

Results of USWE's Survey on Skills, Education and 4.0 technologies in Shipbuilding

2020



This Report is a result of the EU-funded project “Upskilling Shipbuilding Workforce in Europe”

Agreement no	2018 – 3060 / 001- 001
Project Number	600866-EPP-1-2018-1-ES-EPPKA2-SSA-N
Project Start Date	1 November 2018
Project End Date	30 November 2020
Deliverable Title	D2.3 Field Research Report on Needs for Industry 4.0 & D3.5 Validation by the Focus Group Report
Status	Final Version
Dissemination level	Public

MAIN AUTHORS

Victor Arias (Tknika), Sarai Blanc (SEA Europe), Elspeth Hathaway (industriAll Europe), Suvi Kivela (Turku University of Applied Sciences), Juha Valtanen (Turku University of Applied Sciences)

MAIN CONTRIBUTORS

Members of the EU Sectoral Social Dialogue Committee on Shipbuilding and Repair

COPYRIGHT

Non Commercial-Share Alike 4.0 International Creative Commons License.

You are free to share (copy and redistribute the material in any medium or format) and adapt (remix, transform, and build upon the material) under the following terms: Attribution (You must give appropriate credit, provide a link to the license, and indicate if changes were made); Non-Commercial (You may not use the material for commercial purposes).



Co-Funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein

Table of Contents

INTRODUCTION to USWE Project’s Survey	2
SURVEY RESULTS	2
1. Profile of the Respondents	2
2. Educational profile of technical workers	3
3. Age distribution of technical personnel.....	4
4. Gender Gap	4
5. Difficulties with recruitment.....	5
6. The different issues that impact the attractiveness of the industry and recruitment	5
7. Retaining talent	6
8. Sectoral occupations on high demand	7
9. Impact of 4.0 technologies in newbuilding yards & skills	8
10. Impact of 4.0 technologies in SMRC yards & skills.....	9
11. Impact of 4.0 technologies in the supply chain	10
12. Impact of 4.0 technologies on professional profiles	10
13. SMRC – Impact of 4.0 technologies on professional profiles.....	12
14. Current vocational education and training offer and cooperation with industry	12
15. Upskilling and reskilling workers – future training	13

INTRODUCTION to USWE Project's Survey

This Report analyses the results of the Survey carried out by USWE project for collecting additional information from companies and workers representatives and validating the outcomes and preliminary conclusions of the project's research. Hence, the results of the survey feed into several Work Packages and helped mainly to validate the outcomes of WP2 and WP3.

- **WP2: Forecast for Shipbuilding 4.0:** The survey contributes to the collection of information on the impact of 4.0 technologies on specific sectoral occupations. T.2.4. The outcomes of the survey in terms of future demand of professional profiles and skills, the expected impact of 4.0 technologies and the future training needs have also been used for validating and adding additional information to the Forecasting Report.
- **WP3: Identification of Skills and Profiles and WP4: List of Specific Profiles and Skills**
The survey aimed to support the research carried out in WP3 and WP4 for the mapping of sector specific skills and profiles.
- **WP5: Recommendations for Stakeholders and Policy Makers:** The answers of the industry experts about the needs and priorities of the sector will serve as a reliable basis for the policy recommendations from USWE to policy makers and other stakeholders.

Objective and Target Group

The main objective of the Survey was to validate some of the conclusions of previous work packages, and to support the research of USWE adding concrete technical information on the impact of 4.0 technologies on sectoral skills and professional profiles.

Given the technical nature of some questions and the specific sectoral scope of USWE, the survey was circulated only among companies and workers representatives in the shipbuilding industry and its supply chain:

- Newbuilding shipyards
- Ship repair, maintenance and conversion shipyards
- Maritime equipment manufacturers, suppliers and service companies

With the aim of having a representative response, the geographical scope, the size of the companies (SMEs and large companies) and the type of product (naval, commercial, passenger, repair, etc) were also taken into consideration.

The electronic questionnaire was forwarded by SEA Europe and IndustriAll Europe among their membership, targeting selected companies and trade unions across Europe.

SURVEY RESULTS

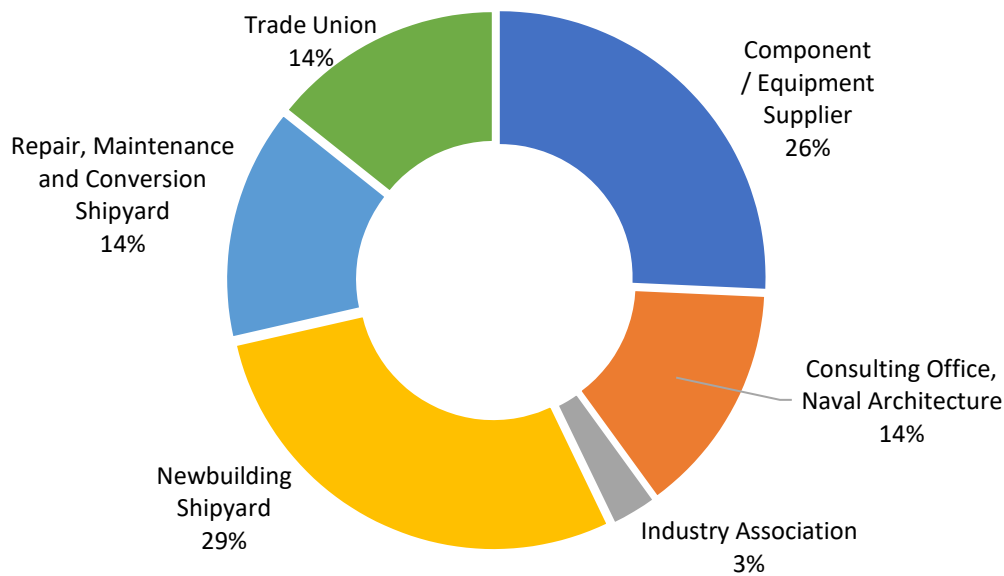
1. Profile of the Respondents

45 organisations participated in the survey. It must be noted that not all of them responded to the entire questionnaire given the technical expertise required for answering part of the questions.

The position of the people filling in the survey was in a large majority top Management of the companies and HR, Knowledge and Training Management. Regarding workers representatives, the respondents were trade unions coordinators at national level and representatives at company level.

The main European countries with a relevant shipbuilding and maritime equipment industry are represented by the survey respondents. These are the following 12 countries: Denmark, Spain, Finland, France, Germany, Greece, Italy, The Netherlands, Norway, Poland, Portugal and Romania.

The survey was responded by large companies and SMEs which provide all together more than 100.000 direct jobs. The main European shipbuilding groups participated in the survey.



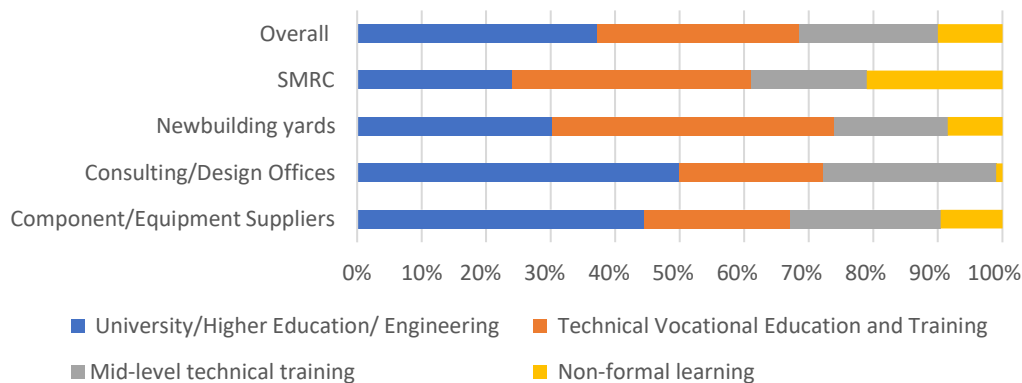
2. Educational profile of technical workers

The responses to the survey show that almost 70% of the technical workers in the industry have a high technical education background, provided by Vocational Education and Training (VET), mostly EQF level 3,4, 5 and High Education Institutions (EQF 6 and over). 20% of the workforce has a mid-technical background and 10% are reported to have non-formal learning.

The shares vary when looking at the level of education by company type. For instance, the share of VET profiles is higher in shipyards than in equipment and consulting companies like naval architecture and design offices where there are higher rates of engineers, naval architects and designers.

Among the shipyards, an interesting figure is the relevance of non-formal learning in ship maintenance, repair and conversion yards (SMRC). As reported by various SMRC yards in different countries, the lack of sectoral education and training offer in their regions and the difficulties to attract workers lead to the need of employing workers with non-formal learning which are trained on-site by the shipyards themselves. Several of these yards are providing certified training for employees.

Education background of technical personnel

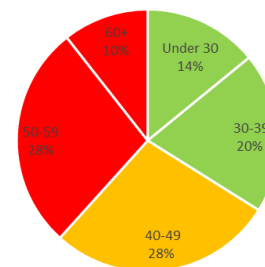


3. Age distribution of technical personnel

38% of the technical workers in the sector are over 50 years old, meaning that in the next 10 years there needs to be a generational change.

Some shipyards have reported that in the next 10 years half of their employees will be retired, with the consequent need of recruiting enough young people to ensure the transfer of knowledge between generations.

Age distribution of technical workers
European Shipyards



4. Gender Gap

The results of the survey indicate that **overall women represent 20% of the technical employees in the sector.**

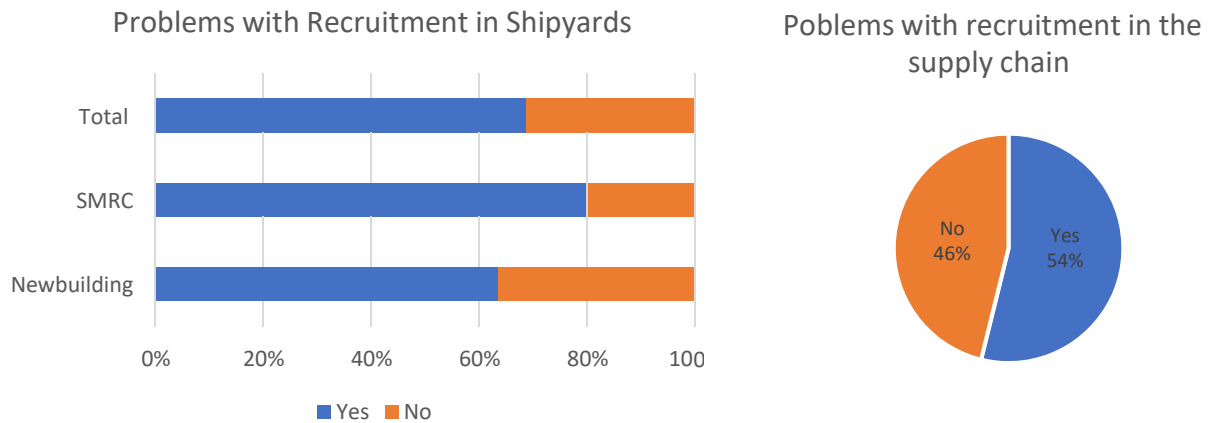
The average is different depending on the type of company. For instance, in newbuilding yards the average of women among technical staff is 21%, while in SMRC yards the share of women is lower (7.2%).

In equipment and component supplying companies the average of women is 14%. However, some companies have reported to have high numbers of women among their technical employees, between 35% and 40%.

Regarding the consulting/naval architecture companies the average is 20%.

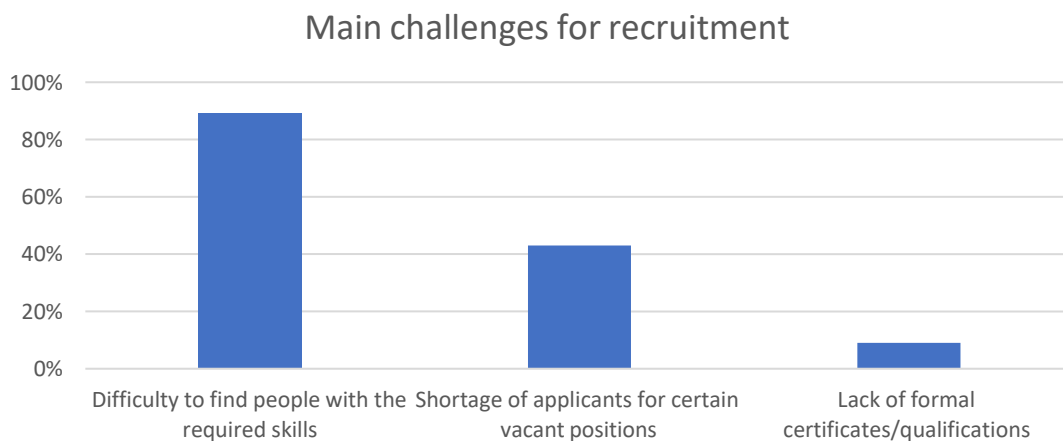
5. Difficulties with recruitment

The survey shows that almost **70% of the responding shipyards** (which include newbuilding and SMRC), and 54% of the equipment and other companies of the supply chain, **face difficulties to recruit new workers**.



Asked about the main recruitment challenges, 90% of the respondents selected the “difficulty of finding people with the right skills”. Moreover, 43% of the respondents have also declared as an important issue the shortage of applicants for certain positions. The lack of formal certificates and qualifications was only selected by 10% of the respondents.

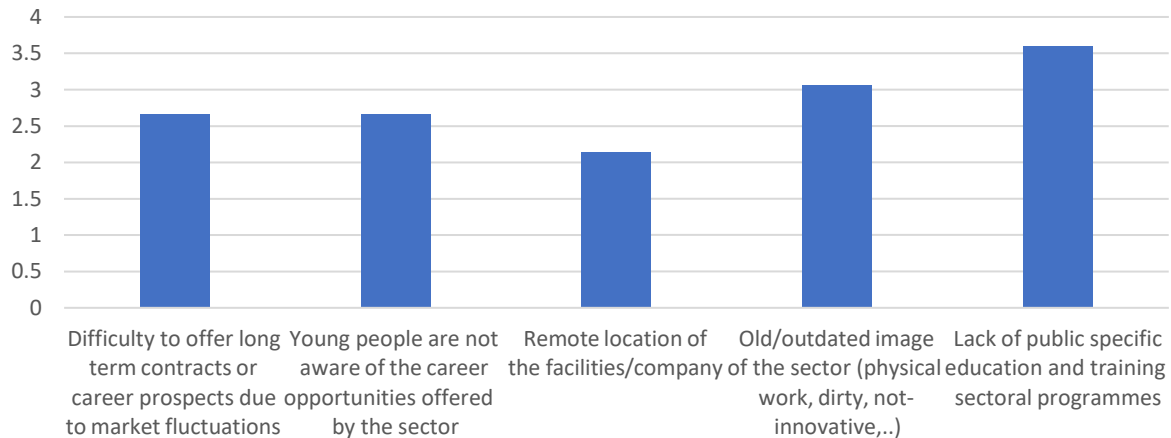
Additionally, companies have also mentioned the “difficulty to find people to relocate”, “lack of training offer”, “lack of sectoral qualifications/skills” or “the job is not attractive for young generations”.



6. The different issues that impact the attractiveness of the industry and recruitment

Among the different perceptions, the **lack of specific education and training for the industry is ranked as the main issue to attract talent to the sector and recruit people with the right skills.** This contributes to the fact that **young people are not aware of the career opportunities** offered by the shipbuilding and maritime equipment industry.

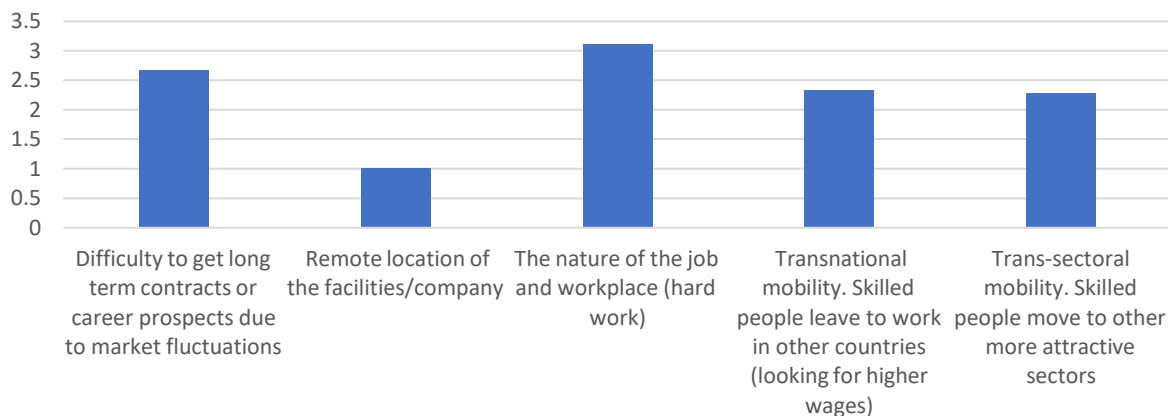
Impact of the following perceptions in the difficulties to attract talent
(1 = very low impact, 5= very high impact)



7. Retaining talent

Overall, **half of the respondents stated that they find difficulties in retaining talent.** However, when looking at different businesses and areas we can see that for **instance 4 out of 5 SMRC yards consider that it is difficult to retain workers in the company.**

Challenges for retaining talent (average valuation, considering
1 = very low impact and 6=very high impact)

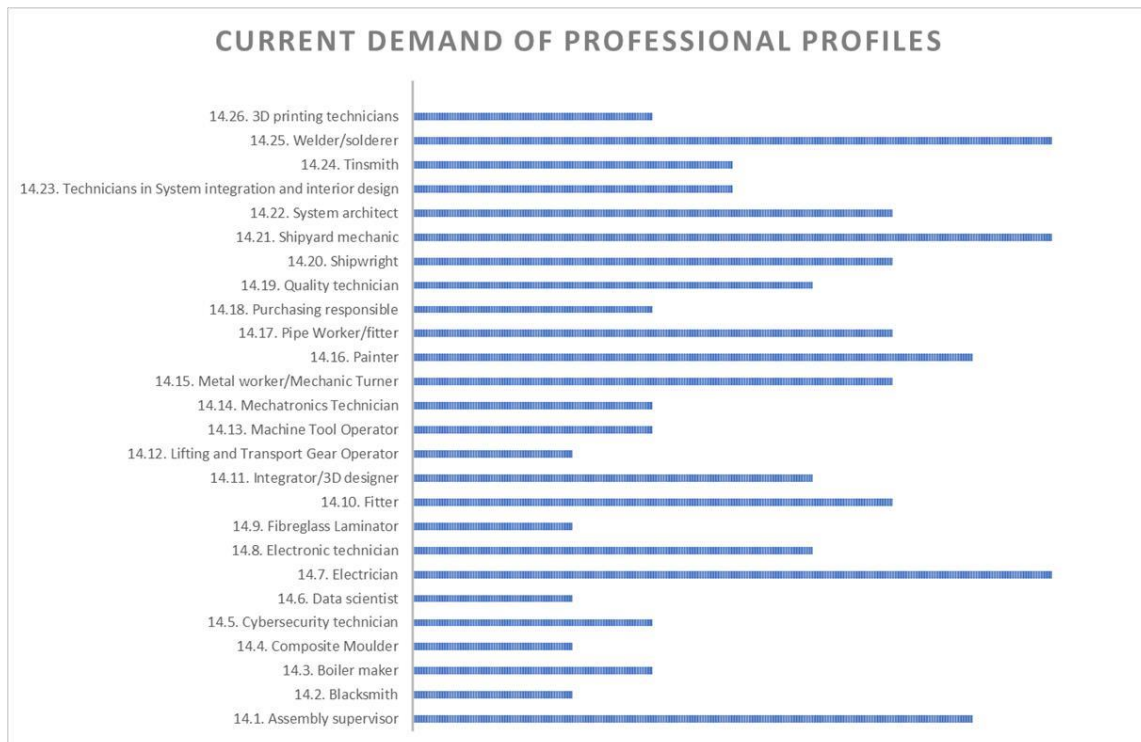


Among the major challenges to retain the talent, the nature of the job and workplace and the difficulty to get long term contracts are the most selected, with a rating of 3 out of 6 points. The difficulty to get long term contracts or career prospects was highly rated by various types of companies mainly in Southern and Eastern Europe and by trade unions representatives.

Concerning other challenges, transnational mobility is mainly affecting “lower-waged” countries, while trans-sectoral mobility was highly rated by very large companies all around Europe.

8. Sectoral occupations on high demand

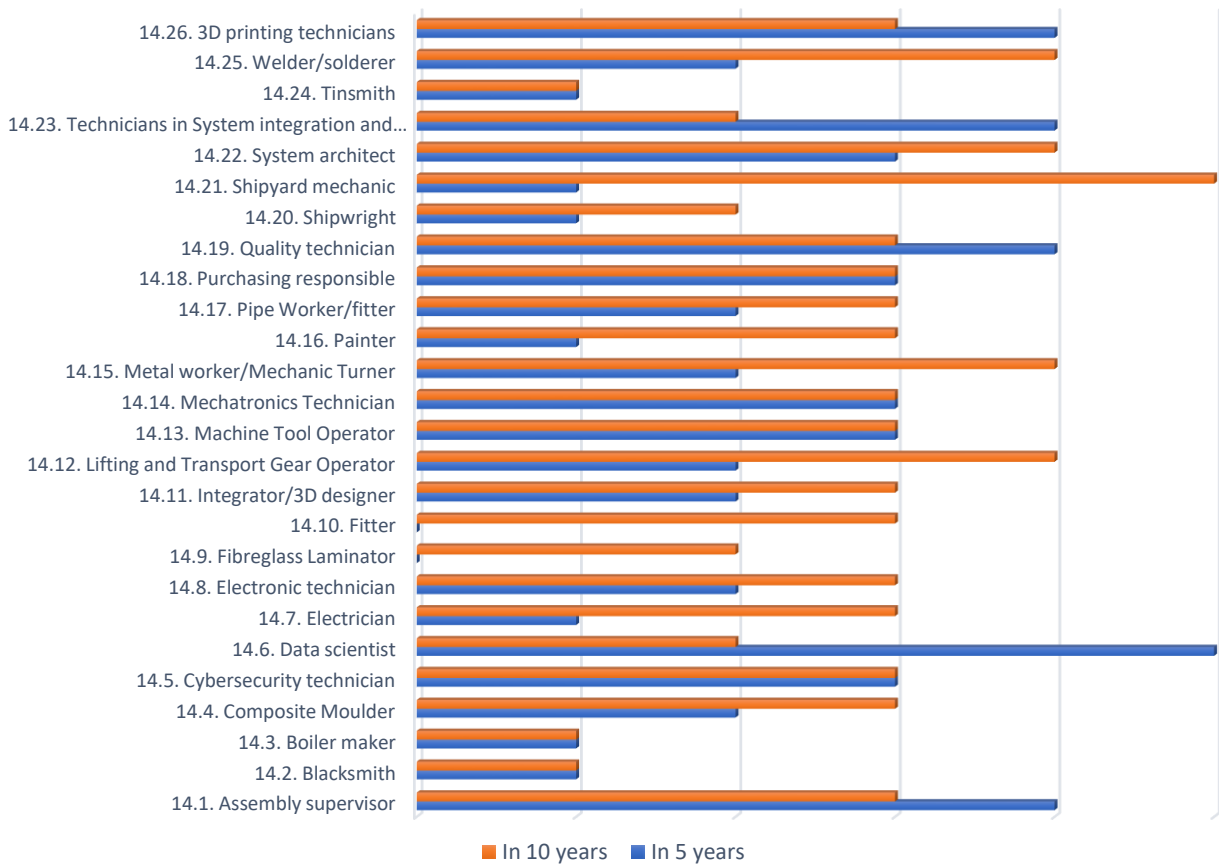
The survey asked about the current demand of 26 sectoral occupations with a VET background. As reported by the experts, **the lack of sectoral blue-collar workers and skills is common to all European countries** with a relevant shipbuilding industry. The that most demanded profiles at European shipyards nowadays are welders and solderers, shipyard mechanics, naval painters, electricians or assembly supervisors but also of other sectoral workers like shipwrights, pipe fitters, mechanic turners, integrators and 3D designers, or electronics technicians.



When looking at the **most demanded sectoral occupations in the next five years, besides the “traditional blue collar occupations”** the respondents pointed to **additional professional profiles in line with the digital transition of the industry**: Data scientists (the most highly ranked occupation), 3D printing technicians, technicians in system integration or cybersecurity technicians for instance.

Regarding the occupations that will be **on high demand in ten years-time**, the responses get similar to the previous question. What is worthy to mention is that “blue-collar” professions like naval welders, mechanics, fitters, pipe makers, painters or electronics technicians will still be necessary in the future. Probably these professionals will use new technologies and therefore the professional profiles and skills will be adapted accordingly as shown on point 9 of the current report. New occupations will also be of utmost importance to cope with the digital and green transformation of the economy.

Demand of professional profiles in the next 5-10 years







9. Impact of 4.0 technologies in newbuilding yards & skills

USWE project has identified several 4.0 technologies that are expected to be widely used in the shipbuilding and maritime equipment industry. Some European shipyards are already using these technologies and exploring additional applications to optimise their design and production processes towards the so-called “Shipyard 4.0”.

USWE’s survey included a question to identify which of the 4.0 technologies would have an impact on the different occupations or profiles identified in previous questions.

As per the respondents almost all the 4.0 technologies listed are impacting the industry and will continue to do so, with the exception of nanotechnologies and quantum technologies that were reported not to be so relevant. A growing use of robotics, additive manufacturing and smart materials, AI, VR/AR, sensors and IoT and cyber technologies is foreseen. Unanimously advanced energy generation and storage technologies will be key.

	Almost impact	no Very impact	low	Similar today	as	Impact will slightly increase	Impact will increase considerably
Additive Manufacturing/3D Printing							
Advanced energy generation, storage and distribution							
Advanced manufacturing							
Smart materials							
Artificial intelligence and machine learning							
Augmented/virtual reality and human machine interfaces							
Big Data							
Communication technologies							
Cyber technologies							
Embedded sensors and connectivity (e.g wearables, Internet of Things)							
Nanotechnologies							
Quantum technologies (e.g computing, sensing) and distributed ledger technologies (e.g blockchain)							
Robotics and unnamed systems							

	Between 50-100% of respondents chose this option
	Between 30-60% of respondents chose this option
	Between 10- 30% of respondents chose this option
	Less than 10% of respondents chose this option

10. Impact of 4.0 technologies in SMRC yards & skills

Contrary to the responses from newbuilding yards, maintenance, repair and conversion shipyards (SMRC) are currently less impacted by 4.0 technologies. Additive manufacturing, 3D printing and smart materials are among the most relevant ones. Artificial Intelligence, Augmented Reality and Virtual Reality technics, robotics, Big Data and communication technologies will also be used for repair, maintenance and conversion works.

	Almost no impact	Very low impact	Similar as today	Impact will slightly increase	Impact will increase considerably
Additive Manufacturing/3D Printing					
Advanced energy generation, storage and distribution					
Advanced manufacturing					
Smart materials					
AI and Machine Learning					
AR/VR and Human Machine Interfaces					
Big Data					
Communication technologies					
Cyber technologies					
Embedded sensors and connectivity (e.g wearables, Internet of Things)					
Nanotechnologies					
Quantum technologies and distributed ledger technologies (e.g blockchain)					
Robotics and unnamed systems					

11. Impact of 4.0 technologies in the supply chain

The supply chain is composed of thousands of companies specialised in very different businesses. This makes it very difficult to draw conclusions on the impact of the different technologies across the supply chain. In order to draw meaningful conclusions a dedicated survey and analysis by type of products and companies should be carried out. Therefore, USWE partners consider that the responses received to this question can't be considered as representative.

12. Impact of 4.0 technologies on professional profiles

The use of new 4.0 technologies as those identified in this report will be progressively spreading across the industry. There will be a need of training experts in different technologies but also those new tools will be used in the daily work of existing occupations.

The impact of new technologies on the existing profiles will be diverse. In particular, AR/VR and human machine interfaces, big data, robotics and unnamed systems will be the 4.0 technologies with the highest impact as they will have an effect on multiple professions at the same time.

Other technologies as advanced energy generation, storage and distribution technologies, advanced manufacturing and communication technologies will have a lower impact on the professions considered in this report.

See the matrix showing the impact of 4.0 technologies on USWE professional profiles on next page.

USWE's Matrix – Impact of 4.0 technologies on VET professional profiles

	Assembly supervisor	Blacksmith	Boiler maker	Composite Moulder	Cybersecurity technician	Data scientist	Electrician	Electronic technician	Fibreglass Laminator	Filter	Integrator/3D designer	Lifting and Transport Gear Operator	Machine Tool Operator	Mechatronics Technician	Metal worker/ Mechanic Turner	Painter	Pipe Worker/fitter	Purchasing responsible	Quality technician	Shipwright	Shipyard mechanic	System architect	Technicians in System integration and interior design	Tinsmith	Welder/ solderer	3D printing technicians
Additive Manufacturing/3D Printing	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Orange	Orange	Yellow	Yellow	Orange	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Orange	Yellow	Yellow	Yellow	Yellow	Yellow	Orange	Red
Advanced energy generation, storage and distribution																										
Advanced manufacturing																										
Advanced smart materials	Orange			Yellow	Yellow				Yellow	Yellow	Red		Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Orange			Orange	Orange		Yellow	Orange
Artificial intelligence and machine learning	Orange				Orange	Yellow					Yellow			Yellow				Orange	Orange		Yellow	Red	Yellow		Yellow	Yellow
Augmented/virtual reality and human machine interfaces	Yellow		Yellow		Orange	Yellow	Yellow	Orange		Orange	Red		Yellow		Yellow		Yellow	Yellow	Red	Yellow	Orange	Red	Red			Yellow
Big Data					Orange	Red	Yellow				Red							Red	Orange			Orange	Orange			Yellow
Communication technologies																										
Cyber technologies	Yellow				Red	Orange		Yellow			Yellow							Yellow	Yellow			Red	Orange			Yellow
Embedded sensors and connectivity (e.g wearables, Internet of Things)					Yellow		Orange	Red						Red					Yellow			Orange	Orange			Yellow
Nanotechnologies				Yellow	Yellow	Yellow								Yellow					Yellow			Yellow		Yellow		Yellow
Quantum technologies (e.g computing, sensing) and distributed ledger technologies (e.g blockchain)					Orange	Orange					Yellow			Yellow							Yellow	Orange	Yellow			Yellow
Robotics and unnamed systems	Red		Yellow		Orange	Orange	Orange	Yellow		Yellow		Yellow	Orange	Yellow	Yellow	Red	Red	Yellow	Yellow	Yellow	Yellow	Red	Orange	Yellow	Red	Orange



USWE Project
Upskilling Shipbuilding Workforce for Europe



Co-funded by the
Erasmus+ Programme
of the European Union

13. SMRC – Impact of 4.0 technologies on professional profiles

In the case of repair, maintenance and conversion shipyards, among the 4.0 technologies, additive manufacturing/3D Printing, advanced smart materials, AI, embedded sensors and connectivity were rated as the most impactful on the different profiles listed in the table below.

	Assembly supervisor	Blacksmith	Electrician	Electronic technician	Machine Tool Operator	Metal worker/Mechanic Turner
Additive Manufacturing/3D Printing					Yellow	Yellow
Advanced energy generation, storage and distribution						
Advanced manufacturing						
Advanced smart materials			Yellow		Yellow	
Artificial intelligence and machine learning	Yellow				Yellow	
Augmented/virtual reality and human machine interfaces		Yellow	Yellow			
Big Data						
Communication technologies						
Cyber technologies				Yellow		
Embedded sensors and connectivity (e.g wearables, Internet of Things)			Yellow	Yellow		
Nanotechnologies	Yellow					
Quantum technologies and distributed ledger technologies						
Robotics and unmanned systems				Yellow		Yellow

14. Current vocational education and training offer and cooperation with industry

62% of the respondents declared that there are no VET centres in their region with adequate sectoral training programmes.

Regarding collaboration between companies and the VET providers, 50% of the respondents confirmed that they cooperate with VET centres and that the company hosts training for students on site. 28% declared a close relation close cooperation to ensure that training and education modules provide the skills that the company needs. Finally, 22% of the respondents has no cooperation with any VET centre.

These data reflect a well-known reality in the sector. It is very difficult to find sectoral education and training programmes in many regions and it is up to the companies to provide their own in-house training.

In those regions with very large companies, there is in general an increasing cooperation between industry and education providers. However, **it is really worrying that more than 60% of the respondents do not find adequate training in their areas.**

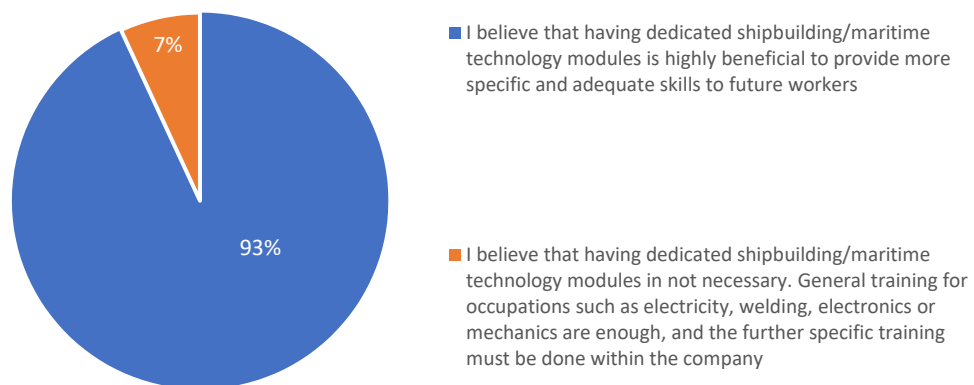
15. Upskilling and reskilling workers – future training

It is often heard that the scarcity of sectoral training offer responds to the fact that shipyards and maritime suppliers can find the necessary skills in trans-sectoral training modules, and that it is afterwards up to the company to provide the additional specific skills that workers require to perform their activities in the maritime technology industry.

When asked about this question, 93% of the respondents mentioned that having access to sectoral shipbuilding/ maritime technology modules is highly beneficial. Only 7% of the respondents consider that dedicated shipbuilding related modules are not necessary, and that general training for occupations such as welding, electricity, mechanics, etc are enough.

The specific qualifications and skills required in this industry are very specific and specialisation courses are needed to ensure a critical mass to highly skilled sectoral workers. Moreover, the availability of education and training programmes would also help to visualise the career opportunities and help attract so much needed talent to the sector.

Dedicated sectoral education and training vs general training



The survey also showed that among the different options for upskilling and reskilling workers, the most effective solutions would come through strengthening cooperation between VET providers and industry, updating existing curricula and training for sectoral occupations and creating new modules on technologies such as AI, advanced manufacturing, programming etc, applied to the shipbuilding and maritime technology industry.



Rue de La Loi 67, 4th Floor
1000 Brussels, Belgium
secretariat@seaeurope.eu
www.seaeurope.eu



Bd Joukahaisenkatu 3
20520 Turku Finland
tel. +358 2 263 350
kirjaamo@turkuamk.fi
www.tuas.fi



Bd roi Albert II, 5
1210 Brussels, Belgium
tel +32 2 226 00 50
www.industriall-europe.eu



(+34) 943 082 900
Zamalbide Auzoa z/g
20100 Errenteria (Gipuzkoa)
Spain