

Built to Adapt

Engineering a Smart and Sustainable Workstation
for an Inclusive Workplace

Author: **Antonia Ribeiro**



According to Article 27 of the UNCRPD and the UNCRPD Act of 2021, work and protection against unemployment are human rights. Yet, international data suggests a persistent lack of employment opportunities for people with disabilities. The **MASCOT project**, a collaboration between the University of Malta, industry, and government entities, aims to create more employment opportunities within the manufacturing industry for people with disabilities by developing an adaptable manufacturing workstation.

In the European Union, '21.8% of people aged 15 to 64 years without a disability were outside the labour force', versus 35.0% of people with some disability, and 67.7% of people with a severe disability (Eurostat, 2025). In 2024, the unemployment rate in Malta for people without disabilities was around 3%. This rate shot up to over 8% for people with disabilities, according to Eurostat.

The International Labour Organisation (ILO, 2026) recognises access to appropriate assistive technologies as a 'precondition for accessing and retaining decent work'. At UM, a multidisciplinary team is developing assistive technology for the manufacturing industry, thus addressing employment discrimination and ableism faced by people with disabilities.

The MASCOT project, *Development of a sMart And Sustainable inClusive wOrksTation*, is a collaboration between UM, Seifert Systems – MASCOT's industrial partner, and Aġenzija

Sapport – the national provider of disability-related services. The UM team includes Prof. Ing. Emmanuel Francalanza as lead investigator and smart manufacturing expert, Prof. Ing. Paul Refalo as the specialist in sustainability, Dr Amy Camilleri Zahra, who brings expertise in disability studies, and Amberlynn Bonello and Nicole Vassallo as the research support officers (RSOs) helping to keep the project on track. The project is a collaboration between the Department of Industrial and Manufacturing Engineering, which provides expertise in smart and sustainable manufacturing, and the Department of Disability Studies, which provides expertise in accessibility and inclusive practices.

MASCOT aims to create an 'inclusive, smart, and sustainable manufacturing workstation' that meets the needs of both the manufacturing industry and people with disabilities. The researchers recognised that current workstations are often designed

according to industrial standards. This, in turn, suggests that the physical and software-related features currently implemented may not provide adequate support for people with physical, intellectual, or cognitive disabilities.

DESIGNING FOR CUSTOMISABILITY

The MASCOT workstation is a reconfigurable manufacturing workstation that can be customised for different impairment groups, abilities, and needs. Central to the design is a human-machine interface (HMI) that can be personalised and adjusted according to each person's preferences, pace, and experience, while providing step-by-step guidance and quality checks.

The key attributes of the MASCOT workstation are its reconfigurability, modularity, and real-time adaptability, enabled by a custom-built Artificial Intelligence (AI) module. This module adapts to the operator in real time, ➡

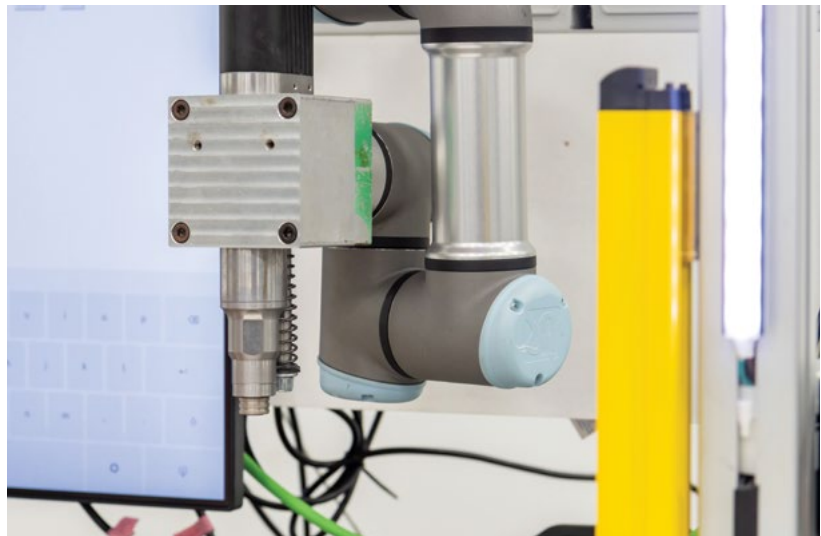
providing relevant, sensory-tolerant, and cognitively accessible assistance and guidance throughout the assembly process. Embedding AI into the workstation enables real-time adaptation to the user's needs.

Some assistive features of the workstation may include adaptable LEDs that change colour to help mitigate sensory load or loss of focus over time. Conversely, if LED lights are perceived as invasive or disturbing, the workstation would detect this discomfort in real time and switch to another output modality (such as paced text-to-speech). Physical reconfigurability is also incorporated, comprising, but not limited to, height adjustability, movable button locations, accessible material source and sink zones, and a collaborative robot (cobot), which assists with manual tasks such as fastening, especially for persons with upper-body limitations.

These assistive technologies can be toggled on and off either manually by the operator or automatically via the workstation's real-time adaptability features, sharing the responsibility and autonomy between the workstation and the user. In this way, the project aims to develop a workstation whose smart technology enables adaptability to the diverse needs of different operators who may change from hour to hour, rather than by generalising across specific impairment groups.

The system also ensures that the quality of the product being manufactured on the MASCOT workstation is a priority. As Francalanza explains, 'an overhead camera will monitor assembly in real-time to ensure that assembly is being completed correctly without the need for continuous human supervision'.

Simultaneously, the MASCOT team also wants to guarantee that the workstation is a sustainable solution.



Features of the adaptable workstation to support individuals with diverse needs employed in the manufacturing industry
Photos courtesy of Kristov Scicluna

To do so, a Life Cycle Sustainability Assessment is being carried out to evaluate the environmental, social, and economic impact of the assistive technology. This allows the researchers to develop a system that has minimal environmental impact, delivers positive social value, and is financially viable.

BRINGING ALL VOICES TO THE TABLE

The researchers are working with various stakeholders to ensure the final workstation meets diverse demands, from industrial productivity to environmental requirements and assistive technologies for different

impairments. The development process is, as the team describes it, 'iterative and multi-disciplinary'.

The MASCOT project brought different voices to the table. The team interviewed people with disabilities, their parents and caregivers, technical staff, manufacturers, and experts in disability studies to conceptualise a modular and truly inclusive workstation. People with disabilities were also involved in the preliminary testing phase, ensuring that the final design incorporated input from people with physical, cognitive, and sensory disabilities and that potential bias from AI models was thoroughly mitigated.

Integrating so many perspectives into a successful final product was challenging. Bonello highlights that during the initial stages of the MASCOT project, the team 'tried to bring as many opinions as possible early on, as well as to understand how prioritising requirements from one stakeholder group could adversely affect the other stakeholder group'. Understanding how changes in design affected accessibility and productivity became critical.

Nonetheless, the team believes that the manufacturing company's needs and those of people with disabilities can be aligned. Integrating people with disabilities expands the industry's available workforce while also enhancing the social inclusion of disabled persons. Through this collaboration,

the manufacturing industry can address labour shortages and meet legal quotas and corporate social responsibility policies. The researchers noted a positive, collaborative attitude among all stakeholders, reinforcing the need for an inclusive workstation and the positive impact of the MASCOT project.

COMING SOON

The MASCOT project began in July 2025, and a working prototype was developed at UM's Department of Industrial and Manufacturing Engineering in the first part of 2026. The next goal is to start fully testing the workstation at Seifert's manufacturing site in 2027.

Although the prototype is being developed for implementation at

Seifert's site, it is intended to be a modular solution, custom to different types of manufacturers. The research team welcomes inquiries from interested companies and sees them as opportunities for further collaboration and, ultimately, for improving the workstation. People with disabilities are also encouraged to contribute, as 'their knowledge and lived experiences in the development of the MASCOT workstation are invaluable', Camilleri Zahra explains.

The MASCOT project may not single-handedly solve all these challenges. Nonetheless, it is a promising step towards making the workforce more inclusive by centring the wants and needs of people with disabilities. **T**

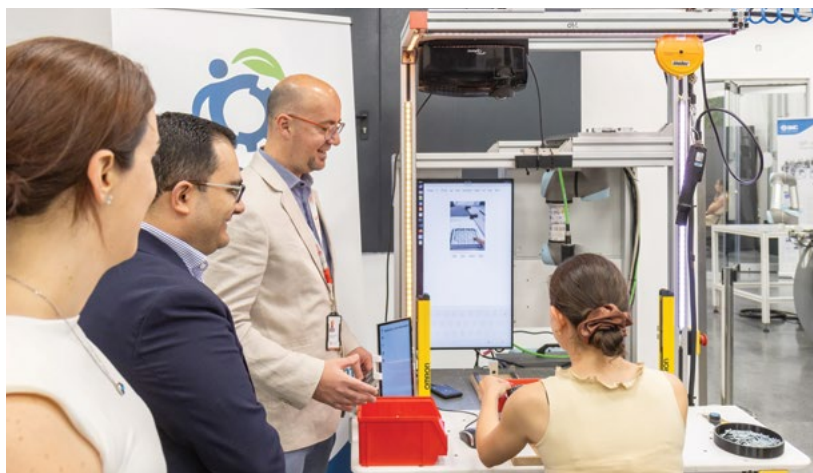
The project 'Development of a sMART And Sustainable inClusive wOrksTation (MASCOT)' is financed by Xjenza Malta through the FUSION: R&I Research Excellence Programme (R&I-2024-006T).

Learn more about the Mascot Project: mascotmalta.mt

Further Reading

Eurostat. (2025). *Disability statistics – Unemployment and people outside the labour force*. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Disability_statistics_-_unemployment_and_people_outside_the_labour_force

International Labour Organization. (2026). *ILO key messages for enhancing the EU Strategy for the rights of persons with disabilities*. <https://www.ilo.org/sites/default/files/2026-03/2026%2002%2006%20ILO%20key%20messages%20Enhancing%20the%20Strategy%20for%20the%20Rights%20of%20Persons%20with%20Disabilities%20up%20to%202030.pdf>



The MASCOT Team showcasing a configuration of the workstation
Photos courtesy of Kristov Scicluna