ISIEA 2023

2nd International Symposium on
Industrial Engineering and Automation
ISIEA 2023

Towards a Smart, Resilient and
Sustainable Industry

22nd -23rd June 2023,
Bozen-Bolzano, Italy

Welcome

to the 2nd International Symposium on Industrial Engineering and Automation, ISIEA 2023

ISIEA is an initiative of the Industrial Engineering and Automation macro-area of the Free University of Bozen-Bolzano. It is an annual event to take place in Bolzano. Accepted papers presented at ISIEA are regularly published in Springer's Lecture Notes and Scopus-indexed, unless contributors prefer not to publish their paper.

ISIEA deals with numerous topics around innovation, transformation and digitalization of the industry, as well as their repercussions. With the upcoming second edition (ISIEA 2023), we aim to make ISIEA an increasingly relevant venue to discuss and present new research findings on Industry 4.0/5.0, industrial applications of Artificial Intelligence, digitalization of manufacturing, learning factories, robotics, design of cyber-physical systems, among the others. The special theme of ISIEA 2023 is "Towards a Smart, Resilient and Sustainable Industry", which expands the topics of interest for the symposium.

Call for Papers

Topics and chairs

The chairs of ISIEA 2023 are Yuri Borgianni, Dominik Matt, Margherita Molinaro and Guido Orzes. They cordially invite you to submit your most recent contribution within the General Track and/or Special/Invited Tracks organized by peers, which deal with specific topics.

Topics of the General Track include, but are not limited to:

- Industry 4.0 / Industry 5.0
- Digital Transformation in Manufacturing and Construction
- Flexible and Human-Centered Manufacturing
- Innovative Learning Methods and Learning Factories
- Digital Twins and Internet of Things
- Additive Manufacturing and Sustainability

- Mechanical Design & Optimization
- Mechatronics & Automation
- Robotics
- Supply Chain Management
- Purchasing Management
- Sustainable Design in Engineering
- User experience and Social Sustainability in Engineering research

The titles of the Special tracks are:

- Achieving Sustainability through Servitization and Product Service Systems
- Advanced methods, tools and techniques for the industrial valorization of waste
- Artificial Intelligence in Manufacturing and Industry
- Biomanufacturing 4.0
- Data-Driven Design for Additive Manufacturing
- Digital Circular Economy in the Manufacturing Industry
- Environmental and circularity assessment of industry digitalization through LCA and other methods

- Evaluating the impact of XR in industry and engineering
- Healthcare 5.0
- Industry 4.0 in family firms
- Organizational evolution in the Industry 5.0 era
- Smart Sustainable Manufacturing
- Sustainable digitalization and digital sustainability in industry - *How the two dimensions can be conjugated to create a more sustainable, resilient and smart society*
- Sustainable Operations and Supply Chains

Special tracks

Achieving Sustainability through Servitization and Product Service Systems

Chairs: Alessandro Annarelli, Fabio Nonino, Sapienza University of Rome; Cinzia Battistella, University of Udine

Contact: alessandro.annarelli@uniroma1.it

Abstract and call for contributions

Companies are pressured from market demanding high-degree customization and integrated solutions fitting customers' preferences.

Servitization is a major strategic change that aims at shifting a company's offering from being product-centric to being product-service-centric, and this is achieved by means of the Product Service System business model.

The topic of Servitization and PSS is nowadays a solid and well-established concept in the business world: it is universally seen as a one of the few ways to meaningfully address all three dimensions of sustainability, represented by the so-called Triple Bottom Line.

The aim of this track is to present and discuss innovative insights with concrete perspectives and results on how product-service evolution is shaping traditional business models and letting emerge new ones on the continuous path towards sustainability.

Advanced methods, tools and techniques for the industrial valorization of waste

Chairs: Leonardo Conti, Lorenzo Fiorineschi, Giuseppe Rossi, Federico Rotini, Universitá degli Studi di Firenze

Contact: federico.rotini@unifi.it

Abstract and call for contributions

The special track focuses on the sustainable valorization of waste coming from different exploitation chains, or of underutilized resources, in the perspective of innovation models based on the concept and principles of the bio-economy.

In particular, the convenient and sustainable valorization of waste and underutilized resources involves the exploration of alternative or combined trends, such as transformation into sustainable materials, use as a source for the extraction of substances, energy conversion, direct/indirect re-use as goods, etc. Furthermore, the new applications also require meeting the demand of efficient technologies to transform waste into products to the appropriate industrial scale.

With reference to this context, the special session welcomes contributions about advanced methods and tools to support the activities involved in the identification and implementation of new valorization chains (like design of new applications, processes, technologies, etc.), as well as case studies, best practices and lesson learnt.

Artificial Intelligence in Manufacturing and Industry

Chair: Eric Coatanea, Tampere University

Contact: eric.coatanea@tuni.fi

Abstract and call for contributions

The special track welcomes contributions on the use of AI in manufacturing and industry. The themes that follow are deemed as the hottest topics and the most interesting aspects to be treated in the special session.

- Explainable vs. non explainable AI (pro and cons)
- Safe AI conditions and consequences for dataset collection, bias detection, training and validation
- Dataset collection and use of metadata,
- AI for modeling and simulation or for online control (consequences, difficulties and limitations)
- AI and multi-disciplinary optimization
- AI vs. classical modeling techniques (differences and similarities)
- Different types of training (supervised, unsupervised, semi-supervises, auto-supervises, and new training paradigms)
- AI learning with small and imperfect datasets
- Reconstruction techniques for missing data.

Biomanufacturing 4.0

Chair: Paola Serena Ginestra, University of Brescia; Antonio Piccininni, Politecnico di Bari

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Abstract and call for contributions

Biomanufacturing 4.0 is expected to replace traditional biomanufacturing production models with a new approach derived from Industry 4.0. This involves integrating the physical and digital in biomanufacturing, where all the systems and equipment in the biomanufacturing process are connected digitally, and technologies such as artificial intelligence or machine learning help to improve the critical process parameter during biomanufacturing. The digital transformation of bioprocess development is also known as Bioprocessing 4.0. Using the internet of things, digital biomanufacturing creates a network of data sources, materials, equipment, and industry representatives. This creates a competitive advantage, increases productivity, boosts the value of biomanufacturing. Contributions in this area are welcomed for this special track.

Data-Driven Design for Additive Manufacturing

Chairs: Serena Graziosi, Politecnico di Milano; Tino Stanković, Swiss Federal Institute of Technology in Zürich

Contact: serena.graziosi@polimi.it ; tinos@ethz.ch

Abstract and call for contributions

The literature has already documented the potential of adopting data-driven approaches to support process planning, optimization and monitoring in Additive Manufacturing (AM). On the contrary, examples and insights on how such techniques could be exploited to enable the Design for Additive Manufacturing (DfAM) for novel applications even further are still limited. Possible reasons behind this gap can be argued by significant differences in design strategies and representations among different length scales at which AM operates and the difficulty of their unification and readiness to support data-driven approaches. Thus, it is unclear which steps and aspects of the design process are ready for the data-driven search space exploration and how the design rationale is expressed within the computational algorithms to support innovation within DfAM. Data-driven design support tools, to succeed, need the availability of big and heterogeneous data by fostering cross-domain knowledge, new competencies and skills, and must respect all ethical issues regarding big data.

This special session on Data-Driven Design for Additive Manufacturing of the International Symposium on Industrial Engineering and Automation invites contributions on state-of-the-art methods and tools to support data-driven DfAM across all stages of the design process, including design guidance and opportunity exploration, data-driven design approaches and design space modelling, knowledge management and ethical issues, and availability of big data. The session will provide an opportunity for design practitioners to discuss the potential of state-of-the-art methods and tools to support data-driven design for additive manufacturing and their implementation in the industry.

Digital Circular Economy in the Manufacturing Industry

Chairs: Gianmarco Bressanelli, Marco Perona, Nicola Saccani, University of Brescia

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Abstract and call for contributions

Circular Economy is an innovative approach for sustainable improvements in the manufacturing industry. In the transition towards Circular Economy, digital technologies (such as IoT, Big Data and analytics, 3D Printing, Blockchain, …) play a central role. They enable Circular Economy at different levels, acting on the total lifespan of products from product development to the end-of-life. However, their enabling role is still overlooked in the literature, limiting their ability to generate sustainable value in manufacturing contexts. Thus, this special track focuses on the role of digitalization as a key enabler of the Circular Economy in the manufacturing industry. Topics of interest include, but are not limited to, the exploitation of digital technologies in product lifecycles; digitalization and servitization for the Circular Economy; circular supply chains enabled by digitalization; the role of digitalization for circular manufacturing.

Environmental and circularity assessment of industry digitalization through LCA and other methods

Chairs: Rainer Pamminger, Technical University of Vienna; Laura Ruiz-Pastor, Universitat Jaume I

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Abstract and call for contributions

The transformation and digitalization of the industry through digitalisation, Industry 4.0, Industrial Internet of Things (IIoT), automatisation finds more and more applications in various areas. These new technologies aim at efficiency improvements in e.g industry applications or enabling new services which could not have been realised without this technology. On the counterpart of all these benefits these new technologies need additional products, components and therefore more resources. For the products or services, itself or for the required data centers e.g., rare resources within the electronics components are needed to produce them. To run these systems more energy is needed. The challenge at the end of life is to reuse, remanufacture or recycle the products and components.

Therefore, the following questions and discussion points will be addressed in this track:

- How can digitisation, I4.0, AI, automatisation etc., lead to environmental and circular solutions? How can digitalisation consider circular economy e.g., repair of small electronic devices?
- What are the environmental impacts related to the digital solutions?
- Are the gains in terms of improved efficiency and enabling circular solutions exceeding the additional environmental impacts?
- Which LCA methods and indicators can be used to determine overall environmental advantages?

Evaluating the impact of XR in industry and engineering

Chair: Federico Morosi, Politecnico di Milano

Contact: federico.morosi@polimi.it

Abstract and call for contributions

This special track intends to provide a discussion forum on the latest research focused on methods and procedures to evaluate systems, tools and applications that take advantage of eXtended Reality (XR) technologies to support human activities. Inside the XR paradigm are considered all the technologies capable to generate immersive environments like Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR) and Metaverse. Authors are welcomed to submit papers whose aim is to evaluate usability, effectiveness, impact on resources or adoption barriers of XR in industrial domains, like engineering design, simulation, manufacturing, training, maintenance, assembly, distribution, purchasing, quality control, logistics, etc. Papers covering the laboratory assessment of XR applications in the following fields will be also considered: automotive, mobility, cultural heritage, education, healthcare and serious games.

Healthcare 5.0

Chairs: Elena Pessot, Simone Gitto, University of Siena; Daniele Spoladore, Walter Terkaj, National Research Council of Italy

Contact: elena.pessot@unisi.it

Abstract and call for contributions

The improvement and resilience of healthcare industry is a major issue in several countries, especially after the peak of COVID-19 pandemic. Smart and sustainable solutions are now driving a transformative shift in services supporting and enhancing patient's health conditions. Technologies as Internet of Things, Artificial Intelligence, Digital Twins and other smart systems are empowering healthcare value chains with higher data collection, analysis, and storage capabilities, for the delivery of more accessible and personalized services that involve a plurality of industries - from hospitals to pharma logistics providers to organisations supporting Ambient Assisted Living. In addition, there are growing concerns on economic and sustainability impacts of management of pharmaceuticals, wastes and energy in healthcare systems, without compromising the quality level of the cares to patients.

This track calls for further insights on fit-for-purpose and innovative solutions that can lead to Healthcare 5.0: the evolution to a smart, patient-centred, sustainable and resilient healthcare industry.

Industry 4.0 in family firms

Chairs: Samuel Appleton, Alfredo De Massis, Marco Mismetti, Emanuela Rondi

Contact: marco.mismetti@unibz.it

Abstract and call for contributions

This track on "Industry 4.0 in Family Firms" tackles the understanding of industry 4.0 in family firms, by presenting the most recent research that examines, both theoretically and empirically, the differences in the way industry 4.0 takes place and is managed in family and non-family firms. We solicit authors to submit empirical, conceptual, and literature review contributions. We welcome the adoption of diverse theoretical and methodological approaches, and submissions by interdisciplinary, international, and mixed industry-academic co-author teams.

Organizational evolution in the Industry 5.0 era

Chairs: Albachiara Boffelli, Jacopo Colombo, Matteo Kalchschmidt, University of Bergamo
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Abstract and call for contributions

The fourth digital revolution has already shown its potential for the operation of companies and business models, bringing significant contributions but at the same time significant changes for organizations. Industry 5.0 comes as a complement to the previous revolution, including new topics of sustainability and resilience, but most importantly shifting the focus to human-machine relationship and cooperation. This track starts from that human-centric approach and is open to research dealing with the relationship between technology and the organization, with emphasis on possible organizational evolutions (e.g., in terms of structures, roles and tasks) triggered by new technologies implementation, from the perspective of the new Industry 5.0 paradigm.

Smart Sustainable Manufacturing

Chairs: Michele Dassisti, Polytechnical University of Bari; Paolo C. Priarone, Politecnico di Torino; Concetta Semeraro, University of Sharjah
Contact: : michele.dassisti@poliba.it

Abstract and call for contributions

Manufacturing is embedded in our lives, as it is a key driver in the industrial, economic and societal transition. Transforming manufacturing activities in a more sustainable ones is the way to bring our world toward a more equitable, ecological and futuristic one. One common statement so far is that smart manufacturing is one method of pursuing sustainable manufacturing, by combining manufacturing with digital technologies. Tools claimed as critical to this digital transition are all those tools that manage information and, ultimately, knowledge. Networks of physical components and sensors (the hardware) as well as all Artificial Intelligence solutions (the software), may allow dominating the variety of technological components, control and management production units for implementing predictive manufacturing strategies. The true question: is smartness the only viable path to holistically reach the sustainability in manufacturing?   This special track aims to stimulate debates on this subject by discussing papers or theoretical, empirical, pragmatic case examples to bring new hints and ideas on the open issue of the relationships between smartness and sustainability. The session aims to come up with a different perspective or even solutions in the hot stream of sustainable manufacturing debate, hopefully exploring (but not limited to) the following topics: (a) design of sustainable production systems and factories; (b) connected and autonomous smart factories; (c) digital technologies and digital twins; (e) sustainable manufacturing and de-manufacturing; (f) zero-defect manufacturing strategies in smart factories; (g) resource and energy-efficient manufacturing; (h) industrial cases towards Industry 4.0 and 5.0.

Sustainable digitalization and digital sustainability in industry

How the two dimensions can be conjugated to create a more sustainable, resilient and smart society

Chairs: Pasqualina Sacco, Elena Rangoni Gargano, Davide Don, Fraunhofer Italia

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Abstract and call for contributions

Digital is everywhere, from supporting in decision-making for human daily life and business management, to performance tracking and optimizing traceability in integrated systems. Can we say that digitalization always promotes sustainable performances of processes and businesses leading to less resource- and energy-consuming activities while ensuring human security?
In a moment where the future is today, we must guarantee the "Do No Significant Harm" (DNSH) principle along the whole life-cycle of digital systems. Therefore, the binomial between digitalization and sustainability gains importance and its understanding is fundamental.
All contributions proposing a step forward in sustainable technologies, low material and energy demand processes and business models, impact assessment and traceability (and more related topics) are welcomed.

Sustainable Operations and Supply Chains

Chair: Markku Kuula, Aalto University

Contact: markku.kuula@aalto.fi

Abstract and call for contributions

This session will focus on sustainable operations and supply networks. The purpose is to understand how companies can continuously improve their operations in line with sustainable development and at the same time ensure this for the entire supply chain. The business environment has changed significantly in recent years. First, the global pandemic had a strong impact on both companies' production, supply chains and consumer behavior. This problem has been highlighted by political conflicts such as the US/China trade war and Brexit. There has been a shortage of components and raw materials as well as shipping containers. As a result, factories had to be closed or they had to choose new suppliers to replace broken supply relationships. Russia's attack on Ukraine has also caused an energy shortage affecting the whole of Europe. In the new situation, companies have had to acquire less environmentally friendly energy to keep their factories operating. All contributions proposing a step forward in sustainable technologies, low material and energy demand processes and business models, impact assessment and traceability (and more related topics) are welcomed.

Submission

dates and deadlines

16.12.22 – Abstract submission (optional)

27.01.23 – Submission of full papers

17.03.23 – End of the first review round

14.04.23 – Submission of final papers

28.04.23 – Communication of final acceptance decision

21.06.23 – Workshop day at NOI Techpark, Bolzano

22-23.06.23 – ISIEA 2023

The submission system will open soon. Abstracts can be also sent to info.isiea2023@unibz.it. The same email address can be used for any requests of support or information.

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