transdisciplinary Skills – Make connections across disciplines to solve complex problems | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Leadership and Management | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

* 8. Please assess, from your job daily experience how you would agree or disagree with the following statement: "There is a serious mismatch between what is taught in **Maritime Education and Training (M.E.T.) institutions**, and what shipping requires".

☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

* 9. What are the most important ways for you to gain new skills? (one choice)

☐ Mentorship ☐ On line training courses
☐ On the job training ☐ Other

* 10. Due to technological progress the skills that seafarers need to succeed at work are changing rapidly. Please present your view regarding the following statement: "**Seafarers are encouraged to continuously (lifelong learning) to acquiring knowledge and skills**".

☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

* 11. What is your gender?

☐ Female
☐ Male

* 12. What is your age?

☐ 21 - 27 ☐ 36 - 42 ☐ 49 - 55
☐ 28 - 35 ☐ 42 - 48 ☐ 55+

* 13. What is your Nationality?

* 14. What is the work role of your job?

☐ Captain / Master ☐ 1st Engineer
☐ Chief officer ☐ 2nd Engineer
☐ 2nd Officer ☐ 3rd Engineer
☐ 3rd Officer ☐ 4th Engineer
☐ Chief Engineer ☐ Electrotechnical Officer

15. Type of Vessel you are now onboard:

- | | |
|--|--|
| <input type="radio"/> Oil Tanker | <input type="radio"/> Bulk/Container Carrier |
| <input type="radio"/> Chemical Tanker | <input type="radio"/> Container Ship |
| <input type="radio"/> Other Tanker | <input type="radio"/> Vehicle Carrier |
| <input type="radio"/> LNG Carrier | <input type="radio"/> Other Specialized Carrier |
| <input type="radio"/> LPG Carrier | <input type="radio"/> Ro-Ro Container |
| <input type="radio"/> Ore/Bulk/Oil Carrier | <input type="radio"/> Ro-Ro Passenger |
| <input type="radio"/> Barge Carrier | <input type="radio"/> Refrigerated Ship (Reefer) |
| <input type="radio"/> Other Bulk Carrier | <input type="radio"/> Other |

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ANNEX 2B: SKILLS OBSOLESCENCE 2019 PILOT SURVEY DEMOGRAPHICS

MAIN DEMOGRAPHIC CHARACTERISTICS OF 2019 PILOT SURVEY RESPONDENTS

- 66.7% of survey participants were at the time of the survey serving on board an oil tanker, 15.5% on dry bulk ships, 5.3% on an LPG carrier, 3.6% on chemical tankers, 3.1% on container ships and 0.2% on other tanker types.
- 99.8% of the respondents to the employees' survey were male.
- The majority of respondents are from one Asian country (61.6%) with European nationalities outside the EU-EEA amounting to another 3.6. EU-EEA nationalities amounted for the remaining 34.8%, spread over seven countries.
- The age group with the largest number of participants was 28-35, with 33.4% of respondents, followed by the 43-48 age group with 18.4%, and the 36-42 group, with 16.7%, as shown in Figure Annex 2B.1.
- Most of the survey participants are Second Officers and Captains (18.4% and 18.1%, respectively), 13.4% were Chief Engineer Officers and 8.4% Electrotechnical Officers, as shown in Figure Annex 2B.2.

FIGURE ANNEX 2B.1
AGE DISTRIBUTION OF 2019 PILOT SURVEY RESPONDENTS

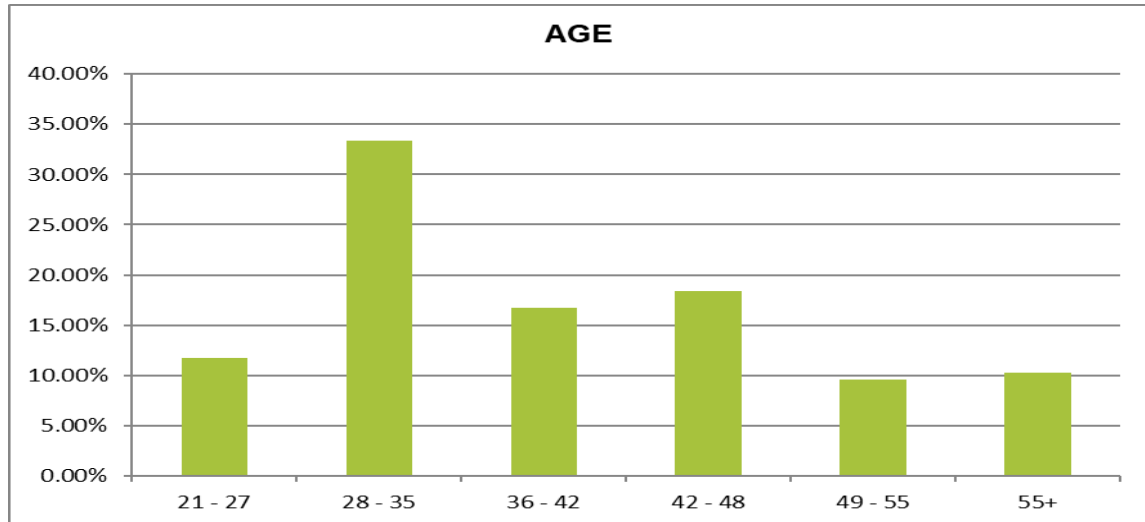
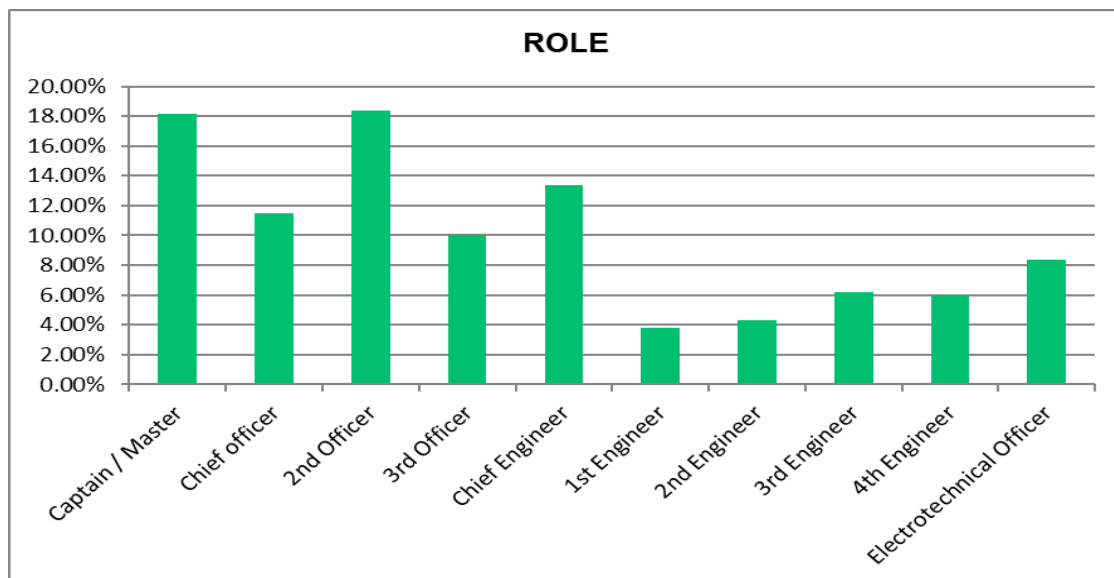


FIGURE ANNEX 2B.2
CREW ROLE DISTRIBUTION OF 2019 PILOT SURVEY RESPONDENTS



| |
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| ANNEX 3A: 2021 SkillSea D3.3 SURVEY – EMPLOYEES' QUESTIONNAIRE |
|---|



SkillSea (FutureProof Skills for the Maritime Transport Sector) - Employees _ 2021

Dear maritime professional on board (or on leave),

SkillSea (FutureProof Skills for the Maritime Transport Sector) is a new EU-funded ERASMUS+ (Sector Skills Alliance) project aiming at developing strategies, identifying and meeting the future skills' needs of the maritime sector. The work on the four-year project has started in January 2019.

This survey, serving the objectives of the project, seeks to measure gaps between present and future skills as these arise from the trends and drivers in Maritime Shipping and are reflected in maritime professionals' perceptions and expectations. We would be grateful if you could share your views via this short questionnaire. Your views are valuable for the future skills of the European Maritime Shipping sector and for the sector as a whole and it will take just about 10 minutes to complete it. The information provided in the questionnaire will be used for research purposes to inform the project. Your responses will be completely anonymous and never analyzed or displayed individually.

Thank you for your time and for your valuable input and wishes for "fair winds and following seas".

* 1. When you graduated and started your job in the maritime sector, how would you best describe your **skills** in relation to what was **required** to do your job **at that time**?

- ☐ My skills were at the time higher than what was required to do my job
- ☐ My skills matched what was required for my job
- ☐ Some of my skills were lower than required for my job and needed or *still* need to be further developed

* 2. Think about **the level of skills** needed to do your job as well as possible. Please rate your own skills level. A rating "0" means you are in need to develop all of the skills required for your job and a rating of "100" means you have all skills required already.

- | | | |
|--------------------------|--------------------------|---------------------------|
| <input type="radio"/> 0 | <input type="radio"/> 40 | <input type="radio"/> 80 |
| <input type="radio"/> 10 | <input type="radio"/> 50 | <input type="radio"/> 90 |
| <input type="radio"/> 20 | <input type="radio"/> 60 | <input type="radio"/> 100 |
| <input type="radio"/> 30 | <input type="radio"/> 70 | |

* 3. What percentage of the knowledge and skills that you acquired during Maritime Education and Training (M.E.T.) is now out of date?

- ☐ 0 - 9% ☐ 40 - 49% ☐ 80 - 89%
☐ 10 - 19% ☐ 50 - 59% ☐ 90 - 100%
☐ 20 - 29% ☐ 60 - 69%
☐ 30 - 39% ☐ 70 - 79%

* 4. How likely or unlikely do you think it is that several of your skills will become outdated in the next five years?

- ☐ Very unlikely ☐ Moderate unlikely ☐ Neutral ☐ Moderate Likely ☐ Very likely

* 5. Technological progress has a significant impact on the maritime sector. Please present your view regarding the following statement: "Further training is needed because of new developments in my field of work which could not be foreseen during my course of study"

- ☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

* 6. Please present your view regarding the following statement: "I could do my job better if I had additional knowledge and skills".

- ☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

* 7. Based on your experience, please rank each of the following skills for seafarers with "1" being the most important and the "5" the least important skill:

| | 1 | 2 | 3 | 4 | 5 |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Automation Skills – Acquire Systems Engineering skills to play a part in new technologies and automation efforts | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Data Analytics and Cyber Security Skills – Generate business insights and upkeep cyber security of the fleet and automated systems | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Green Shipping Skills/Sustainability – Keep abreast of new developments in green shipping | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Transdisciplinary/Transversal Skills – Make connections across disciplines to solve complex problems | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Leadership and Management | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

* 8. Please assess, from your job daily experience how you would agree or disagree with the following statement: "There is a serious mismatch between what is taught in **Maritime Education and Training (M.E.T.) institutions**, and what shipping requires".

☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

* 9. What is the most important way for you to **gain new skills**? (one choice)

☐ Mentorship ☐ On line training courses
☐ On the job training ☐ Other

* 10. Estimate the **degree** to which **current maritime professionals' skills** cover for **future needs on board** on a 5 year horizon:

| | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
|----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1.Navigation | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 2.Digitalization | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 3.Safety | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 4.Sustainability - Quality | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 5.Automation | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

* 11. Estimate the **degree** to which **current maritime professionals' skills** cover for **future needs ashore** on a 5 year horizon:

| | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
|----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1.Operations | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 2.Digitalization | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 3.Safety | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 4.Sustainability - Quality | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 5.Remote operations | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

* 12. Have you studied in an **European MET** or in a **non-European MET**?

☐ European MET ☐ Non-European MET

* 13. What is your gender?

☐ Female
☐ Male

* 14. What is your age?

☐ 21 - 27

☐ 36 - 42

☐ 49 - 55

☐ 28 - 35

☐ 42 - 48

☐ 55+

* 15. What is your **nationality**?

* 16. What is the **work role** of your job?

☐ Captain / Master

☐ 1st Engineer

☐ Chief officer

☐ 2nd Engineer

☐ 2nd Officer

☐ 3rd Engineer

☐ 3rd Officer

☐ 4th Engineer

☐ Chief Engineer

☐ Electrotechnical Officer

17. Type of **vessel** you are now onboard:

☐ Oil Tanker

☐ Bulk/Container Carrier

☐ Chemical Tanker

☐ Container Ship

☐ Other Tanker

☐ Vehicle Carrier

☐ LNG Carrier

☐ Other Specialized Carrier

☐ LPG Carrier

☐ Ro-Ro Container

☐ Ore/Bulk/Oil Carrier

☐ Ro-Ro Passenger

☐ Barge Carrier

☐ Refrigerated Ship (Reefer)

☐ Other Bulk Carrier

☐ Other

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| ANNEX 3B: 2021 SkillSea D3.3 SURVEY – EMPLOYEES' QUESTIONNAIRE -SURVEY DEMOGRAPHICS |
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MAIN DEMOGRAPHIC CHARACTERISTICS OF 2021 SURVEY RESPONDENTS

- There is a clear over-representation of the wet/fuel carrying sector (see section 4.1.3 in Chapter 4) as 71.3% of survey participants were at the time of the survey serving on board an oil tanker, 3.0% on LNG carriers, 2.3% on an LPG carrier, 2.0% on chemical tankers, with the remaining 21.4% spread between bulk, container, and other types, as shown in Fig. 3B.6.
- 96.4% of the respondents to the employees' survey were male, as shown in Fig. 3B.1.
- Location of studies was at European METs for 58.4% of respondents and non-European for 41.6%, as shown in Fig. 3B.1.
- The age group with the largest number of participants was 28-35, with 29.4 % of respondents, followed by the 21-27 age group with 20.9% and the 36-42 group, with 19.1%, as shown in FigureAnnex 3B.3.
- The largest nationality group of respondents is from the Philippines (31.1%). European countriesaccount for 60.3% of total and EU-EEA countries (including the UK) account for 54.2% of the total, as shown in Figure Annex 3B.4 below.
- Most of the survey participants were Second Officers and Captains (19.1% and 15.0%, respectively), 12.4% were Third Officers, 11.1% were Chief Officer, 9.9% were Electrotechnical Officers, and 9.5% Chief Engineer Officers, as shown in Figure Annex 3B.5.

FIGURE ANNEX 3B.1
LOCATION OF STUDIES OF RESPONDENTS

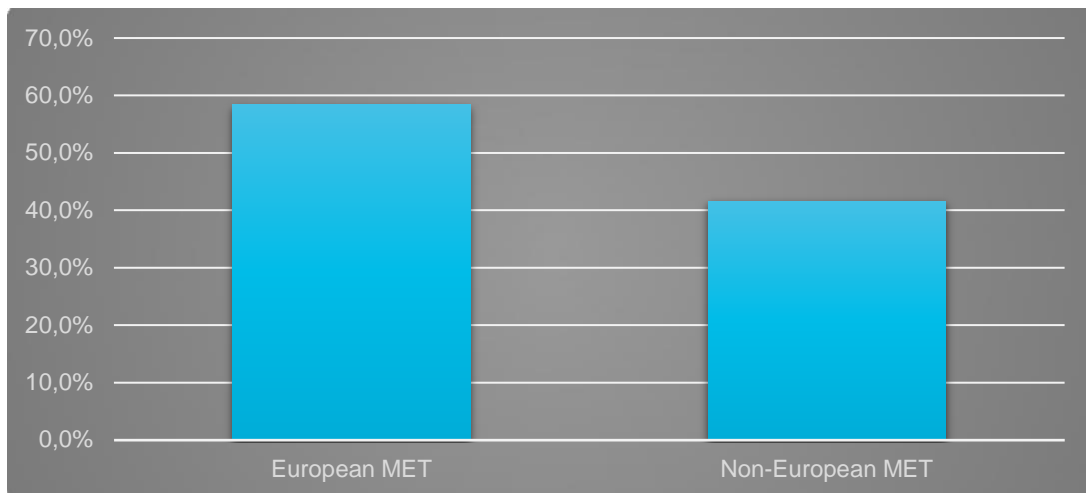


FIGURE ANNEX 3B.2
GENDER OF RESPONDENTS

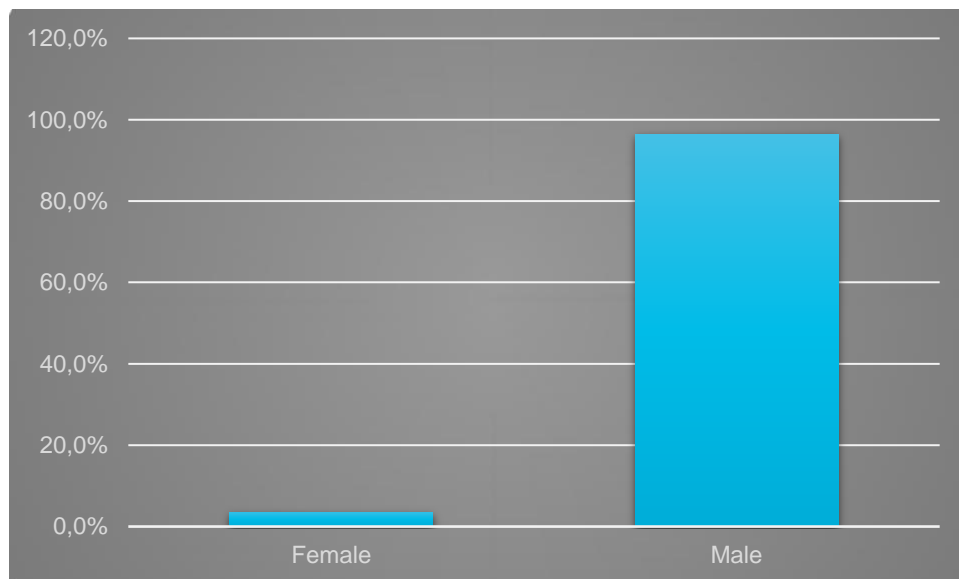


FIGURE ANNEX 3B.3
AGE OF RESPONDENTS

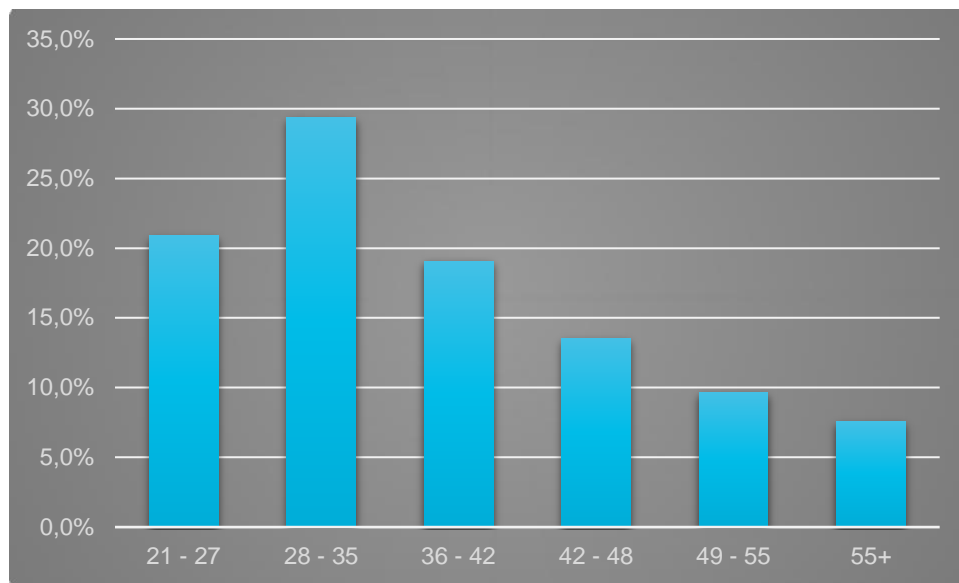


FIGURE ANNEX 3B.4
NATIONALITY OF RESPONDENTS

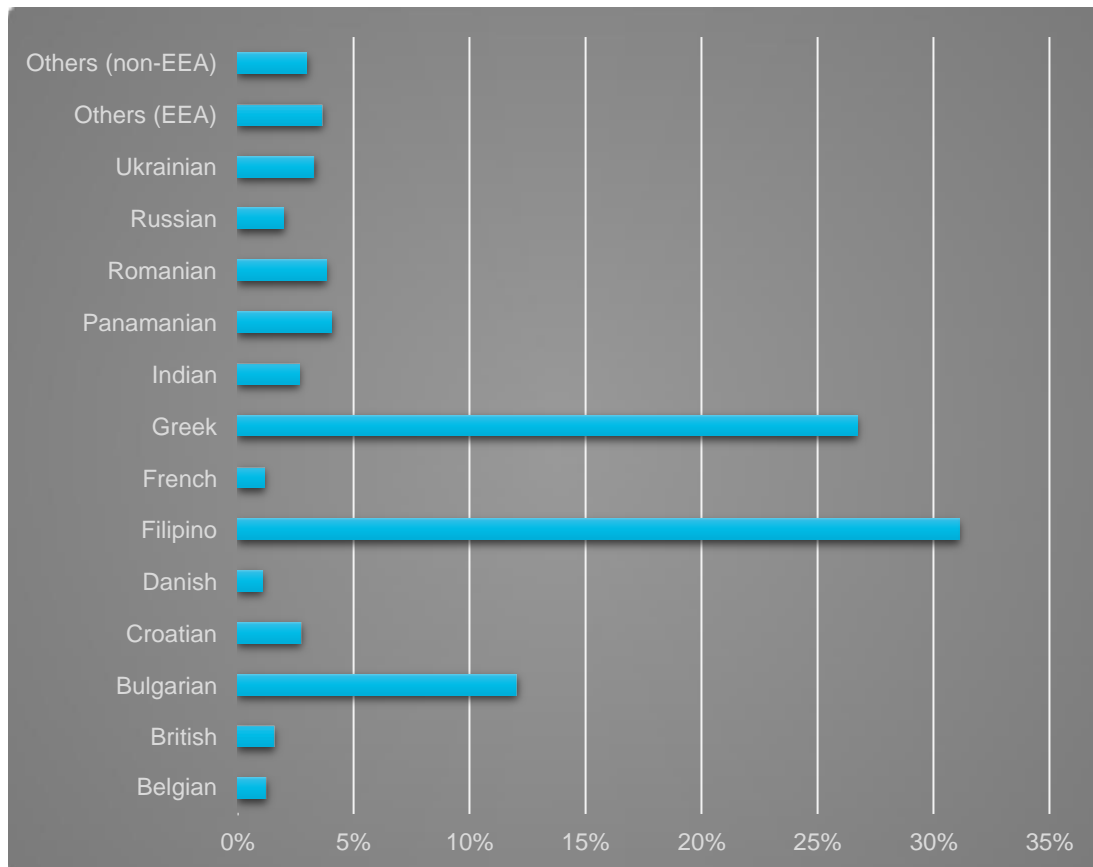


FIGURE ANNEX 3B.5
ROLE OF RESPONDENTS

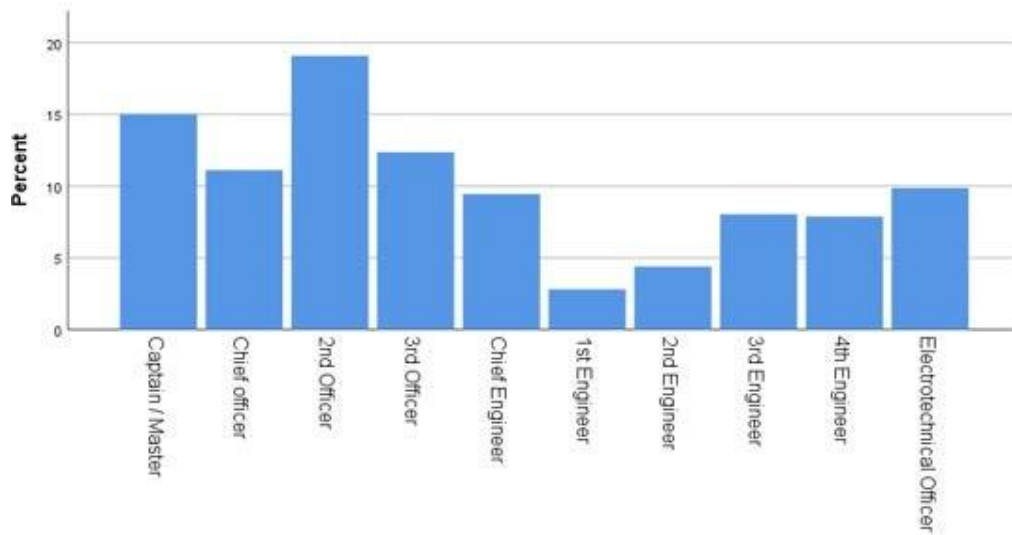


FIGURE ANNEX 3B.6
TYPE OF VESSEL ON WHICH SERVING

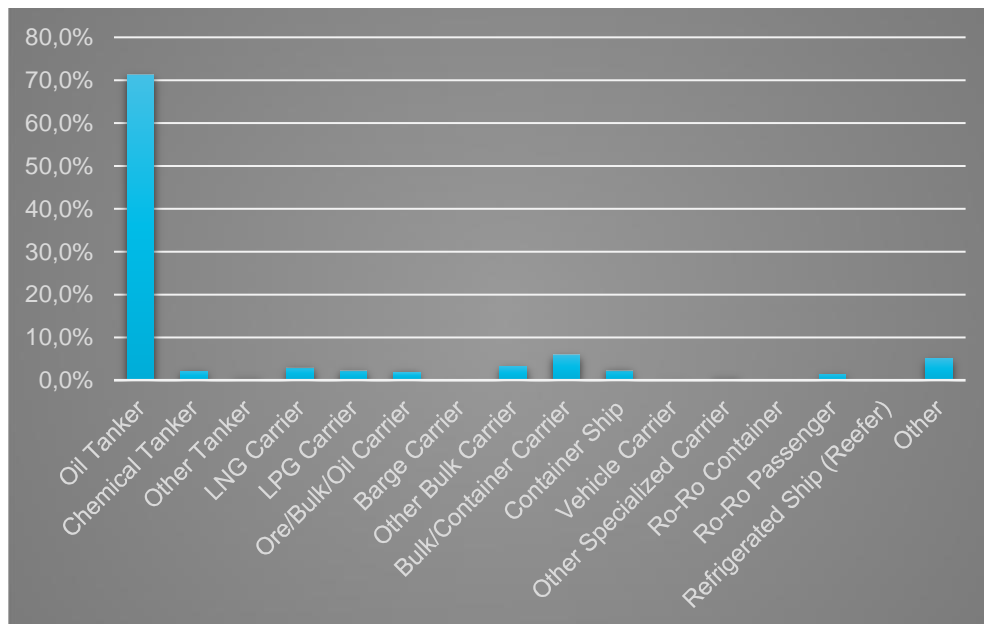
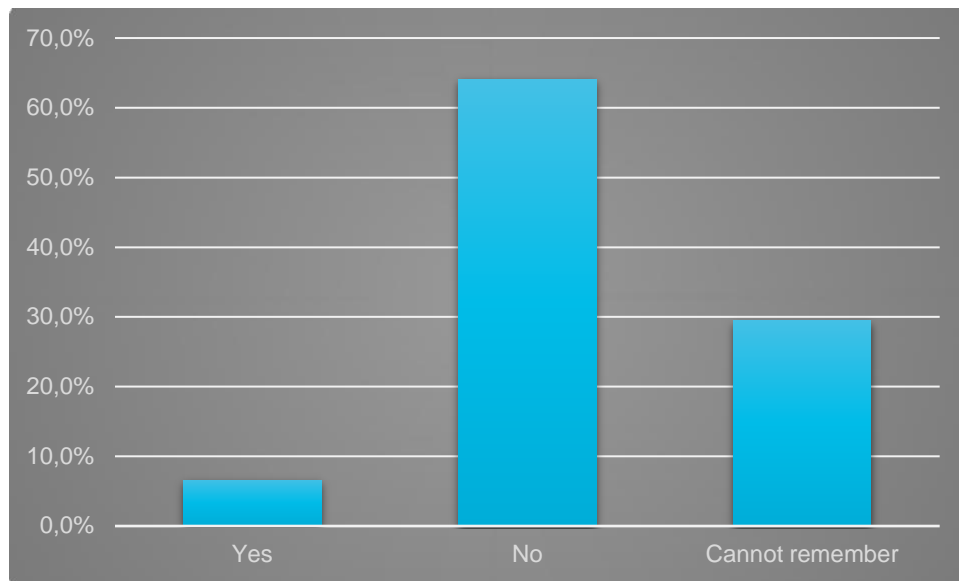


FIGURE ANNEX 3B.7

HAD YOU FILLED IN THE 2019 EUGENIDES FOUNDATION SURVEY?



| |
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| ANNEX 3C : 2021 SkillSea D3.3 SURVEY – EMPLOYERS' QUESTIONNAIRE |
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SkillSea (FutureProof Skills for the Maritime Transport Sector) – Employers_2021

Dear Manager,

SkillSea (FutureProof Skills for the Maritime Transport Sector) is a new EU-funded ERASMUS+ (Sector Skills Alliance) project aiming at developing strategies, identifying and meeting the future skills' needs of the maritime sector. The work on the four-year project has started in January 2019.

This survey, serving the objectives of the project, seeks to measure gaps between present and future skills as these arise from the trends and drivers in Maritime Shipping and are reflected in the industry's expectations. We would be grateful if you could share your views via this short questionnaire. Your views are valuable for the future skills of the European Maritime Shipping sector and it will take just about 10 minutes to complete it. The information provided in the questionnaire will be used for research purposes to inform the project. Your responses will be completely anonymous and never analyzed or displayed individually.

Thank you for your time and for your valuable input.

* 1. Please state your candid view regarding to what extent you believe that **Deck officers, Engine officers and Electrotechnical officers (ETO)** possess the following skills:

| | Not at all | To a small extent | To a moderate extent | To a great extent | To a very great extent | N/A |
|---|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| Communication (Effective written and verbal communication) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lifelong learning (Regular upgrade of skills and knowledge) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Cultural awareness and understanding (In-depth understanding of people from other countries or backgrounds have) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Environmental awareness (Inclusion of environmental concerns in decision-making) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | Not at all | To a small extent | To a moderate extent | To a great extent | To a very great extent | N/A |
|---|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| Self-awareness (Self-evaluation of emotions, behaviors, beliefs, motivations, strengths and weaknesses) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Situational awareness and risk assessment (Being aware of what is happening around you and identifying possible threats) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Time and stress management (Making the best choices and decisions within the available time) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Working in teams or groups (Operating smoothly and efficiently within a group) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Adaptability to new environments (Adapting responses to altered circumstances (changed crew composition, new type of ship, routes etc.) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Apply data for making decisions (Collecting and organizing data from navigational equipment and other sources to make the right decisions) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Coaching and mentoring (Coaching is assisting individuals to perform a task. Mentoring is focusing on the career development of the individuals) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Conflict management (Dealing with disputes in a rational, balanced and effective way) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Critical thinking (Solving problems and making the right decisions at work) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | Not at all | To a small extent | To a moderate extent | To a great extent | To a very great extent | N/A |
|--|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| Multicultural diversity management (Effectively deploying and harmonizing on board individual idiosyncrasies from different backgrounds) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Digital security and data protection (Protecting Informational and Operational Technology Systems data on board from unauthorized access, manipulation and disruption) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Energy management (Applying systematic methods to measure, analyze and improve vessel energy usage) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Observation and monitoring (Combining all the disposable instruments to monitor the navigation of the ship or the engine performance) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Processing data and information from organizational databases and web sources (Collecting and processing raw data from various sources to produce meaningful information) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| STEM (Science, Technology, Engineering Mathematics) skills (The capacity to use technical, mechanical and mathematical skills in job process) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | Not at all | To a small extent | To a moderate extent | To a great extent | To a very great extent | N/A |
|--|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| Ship-Generated Waste management (implying an environmentally sound waste management according to the established environmental standards) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

* 2. Please **assess** the level of **skills required currently** (on average) from seafarers. A rating "0" means that no skills are required for exercising their duties and a rating "100" means that the highest level of skills is required.

- ☐ 0
- ☐ 10
- ☐ 20
- ☐ 30
- ☐ 40
- ☐ 50
- ☐ 60
- ☐ 70
- ☐ 80
- ☐ 90
- ☐ 100
- ☐ Other (please specify)

* 3. What percentage of the knowledge and skills that are acquired during Maritime Education and Training (M.E.T.) is now outdated?

- ☐ 0 - 9%
☐ 10 - 19%
☐ 20 - 29%
☐ 30 - 39%
☐ 40 - 49%
☐ 50 - 59%
☐ 60 - 69%
☐ 70 - 79%
☐ 80 - 89%
☐ 90 - 100%

* 4. Please present your candid view regarding to what extent do you demand the following skills from Deck officers, Engine officers and Electrotechnical officers (ETO):

| | Not at all | To a small extent | To a moderate extent | To a great extent | To a very great extent | N/A |
|--|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| Communication (Effective written and verbal communication with other crew members) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lifelong learning (Regular upgrade of skills and knowledge) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Cultural awareness and understanding (In-depth understanding of the differences that people from other countries or backgrounds have) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Environmental awareness (Inclusion of environmental concerns in decision-making) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Self-awareness (Self-evaluation of emotions, behaviors, beliefs, motivations, strengths and weaknesses) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | Not at all | To a small extent | To a moderate extent | To a great extent | To a very great extent | N/A |
|---|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| Situational awareness and risk assessment (Being aware of what is happening around you and identifying possible threats) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Time and stress management (Making the best choices and decisions within the available time) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Working in teams or groups (Operating smoothly and efficiently within a group) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Adaptability to new environments (Adapting responses to altered circumstances (changed crew composition, new type of ship, routes etc.) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Apply data for making decisions (Collecting and organizing data from navigational equipment and other sources to make the right decisions) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Coaching and mentoring (Coaching is assisting individuals to perform a task. Mentoring is focusing on the career development of the individuals) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Conflict management (Dealing with disputes in a rational, balanced and effective way) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Critical thinking (Solving problems and making the right decisions at work) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | Not at all | To a small extent | To a moderate extent | To a great extent | To a very great extent | N/A |
|--|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| Multicultural diversity management (Effectively deploying and harmonizing on board, the individual idiosyncrasies based on different backgrounds) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Digital security and data protection (Protecting Informational and Operational Technology Systems data on board from unauthorized access, manipulation and disruption) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Energy management (Applying systematic methods to measure, analyze and improve vessel energy usage) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Observation and monitoring (Combining all the disposable instruments to monitor the navigation of the ship or the engine performance) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Processing data and information from organizational databases and web sources (Collecting and processing raw data from various sources to produce meaningful information) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| STEM (Science, Technology, Engineering Mathematics) skills (The capacity to use technical, mechanical and mathematical skills in job process) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | Not at all | To a small extent | To a moderate extent | To a great extent | To a very great extent | N/A |
|---|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| Ship-Generated Waste management (implying an environmentally sound waste management according to the established environmental standards) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

* 5. To what extent do you think there can be difficulties in recruiting Deck officers, Engine officers and Electrotechnical officers?

| | Not at all | To a small extent | To a moderate extent | To a great extent | To a very great extent | N/A |
|--|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| Deck officers of European METs | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Deck officers of non-European METs | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Engine officers of European METs | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Engine officers of non-European METs | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Electrotechnical officers of European METs | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Electrotechnical officers of non-European METs | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

* 6. Please present your candid view regarding the barriers in recruiting Ship Officers (Deck officers, Engine officers and Electrotechnical officers) who graduated from European METs:

| | Strongly disagree | Disagree | Neutral | Agree | Strongly Agree | N/A |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Lack of adequate experience | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lack of the suitable mix of skills | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lack of appropriately qualified staff | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Competition from other companies | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Not enough graduates from the European Maritime Education and Training (MET) institutions | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Stronger preference for on-shore career opportunities | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

* 7. How likely is it to use the following strategies if your company faced difficulties in filling vacancies?

| | Not at all | To a small extent | To a moderate extent | To a great extent | To a very great extent | N/A |
|---|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| Employ from crew agencies | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Recruit overseas | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Delay work | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Increase of workload for other employees (at least temporarily) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Increase salaries and benefits to attract officers from other companies | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Contact MET institutions career offices to inform alumni for vacancies | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

* 8. To what extent the recruitment of young seafarers from your company is determined by the reputation of the European Maritime Education and Training (MET) Institution that he/she has graduated?

- | | |
|--|--|
| <input type="radio"/> Not at all | <input type="radio"/> To a great extent |
| <input type="radio"/> To a small extent | <input type="radio"/> To a very great extent |
| <input type="radio"/> To a moderate extent | <input type="radio"/> N/A |

* 9. How well would you qualify the level at which European MET Institutions prepare fully skilled seafarers?

- | | |
|-------------------------------------|-------------------------------------|
| <input type="radio"/> Very Poor | <input type="radio"/> Above average |
| <input type="radio"/> Below average | <input type="radio"/> Excellent |
| <input type="radio"/> average | <input type="radio"/> N/A |

* 10. Please indicate the possibility for potential benefits to shipping companies if they will collaborate with European METs?

- | | |
|---------------------------------------|---|
| <input type="radio"/> No benefit | <input type="radio"/> High benefit |
| <input type="radio"/> Low benefit | <input type="radio"/> Very high benefit |
| <input type="radio"/> Average benefit | <input type="radio"/> N/A |

* 11. To what extent any shortages in well-trained graduates of European Maritime Education and Training courses could be attributed to the following causes?

| | Not at all | To a small extent | To a moderate extent | To a great extent | To a very great extent | N/A |
|---|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| The STCW based education in MET institutions is obsolete | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Inability to attract fully skilled people in the maritime sector | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Inability of seafarers to keep up with technological changes | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Inability of formal and informal maritime education to keep up with technological changes | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Absence of Lifelong Learning culture among the stakeholders of the maritime sector | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Inadequate provision of postgraduate training from the companies | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Competition within the sector for proficient seafarers | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Inadequate cooperation with other actors in the sector to develop the required skills | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

* 12. Estimate the degree to which current maritime professionals' skills cover for future needs on board on a 5 year horizon:

| | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
|----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1.Navigation | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 2.Digitalization | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 3.Safety | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 4.Sustainability - Quality | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 5.Automation | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

* 13. Estimate the **degree** to which **current** maritime professionals' skills cover for **future needs ashore on a 5 year horizon**:

| | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
|-----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1. Operations | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 2. Digitalization | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 3. Safety | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 4. Sustainability - Quality | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 5. Remote operations | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

* 14. Please **define** the most usual **training strategy** for your **onboard maritime professionals** followed by your company:

- ☐ Training delivered in-house
☐ Training delivered in MET institutions
☐ Training delivered through other external training providers

* 15. Please present your candid view regarding the following statement: "The cooperation between shipping companies and European MET institutions' career offices for recruiting Deck officers, Engine officers and Electrotechnical officers is very satisfactory":

- ☐ Strongly disagree ☐ Agree
☐ Disagree ☐ Strongly Agree
☐ Neutral ☐ N/A

* 16. What are the most common vessel types in your company? (if applicable you can select more than one answers)

- | | | |
|---|--|---|
| <input type="checkbox"/> Oil Tanker | <input type="checkbox"/> Barge Carrier | <input type="checkbox"/> Ro-Ro Container |
| <input type="checkbox"/> Chemical Tanker | <input type="checkbox"/> Other Bulk Carrier | <input type="checkbox"/> Ro-Ro Passenger |
| <input type="checkbox"/> Other Tanker | <input type="checkbox"/> Bulk/Container Carrier | <input type="checkbox"/> Refrigerated Ship (Reefer) |
| <input type="checkbox"/> LNG Carrier | <input type="checkbox"/> Container Ship | <input type="checkbox"/> Other |
| <input type="checkbox"/> LPG Carrier | <input type="checkbox"/> Vehicle Carrier | |
| <input type="checkbox"/> Ore/Bulk/Oil Carrier | <input type="checkbox"/> Other Specialized Carrier | |

* 17. What is the number of seafarers employed in your company?

- | | |
|-------------------------------|-------------------------------|
| <input type="radio"/> 0-50 | <input type="radio"/> 600-699 |
| <input type="radio"/> 51-99 | <input type="radio"/> 700-799 |
| <input type="radio"/> 100-199 | <input type="radio"/> 800-899 |
| <input type="radio"/> 200-299 | <input type="radio"/> 900-999 |
| <input type="radio"/> 300-399 | <input type="radio"/> 1000+ |
| <input type="radio"/> 400-499 | <input type="radio"/> N/A |
| <input type="radio"/> 500-599 | |

* 18. What is the number of years of your experience in the maritime sector?

- | | |
|-----------------------------|-----------------------------|
| <input type="radio"/> 0-5 | <input type="radio"/> 16-20 |
| <input type="radio"/> 6-10 | <input type="radio"/> 25+ |
| <input type="radio"/> 11-15 | <input type="radio"/> N/A |

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| ANNEX 3D: 2021 SkillSea D3.3 SURVEY – EMPLOYERS' QUESTIONNAIRE -SURVEY DEMOGRAPHICS |
|--|

FIGURE ANNEX 3D.1
MOST COMMON VESSEL TYPES IN RESPONDENT'S COMPANY

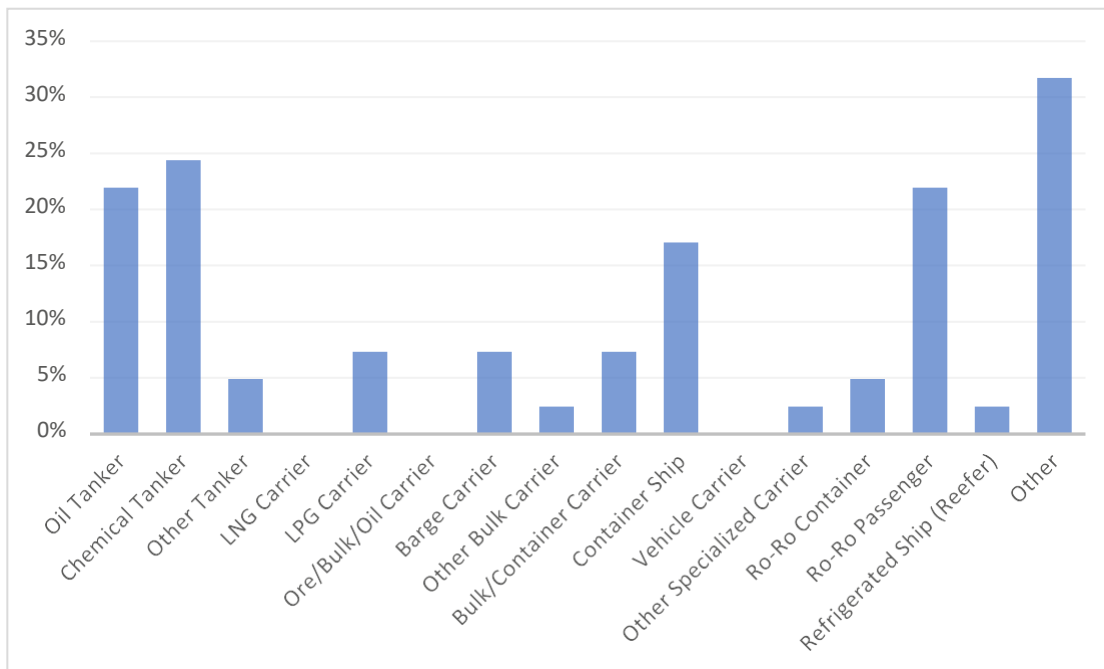


FIGURE ANNEX 3D.2
NUMBER OF SEAFARERS EMPLOYED IN RESPONDENT'S COMPANY

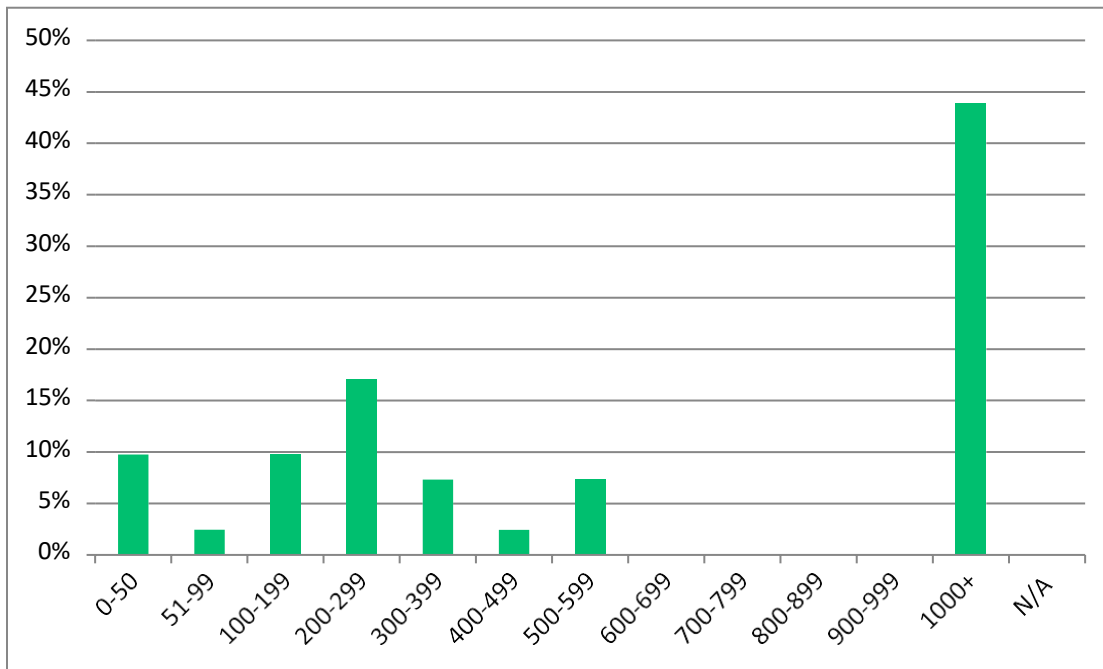
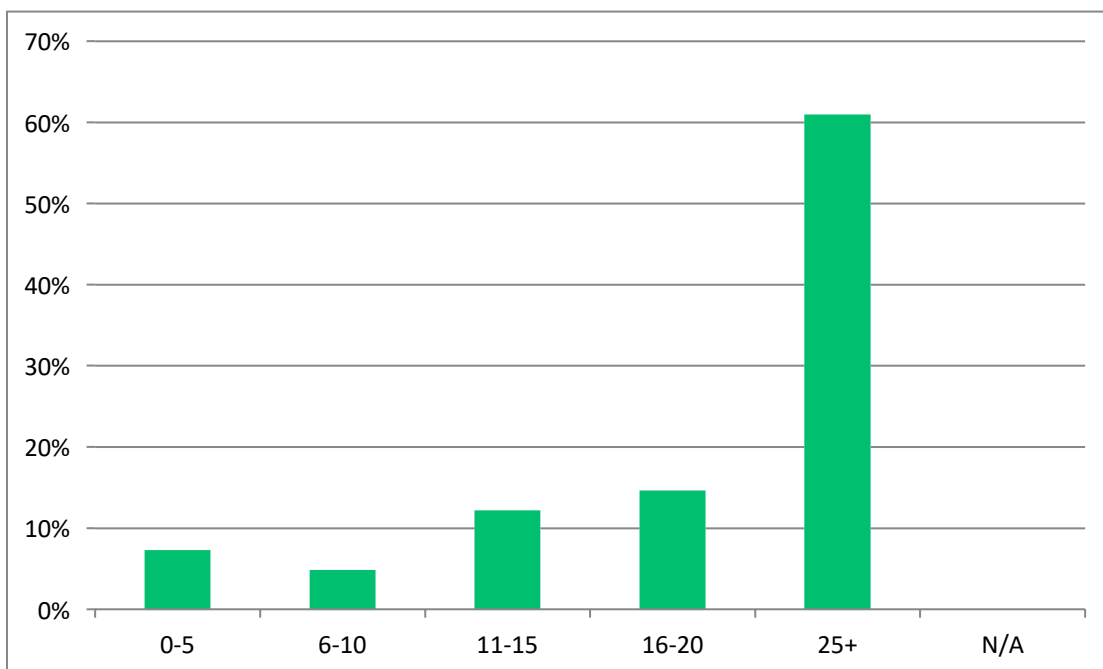


FIGURE ANNEX 3D.3
YEARS OF YOUR EXPERIENCE IN THE MARITIME SECTOR



ANNEX 3E: SKILLSEA CIRCULATED 2021 SURVEY DISSEMINATION MATERIAL



Short article:

Maritime professionals on board: please fill out this survey to keep our profession future-proof!

SkillSea (FutureProof Skills for the Maritime Transport Sector) is a new EU-funded ERASMUS+ project aiming at developing strategies, identifying and meeting the future skills' needs of the maritime sector.

This survey, serving the objectives of the project, seeks to measure gaps between present and future skills as these arise from the trends and drivers in Maritime Shipping and are reflected in maritime professionals' perceptions and expectations. We would be grateful if you could share your views via a short questionnaire.

For maritime professionals on board: <https://www.surveymonkey.com/r/XYTHWJB>

- ☐ Your views are valuable for the future skills of the European Maritime Shipping sector and for the sector as a whole!
- ☐ We only need 10 minutes to complete of your time.
- ☐ The information provided in the questionnaire will be used for research purposes to inform the project. Your responses will be completely anonymous and never analysed or displayed individually.

—

Social media updates:

LinkedIn update

Maritime professionals on board: can we please ask for your input? Project SkillSea seeks to measure gaps between present and future skills needs. Our ultimate goal is to keep the maritime profession future-proof! For that we rely on your input. We have a short survey prepared: <https://www.surveymonkey.com/r/XYTHWJB> It takes about 10 minutes of your time. Thank you so much for your help! SkillSea is co-funded by the Erasmus+ Programme of the EU.

Facebook update

Maritime professionals on board: can we please ask for your input? Project SkillSea seeks to measure gaps between present and future skills needs. Our ultimate goal is to keep the maritime profession future-proof! For that we rely on your input. We have a short survey prepared: <https://www.surveymonkey.com/r/XYTHWJB> It takes about 10 minutes of your time. Thank you so much for your help! SkillSea is co-funded by the Erasmus+ Programme of the EU.

Twitter

Maritime professionals on board: could you please fill out this survey: <https://www.surveymonkey.com/r/XYTHWJB>. Project SkillSea is searching for gaps between present and future skills needs. Please give us your input – duration 10 mins. Thank you in advance.

| |
|--|
| ANNEX 4A: FOCUS GROUPS' PARTICIPATION (COUNTRIES) |
|--|

Participants in the first, 12 November 2020, focus group (employers, North-western and Eastern Europe) were from:

1. Norway
2. UK
3. UK
4. Belgium

Participants in the second, 13 November 2020, focus group (employees, North-western and Eastern Europe)⁶² were from:

5. Denmark
6. Finland
7. Sweden

Participants in the third, 16 November 2020, focus group (combined employees and employers, Southern Europe) were from:

8. Malta (employer side)
9. Spain (employee side)
10. Greece (employer side)
11. Belgium (employee side)
12. Cyprus (employer side)
13. Italy (employer side)

Discussions were moderated by Orestis Schinas (HSBA) and Mr. Dimitris Papachristos (EF) and in groups representatives of the social partners, ETF and ECSA, were invited and participated.

⁶² Comments were received by one participant not able to connect. (See Annex 4B).

ANNEX 4B: FOCUS GROUP SPECIMEN OF ANSWERS

(Comments sent by email as participant was not able to connect)

1. Do you think that employees possess the right skills (as per their training)?
Basically yes, the STCW describes the competences and skills that seafarers must have
2. Have you encountered systematically needs /challenges not covered by competences and skills gained by training? (gaps identified)
No, not systematically. Rather, the different shipowners have specific needs. There are different types of ships and different technical levels of ships and so on.
3. Can you identify new fields of skills and competences that should be covered by additional training? (e.g., IT, cyber, leadership etc.)
The conventions at the IMO, and therefore the STCW, are lagging behind technical developments. However, it must also be said that the ships are not all at the same technical level. So, the training standards laid down provide a good basis for everyone. It is also the responsibility of seafarers and shipowners to acquire or impart the knowledge and skills required for individual deployment.
4. Do you see any differences in competences and skills of EU trained vs non-EU trained mariners?
There is no general answer to this question; in principle, good seafarers come from all countries. However, differences can be observed in the depth of the training and in the focus of the training. These differences can also be observed within the individual countries, within Europe and also worldwide.
5. Do you see any problems in finding the required numbers of EU or non-EU mariners today and/or in the near future?
No
6. Do you see any problems finding EU or non-EU mariners today and/or in the near future with the right skills?
No

ANNEX 5: QUARTILES GRAPHS

FIGURE ANNEX 5.1

SELF-ASSESSMENT OF THE NECESSARY SKILLS CURRENTLY POSSESSED –QUARTILES

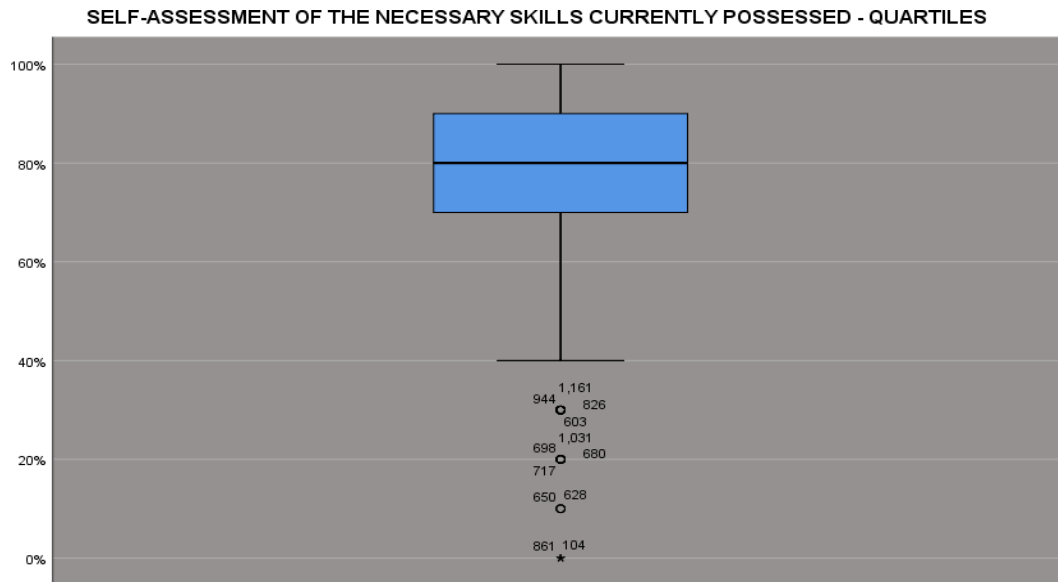


FIGURE ANNEX 5.2

NAVIGATION SKILLS ON BOARD - QUARTILES

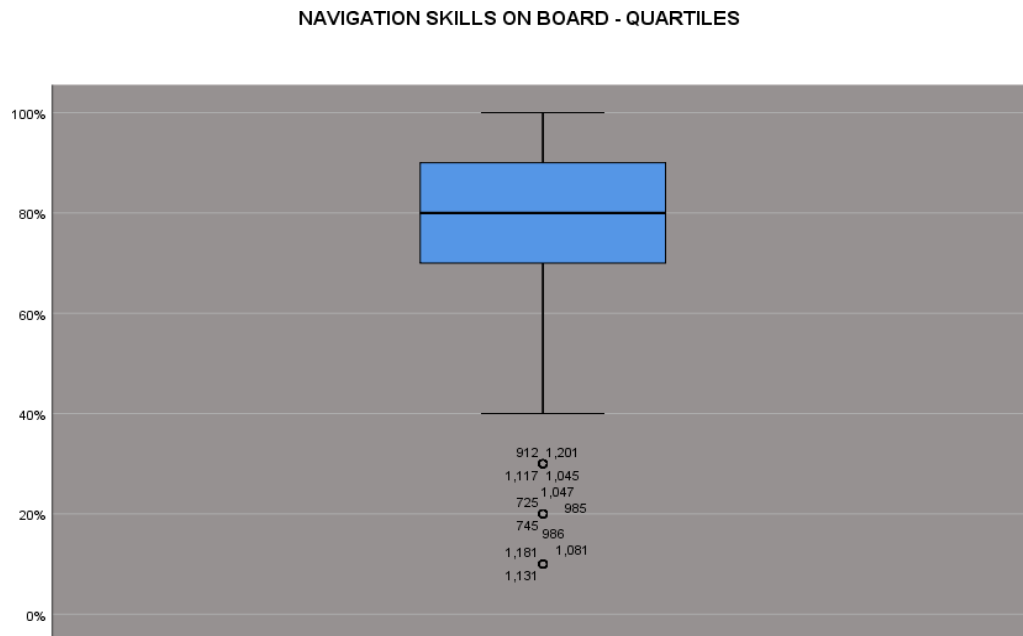


FIGURE ANNEX 5.3
DIGITALISATION SKILLS ON BOARD - QUARTILES

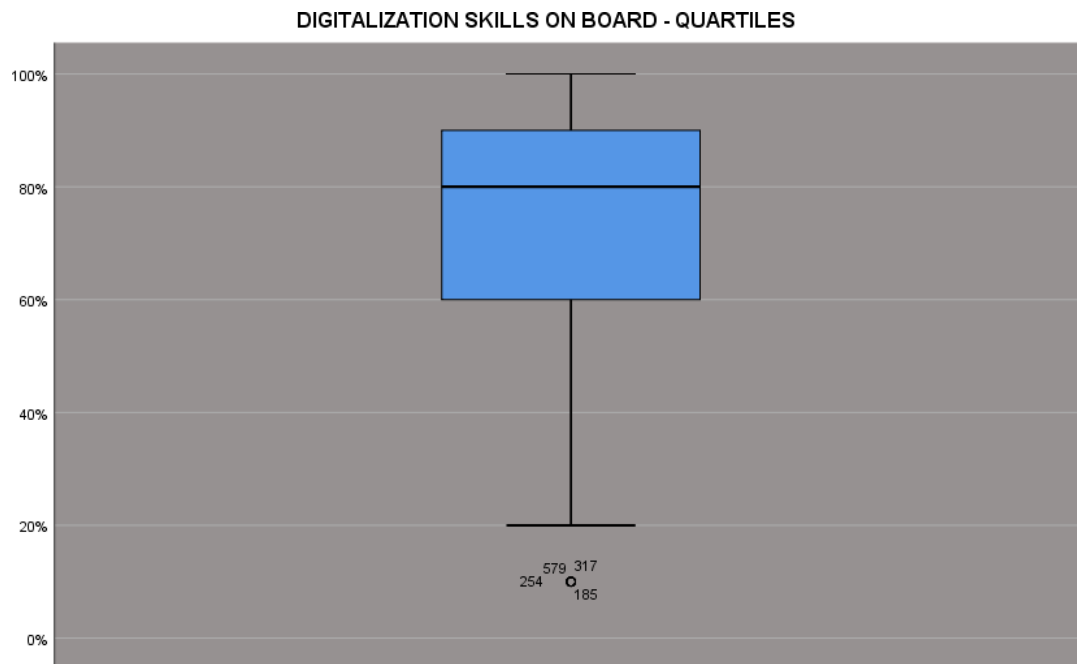


FIGURE ANNEX 5.4
SAFETY SKILLS ON BOARD - QUARTILES

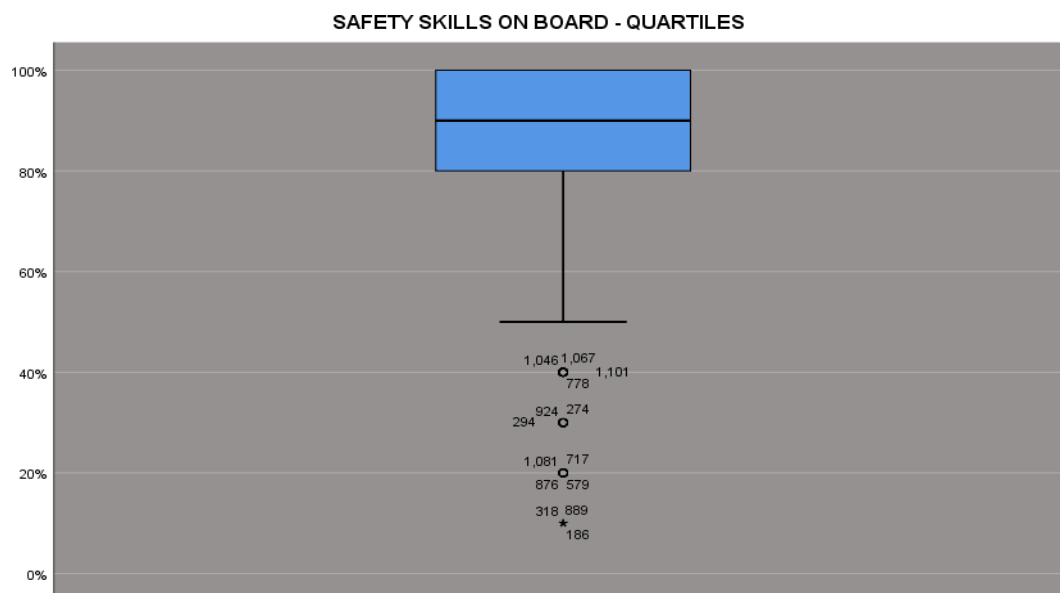


FIGURE ANNEX 5.5

SUSTAINABILITY – QUALITY SKILLS ON BOARD - QUARTILES

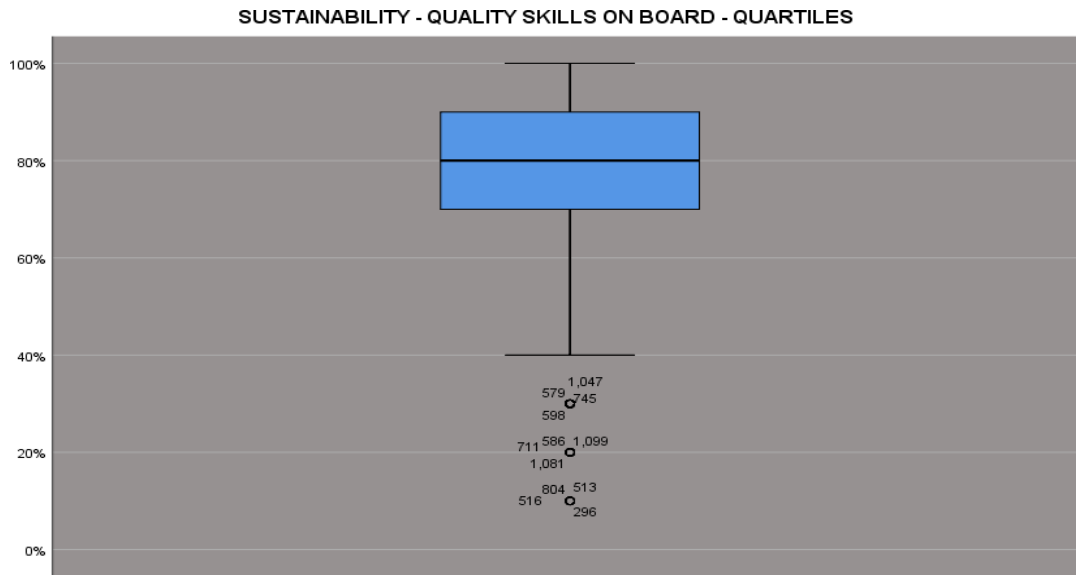


FIGURE ANNEX 5.6

AUTOMATION SKILLS ON BOARD - QUARTILES

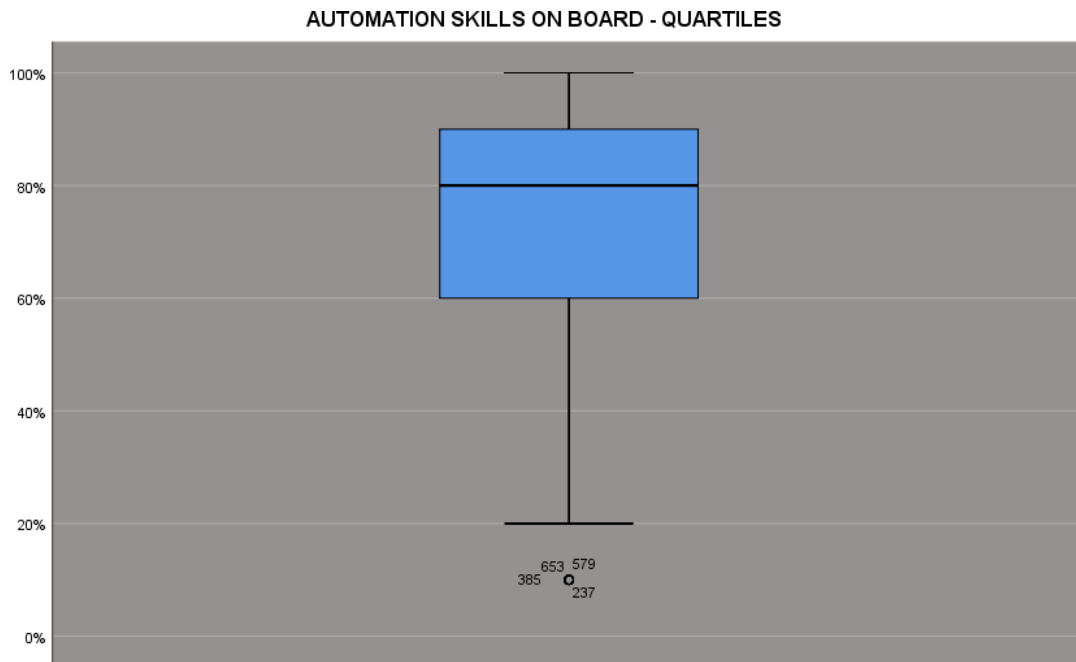


FIGURE ANNEX 5.7
OPERATIONS SKILLS ASHORE - QUARTILES

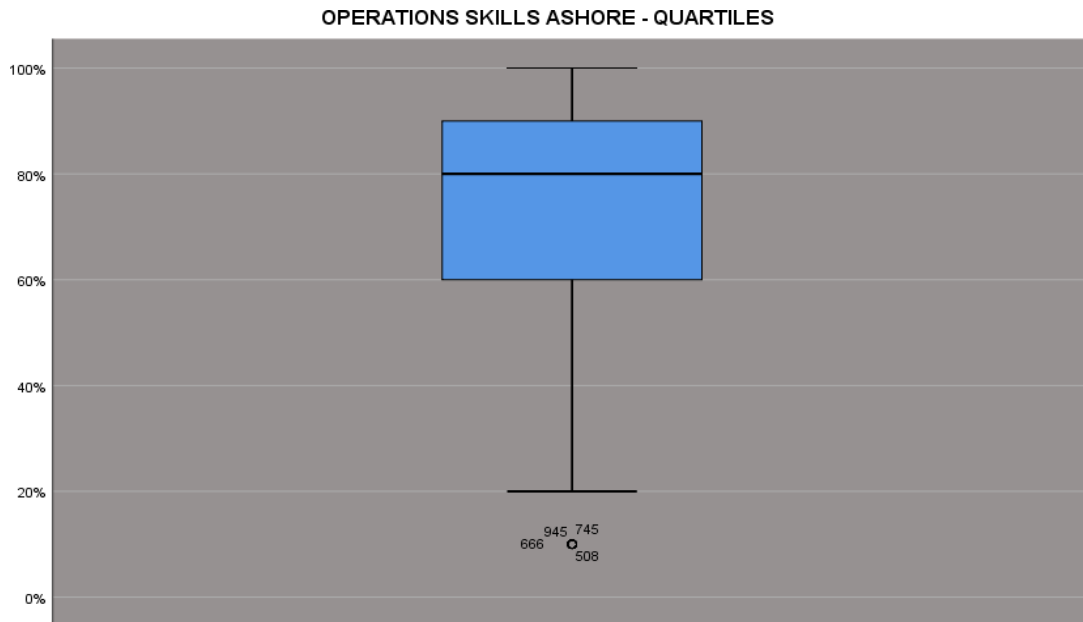


FIGURE ANNEX 5.8
DIGITALISATION SKILLS ASHORE - QUARTILES

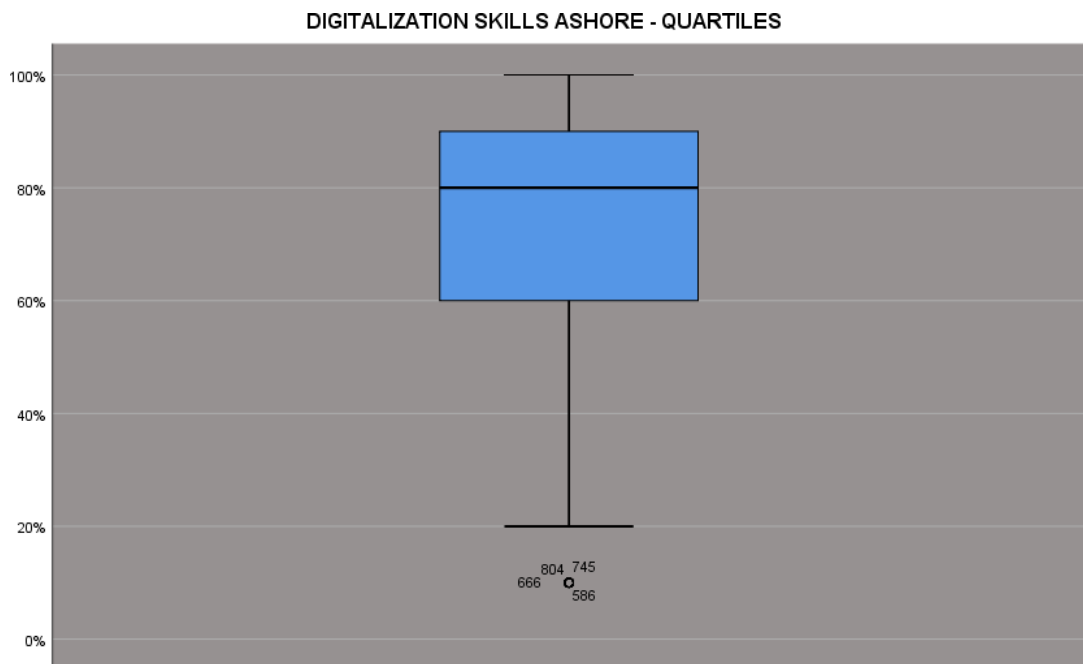


FIGURE ANNEX 5.9
SAFETY SKILLS ASHORE - QUARTILES

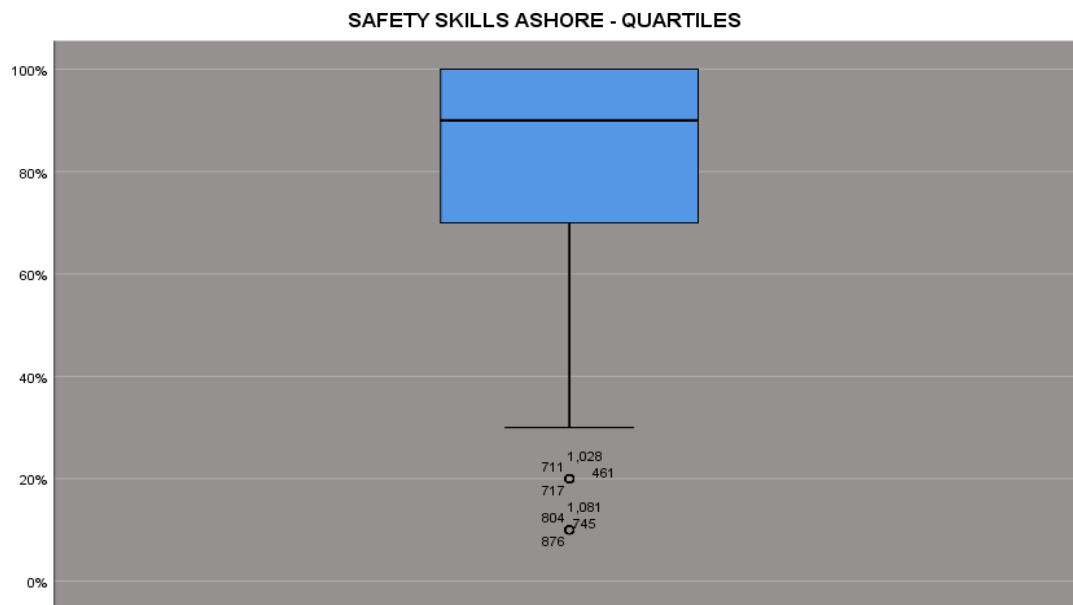
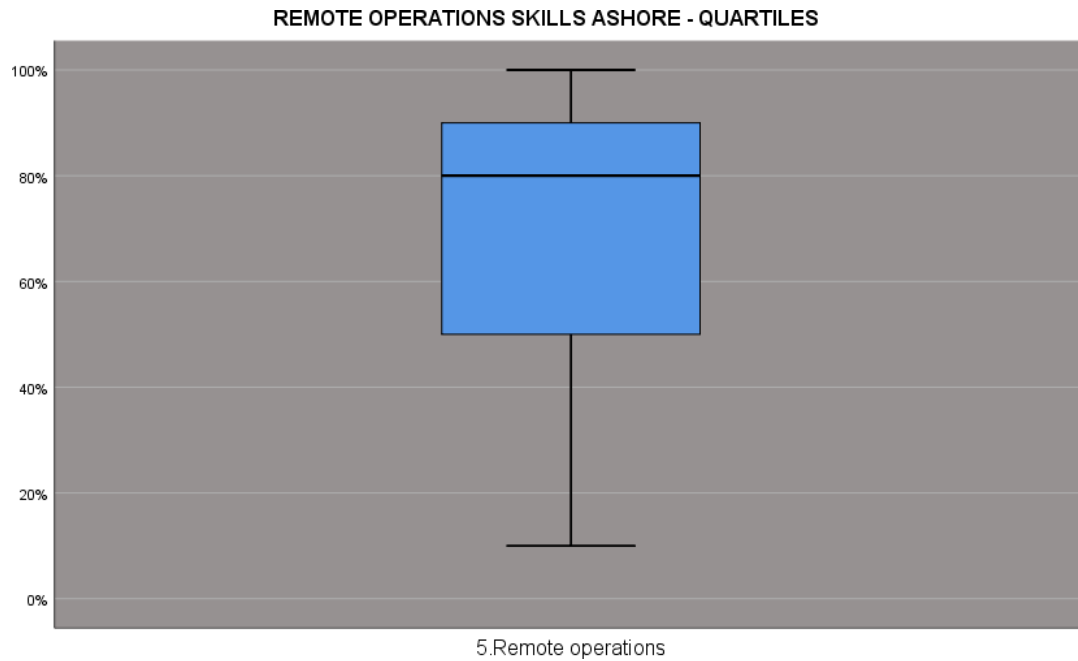


FIGURE ANNEX 5.10
SUSTAINABILITY AND QUALITY SKILLS ASHORE - QUARTILES



FIGURE ANNEX 5.11
REMOTE OPERATIONS SKILLS ASHORE - QUARTILES



ANNEX 6: LEVEL DESCRIPTORS IN THE EUROPEAN QUALIFICATIONS FRAMEWORK

Each of the eight levels is defined by a set of descriptors indicating the learning outcomes relevant to qualifications at that level in any system of qualifications.

| | Knowledge | Skills | Responsibility and autonomy |
|--|---|---|---|
| | In the context of EQF, knowledge is described as theoretical and/or factual. | In the context of EQF, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments). | In the context of the EQF responsibility and autonomy is described as the ability of the learner to apply knowledge and skills autonomously and with responsibility |
| Level 1 The learning outcomes relevant to Level 1 are | Basic general knowledge | Basic skills required to carry out simple tasks | Work or study under direct supervision in a structured context |
| Level 2 The learning outcomes relevant to Level 2 are | Basic factual knowledge of a field of work or study | Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools | Work or study under supervision with some autonomy |
| Level 3 The learning outcomes relevant to Level 3 are | Knowledge of facts, principles, processes and general concepts, in a field of work or study | A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information | Take responsibility for completion of tasks in work or study; adapt own behaviour to circumstances in solving problems |

| | | | |
|---|---|--|--|
| <p>Level 4</p> <p>The learning outcomes relevant to Level 4 are</p> | <p>Factual and theoretical knowledge in broad contexts within a field of work or study</p> | <p>A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study</p> | <p>Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities</p> |
| <p>Level 5^[1]</p> <p>The learning outcomes relevant to Level 5 are</p> | <p>Comprehensive, specialized, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge</p> | <p>A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems</p> | <p>Exercise management and supervision in contexts of work or study activities where there is unpredictable change; review and develop performance of self and others</p> |
| <p>Level 6^[2]</p> <p>The learning outcomes relevant to Level 6 are</p> | <p>Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles</p> | <p>Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialized field of work or study</p> | <p>Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for managing professional development of</p> |

| | | | |
|--|--|--|--|
| | | | individuals and groups |
| <p>Level 7[3]</p> <p>The learning outcomes relevant to Level 7 are</p> | <p>Highly specialized knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research</p> <p>Critical awareness of knowledge issues in a field and at the interface between different fields</p> | <p>Specialized problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields</p> | <p>Manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches; take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams</p> |
| <p>Level 8[4]</p> <p>The learning outcomes relevant to Level 8 are</p> | <p>Knowledge at the most advanced frontier of a field of work or study and at the interface between fields</p> | <p>The most advanced and specialized skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice</p> | <p>Demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research</p> |

Source: <https://ec.europa.eu/ploteus/en/content/descriptors-page>, accessed December 15, 2019.

NOTE: As mentioned by the source, the Framework for Qualifications of the European Higher Education Area provides descriptors for three cycles agreed by the ministers responsible for higher education at their meeting in Bergen in May 2005. Each cycle descriptor offers a generic statement of typical expectations of achievements and abilities associated with qualifications that represent the end of that cycle.

1. The descriptor for the short cycle developed by the Joint Quality Initiative corresponds to the learning outcomes for EQF level 5.
2. The descriptor for the first cycle corresponds to the learning outcomes for EQF level 6.
3. The descriptor for the second cycle corresponds to the learning outcomes for EQF level 7.
4. The descriptor for the third cycle corresponds to the learning outcomes for EQF level 8.

