

Session theme– Forum Innovation 2025

Industry 4.0 in the MENA Region: Driving Innovation, Transformation, and Sustainable Growth

Names and institutions of the session' chairs:

Adel BEN YOUSSEF (GREDEG-CNRS & University Côte d'Azur, France)

E-mail: adel.ben-youssef@univ-cotedazur.fr

Sama MBANG (Institute of Technology in Karlsruhe (Germany))

E-mail: sama.mbang@dta-alliance.com

Rafik FEKIH (United Nation Industrial DEvelopment Organization - Wien)

Email: R.FEKI@unido.org

Description of the theme:

The Fourth Industrial Revolution, commonly referred to as Industry 4.0, is reshaping industries worldwide through the integration of artificial intelligence (AI), the Internet of Things (IoT), big data, robotics, and blockchain. In the Middle East and North Africa (MENA) region, these technologies offer opportunities to enhance productivity, foster innovation, and promote sustainable economic growth. Historically reliant on hydrocarbons, MENA economies face increasing pressure to modernize their industrial base to remain competitive in a rapidly digitizing world. This modernization serves a dual purpose: increasing the competitiveness of existing industries while diversifying economic structures. Some countries, particularly in the Gulf Cooperation Council (GCC), focus on high-tech manufacturing, logistics automation, and AI-driven services to strengthen their global positioning. Others, such as North African economies, seek to expand beyond traditional industries by integrating smart technologies into manufacturing, energy, and services. Industry 4.0 solutions, such as automation, smart grids, and IoT-driven optimization, also contribute to the region's sustainability agenda by improving energy efficiency and aligning industrial practices with decarbonization goals (Ben Youssef, 2020). However, these advancements introduce new risks, including digital security vulnerabilities, technological dependence, and regulatory challenges that must be effectively managed (Dos Santos Filho et al., 2024).

The adoption of Industry 4.0 across MENA is not limited to manufacturing but extends to broader economic activities, including logistics, energy, and finance, allowing for enhanced efficiency, cost reduction, and integration into global value chains. Yet, significant barriers remain, including uneven access to digital infrastructure, skill mismatches in the workforce,

and disparities in technological readiness across countries. While advanced economies such as the UAE and Saudi Arabia have implemented ambitious digital transformation strategies, others face structural limitations that slow adoption. Workforce upskilling and reskilling are crucial, as the demand for new digital competencies rises exponentially (Bongomin et al., 2020). Moreover, open innovation models, such as *living labs*, play an essential role in adapting Industry 4.0 solutions to regional needs, particularly in rural and peri-urban areas (Fasshauer & Zadra-Veil, 2020). Addressing these challenges requires coordinated policy efforts to develop digital infrastructure, reform education systems, and establish regulatory frameworks conducive to innovation. By embracing Industry 4.0 and leveraging its potential across multiple sectors, the MENA region can enhance its global economic integration, improve industrial competitiveness, and build a more resilient, sustainable future.

This track invites contributions that examine the dynamics of Industry 4.0 adoption and its implications for the MENA region. We encourage submissions that explore the technological, economic, social, and environmental aspects of this transformation, providing insights into how the region can harness the potential of Industry 4.0 to build a sustainable and resilient industrial ecosystem. We invite scholars, industry experts, policymakers, and practitioners to submit original research, case studies, and analytical papers on Industry 4.0 in the MENA region. Topics of interest include, but are not limited to:

- Technological adoption in key sectors: AI, IoT, robotics, and automation in manufacturing, energy, and logistics.
- Smart manufacturing: Digital twins, predictive maintenance, and smart factories in the MENA context.
- Workforce transformation: Addressing skill gaps and preparing for the future of work in Industry 4.0.
- Economic diversification: Leveraging Industry 4.0 to reduce dependency on resource-based economies.
- Integrating sustainable practices into Industry 4.0 frameworks.
- Overcoming gaps in connectivity and technological readiness.
- Crafting supportive frameworks to facilitate Industry 4.0 adoption.
- Collaborations for technology deployment and innovation hubs.
- Enabling small and medium enterprises to adopt Industry 4.0 technologies.
- Success stories and lessons learned from Industry 4.0 implementation in MENA countries.
- Enhancing cross-border initiatives and knowledge-sharing to accelerate digital transformation.
- Identifying and addressing financial, cultural, and regulatory obstacles.
- Etc.

References:

Ben Youssef, A. (2020). How Can Industry 4.0 Contribute to Combatting Climate Change? *Revue D' Économie Industrielle*. <https://doi.org/10.4000/rei.8911>

Bongomin, O., Gilibra Ocen, G., Oyondi Nganyi, E., Musinguzi, A., & Omara, T. (2020). Exponential disruptive technologies and the required skills of Industry 4.0. *Journal of Engineering*, 2020.

Da Costa, M.B., Dos Santos, L.M.A.L., Schaefer, J.L., & Baierle, I.C. (2019). Industry 4.0 technologies basic network identification. *Scientometrics*, 121(2), 977–994.

Dos Santos Filho, V. H., de Resende, L. M. M., & Pontes, J. (2024). Development of a theoretical model for digital risks arising from the implementation of Industry 4.0 (TMR-I4.0). *Future Internet*, 16(6), 215.

Fasshauer, I. et Zadra-Veil, C. (2020) . Le living lab, un intermédiaire d'innovation ouverte pour les territoires ruraux ou péri-urbains ? *Innovations*, N° 61(1), 15-40. <https://doi.org/10.3917/inno.pr2.0078>.

Vermeulen, B., & Pyka, A. (2024). The twin digital and green transition: Paradigm shift or tech fix? *Journal of Innovation Economics & Management*, 45(3), 1–26.

Submit your communication proposal by April, 30, 2025: <https://foruminnov25.univ-littoral.fr/en/submit/>