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Maritime Alliance for fostering the European Blue Economy through a Marine Technology Skilling Strategy

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

Highlights of MATES Pilot Experiences

ED2MIT: Education and Training for Data Driven Maritime Industry

Layman Report

November 2021

About this Report

This document was developed through the EC-funded Erasmus+ project **MATES: Maritime Alliance for fostering the European Blue Economy through a Marine Technology Skilling Strategy.**

The objective of the MATES project is to develop a skills strategy that addresses the main drivers of change in the maritime industries, in particular shipbuilding and offshore renewable energy. Both sectors are strongly linked and require new capacities to succeed in an increasingly digital, green and knowledge- driven economy.

Duration: January 2018 – April 2022 (52 months)

More information on the project is available at projectmates.eu.

Document information	
Short description	This document helps to develop effective approaches in delivering the pilot experience entitled "ED2MIT: Education and Training for Data Driven Maritime Industry".
Next steps	These results present a solid foundation for the Maritime Technologies Skills Strategy and the long-term Action Plan and sustainability.
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AQUATT
Science. Communication. Knowledge. Innovation.

1. Context

Emerging data economy, as a part of the more general Fourth Industrial Revolution (referred to as Industry 4.0) is powered by the convergence of previously disconnected fields such as Cloud Computing, Big Data, Data Science and Analytics (DSA), Artificial Intelligence (AI), Internet of Things (IoT), robotics, mobile technologies, 3D printing, nanotechnology and biotechnologies, that all are based on automation and digitalisation of organisational, manufacturing and business processes. Industry 4.0 will be characterized by fast development, a high level of technology convergence, and the increased role of knowledge, skills, and human factors to enable the continuous and sustainable development of a digital society.

Sustainable development of the modern data driven economy requires specific digital and data skills which in general are common but in many cases not native for non-computer/IT domains. Addressing demand for digital and data skills requires cooperation between computer/IT specialists (and educators) and re-thinking and re-designing both traditional educational models and existing courses to reflect the multi-disciplinary nature of data driven technologies and application domains.

Industry digitalisation will bring benefits of effective exchange of technical solutions, application, optimisation algorithms between different sectors and branches using standard processes and data models, common software/application platforms.

Active use of complex machines such as modern ships, ports and ORE devices, requires digital technologies to operate, control, and ensure safety and sustainability while protecting technical and sensitive information.

Data Science Analytics, Artificial Intelligence and other data technologies will have a strong transformational effect on the maritime industry that requires corresponding digital and data skills for organisational roles. The maritime industry has a very high potential to benefit from digital and data driven technologies, AI and automation.

Target beneficiaries include technicians and VET teachers/trainers interested in Big Data and Data Management best practices and applications for maritime and offshore energy sectors. MATES partners and MATES Thematic Groups' experts. Women are motivated to attend ED2MIT courses.

Results of this Pilot experience are particularly relevant for the following stakeholder groups:

- Industry
- Research and Development Centres/Universities

2. Overview of the ED2MIT Pilot Experience

ED2MIT Pilot Experience was developed by the University of Amsterdam, with organisational, logistical and dissemination support of the MATES project partners.

ED2MIT Pilot Experience focused on creating a sustainable training framework for developing and improving digital and data skills for future/ongoing digitalisation of the maritime industry. The goal was also to bridge the gap between the original Data Science and Information Technologies community and maritime professional community with the recognised demand for data and digital skills and facilitate knowledge transfer between two professional communities.

This PE has effectively used the EDISON Data Science Framework (EDSF)[1] and corresponding skills management and curricula development methodology proposed in the EDISON[2] project and is currently used in multiple domains that require Data Science and general digital and data competences and skills which have been defined according to European Digital Competence framework DigComp2.1[3]. Using EDSF accelerated the development of the training courses to support the demand for general digital and data skills by all types of professions and workers that will work with the future data driven and AI enabled processes, manufacturing and operation.

OUTCOMES

- Set of training materials on digital and data technologies developed covering main competence areas defined in DigComp: Data driven technologies and Data Management, Cloud Services and Cloud Economics, Data Science and Big Data Analytics, Digital content creation, access and management
- Four training courses delivered for the maritime community to address critical competence areas in digital transformation of the maritime industry.
- The experience of developing and delivering training materials has contributed to the educational and research community via conference publications and community events presentations (workshops, seminars).

Summary of Participants Engaged in the ED2MIT courses

Hours of Training	43
Participants	117
Countries reached	9

1 The Data Science Framework, A View from the EDISON Project, Editors Juan J. Cuadrado-Gallego, Yuri Demchenko, Springer Nature Switzerland AG 2020, ISBN 978-3-030-51022-0, ISBN 978-3-030-51023-7 (eBook, printed book)

2 EDISON project (2015-2017) - http://www.edison-project.net/

3 DigComp 2.1, 2017, The Digital Competence Framework for Citizens, by Stephanie Carretero, Riina Vuorikari and Yves Punie, Joint Research Center, 2017, EUR 28558 EN [online] https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/digcomp-21-digital-competence-framework-citizens-eight-proficiency-levels-and-examples-use

3 Achievements

The ED2MIT Pilot Experience proved that there is a real need to upskill the Shipbuilding sector workforce in digital tools. Here we outline the materials available and their main impact.

3.1. Developed contents

The training was originally planned as face to face, but because of the COVID-19 pandemic situation they had to be developed online. Below you can find the content of the training. **ED2MIT offers special support for educators intending to use the training materials for their curricula and extra-curricular activities**.

Four online courses for the maritime sector were developed

Introduction to Data Science & Analytics Foundations for the maritime sector (Self-training- 16 hours)

Learning outcomes

Participants **learned** the main methods in statistical analysis, data exploration and data preparation, as well as **acquired** a basic knowledge on machine learning, classification techniques and cluster analysis.

Industrial Data Spaces, Organizational Data Management (DAMA) & Governance for the maritime sector (9 hours)

Learning outcomes

Attendees **stablished** effective Data Management and Data Science team at their organisations. They **followed** the best practices and standards on DAMA and Governance, e.g. DAMA BoK (International DAMA Body of Knowledge) & DAMA Architecture.

Big Data Infrastructure Technologies for Data Analytics (12 hours)

Learning outcomes

Participants **learned** the main components of an enterprise' Big Data Infrastructure, as well as the main cloud-based data analytics components and services. Also they **got a basic knowledge** on data protection, security threats and mitigation models

Introduction to Big Data and Data Management for Maritime Industry (12 hours)

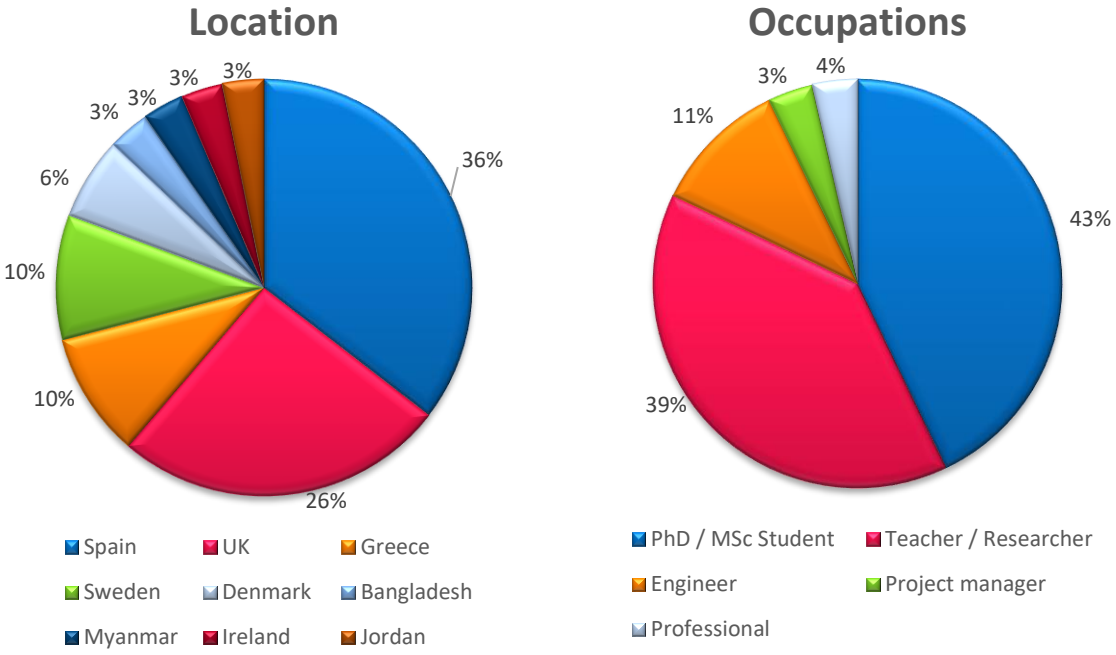
Learning outcomes

Participants **learned** Big Data concepts & Big Data Reference Architecture (BDRA) as defined by NIST standards & **applied** organisational recommendations and Big data tools.

3.2. Results

In total 43 hours of training was provided to 117 people.

- First course reached 88 attendees, of which 43% were PhD or MSc Students and 39% Teachers or Researchers. Audience came mainly from Spain and UK, but also from countries outside of the EU.



- The following courses, as were more specific and requirements for registering implied knowledge of programming languages: python or Java & familiarity with Linux system, shell commands and SSH, number of participants fall drastically by below 20 for each of them.

3.3. Main Impact

Interest was shown by a University Lecturer at the Arctic University of Norway, in using the training materials in their own course. They have BSc programs in Nautical Science, Ocean Technology and also Master and PhD programs within the same field. They confirmed the material from the ED2MIT Pilot Experience is relevant for their courses and is at a proper level for BSc students.

Measures to increase impact

- The developed course are placed into the Open Access repository (such as Zenodo[4] or Open Research Europe[5] supported by EC) what will increase community exposure and possible use by wider community. Availability of such materials and courses should be disseminated to maritime professional associations and VET or training organisations.
- ED2MIT course can be used as a basis for developing targeted training programs or as extra-curricular material for already existing courses in maritime university and VET programs.
- Further adoption of the digital and data training will require a special program and follow on projects which tasks would be to develop training (primarily goal) and education (secondary goal) programs and courses adapted to maritime context and create trainers on digital and data technologies from the maritime sector(s): Training for trainers. This program should use MATES results. Such experience

4 Zenodo platform, https://zenodo.org
5 Open Research Europe (ORE) - https://open-research-europe.ec.europa.eu/

and follow on projects on skills development programs have been realized in multiple scientific domains and IT industry sectors under EC DG-Connect, DG-Growth, e-Infrastructure in H2020 (supported by multiple calls in H2020) and currently included in Horizon Europe.

4. European Added Value

ED2MIT courses include basic courses that can be offered to different groups at the level sufficient to make an informed decision and provide a basis for further study by course attendees.

The training materials can be used for "training the trainers" from the maritime industry to ensure wider dissemination and impact of the MATES project. The materials and curricula can be customised and adapted to organisational processes and tasks as well as used by universities, VET and professional training organisations. In this way, the ED2MIT can contribute to developing effective methodologies for digital skills management and capacity building in the maritime industry.

The courses are intended for achieving the basic competence level EQF2 - EQF3: awareness, simple tasks and guided regular tasks. Advanced courses supported with necessary practical training are targeting competence level EQF3 -EQF4: simple tasks, guided regular tasks, and independent regular tasks.

ED2MIT training materials are brought to the maritime community as a result of cooperation between educators and experts in Computer Science, Big Data and Data Science, Data Management and Governance, on the one hand, and maritime technology experts, on the other hand, which was also supported by widely adopted methodologies for competences/skills management such as EDSF and DigComp2.1. The methodology and training materials can be further used for training the trainers on digital and data technologies from native maritime specialists to deliver future training in the most effective way.

Training materials and recorded courses will facilitate the development of training courses adapted to specific maritime branches and organisations. Recommendations based on ED2MIT experience are included in the MATES Skills Strategy.

The results achieved in ED2MIT are highly scalable but would require specially focused future projects and activities as mentioned above, with the following measures:

- Scalability will be ensured by creating a repository of customizable training materials and a network of trainers from maritime industry
- Most of scale-up activities will be created by including standard training on digital and data skills into programs of training sessions/events by maritime organizations, professional associations and VET or training organizations

ED2MIT results and key outcomes provide a direct contribution to European goals and provide added value in developing digital and data skills for the maritime industry. The fact that this PE is focused on creating a sustainable training framework for digital and data skills directly responds to priorities identified by EU policies in addressing the digital skills gap with emerging maritime industry digitalization, automation and Artificial Intelligence (AI) impact. New skills for Europe Agenda[6] states that Europe needs a digital transformation. This PE addresses an increasingly important feature of the required technology shifts in the use of information and communication technologies (ICT) in energy7.

6 New Skills Agenda for Europe - Employment, Social Affairs & Inclusion - European Commission'. [Online]. Available: https://ec.europa.eu/social/main.jsp?catId=1223

7 European Commission, 'Energy Roadmap 2050, COM (2011) 885 final'. 15-Dec-2011.

All layman reports and education and training materials from all the MATES Pilot Experiences are available on the MATES website and include:

ED2MIT: Education and Training for Data Driven Maritime Industry projectmates.eu/pilotexperience/ed2mit
MOOCs on Industry 4.0 and the naval sector projectmates.eu/pilotexperience/mooc-training-course
Freeboard projectmates.eu/pilotexperience/freeboard
The Magnus Effect projectmates.eu/pilotexperience/the-magnus-effect
Innovation Manager in Shipbuilding Course projectmates.eu/pilotexperience/innovation-manager-course
Additive Manufacturing and Risk Management in the Shipbuilding and Ship Repairs Sectors projectmates.eu/pilotexperience/training-seminar
MOL^2 Maritime on the Loop of Ocean Literacy projectmates.eu/pilotexperience/mol2
Offshore Renewable Energy Courses projectmates.eu/pilotexperience/renewable-energies-crash-courses
Ocean Pro.Tec Lab projectmates.eu/pilotexperience/ocean-pro-tec-lab
Green Move projectmates.eu/pilotexperience/green-move
Definition of New Occupational Profiles projectmates.eu/pilotexperience/dop-definition-of-new-occupational-profiles

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