

# User-centric robotic solutions for shipbuilding

## Mari4\_YARD 3rd workshop

9 NOVEMBER 2023

Hamburg University of Technology

TUHH

Hamburg, Germany



Mari4\_YARD is implementing worker-centric solutions that increase workers' productivity by providing them with the right tools and information as well as improving their working conditions.

This third workshop aimed to present the technologies developed during the first three years of the project and now ready to be applied in shipyards to support the shipbuilders in their heavy and time-consuming daily tasks.

During the workshop, visitors could walk around the exhibition booths and have a look at the different technologies we developed in Mari4\_YARD, in place (where possible) or as a presentation- or video-demo.

There was plenty of room for exchange and networking to foster the Mari4\_YARD results exploitation and enabling EU wide manufacturing adoption in SM-shipyards.

### AGENDA

**13:00 -13:30** Welcome and brief introduction of Mari4\_YARD project  
(Jawad Masood- AIMEN)

**Parallel demo sessions** Exoskeletons assisting workers (Andrea Parri - IUVO)

**13:30 -16:00** Augmented reality (Adam Gąsiorek - TTPSC)

Mobile manipulator for logistic operations (Luis Rocha - INESC TEC)

Collaborative robots for welding (Jawad Masood - AIMEN)

Hand-guiding system for industrial robots (Konstantinos Katsampiris Salgado - LMS)

**Augmented reality with handheld devices (Vincent Settler - TUHH)**



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant Agreement n° 101006798.

[www.mari4yard.eu](http://www.mari4yard.eu)



# Demo sessions

## Exoskeletons assisting workers

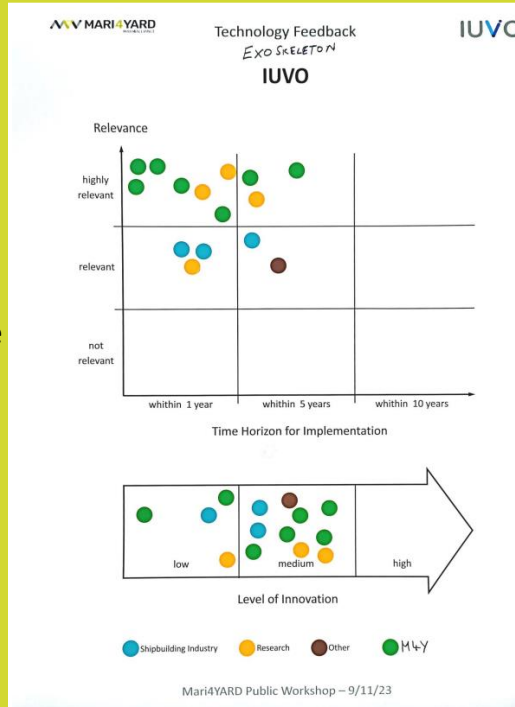
led by **Andrea Parri, IUVO**

Shoulder-support exoskeletons are designed to provide antigravitational support to the user's arms for those job activities requiring static or repetitive shoulder flexion. Lumbar-support exoskeletons are designed to support the user's trunk erector muscles through an assistive action delivered at the level of the lumbo-sacral joint in those job activities requiring repetitive load lifting actions or static flexion trunk poses. As "wearable" tools, both exoskeletons are designed to provide a comfortable human-machine interaction thanks to a light-weight structure, high kinematic compatibility ensuring for complete freedom of movement and high adaptability.



### Main advantages of using exoskeletons?

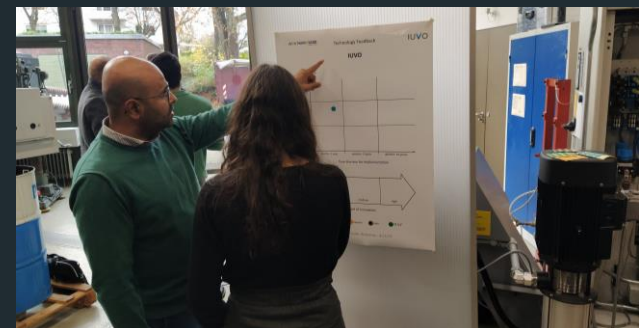
- ↓ Reduction of workers physical effort in the execution of the target tasks
- ↑ Usability and acceptability assessed
- ↑ Improvement of the ergonomics risk factor in the target applications



### What the participants think...

Relevance vs time: relevant or high relevant within 1 to 5 years

Level of innovation: low-medium



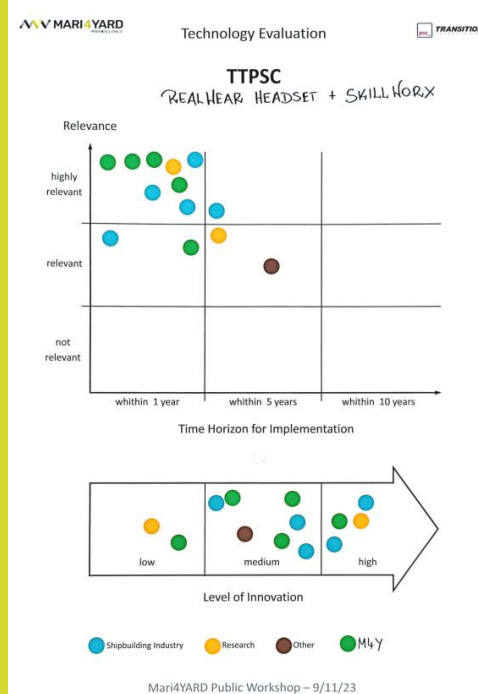
## Augmented reality

led by **Adam Gqsiolek, TTPSC**

Mari4\_YARD provides shipyard workers with head-mounted devices that are attached to safety helmets and having connectivity, monocular camera, microphones, noise cancellation algorithms. That setup gives the workers full hands-free experience to check, record and document construction progress, completion, and quality of delivered work and follow digital work instructions. The system serves as a source of information for field workers during on-the-job activities.

### Main advantages of using augmented reality?

- ↓ Reduction of reworks and changes, particularly in the latest phases of the construction.
- ↑ Increase of precision and quality by relying on AR/MR tools for a precise positioning of the different subassemblies.
- ↑ More efficiently training for new shipyard workforce in machinery and deck equipment.



### What the participants think...

Relevance vs time: relevant or high relevant within 1 year

Level of innovation: medium-high



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant Agreement n° 101006798.

[www.mari4yard.eu](http://www.mari4yard.eu)

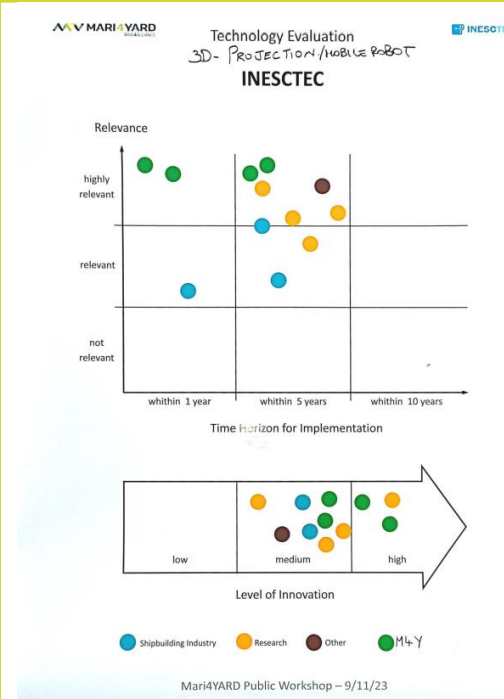
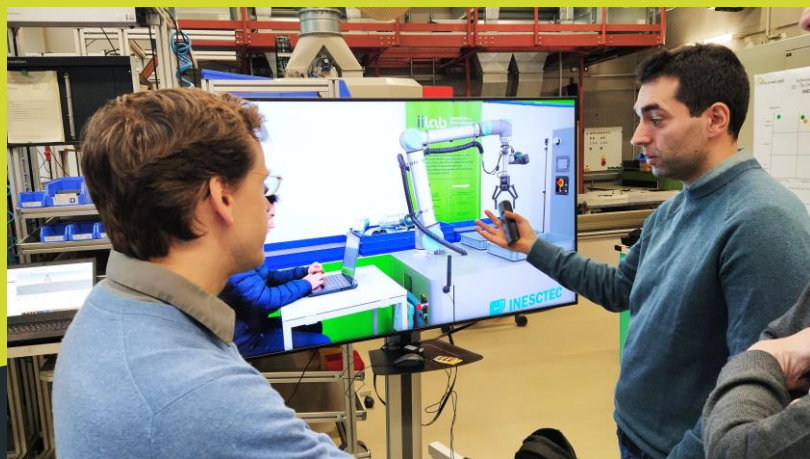


# Demo sessions

## Mobile manipulator for logistic operations

led by **Luis Rocha, INESC TEC**

The Autonomous mobile robots developed by INESC TEC can transport raw materials and individually manufactured parts between stores and workshops, as well as between workshops and subassembly areas, increasing the intra-logistic process efficiency while also freeing up human resources for higher-value tasks.



What the participants think...

Relevance vs time: relevant within 5 years

Level of innovation: medium-high

Main advantages of using mobile manipulators?

- ↑ increased accuracy
- ↑ increased efficiency
- ↑ increased productivity

## Collaborative robots for welding

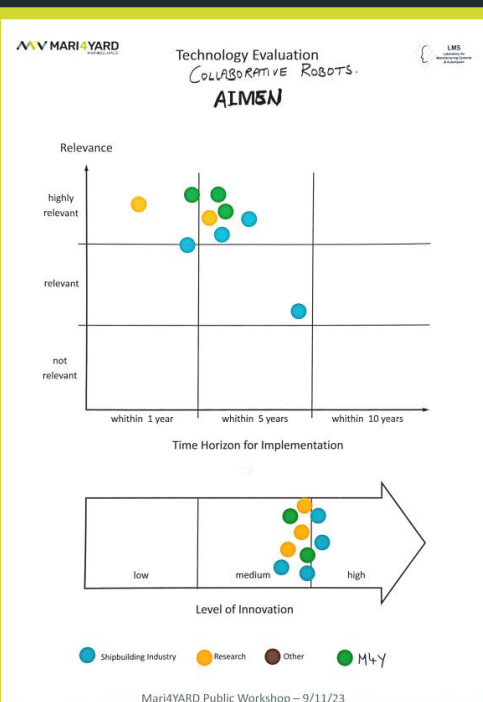
led by **Jawad Masood, AIMEN**

These so called COBOTS (COLlaborative roBOTS) can perform semi-autonomous operations to extend the workers capabilities in the pre-fabrication and outfitting stages. They are becoming smaller and smaller to work in confined spaces and inside the ship for both new construction and retrofitting.

Thanks to the joint work of AIMEN Centro Tecnológico and Canonical Robots.

Main advantages of using cobots ?

- ↑ Symbiotical integration of operators' skills and dexterity into flexible and reconfigurable solutions
- ↑ Safety and modularity
- ↓ Programming and setting time reduction by skill-based and intuitive robot programming
- ↓ Reduction of production process time



What the participants think...

Relevance vs time: high relevant within 5 years

Level of innovation: medium-high



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant Agreement n° 101006798.

[www.mari4yard.eu](http://www.mari4yard.eu)

# Demo sessions

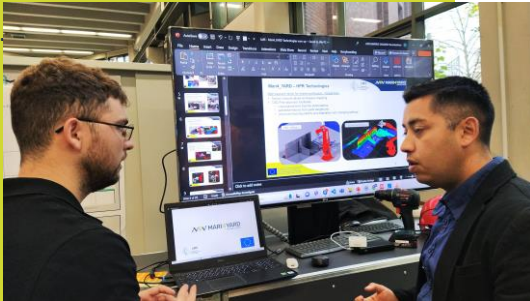
## Hand-guiding system for industrial robots

led by **Konstantinos Katsampiris-Salgado, LMS**

Hand guiding technology consists of moving the robot by direct operator interaction with a device placed at robot's wrist. Robot is also equipped with a Force/Torque sensor and high-speed communication protocol to monitor forces and torques applied by the operator in real-time. The controller can be configured for smooth operations.

### Main advantages of using hand guiding system?

- ↓ Risk reduction of injuries due to load manipulation
- ↓ lower programming time,
- ↑ applications of industrial high payload robots



What the participants think...

Relevance vs time: relevant within 5 years

Level of innovation: high

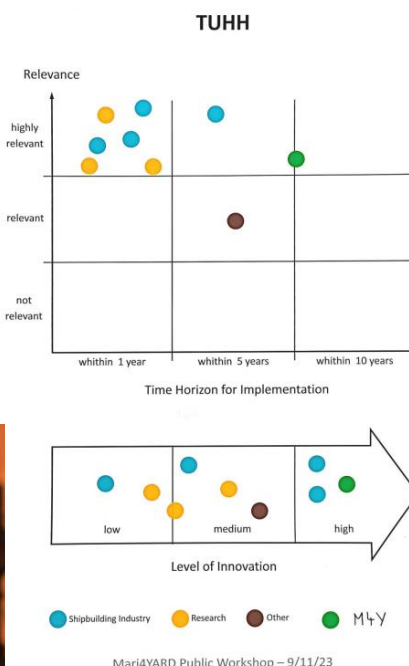
## Augmented reality with handheld devices

led by **Vincent Settler, TUHH**

The technology is a user-centric tablet application for easy checking of construction progress in a designated construction area. In addition to this, a web application was developed to prepare and provide the data for the tablets and also serve as a user interface for clear evaluation of the progress recording.

### Main advantages of using AR tablets?

- Faster recording of construction progress
- More precise recording of the progress
- Faster and more transparent communication of the actual progress



What the participants think...

Relevance vs time: high relevant within 1 year

Level of innovation: low-medium-high