



15th IFAC Workshop
Intelligent Manufacturing Systems (IMS 2025)
Koszalin, Poland, 11-12 September 2025



<https://ims2025.pl/>

This proposal is endorsed by TC 5.1 Manufacturing Plant Control

INVITED SESSION

ADVANCES TOWARD SMART DIGITIZED SHOPFLOORS

Invited Session Code: **5puen**

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KEYWORDS: Manufacturing Plant Control, Digitalization of manufacturing systems, Intelligent/smart manufacturing systems, Modeling of manufacturing operations, Intelligent decision support systems in manufacturing, Holonic manufacturing systems, Cyber-physical production system.

Abstract:

The ongoing and incoming developments in technologies are nowadays radical and fostering relevant impacts in key industrial processes. Industrial shopfloors are in the perfect position to exploit the convergence of digitalization and other technological advances in manufacturing and automation technologies. This will not only improve shopfloor productivity and cost efficiency, but will also change the way manufacturing systems operate and increase their product variety and customization. New-generation smart, advanced and robust systems are in various degrees of development – finally leading to smart manufacturing systems built upon Industry 4.0 and Industry 5.0 principles and technologies. The advances appear in various fields leading to the introduction of augmented reality, machine vision and tracking, smart sensors and their fusion, machine learning and artificial intelligence (AI), advanced smart robotics, cloud-edge computing capabilities, digital twins, cyber-physical systems, etc. Additionally, the Internet of Things (IoT) enables smart manufacturing by offering connectivity of manufacturing systems, devices, tools, products, and components. On top of this, smarter operations of machines and shopfloors may also utilize the advent of the digital twins to find ways for taking full advantage of the virtual copy of the physical manufacturing process to enable quick and decentralized decisions. Thus,

better models will lead to significant improvement of flexibility and speed of the whole manufacturing system. Meanwhile, Industry 5.0 is emerging to complement Industry 4.0 with further consideration of human-factors and workers' well-being towards a sustainable, human-centric, and resilient industry.

The challenge is to manage the transition toward smart manufacturing systems. Therefore, this Invited Session focuses on the changes brought about by the technological advances in the industrial shopfloors. A major question arises: "how to develop models and methodologies that best utilize the technological improvements and instill effectiveness and foster efficiency in the shopfloors?" Considering this question as a major driver of interest for this session, the utilization of optimization models, control algorithms and techniques, digitalization and automation technologies, and management methods, is envisioned in order to allow smart cyber physical manufacturing systems featuring self-optimization, self-configuration, self-diagnosis, resiliency to disruptions and intelligent support to workers in their tasks. All these models, techniques, algorithms, methods, and technologies would allow to better employ cost-effective industrial shopfloor processes.

This Invited Session seeks original manuscripts in order to investigate the design and management of smart manufacturing systems compatible with Industry 4.0/5.0 principles and technologies. It also seeks to exploit mathematical models, algorithms and techniques, automation and digitalization technologies, management methods and approaches as well as industrial case studies. A particular interest of the session is the development of smart assembly, smart manufacturing, and smart part logistics, as well as the intelligent support systems for manufacturing decision-making in the scope of these processes.

Possible topics of this Invited Session include but are not limited to:

- Intelligent support systems to assist workers in their increasingly complex tasks
 - Augmented reality (AR)/Virtual reality (VR) for operator assistance
 - Cobots and innovative robotic technologies and their implementations in shop floors
 - AI for manufacturing processes
 - Computer/Machine vision for manufacturing processes
 - Big data analytics for manufacturing systems and processes
 - Machine learning for manufacturing processes
 - Digital twins for decision making in Industry 4.0/5.0 era
 - AR/VR, Virtualization and simulation techniques for manufacturing decision making
 - Bio-inspired manufacturing, theory of complexity, swarm intelligence, self-adaptation
 - Self-configuration and self-diagnosis IoT methods for manufacturing shop floors
 - Self-optimization models for scheduling and sequencing manufacturing shop floor
 - Blockchain technology and its application in manufacturing
 - Intelligent/smart tracking and decision-making for resource efficiency in the circular economy
 - Autonomy, autonomous vehicles/robots, and drones
 - Control algorithms for smart part logistics
 - Smart part logistics design and management
 - Multi-agent/Self-organizing systems and emergent behavior
 - Novel case-studies of AI and smart technique integration in shopfloors
 - Smart assembly station and system design and management
 - Self-configuration and self-diagnosis methods and technologies for assembly systems.
 - Artificial generative intelligence (AGI) for improving production processes
 - Human-AI Teaming for manufacturing/assembly
 - Cloud-edge computing for shopfloors
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Timeline:

- **December 16, 2024:** Deadline for paper submission
- **March 03, 2025:** Notification of acceptance/rejection
- **April 07, 2025:** Final paper submission
- **September 11-12, 2025:** 15th IFAC IMS Workshop (IMS 2025), Koszalin, Poland

Manuscript Preparation

For Manuscript Preparation please look at

<http://www.ifac.papercept.net/conferences/support/support.php>

For Manuscript submission please look at <https://ifac.papercept.net/conferences/scripts/start.pl>

Upon submission, make sure to use the **Invited session identification code: 5puen**

For any further information, please contact the Invited Session Guest Editors

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