Editorial: Artificial Intelligence (AI) and Data Sharing in Manufacturing, Production and Operations Management Research

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The term AI refers to the digital technologies performing activities, tasks and decisions normally deployed by human intelligence (Pomerol, 1997). Recently, the context of Artificial Intelligence (AI) was brought to the forefront of attention, as a wide range of operations could be transformed through multidisciplinary approaches based on data sharing (Spanaki et al. 2018) and AI applications.

The applications of AI, data analytics and intelligent processes in Manufacturing, Production and Operations pose multiple challenges and managerial implications. The vast range of challenges could span from difficulties in using and adopting these applications, identifying the required skills and capabilities for the employees, to a wide variety of productivity and performance problems. There are multiple opportunities but also respective challenges for the supported supply management tasks; therefore, the research should support the operations by promoting AI approaches for smart and intelligent operations in multiple industrial sectors while predicting weaknesses and risks (Sivarajah et al.,2019; Giannakis & Papadopoulos, 2016).

There is emerging anecdotal evidence that AI and data analytics for manufacturing and production can fundamentally reshape the existing operational practices and tasks (Sivarajah et al., 2019; Papadopoulos et al., 2017; Dubey et al., 2019). Various organizations have already applied AI and data analytics for humanitarian operations addressing healthcare and hunger challenges through early-stage medical diagnosis, identifying agrifood supply chain risk, optimized food distribution, effective crisis response by quickly and accurately forecasting natural disasters (Google AI, 2019) and also managing food waste (Irani et al., 2018; Despoudi et al., 2018) effectively. However, scaling up AI usage could have some significant bottlenecks, such as misuse of AI algorithms, privacy breaches and data accessibility (Spanaki et al., 2019). Like other technological developments, the use of AI just like other technological developments, comes with its own challenges and risks that can lead it to being misused, leading to user distrust, and raising ethical concerns. This SI, hence, aimed to promote the research around the area of AI and data sharing in manufacturing, production, and operations research.

We had an immense response to our call for papers. We received diverse submissions, some of which were exceptional, but others were out of scope, and therefore, we had to reject them. The rest of the papers underwent two or three rounds of review by subject experts. The eleven accepted papers were organized into three themes:

Theme 1: Reviews of the literature on AI and Data Sharing in Manufacturing, Production and Operations Management Research

In this stream, we present two papers. The first paper by Nayernia, Bahemia, and Papagiannidis (2021) is a systematic review of the literature on implementing I4.0. It uses text mining to analyze 97 articles published from 2015-2021. The analysis reveals eleven research streams grouped into five levels, namely industry and firm, smart factory, data, human resources, and supply chain. Within each stream, sub-themes and future research areas were identified, namely I4.0 as a remedy for the COVID-19 pandemic, the tension between value creation and value protection during the implication of I4.0, and contingency planning for I4.0.

The second paper by Bechtsis, Tsolakis, Iakovou, and Vlachos (2021) outlines the challenges supply chains face given the 'new normal' and provides a critical taxonomy of the literature on supply chains and disruptions. They identify gaps in the literature related to (i) the impact of security on supply chain operations, (ii) cost-effective resiliency strategies and practices, and (iii) the social and labour dimensions of sustainability. Furthermore, they propose a framework that includes the identified challenges, gaps in the literature and practice, and opportunities in supply chain management research, which is then validated through a case study of the organic food supply chain.

Ola, Liu, Suklan, Jayawickrama, and Arakpogun (2021) review the literature on sustainable supply chains for food and drink industry (FDI) and explore AI theory in supply chain networks and alternative supply chain financing for the FDIs. They subsequently propose a meta-framework based on the literature in supply chain networks, supply chain finance, and AI technologies. They argue that the implementation of AI directly with supply chain finance is not supported, whereas implementing AI with supply chain networks, is supported as well as the implementation of AI, supply chain networks, and supply chain finance. Hence, AI could lead to to a sustainable financing for the FDIs.

Theme 2: AI algorithms in Manufacturing, Production and Operations Management Research

Palombarini and Martinez (2021) focus on using AI and Deep Reinforcement Learning in rescheduling decisions taken at the shop floor to achieve efficient production under dynamic conditions. They model the rescheduling task as a closed-loop control problem. An artificial autonomous agent implements a control policy generated offline using a scheduling simulator to learn repair policies directly from high-dimensional sensory inputs and use an industrial example to showcase their approach.

Al-Surmi, Bashiri, and Koliousis (2021) investigate the role of marketing and AI strategies to improve operational performance. Their study is unique in that they conceptualize and empirically test the mediating role of marketing strategy, IT strategy, operational performance, and AI decision-making. Based on these strategies, they build a decision-making framework confirmed by SEM analysis drawing on data from 242 managers from various industries. The strategies are then examined optimally using artificial neural networks (ANN) to feed into a decision-making framework.

Belhadi, Kamble, Fosso-Wamba, and Queiroz (2021) focus on AI's role in achieving supply chain resilience. They propose a decision-making framework that aims to identify and apply AI techniques to achieve supply chain resilience. This framework is based on Multi-Criteria Decision-Making and is underpinned by AI-based algorithms such as Fuzzy systems, Wavelet Neural Networks (WNN) and Evaluation based on Distance from Average Solution (EDAS) to identify patterns for developing strategies to achieve supply chain resilience. Drawing on an analysis of data from 479 manufacturing companies, the findings illustrate that fuzzy logic programming, machine learning big data, and agent-based systems are the most promising techniques used to promote SCRes strategies. The paper's contribution lies in proposing a decision-making framework that assists managers in deploying AI to build supply chain resilience strategies.

Tsolakis, Zissis, Papaefthimiou, and Korfiatis (2021) investigate the environmental implications of adopting Automated Guided Vehicles (AGVs) in container terminals. They address the gap in the literature on how to quantify the environmental gains stemming from the use of AI and automation for shoreside operations at freight ports. Their study involves simulation of a real-world container terminal used on Europe's fastest-growing container port (Piraeus) to quantify the environmental benefits related to routing scenarios via different types of AGVs. The study contributes to the contribution of AI at non-automated port terminals, both at operational and management levels.

Manimuth, Venkatesh, Sreedharan, and Mani (2021) investigate the role of real-time monitoring in smart manufacturing based on the application of AI, and in particular, Machine Learning and the Internet of Things (IoT). They use K-mean clustering and support vector in combination with IoT-enabled embedded devices to design, deploy and test the effectiveness of the vehicle assembly process in the VUCA context. Their study highlights the impact of AI algorithms and methods in relating the parameters of cost, performance, energy, and productivity to enhance productivity and efficiency.

Usuga-Cadavid, Lamouri, Grabot, and Fortin (2021) use ML through two deep learning models (CamemBERT and FlauBERT) for natural language processing (NLP) to harness unstructured data from maintenance logs to predict machine breakdowns, problematic situations, and repair activities. They demonstrate the applicability of these models to achieve results with minimum text pre-processing and hyperparameter tuning. The method is useful in that it can extract valuable information from poorly structured maintenance reports.

Murugappan, Subramanian, Rahman, Goh, and Chan (2021) propose a clustering technique to model the Multi-Robot Task Allocation (MRTA) problem with a balance constraint to improve the utilisation (completion time) of the robots. Their results suggest that K-means clustering is an appropriate method to solve the problem with complex topologies and it is scalable to deal with any number of tasks and robots compared with Gaussian Mixtures Models and hierarchical clustering methods.

Theme 3: Adoption of AI and Data Sharing in Manufacturing, Production and Operations Management Research

Cadden, Dennehy, Mantymaki and Treacy (2021) investigate AI integration within supply chains. They examine the organizational and behavioural factors that influence the adoption of AI in supply chains. They hypothesize the relationship between supply chain culture and AI. They illustrate the role of cultural enablers in integrating AI within supply chains and present implications for theory and practice.

Dora, Kumar, Mangla, Pant, and Kamal (2021) investigate the adoption of AI within food supply chains. AI could assist in addressing issues related to quality and wastage by improving transparency and traceability. They identify the critical success factors (CSFs) related to the adoption of AI in Indian food supply chains by using the rough-SWARA technique to rank and prioritize the CSFs. The paper's contribution lies in proposing CSFs that could help practitioners and governmental agencies form policies for the adoption of AI in food supply chains.

All the accepted papers in the SI have covered different aspects of using AI and data sharing within operations and the supply chain. We believe we have provided enough food-for-thought to academics and practitioners who would like to explore the role of AI in operations and supply chain management.

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