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1 INTRODUCTION

This document outlines the dedicated efforts to disseminate the significance and advantages of the OrChESTRA Project and ODTÜ MEMS Centre, ensuring an engaged and informed audience. The main goal is to foster a dynamic two-way communication channel, enhancing the understanding and visibility of OrChESTRA and ODTÜ MEMS among various stakeholders, including industry representatives, academia, policymakers, students, and the general public.

To achieve this, a series of targeted outreach activities have been planned and executed. One of the main crucial activities is engaging directly with local stakeholders through visits and one-to-one meetings. The Student Days and Professionals' Days are additional pillars of OrChESTRA's outreach strategy. These events are designed to enlighten professionals and young researchers about the interdisciplinary nature and the high value of microfluidics technologies. By involving representatives from academia and industry, it is aimed to offer insights into promising career paths within the sector and foster trans-disciplinary collaborations. These interactions are expected to catalyse innovation and research in microfluidics, contributing to the field's growth and the project's success.

In summary, the "Outreach Activities Report-1" summarises the comprehensive approach to communicate the essence and benefits of the OrChESTRA Project. Through a blend of open days and direct stakeholder engagement, it is endeavoured to build a strong community of support, collaboration, and innovation, driving forward the frontiers of microfluidics technology to enhance the national impact.

2 OUTREACH ACTIVITIES OVERVIEW

The OrChESTRA Project recognizes the crucial role of outreach activities in disseminating the research infrastructure and main achievements of ODTÜ MEMS, while also engaging with a broader audience. This section outlines a comprehensive strategy and rationale behind the selected outreach activities. These are designed to foster a two-way communication channel with the targeted audience, which includes the industry, academia, policymakers, students, and the general public. The overarching goal is to significantly boost national impact, ensuring that the benefits of the centre are widely understood and utilized across various sectors.

2.1 Rationale for Selected Activities

The outreach strategy for the OrChESTRA has been precisely designed to cater to the diverse interests and needs of the defined stakeholders. The selection of activities is based on a multi-faceted approach to ensure broad and effective dissemination of project outcomes. These activities are intended to:

Increase visibility: Enhance the ODTÜ MEMS' and OrChESTRA's visibility among key stakeholders and the general public through media engagement and public events.

Foster engagement and collaboration: Encourage active participation and collaboration among researchers, industry representatives, and policymakers, with the aim of not only sharing knowledge and achievements but also transforming ODTÜ MEMS into a "hub" for innovation and collaboration in microfluidics and Organ-on-a-chip (OoC) fields. This initiative will seek to leverage ODTÜ MEMS' capabilities to foster a vibrant ecosystem where ideas and resources are exchanged freely, contributing significantly to the advancement of science and technology at a national and international level.

Educate, inform, and attract: Provide valuable information on the advancements in microfluidics and its applications, emphasizing the OrChESTRA's contributions to the field and promote ODTÜ MEMS as a leading research centre and a promising career destination for graduates.

Influence Policy: Engage with policymakers to highlight the importance of microfluidics in setting national and European research priorities.

2.2 Target Audience and Expected Impact

The targeted audience is defined as follows:

Industry Professionals: The OrChESTRA Project aims to foster collaborations and accelerate the commercialisation of OoC technologies by engaging with industrial organisations. This initiative seeks to bridge the gap between research innovations and market-ready technologies, facilitating partnerships that can lead to the development of cutting-edge products and solutions in the microfluidics sector. By promoting active collaboration and offering comprehensive support, ODTÜ MEMS aspires to become a pivotal hub for industrial organizations seeking to leverage the latest advancements in microfluidics, providing them access to state-of-the-art facilities and resources.

Academic Community: Key objective is to encourage academic exchange and nurture the next generation of researchers in microfluidics. The project focuses on creating a vibrant ecosystem where academicians can share knowledge, collaborate on research initiatives, and access state-of-the-art facilities and resources. By fostering a strong academic network, the OrChESTRA Project positions itself as a central hub for educational excellence and research innovation in microfluidics, aiming to attract top talent and facilitate groundbreaking studies.

Policymakers: Engaging with policymakers is crucial for influencing research and development policy and funding priorities in the field of microfluidics. OrChESTRA seeks to establish a dialogue with government bodies and regulatory agencies to highlight the importance of microfluidics technology and its potential impact on various sectors, including healthcare and biotechnology. By providing policymakers with evidence-based insights and showcasing the societal benefits of microfluidics, the project aspires to shape policy frameworks that support innovation and growth in this dynamic field.

Students: Students are an integral part of the targeted audience, with the project aiming to inspire and educate them in the field of microfluidics. Through Students Days, students are exposed to the world of microfluidics, encouraging their pursuit of careers in science and engineering. The project's focus on student engagement helps cultivate a skilled workforce ready to tackle the challenges and opportunities presented by microfluidics technologies. Beyond specific activities dedicated to students, ODTÜ MEMS positions itself as an attractive destination for graduates, offering a dynamic and innovative environment where they can apply their skills and contribute to groundbreaking research and development projects. This emphasis on creating pathways for student involvement to professional engagement underlines ODTÜ MEMS's commitment to not only fostering education but also to nurturing careers in the growing field of microfluidics.

General Public: Raising awareness and understanding of microfluidics technology and its societal benefits among the general public is another important goal. Through website, the project clarifies microfluidics for a non-specialist audience, highlighting its applications in everyday life and its potential to address global challenges. By engaging with the general public, the project not only educates but also builds societal support for scientific research and innovation in microfluidics.

By targeting these diverse groups, the OrChESTRA Project aims at creating a comprehensive ecosystem that supports the development and dissemination of microfluidics technologies, fostering a culture of collaboration, innovation, and public engagement that positions it as a central hub in the field.

Therefore, our aim is to foster strong collaboration networks and increase awareness and education about microfluidics. By actively engaging with key stakeholders, including industry professionals, the academic community, and policymakers, robust networks that pave the way for future collaborations and opportunities will be built. This direct engagement is crucial for conveying the significance and potential of microfluidics, inspiring a new generation of researchers, and informing the public about the transformative possibilities of this technology. Furthermore, the interactions with policymakers are aimed at influencing the direction of research agendas and funding priorities within the field, advocating for the support and recognition microfluidics deserves.

3 OUTREACH ACTIVITIES CONDUCTED

During the first 18 months of the OrChESTRA Project, a diverse range of activities were conducted to increase the visibility of ODTÜ MEMS and advance the field of OoC and its applications across various sectors.

3.1 Visits to Local Stakeholders and One-to-One Meetings

In an effort to enhance the visibility of ODTÜ MEMS and foster potential R&D collaborations, a strategic approach was taken to engage with key local stakeholders, including policymakers, industrial organizations, universities, and other research centres. This engagement strategy was planned accurately, beginning with preliminary studies to identify the most relevant stakeholders to ODTÜ MEMS's mission and areas of research. These preparatory efforts ensured that the outreach was targeted and effective, maximizing the potential for meaningful collaborations.

As a result of these focused preparations, a total of 32 visits and one-to-one meetings were conducted, demonstrating a comprehensive effort to bridge connections across various sectors critical to the advancement of microfluidics research and development. The breakdown of these engagements reveals a tailored approach: 19 meetings with businesses underscored the project's commitment to fostering industrial partnerships and translating research into commercial applications. Engagements with 6 public entities, including policymakers and government bodies, aimed at aligning the project’s objectives with national research priorities and securing support for future initiatives. Additionally, 4 meetings with other research institutions highlighted ODTÜ MEMS’ and the project's dedication to academic collaboration and knowledge exchange, further solidifying its foundation in the scientific community. The international dimension of these efforts was also significant, with 3 meetings involving international stakeholders, showcasing ODTÜ MEMS’s commitment to global research partnerships and its role in the international microfluidics landscape. The list of visits and one-to-one meetings conducted by ODTÜ MEMS, along with their distribution according to the type of organization, is presented in Table 1 and Figure 1 respectively.

Table 1: List of visits and one-to-one meetings.

Date and time of the meeting/visit	Stakeholder	Main discussion topics
24/03/2023	ODTÜ GÜNAM	Learning about the infrastructure of GÜNAM and using BioMEMS
28/04/2023	TOBB	Discussions on cleanroom facilities and BioMEMS infrastructure
02/05/2023	Ministry of Industry and Technology	Possible international funding opportunities
18/05/2023	Ford OTOSAN	Possible collaboration areas including BioMEMS
22/05/2023	TOGG	Utilization of BioMEMS sensors
30/05/2023	ASELSAN	Identification of virus in samples
01/06/2023	Oxentia, ODTÜ TTO	Commercialization of CTC BioMEMS chip
08/06/2023	Ankara Chamber of Industry	Possible collaboration opportunities with Ankara's local industrial companies
09/06/2023	Metapax Acoustics	Acoustic sensors, BioMEMS, lab-on-a-chip systems
18/07/2023	Hacettepe University	OoC systems
25/07/2023	ASELSAN	MEMS applications in cameras
27/07/2023	TÜBİTAK Yital	Cleanroom management and investment
28/07/2023	Ministry of Industry and Technology, NATO	Collaboration for NATO DIANA Programme to use our infrastructure
01/08/2023	TÜSEB	Production of an insulin pump using MEMS technology.
01/08/2023	Pakistan Business Council	Introduction of MEMS Center
02/08/2023	OBS	High-throughput production of a sensor
04/08/2023	Ministry of Environment, Urbanization and Climate Change	Climate change and possible sensors for environmental monitoring
14/08/2023	TARLA	MEMS use in particle accelerators
17/08/2023	Ford OTOSAN, MEXT, MESS	Possible collaboration opportunities for an EU Widening project
06/09/2023	AYMED Medikal	Pressure sensors for kidneys
19/09/2023	Nanomagnetics	AFM Cantilever production
21/09/2023	Meribank Taiwan, Taidoc	Continuous glucose monitoring systems
09/10/2023	MKE, UDEA	MEMS trigger for immunisation
18/10/2023	Vessel X	Introduction of MEMS Center
24/10/2023	HAVELSAN	Sensors for simulators

02/11/2023	Ortana, METU	Flexible pressure sensor for wind farms
07/11/2023	SolarVis	Introduction of MEMS Center
08/11/2023	Embassy of Pakistan	Establishment of a MEMS facility in Pakistan
09/11/2023	TUSAŞ	MEMS pressure sensors for wind tests
20/11/2023	Tarabios	Fiberoptic based biosensors, blood coagulation
28/11/2023	HTR	Superlattice technology for images
01/12/2023	THY Teknoloji	Possible R&D collaboration opportunities

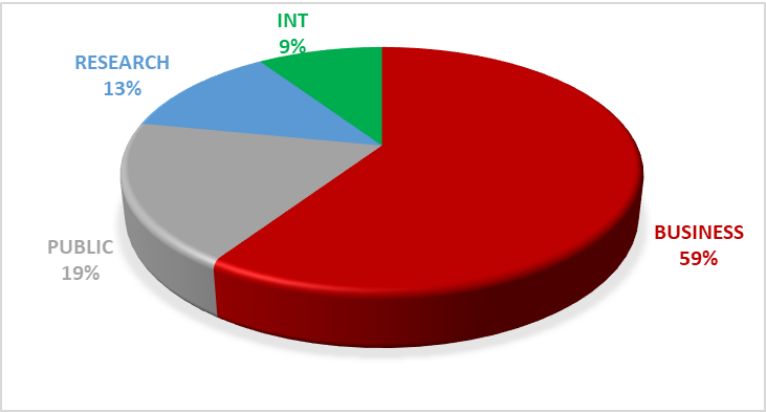


Figure 1: Distribution of stakeholder meetings**.**

This strategic engagement not only promoted ODTÜ MEMS's activities and capabilities to a broad spectrum of stakeholders but also opened avenues for potential R&D collaborations, setting a solid groundwork for future advancements in the field.

3.2 Students Days

To foster engagement and increase awareness among the next generation of engineers and scientists, ODTÜ MEMS organized five dedicated Students Days, targeting a diverse group of students from various academic backgrounds. These events were designed to showcase the cutting-edge research and educational opportunities available at ODTÜ MEMS, aiming to inspire and attract students to the vibrant field of microfluidics and MEMS technologies.

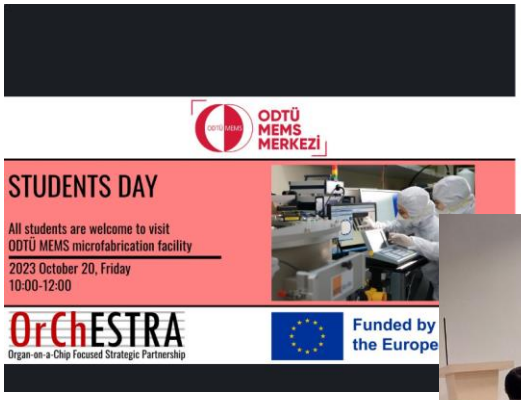
Each Students Day followed a comprehensive agenda that included a welcome and introduction to the ODTÜ MEMS Centre, followed by sessions such as BioMEMS, in vitro diagnostics, neural probes, image sensors. These presentations were planned to cover a wide range of topics within MEMS and microfluidics, providing students with a broad overview of the field's possibilities. Additionally, a tour of the ODTÜ MEMS cleanroom facility was a highlight, offering students a rare glimpse into the state-of-the-art environment where MEMS devices are fabricated. Announcements for these events were shared with public via LinkedIn, ensuring wide visibility among the academic community and industry professionals alike. Through these Students Days, ODTÜ MEMS aimed not only to educate but also to spark curiosity and ambition among students, encouraging them to consider careers in the exciting and evolving field of microfluidics.

3.2.1 Visit of METU Electrical and Electronics Engineering Department Students

The series of Students Day kicked off on 20th October 2023 with an event for third-year students from the METU Electrical and Electronics Engineering Department. This session was tailored to illuminate the intersection of electrical engineering with microfluidics, highlighting the innovative applications and potential career paths in this area. The event took place at ODTÜ MEMS facilities with the participation of 35 attendees.

Promotion of the event was conducted through targeted emails and LinkedIn posts, ensuring optimal outreach to the intended audience. A team of distinguished researchers from ODTÜ MEMS led the presentations, delving into the core research areas of the centre, including BioMEMS, in vitro diagnostics, neural probes, RF MEMS, and image sensors. These talks were designed not just to inform but also to inspire, showcasing the depth of microfluidics research and its applications.

This opening event set a high standard for the subsequent Student Days, effectively engaging students with the dynamic field of microfluidics and MEMS technology, and paving the way for future explorations and potential careers in this innovative domain.



3.2.2 Visit of Sinop Deneyap Teknoloji Atölyesi Students

The Student Days series continued its momentum with a special event on 13th November 2023, welcoming students from Sinop Deneyap Teknoloji Atölyesi. This session, attended by 39 participants, was specifically designed to engage the bright, upcoming minds from Deneyap, an initiative launched under the Future Technology Stars Program in 2017 by the Türkiye Technology Team Foundation (T3 Foundation). Deneyap aims to cultivate the next generation of engineers, technology entrepreneurs, and leaders for a strong, independent Türkiye.

The seminar was led by Atilla Hakan Ozdemir, who provided insightful introductions to the field of microfluidics and the cutting-edge research and development activities at ODTÜ MEMS. The focus of this session was to bridge theoretical knowledge with practical applications, offering students a first-hand look at the possibilities and innovations within microfluidics.

One of the important sessions of the event was the guided tour of the ODTÜ MEMS facilities, including the cleanroom where students could witness the processes involved in microfluidics device fabrication. This visit not only served to explain the complexities of microfluidics research but also to showcase the state-of-the-art resources and technologies at the disposal of researchers at ODTÜ MEMS.

This event was a significant step in fostering interest and understanding of microfluidics among young talents from Deneyap, aligning with the mission to nurture future technology leaders. By providing a platform for direct engagement with advanced research and development, ODTÜ MEMS would like to inspire these students to explore and contribute to the evolving field of microfluidics, underpinning the broader goal of technological empowerment and innovation in Türkiye.

3.2.3 Visit of METU Physics Department Students

On 14th December 2023, the Student Days series offered a unique opportunity for senior physics students from METU to explore the world of MEMS technologies. With an intimate gathering of 17 participants, this event was tailored to uncover the fundamental scientific principles that underpin the development and innovation within these fields.

The seminar emphasized the interdisciplinary nature of MEMS, highlighting the critical role that physics plays in advancing technology. Students were introduced to the ways in which concepts from physics directly contribute to creating innovative solutions in MEMS. This approach aimed not only to educate but also to inspire students by demonstrating the tangible impact of their field of study on cutting-edge technological advancements.

The session served as a bridge connecting theoretical knowledge with practical application, thereby illuminating the path for these future physicists to apply their expertise in a dynamic and rapidly evolving domain. By focusing on the integration of physics with MEMS technology, the event underscored the vast potential for interdisciplinary collaboration and innovation, encouraging students to explore numerous opportunities that lie at the intersection of these fields.

3.2.4 Visit of ODTÜ MEMS to Başkent University

On 14th December 2023, ODTÜ MEMS embarked on a strategic visit to Başkent University, aiming to engage with and inspire a wider audience of students interested in MEMS research. This initiative was part of OrChESTRA's outreach to showcase the expansive opportunities within the realm of MEMS and microfluidics technologies. The visit, hosted by Başkent University, brought together 50 participants, including students and faculty members, demonstrating a keen interest in the interdisciplinary applications and collaborative potential of MEMS research.

During the session, the focus was placed on the collaborative nature of MEMS research, underscoring its significant impact across various scientific domains. In addition to introduction of ODTÜ MEMS, the presentation highlighted the relationship between MEMS technologies and other fields of study, emphasizing how these collaborations drive innovation and advance the frontiers of science and engineering.

The event was a testament to the ongoing partnership between ODTÜ MEMS and academic institutions like Başkent University, aiming to cultivate an environment where students are encouraged to explore, innovate, and contribute to the evolving landscape of MEMS and microfluidics research. By fostering these connections, ODTÜ MEMS continues to play a pivotal role in nurturing the next generation of scientists and engineers, equipped to tackle the challenges and seize the opportunities presented by these cutting-edge technologies.

3.2.5 Visit of ODTÜ Mechanical Engineering Department Students

On 22nd December 2023, the Student Days series culminated in a dedicated event for third-year mechanical engineering students from METU. This event aimed to provide a deep dive into the microscale domain, showcasing the critical role of mechanical engineering in pushing the boundaries of microfluidics and MEMS technologies. The session illuminated the unique challenges and significant rewards associated with microfabrication, from conceptual design to the creation of functioning devices.

The event attracted 15 participants, demonstrating a targeted interest in the specialized field of MEMS from the mechanical engineering perspective. A highlight of the day was the cleanroom visit, offering students a rare opportunity to observe the state-of-the-art facilities.

This event served as a bridge connecting theoretical knowledge with practical applications, underscoring the indispensable role of mechanical engineering in the development of innovative MEMS solutions. By engaging directly with the future engineers of MEMS technology, the session aimed to inspire a new generation of mechanical engineers to explore the vast potential and opportunities within the microscale world, further solidifying the foundational role of mechanical engineering in the progression of MEMS research and development.

3.3 Clustering Efforts

ODTÜ MEMS has significantly advanced micro-medical technologies in Türkiye by leading clustering efforts to promote innovation and collaboration. This initiative, involving a partnership with seven entities, led to the establishment of the Micro Medical Technologies Platform – MAESTRO. Supported by a €2 million grant from TÜBİTAK, MAESTRO signifies a national commitment to medical technology advancement, particularly in the realm of BioMEMS. This initiative is pivotal in Türkiye's medical technology research and development, marking a significant milestone.

MAESTRO is dedicated to advancing medical technology by developing state-of-the-art prognostic, diagnostic, and therapeutic products utilizing BioMEMS technology. Aimed at tackling chronic diseases and cancer, the platform integrates 10 projects, each exploiting micro-medical technologies to enhance patient outcomes and healthcare services.

In addition to the creation of MAESTRO, ODTÜ MEMS's commitment to enhancing the ecosystem for micro-medical technologies extends beyond national borders. As part of its clustering activities, ODTÜ MEMS is in the process of preparing a project proposal, ACCORDO, for the Excellence Hubs call (HORIZON-WIDERA-2023-ACCESS-07) in collaboration with Portugal. This international partnership aims to further elevate the research and development activities in micro-medical technologies by fostering cross-border collaboration, knowledge exchange, and the pooling of resources and expertise.

4 CONCLUSION

The OrChESTRA Project's outreach activities play a pivotal role in enhancing the impact of ODTÜ MEMS' research in the field of microfluidics. By organizing public events, our goal is to significantly increase the centres and project's visibility. This approach is designed not only to draw the attention and support of a broad audience but also to lay the groundwork for a wider understanding and appreciation of microfluidics technology. Through these efforts, it is aimed to attract interest from various sectors, including industry, academia, and the general public, thereby ensuring that our findings reach and resonate with a diverse group of stakeholders.

Ultimately, the outreach activities undertaken by the OrChESTRA Project are essential for creating an ecosystem that nurtures innovation and collaboration in microfluidics. The comprehensive approach of OrChESTRA is instrumental in advancing the field of microfluidics, ensuring that its technologies and applications continue to evolve and impact various sectors positively. Through the OrChESTRA Project, we are committed to making a lasting contribution to the field, demonstrating the critical role of outreach in the success and progression of scientific research.

Moreover, the Student Days organised by ODTÜ MEMS have made a meaningful impact, sparking interest in micro-medical technologies among students. These events offered a first-hand look at BioMEMS, encouraging students from various fields to consider careers in this innovative area. The direct interaction with ODTÜ MEMS's experts and the opportunity to see advanced research facilities have not only educated but also inspired attendees. Importantly, these initiatives have led to an increase in new researchers joining the centre, enriching our team with fresh perspectives and enthusiasm. This boost in engagement highlights the value of connecting students with real-world applications and research opportunities, laying the groundwork for future advancements in healthcare technologies.

To summarise, ODTÜ MEMS and OrChESTRA partners are committed to expanding its outreach activities, exploring new avenues for collaboration, and further integrating the innovative solutions developed through the OrChESTRA Project into the wider scientific and industrial communities. By continuing to engage with all sectors of society, it is not only aimed to advance the field of microfluidics but also to contribute to the global effort to address pressing healthcare challenges.