Book of Abstracts

DPISE 2025 Workshop

05th June 2025

Universidade do Minho
Escola de Engenharia

CENTROALGORITMI

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Preface

This book compiles the abstracts presented at the 2025 Workshop of the Doctoral Program in Industrial and Systems Engineering (DPISE/PDEIS).

This annual gathering, now in its eighth edition, took place on June 5, 2025, at the Azurém Campus of the University of Minho.

The workshop serves as a vital platform to promote the scientific endeavors within the doctoral programs, facilitating engagement among students, supervisors, and researchers with shared interests in DPISE/PDEIS research areas.

The event comprised a dedicated morning session for students to present their individual projects.

The Editors wish to express their profound appreciation to all contributing authors/students for their commitment and for ensuring the significant success of the DPISE/PDEIS 2025 Workshop.

Rui M. Sousa
Organizing Committee
Chair, Director of DPISE/PDEIS

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Session A1

05th June 2024, 10:00 A.M. – 10:45 A.M. | Room: 0.08/Ed.11

Moderator: Prof. Nélson Costa

Analysis of the Impact of Variables on Hospital Operations Management KPIs

Paulo Manuel Martins Fernandes (paulomartinsfernandes95@gmail.com)

Abstract. Over the past decades, the need to allocate available resources more efficiently in the healthcare sector has become increasingly relevant. The recent COVID-19 pandemic has highlighted the urgency of strengthening the sector. Since the end of the 20th century, there has been growing interest in applying Lean methodologies to the healthcare sector, known as Lean Healthcare. However, despite growing interest, research in healthcare services remains limited, with a lack of proven evidence to support decision-making by hospital managers. This research aims to study the variables present in the hospital context by identifying, defining, characterizing, and categorizing them. Using mathematical models - such as the Lasso method and Pearson's method - and simulated environments, the goal is to assess the weight and impact of various variables on hospital KPIs and their correlations. This will enable hospital management to make informed decisions, prioritizing the variables that directly improve the quality of care provided to patients. The expected outcomes of this project include practical advances in hospital systems, promoting greater efficiency, sustainability and quality in healthcare services. This research also aims to introduce an innovative and original approach by combating the low integration between Engineering, Industrial Management and Hospital Operations Management, providing an interdisciplinary and pioneering perspective.

Application of Process Mining to Identify and Improve Healthcare Processes

Erik Teixeira Lopes (erik.lopes@algoritmi.uminho.pt)

Abstract. Healthcare processes are characterized by high complexity, the involvement of multiple stakeholders, and clinical constraints that can affect patient flow. In the case of emergency departments, often the main entry point for many patients, these characteristics are even more pronounced due to their connections with various hospital departments and variable demand.
Despite the widespread use of healthcare information systems, the large volume of data and issues related to incomplete or inaccurate records present challenges for data analysis approaches. In this context, using an anonymized dataset, the researchers applied process mining to identify patient flow within the emergency

department of a hospital. The results reveal the wide variety and complexity of patient pathways, enabling the identification of critical activities and bottlenecks.
By performing a step-by-step analysis focused on yellow-triage patients (according to the Manchester Triage System) the researchers discuss the challenges of using this approach and propose strategies to overcome them. A structured method for applying process mining in healthcare is presented. Finally, based on the findings, various scenarios were proposed and simulated to improve hospital operations. Although not yet implemented, this research offers a combined perspective on the use of process mining and discrete event simulation, supporting its potential application in other healthcare contexts and institutions.

Validation of an IMU-Based Setup for Respiratory Pattern Assessment Using a Dorsal Functional Reference: A Clinically-Oriented and Computational Approach

Rodrigo Brandão Martins (rbdmartins@gmail.com)

Abstract. The assessment of respiratory patterns is essential in clinical practice. Traditionally, clinicians rely on observational methods and manual palpation, which are subjective and limited in capturing detailed movement data. On the other end of the spectrum, laboratory-based tools such as optoelectronic motion capture systems and plethysmography offer high-precision measurements but are costly, non-portable, and not suitable for routine use. This work presents the design and validation of an inertial measurement unit (IMU)-based system using a dorsal, functionally oriented reference sensor for the analysis of thoracoabdominal movement. A complete processing pipeline was implemented, from data acquisition with MTw (Movella) sensors to conversion into a functional anatomical reference frame (based on ISB standards), with custom axis polarity adjustments and Euler sequence definitions tailored to each sensor's local orientation and regional arthrokinematics. The system enables extraction of clinically meaningful relative angles (Roll, Pitch, Yaw), and their synchronized visualization alongside participant video recordings. This approach supports both functional analysis and pattern recognition, bridging clinical applicability and biomechanical precision.

Self-Sustainable Predictive Framework to Support Decision-Making in Ergonomics and Human Factors

Mariana Maia Carneiro (b13210@uminho.pt)

Abstract. Work-Related Musculoskeletal Disorders (WRMSDs) continue to be a leading cause of occupational injuries, particularly in dynamic sectors like Smart Retail. Traditional ergonomic assessment tools, such as REBA and RULA, provide valuable insights but lack predictive capabilities and adaptability to real-time, diverse work environments. This research proposes a self-sustainable predictive framework that integrates Artificial Intelligence (AI), Machine Learning (ML), and Human Digital Twins (HDTs) to support decision-making in Ergonomics and Human Factors. The framework aims to offer personalized, real-time feedback, enhancing scalability and adaptability across various industrial settings. By leveraging adaptive neural networks

and real-time motion capture data, the system can simulate workplace modifications and provide tailored, data-driven recommendations to mitigate ergonomic risks. This approach not only addresses the limitations of existing tools but also aligns with the principles of Industry 5.0, emphasizing human-centric solutions that prioritize worker well-being, safety, and productivity. The proposed framework aspires to bridge the gap between theoretical advancements and practical applications, fostering safer and more efficient workplaces through innovative, scalable, and inclusive ergonomic solutions.

Session A2

05th June 2024, 10:00 A.M. – 10:45 A.M. | Room: 0.07/Ed.11

Moderator: Prof. Rui Sousa

Semantic Mediation for Manufacturing Information Systems

José Carlos de Figueiredo Martins (id11227@alunos.uminho.pt)

Abstract. Manufacturing Information Systems (MIS) are integrated Information Systems (IS) developed to collect, organize, and present all information and data required to plan and control manufacturing processes during production. MIS are integrated into a more comprehensive system, the Enterprise Information System (EIS). With the increased diversity of EIS, organizations need to incorporate different IS, potentially with autonomous and heterogeneous data sources. Semantic heterogeneity, an obstacle to IS integration and synchronisation, can be defined as the occurrence of differences and incompatibilities in how data's meaning is represented and interpreted across various systems or contexts. This project aims to develop a Semantic Mediation model that will contribute to the integration and synchronization of heterogeneous MIS in an agile manner, thereby eliminating the need for a software developer's intervention. Semantic heterogeneity, Semantic Mediation and Semantic Interoperability are key concepts in the field of computer science, particularly in areas such as data integration and IS. A relationship can be established between these key concepts. Semantic heterogeneity is the problem, Semantic Mediation is the solution or process to address this problem, and semantic interoperability is the desired state or goal, where different systems can interact and understand each other's data efficiently and meaningfully.

Manufacturing System Failures Identification through Predictive Approach: A Contribute for Industry 5.0

Eduardo Manuel Cardoso Dias de Pessoa Santos (id11155@uminho.pt)

Abstract. Industry 5.0 represents a forward-looking vision that combines technological advancements with social responsibility, resilience, and sustainability. The technology allows 100% product inspection at End of Line (EOL), but this is a non-perfect system that may result in critical failures in customer tests. This context motivated the PhD project that started in September 2023 and has the goal of establishing a predictive framework for detecting possible failures or deviation in mature manufacturing systems and products, as early as possible, before they manifest later in the process or at the customer. The framework aims to stablish predictive methods in a zero-defect strategy and reduce human subjectivity. It means starting an effective predictive quality. One of the essential conditions is the collection of data, which needs to be relevant, accurate and sufficient. Therefore, Data Quality (DQ) is being considered relevant for this project. The concept is being discussed among scholars and Industry since the nineties. Every year, companies lose huge amounts of money due to decisions based on poor data quality. So, the quality of measurement data should be more and more a recurring concern in industry. The PhD project shows that Data Quality is a topic under discussion with no clear agreement on concept and approaches. To better understand what different authors advocate about DQ, a systematic literature review is ongoing and a product EOL data is under investigation.

Session A3

05th June 2025, 10:00 A.M. – 10:45 A.M. | Room:0.11/Ed.11

Moderator: Prof. Anabela Alves

Contribution of Lean Games to Create Value in Companies

Gabriela da Rosa Witeck (gabiwiteck@gmail.com)

Abstract. In today's competitive landscape, companies strive to improve efficiency and performance. Lean thinking, focused on waste reduction and continuous improvement, plays a key role in achieving operational excellence. However, successful Lean implementation depends on a work environment that fosters trust, creativity, and active employee engagement. Training is crucial and must go beyond theory to encourage practical application. Experiential methods, such as games, enhance this process by making learning more engaging and impactful.
This thesis explores how games support the development of Lean competencies and proposes a model to quantify their training value. A literature review revealed a gap in tools for measuring such impact. Two questionnaires were conducted in Northern Portugal with trainers and trainees to address this. The results highlight the need for comprehensive evaluation methods combining qualitative and quantitative data, aligned with a culture of continuous improvement. From these findings, the LEEV (Lean Learning Engagement, Empowerment, and Value-added) model is proposed. It offers a structured framework to assess the effectiveness of game-based Lean

training. It emphasizes the importance of people and culture in Lean success, providing organizations with a tool to better implement and sustain Lean initiatives.

Development of a Production Planning and Control Model for Pull Production

Ana Luísa Ribeiro Fernandes (analuisa_rf@outlook.pt)

Abstract. This project proposes the development of an innovative Production Planning and Control (PPC) model focused on the tactical level, aiming to overcome the limitations of traditional MRP (Material Requirements Planning)-based systems. The proposed model integrates pull production principles, proven effective at the operational level, into the tactical planning process to ensure greater responsiveness and fluidity in handling customer orders, production orders, and purchase orders. It targets complex industrial environments characterized by high product variety, variable lot sizes, and dynamic production routes. By moving away from push-based planning logic, this model offers a more agile and adaptive solution that reduces lead times, improves delivery date accuracy, and enables efficient resource and material management with minimal WIP levels. The core research question explores how a tactical PPC model can enhance production flow and order management. The model operates by dynamically generating requirements based on actual demand, continuously updating plans, and confirming feasible delivery dates before order release. It also ensures effective coordination of tools and devices required for operations. This approach contributes to a new generation of flexible, flow-oriented tactical planning systems aligned with modern industry demands for agility, speed, and efficiency.

Bridging Theoretical Advancements and Practical Implementation in Data-Driven Supply Chain Management: A Review

Hermenegildo Baptista (hermenegildo59@hotmail.com)

Abstract. Supply Chain Management (SCM) has evolved from a logistical function into a strategic pillar, driven by the pursuit of efficiency, cost reduction, and resilience. As supply chains become more interconnected, companies are increasingly pressured to optimize operations and base decisions on data. Analytical methods, artificial intelligence, and operations research have emerged as key tools for forecasting, automation, and decision support. However, around 40% of approaches proposed in academia remain unimplemented in practice, revealing a gap between theory and application. This study pursues two main objectives: i) to analyze the evolution of analytical methods (descriptive, diagnostic, predictive, and prescriptive) in SCM, emphasizing their role in data-driven decision-making; and ii) to identify and categorize the barriers to their adoption, distinguishing between theoretical and practical challenges. Through a systematic literature review using the Scopus database, this research proposes the SCM-DA Constraints Matrix, a framework that organizes these limitations from both academic and industry perspectives. Future steps include conducting industry surveys to validate findings and create a strategic roadmap to overcome barriers and foster broader adoption of data-driven methods in SCM.

Towards an Open-Source Framework for Discrete Event Simulation in Production Systems

Denisa Correia Borges (denisacorreiaborges99@hotmail.com)

Abstract. Simulation represents a powerful methodology for modelling real and theoretical systems, with broad applicability across industrial and scientific domains. However, its adoption continues to face various technical and structural challenges. A significant barrier lies in the predominance of proprietary commercial tools, which, although offering robust features and vendor support, often impose constraints on integration and flexibility—critical aspects in the evolving context of industrial digitalisation and digital twin implementation. Open-source alternatives present a promising pathway by enabling greater transparency, flexibility, collaborative development, and seamless integration with diverse systems. This research focuses on developing building blocks within Discrete Event Simulation (DES), aiming to reduce the effort in system modelling and scenario creation, while addressing the shortage of modellers in the labour market. These building blocks will be developed as an open-source solution, promoting access to simulation technologies, encouraging collaboration, and supporting integration within Digital Twin architectures. To inform development, a comparative analysis identified common functional components across established commercial tools (such as Simio, Arena, and ProModel) and open-source platforms like JaamSim. The resulting tool seeks to contribute to Industry 4.0 by making simulation more accessible, interoperable, and aligned with digital transformation.

Session B1

05th June 2025, 11:15 A.M. – 12:00 A.M. | Room: 0.08/Ed11

Moderator: Prof. Rui Lima

Towards Operational Excellence in Research Centres

Aline Magalhães de Barros (mbarros.aline@gmail.com)

Abstract. This project emerged from years of experience navigating both the scientific and operational dimensions of research. While working at the Centre of Biological Engineering (CEB), I became aware of persistent inefficiencies, mainly in support processes, that impact research performance. These experiences, combined with training in Lean, motivated me to explore how Operational Excellence (OpEx) principles could be adapted to the research context. The project aims to develop a tailored OpEx model for public research centres (RC), improving performance and promoting impactful research. In fact, an early systematic review identified a formal gap regarding OpEx application in RC. The project follows an Action Research

strategy to support knowledge generation and institutional change. The work began with a literature analysis that led to the identification of eight core OpEx models and nine classes of principles – on this, a conference paper was published, and a second one is almost ready for journal submission. Based on the review and project objectives, four constructs were defined (OpEx principles, Critical Success Factors, Problematic Processes, and Employee Engagement) to guide the design of two instruments (interview and questionnaire). Their application at CEB generated a solid knowledge base for the next steps – on this, a third paper was prepared and submitted to a journal. The next step is to design a conceptual model. Simulation and validation will follow.

Assembly Line Operator Loop Tracking with UHF RFID

Alberto António Bumba (2ab@hotmail.com)

Abstract. Efficient monitoring of operator activity on assembly lines is crucial for enhancing productivity and supporting lean manufacturing practices. This study presents the development and validation of a prototype system utilizing Ultra High-Frequency (UHF) Radio Frequency Identification (RFID) technology to automatically track operator loops in a real industrial environment. The proposed system comprises a four-port UHF RFID reader, multiple antennas, and various tag types, including anti-metal designs. The methodology included system calibration, environmental finetuning, and simulation trials with one and two operators. Key performance indicators such as loop time and station processing time were measured and compared against traditional timekeeping and predetermined time systems (MTM). Results showed that the UHF RFID system achieved high accuracy, with deviations of less than 2.8% from MTM references, comparable to manual stopwatch-based methods. The findings demonstrate that UHF RFID can serve as a viable, scalable, and less intrusive alternative for real-time operator monitoring in complex manufacturing settings.

Enhancing Human-Robot Collaboration through Interaction Strategies and Verbal Transparency

André Cardoso (andre.cardoso@dps.uminho.pt)

Abstract. Effective human-robot collaboration (HRC) relies on balancing cognitive load and trust to optimize the human experience and task efficiency. This study investigates how different collaborative robot (cobot) behaviors influence these two critical factors. Twenty participants engaged in interactions with a cobot under four distinct behavioral modes: (i) request-based approach (RBA), (ii) request-based approach with verbal transparency (RBAVT), (iii) anticipatory approach (AA), and (iv) anticipatory approach with verbal transparency (AAVT). After each interaction, participants completed the NASA Task Load Index (NASA-TLX) to assess cognitive workload and the Trust Perception Scale in Human-Robot Interaction (TPS-HRI) to evaluate perceived trust. Task completion time was also recorded as a performance metric. The results revealed that the AAVT condition emerged as the most balanced and effective interaction mode, successfully minimizing cognitive workload, enhancing

trust, and preserving task efficiency. While each mode exhibited distinct advantages and drawbacks, verbal transparency consistently contributed to more favorable outcomes across all measured dimensions. These findings underscore the importance of anticipatory behavior combined with clear, verbalized cobot intentions in promoting more effective, trustworthy, and cognitively manageable human-robot interactions..

Session B2

05th June 2025, 11:15 A.M. – 12:00 A.M. | Room:0.07/Ed.11

Moderator: Prof. José António Oliveira

Decision-support Frameworks for Industrial Symbiosis Practices in Photovoltaic Waste Management

Marcela Leonardo Jorio (id10256@alunos.uminho.pt)

Abstract. The increasing deployment of solar photovoltaic technologies has intensified concerns regarding end-of-life waste management and the recovery of critical raw materials. Given the socio-environmental and economic significance of photovoltaic panels' waste, their integration into circular economy and industrial symbiosis strategies is becoming imperative. However, current sustainability assessment methods remain fragmented, with few frameworks adequately supporting informed decision-making across sustainability dimensions. This study conducts a literature review of existing decision-support frameworks that integrate Life Cycle Assessment and Multi-Criteria Decision Analysis in the context of industrial symbiosis. The results reveal limited applications of this hybrid methodology specifically targeting photovoltaic waste streams. Key challenges, gaps, and trends were identified being shared into particular inputs and holistic outputs. Based on this synthesis, the paper proposes foundational features for a robust framework tailored to the industrial symbiosis of the photovoltaic waste context, emphasizing dynamic modeling and the critical role of digital tools. This work contributes both a conceptual roadmap and a practical foundation for researchers, policymakers, and industry actors seeking to enhance the sustainability and circularity of photovoltaic waste through industrial symbiosis.

What If? Forecasting the Demand for Electrical Vehicles in Portugal

Anna Luiza Sousa Vieira Santos (id10820@uminho.pt)

Abstract. Global trends in climate warming and resource scarcity, driven by an increasing reliance on fossil fuels, pose significant challenges to environmental sustainability. The transportation sector, responsible for nearly 25% of global greenhouse gas emissions, is among the largest environmental polluters, mainly due

to the prevalence of fossil fuel-powered vehicles. In response, Portugal is dedicated to attaining carbon neutrality by 2050, focusing on electrifying transportation, promoting the adoption of electric vehicles, and expanding the necessary infrastructure. In 2023, electric vehicles made up 16% of vehicle sales in the country, with continued growth anticipated in the coming decades. This study uses ARIMA and Simple Exponential Smoothing models to forecast EV sales trends in Portugal from 2024 to 2050. The findings indicate substantial growth, with annual growth rates projected between 50% and 60%. However, environmental and structural risks are linked to this transition, such as the demand for significant investments in charging infrastructure and effective battery waste management. The research underscores the necessity for strong public policies and strategic planning to ensure a sustainable shift to electric mobility in Portugal.

Impact of Electricity Tariffs and Demand Response on Market Dynamic and Consumer Benefits

Sara Golmaryami (sara.golmaryamii@gmail.com)

Abstract. This study aims to assess the economic impact of simple and Time-of-Use (ToU) tariffs on household electricity consumption in Portugal, focusing on distributor profitability and consumer cost savings. The study uses hourly open-source data from E-Redes (energy consumption) and OMIE (market electricity prices) for February 2024. The findings reveal that the simple tariff's flat rates fail to incentivise consumption shifts, leading to higher peak-hour demand. This demand concentration compresses distributor profit margins and strains grid efficiency. Conversely, ToU tariffs, with different peak, off-peak and mid-peak pricing strategies, encourage flexibility for consumers to load shifting, reducing consumer costs, balancing demand, and improving distributor profitability. Lower peak-hour consumption decreases procurement costs, optimising revenue management and grid performance. Given these economic advantages, integrating ToU pricing into demand response (DR) strategies can enhance market stability and operational efficiency. To facilitate this transition, policymakers should prioritise consumer education, optimised pricing structures, and infrastructure modernisation. Ensuring the effective implementation of ToU tariffs will support a more resilient and adaptable electricity market. However, as this study examines one-month, multi-seasonal research is necessary to validate and refine these findings.

Energy Demand Forecasting for Developing Economies in Sub-Saharan Africa

Budareld Maria Mbumba (budareldm@gmail.com)

Abstract. In Sub-Saharan Africa, millions lack access to reliable electricity, hindering socio-economic progress. Addressing this challenge requires effective power generation expansion planning to bridge this electricity access gap and narrow the socioeconomic disparities in the region. Nonetheless, a challenge remains since traditional demand forecasts often overlook "suppressed demand" for power planning. Suppressed demand refers to unmet or latent demand for electricity that arises from the incapability to meet minimum service levels due to various constraints, such as

lack of infrastructure and poverty. In other words, the lack of electricity infrastructure, for instance, stops consumers from performing a series of activities, including income-generating ones, which translates into higher disposable income and further electricity consumption at a household level.
This paper focuses on Angola, a Sub-Saharan country that is undergoing a process of modernization of production capacity and transmission networks. Additionally, there is a large electricity access gap between the rural and the urban populations, which encompass 20.3% and 60.1% of population access to electricity, respectively. A bottom-up approach will be employed to forecast demand in association with available 3 household-level data and recognizing that future energy demand in developing countries is highly dependent on the economic and social contexts and subject to large uncertainties.

Session B3

05th June 2025, 11:15 A.M. – 12:00 A.M. | Room:0.11/Ed.11

Moderator: Prof. Teresa Monteiro

Mapping the Future: Exploring Bankruptcy Prediction Models Through a Systematic Literature Review

Ana Margarida Jorge Sousa (amjorgesousa@gmail.com)

Abstract. In the modern global economy, financial distress prediction has become critical due to recent global uncertainties. In response to these challenges, the field of bankruptcy prediction has evolved significantly, transitioning from traditional statistical models to advanced artificial intelligence approaches. Although this evolution has expanded methodological possibilities, a critical gap persists: model selection often fails to account for key contextual factors, including data and context specifics. This review analyses 87 journal articles (2002–2022) and identifies three key trends: (1) artificial intelligence methods have dominated academic research on bankruptcy prediction over the past 20 years; (2) models that combine accounting ratios with different types of indicators demonstrate superior robustness across business cycles; and (3) the lack of standardised benchmarks complicates cross-study comparisons. In conclusion, this review highlights that while AI dominates modern bankruptcy prediction, hybrid models combining accounting and non-financial data show greater robustness. However, the lack of standardised benchmarks and interpretability trade-offs means no single method is universally superior—selection depends on data context and predictive goals.

A Metaheuristic Approach for the Production Routing Problem

Mário Leite (maleite.cbc@gmail.com)

Abstract. This work addresses the Integrated Production Routing Problem (IPRP), a complex combinatorial challenge inspired by the real operations of a Brazilian furniture manufacturer. The problem involves coordinating production and distribution decisions over a finite planning horizon, divided into periods, for multiple items with varying attributes, such as weight, size, and components. This IPRP incorporates several constraints, including sequence-dependent setups, safety stocks and limited production capacity during periods, heterogeneous vehicle fleets, multi-period routing, and customers with multiple time windows and deadlines. The objective is to minimize the total cost, which integrates setup costs, inventory holding, and transportation expenses. This coupling of production and distribution decisions introduces temporal and spatial interdependencies that render the problem NP-hard and intractable via exact methods for realistically sized instances. To tackle this problem, we propose a Variable Neighborhood Search metaheuristic. The initial solution is obtained through a constructive heuristic, and a set of neighborhood structures is used to explore the solution space. The proposed approach is evaluated through extensive computational experiments on benchmark instances, demonstrating its effectiveness in handling the inherent complexity and integrated nature of the Integrated Production Routing Problem.

Exploring Sustainability Impacts in Construction under a SROI Methodology Perspective

Filipe Machado Duarte (filipemacduarte@gmail.com)

Abstract. Policymakers are increasingly pressuring construction companies to demonstrate the socio-economic and environmental benefits of urban regeneration, rehabilitation, renovation and retrofit projects. This research addresses this problem by comparing different methodologies for measuring the required sustainability impacts and evidencing the usage of the selected methodology. A comprehensive literature review identified various methodologies capable of measuring sustainability impacts, which were then assessed based on their coverage, sector applicability, holistic assessment capabilities, and suitability for initial project evaluation. This work selected the Social Return On Investment (SROI) among the comprehensive list of methodologies due to its unique suitability based on evaluation dimensions, not only at their post-project phase, like several others, but also at their project-inception phase. The SROI usage is demonstrated in an illustrative construction project. The research highlights the strengths and weaknesses of SROI, including its technical limitations and challenges. The retrospective analysis offers insights into SROI's effectiveness in auditing the sustainability impacts of completed projects, examining how the construction project fostered social interactions, improved public spaces, and enhanced stakeholder's wellbeing while exploring methods to quantify sustainable value. It also discusses its implementation underlying challenges and its predictive abilities.

Moderator List

Author List