

# **Proposal of a Maturity Assessment Approach for the Implementation of an Environmental Monitoring System**

**Khalid Benhida, Ahmed Boulahoual, Noureddine Dahmani and Sanaa El Hidaoui**

Cadi ayyad University, UCA

EST Safi/LAPSSII, Route Dar Si-Aïssa BP 89 Safi

Marrakesh, Morocco

[kbenhida@gmail.com](mailto:kbenhida@gmail.com), [k.benhida@uca.ac.ma](mailto:k.benhida@uca.ac.ma), [a.boulahoual@yahoo.fr](mailto:a.boulahoual@yahoo.fr), [a.boulahoual@uca.ac.ma](mailto:a.boulahoual@uca.ac.ma)

## **Abstract**

Industry 4.0 is a paradigm that aims to increase the digitalization and automation of production systems by using a set of digital technologies such as the internet of things, cyber-physical systems, cloud computing, big data, artificial intelligence, etc. Industry 4.0 significantly contributes to the digital transformation of industrial companies and provides several benefits to these companies, such as increased connectivity of production systems, faster and more reliable information processing, and enhanced industrial control capabilities, etc. However, it can be said that Industry 4.0 primarily focuses on the technical tools of production and does not necessarily include the human factor or the social and environmental aspects, which can also influence the digital transformation of production systems. Industry 5.0 complements Industry 4.0 by placing humans at the center of this digital transformation. Moreover, Industry 5.0 also takes into account other aspects such as sustainability and the resilience of production systems. The study presented in this paper falls within the general field of Industry 5.0 and specifically addresses the environmental aspect of production systems. It aims to improve the implementation of digital tools for real-time monitoring of the environmental impacts of an industrial production unit. This study focuses particularly on proposing an approach for the prior assessment of the maturity of a production unit before implementing a digital tool for monitoring its environmental impacts. The approach we propose is based on a set of steps, such as the overall assessment of the company's digital maturity, the evaluation of maturity regarding the technologies used in Industry 4.0, the company's maturity in identifying and measuring environmental impacts, and finally, its ability to implement a digital monitoring system for environmental impacts.

## **Keywords**

Industrial unit, Environmental impact, Real-time monitoring, Digital maturity, Industry 5.0

## **Biographies**

**Khalid Benhida** Khalid is a professor at the EST of Safi and a member of the LAPSSII laboratory at Cadi Ayyad University in Marrakech, Morocco. He got his Ph.D degree, state doctorate and habilitation in the fields of electronics and industrial Engineering. He serves as a supervisor and director for several Ph.D and is the author and co-author of numerous publications, patents, and scientific communications.

**Ahmed Boulahoual** is an assistant professor at the EST of Safi and a member of the LAPSSII laboratory at Cadi Ayyad University, Morocco. He is the co-author of some publications, author and co-author of some scientific communications.

**Noureddine Dahmani** is a research scholar at the Department of Engineering Science, Faculty of Science and Technology, Cadi Ayyad University, Marrakech, Morocco. He is doing his PhD in the area of Green Lean design and industry 4.0 in product development. He has about 8 years of industry experience. His research interests include

product design, Lean product development, sustainable product, lean design, design methodologies, Eco design and Industry 4.0.

**Sana El Hidaoui** got her Ph.D. degree in Industrial & Logistic Engineering at Cadi Ayyad University- Faculty of Technical Sciences, Marrakech, Morocco, in 2022. She received engineering diploma in “Industrial Engineer” from ENSA Safi, Cadi Ayyad University, Marrakech, Morocco, in 2015. She is currently in charge of teaching, with the ENSA of Safi-Cadi Ayyad University. She is the author of more than 10 articles, and Her Ph.D. research interest is centered on Green Supply Chain Modeling and management.