Perceptions of Industry 5.0: Sustainability Perspective

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Today, Industry 5.0 can be regarded as the latest stage of industrial revolution, where collaboration between humans and smart technologies reaches a new level. This editorial presents insights into Industry 5.0. It explains the concept of Industry 5.0 according to the latest developments, in its three fundamental pillars: human-centric, sustainable, and resilient. Finally, it discusses how Industry 5.0 can contribute to sustainability.

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Why Industry 5.0?

The Industry 5.0 era attempts to integrate human and technological capabilities to create a more resilient and sustainable manufacturing environment. The transition to Industry 5.0 is marked by the collaboration between humans and smart technologies. Unlike Industry 4.0, which focused on automation and digital connectivity, Industry 5.0 emphasizes the synergy between humans and the capabilities of artificial intelligence (Machado and Davim 2023a; Machado and Davim 2023b; Xu *et al.* 2021).

Iliana Ivanova, Commissioner for Innovation, Research, Culture, Education and Youth, says in the recent ERA report "*The notion of human centricity puts core values and principles such as trust, security, openness and inclusiveness at the heart of technology development. Digital technologies themselves can facilitate human centricity in ways that have not previously been possible, in particular by allowing the joint design of processes, systems and work environments*". Among other aspects in the aforementioned report, the following deserve to be highlighted: "*Industry 5.0 provides a transformative vision for industry as a driver of sustainability, resilience, and human-centricity*" and yet "*This systemic approach to human-centricity therefore aims to ensure that technological advancements not only enhance individual performance and well-being, but also contributes to a more equitable, sustainable, and humane society*" (ERA Report, 2024).

The Three Pillars

The Industry 5.0 concept with its three pillars is described in Fig. 1. In addition to providing collaboration between humans and smart technologies in a resilient environment, Industry 5.0 also focuses on promoting sustainability. Given the negative impacts of industrialization on the environment, companies are increasingly seeking responsible approaches in the pursuit of their activities (ERA Report 2024).

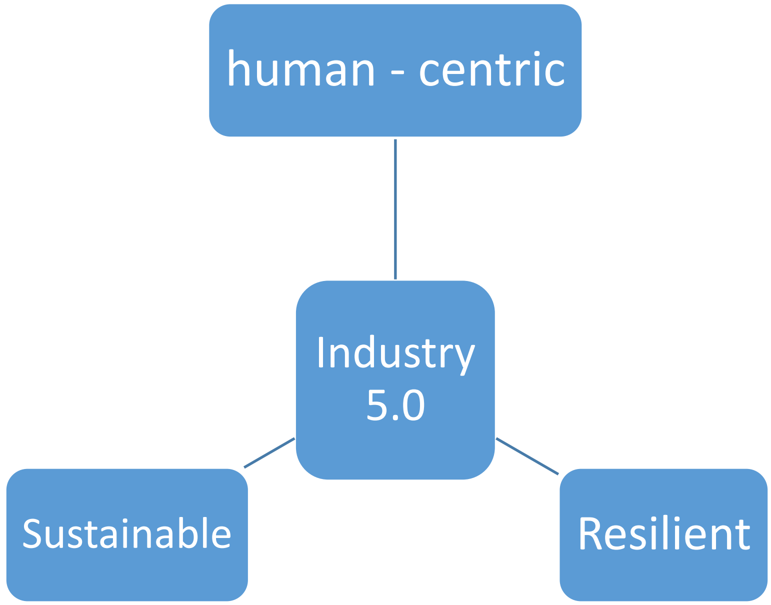

Fig. 1. Definition of Industry 5.0 concept with its three pillars

Industry 5.0 promotes a circular economy, in which waste and by-products from industrial processes are recycled and reused to create new materials and products. In this regard, dependence on finite natural resources is reduced, and the amount of waste sent into the environment is minimized.

Industry 5.0 encourages improvements in energy efficiency. Energy management systems and smart sensors are increasingly used to identify and reduce energy loss in industry. This not only reduces costs, but it also reduces companies' carbon footprint, contributing to the green transition in the fight against climate change.

When defining a sustainability strategy, companies must commit to the three ESG pillars (environment, social and governance) and the 17 UN sustainable development goals (SDGs).

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