Closing the Automation Gap: Robotics for Textile Handling in Europe contributing to competitiveness

The event **"Closing the Automation Gap: Robotics for Textile Handling in Europe contributing to competitiveness"** brought together European Commission representatives, textile-sector stakeholders, industry actors, robotics researchers, and European project coordinators to discuss how robotic manipulation of textiles and other deformable objects can move from research promise to industrial impact and what conditions/support is and can be set by the policy and decision makers. Across the presentations, the core message was consistent: Europe has strong scientific capacity and relevant policy momentum, but the field remains fragmented, under-deployed, and not yet sufficiently connected to the realities of textile production, recycling, logistics, and healthcare.

The opening policy contributions framed robotic textile manipulation as both a **technology challenge** and a **European industrial-policy issue**. Antonio Puente Rodero situated soft and deformable manipulation within broader EU AI and robotics priorities, including the AI Continent Action Plan, the Apply AI Strategy, and the proposed European Robotics Catalyst. His presentation emphasized that while rigid manufacturing has been widely automated, tasks involving textiles, cloth, PPE, fragile goods, and deformable materials remain difficult because of perception, control, gripping, speed, contact physics, and standardization challenges. He also positioned projects such as ROMANDIC, FlexCycle, SoftEnable, TORNADO, MOZART, SWAG, and BACCHUS as evidence that Europe already has a strong project ecosystem, but needs better coordination and a stronger path to deployment.

Silvia Ferratini's presentation connected the robotics discussion to EU sustainability and circular-economy policy for textiles. She explained that the textile sector is economically important, but environmentally demanding, and that new policy instruments such as the Ecodesign for Sustainable Products Regulation, Digital Product Passports, the Waste Framework Directive, separate textile collection, and Extended Producer Responsibility will increase the practical need for automation. Robotics and AI were presented as enabling technologies for traceability, compliance reporting, fibre identification, sorting, garment disassembly, recycling, and circular value chains. This made clear that automation is not only a productivity tool: it is also a way to make circular textile policy implementable at scale.

The ROMANDIC White Book and Network of Excellence sessions then broadened the discussion from individual technologies to European coordination. Guillem Alenyà's White Book presentation argued that robotic textile manipulation is strategically important for Europe, but that current efforts are still too fragmented and prototype-based. The identified barriers include technical reliability across variable textile materials, lack of common benchmarks, high deployment costs, integration complexity, missing skills, and insufficient scale-up mechanisms. The White Book recommended demonstrators, pilot factories, European Testing and Experimentation Facilities, competitions, benchmarking, training, and stronger cross-sector collaboration.

The presentation on **DOM-net.eu** showed how the Network of Excellence can help respond to this fragmentation. DOM-net was presented as a mechanism to connect researchers, institutions, industry, policymakers, regulators, students, and practitioners in deformable object manipulation. Its role is to make expertise visible, structure knowledge around modelling, sensing, learning, planning, grippers, hardware and benchmarking, and provide

shared repositories for projects and events. The broader message was that closing the automation gap requires not only better robots, but also a durable European community able to coordinate roadmaps, benchmarks, expertise, and industrial needs.

The industry-oriented session emphasized that automation must be judged by its contribution to **competitiveness, circularity, and deployment readiness**.

It started with a presentation by the company THERKER from Spain. However, they did not give permission to share the content.

The presentation from IOS/OpenLOOP focused on textile recycling as an industrial and environmental opportunity. Prof. Aleksandra Lobnik showed that textile waste can be a source of valuable secondary raw materials, including recycled terephthalic acid, glucose, 5-HMF and other chemicals from PET/cellulosic waste. At the same time, she stressed that recycling markets are economically complex and that automation is needed for sorting, contaminant detection, disassembly, material handling, process control and fibre recovery. Her contribution connected chemistry, robotics and circularity, showing that closing the automation gap in textiles also means making recycling economically and technically scalable.

Nicholas Tengelin's Rebl Industries presentation reinforced this deployment perspective. The central argument was that the automation gap is not mainly the step from lab to demo, but the step from demo to repeated, reliable, high-volume operation. Rebl's Robotics-as-a-Service model was presented as one way to reduce customer risk by selling outcomes rather than robots. The presentation distinguished between tasks that are already deployable, such as handling identifiable deformable and mixed-material items in structured flows, and harder frontier tasks such as deteriorated, sensitive, unidentifiable, or high-speed folding/disassembly cases.

Pedro Gonçalves presented the EURATEX view that European textiles cannot compete primarily on lowest cost. Instead, they must compete through quality, flexibility, speed, sustainability, traceability, advanced manufacturing, and better resource use. The sector's structure is crucial: it is dominated by SMEs, regional clusters, and specialized companies, so automation strategies must be affordable, integrable, and supported by skills, funding, and deployment-oriented partnerships. His key phrase, "fabric is not metal," captured why textile automation is uniquely difficult and why deployment readiness matters as much as research.

The research landscape session showed that Europe is actively developing complementary approaches to deformable-object manipulation. ROMANDIC combines research on dynamic textile manipulation with Horizon Twinning, capacity building, mobility, research management, and network development. It addresses motion strategies that exploit textile dynamics, integrated task and motion planning, lightweight grippers, simulation-based textile handling, autonomous flattening, unfolding in the air, and laundry-handling demonstrations.

FlexCycle focuses on robotic solutions for recycling soft materials such as clothing, cables, flexible plastics, and future fuel-cell membranes. Its contribution is a transferable framework combining adaptive sensing, machine learning, finite-element modelling, soft-material skills, task and motion planning, grippers, cutters, fixtures, and human-robot workflows.

SoftEnable demonstrated the relevance of deformable manipulation in healthcare and food handling, including raw fish and meat manipulation, medical pouch opening, and medical gown handling. The project's main lesson is that real-world soft-object handling is possible, but robustness, high-TRL deployment, exploitation, and company visibility remain key barriers.

TORNADO added the perspective of foundation models and adaptive autonomous mobile robots for small, soft, and deformable objects. Its pilots in manufacturing, healthcare, and logistics/waste management show how perception, disturbance recovery, continuous planning, safe interaction, and cloud/AI-enabled robotics may help robots generalize across dynamic human-centric environments.

The final debate, whose participant line-up differed from the originally announced agenda, reinforced the central conclusion that the automation gap is both a **research gap** and a **deployment gap**. The discussion stressed that deformable objects remain technically difficult because robots cannot fully predict or pre-program all possible object states. At the same time, several speakers emphasized that deployment requires safe testing spaces, funding support, outcome-based procurement, Robotics-as-a-Service models, industry alliances, and earlier exposure of research systems to real factories, warehouses, hospitals, and recycling environments. The debate also highlighted Europe's need to become less risk-averse, collaborate more strategically, and create common testbeds and benchmarks so that promising robotics technologies can scale before competitors elsewhere capture the opportunity.

Conclusions

- **The automation gap is not only technical; it is also a deployment gap.** Europe has strong research, but needs better mechanisms to move from prototypes to robust, high-volume, economically viable systems.
- **Textile automation is strategically important for competitiveness and circularity.** Robotics can support productivity, quality, labour resilience, traceability, Digital Product Passports, sorting, disassembly, fibre recovery, and circular textile value chains.
- **Deformable-object manipulation remains difficult because "fabric is not metal."** Textiles and soft materials deform, fold, tangle, degrade, hide their geometry, and vary from item to item, requiring adaptive perception, planning, control, grippers, and learning.
- **Europe needs shared testbeds, benchmarks, demonstrators, and pilot lines.** Common evaluation environments would help compare approaches, reduce duplication, validate performance, and accelerate industrial uptake.
- **SMEs and industrial users need de-risked adoption models.** Funding support, outcome-based procurement, Robotics-as-a-Service, experimentation facilities, and integration support are essential for textile companies with limited investment capacity.
- **The Network of Excellence should build alliances, not silos.** DOM-net and related efforts should connect robotics researchers with textile networks, industry associations, recyclers, policymakers, and automation providers around focused, deployable challenges.