**Digital Transformation in the Shipping Industry: a Network-Based Bibliometric Analysis**

**1. Introduction**

Digital transformation in the shipping and maritime industries is of strategic importance. It is shaped mainly by the rapid developments in digital technologies and the increasing demands for enhanced operational efficiency, sustainability and competitiveness across the global maritime supply chain. The integration of innovative technologies in the maritime sector, including artificial intelligence (AI), machine learning (ML), blockchain, the Internet of Things (IoT), Big Data analytics, digital twins, autonomous vessels, and enhanced cybersecurity measures, has facilitated significant advancements in maritime logistics, port operations, and vessel management. Maritime digital transformation aims to support decision-making in maritime operational processes, streamline fleet management tasks, enhance safety and environmental performance and reduce vessel environmental impact.

Despite the increasing adoption of innovative technologies, the maritime sector remains a complex and fragmented domain. There are various levels of digital maturity across different maritime sub-sectors. Previous research has examined diverse aspects of maritime digital transformation, ranging from industry-wide systematic reviews to bibliometric analyses that highlight specific technological trends or research gaps. However, prior studies primarily focus on predefined technological domains or specific industrial sub-sectors, which limits their findings' scope and generalises their research conclusions. Additionally, the methodological frameworks employed across existing studies demonstrate substantial variation, encompassing systematic literature reviews (SLRs), conceptual papers, or bibliometric network analyses. Even though each contributes uniquely to the maritime sector research, sometimes it provides isolated findings to the broader transformation of the maritime landscape.

To bridge this research gap, the present study employs a network-based bibliometric analysis approach to provide a holistic perspective on the digital transformation of the shipping industry. Unlike many prior studies that categorise research into predefined technological areas, this study takes an unbiased, data-driven approach to map the broader research maritime landscape. Though a data-driven approach, the study uses graph-theoretical methods and natural language processing (NLP)to examine research trends systematically. Specifically, co-authorship and co-citation networks are analysed using community detection algorithms and thematic clustering techniques to identify influential research clusters, collaboration patterns, and emerging topics in the field. Finally, analysing an extensive dataset of scientific publications, this study identifies dominant research clusters, major contributing institutions, and key technological themes such as fuel efficiency, risk management, AI, and cybersecurity—providing a data-driven understanding of maritime digital transformation trends.

The study makes three key contributions. First, it conducts a detailed bibliometric analysis of the digital transformation in the maritime industry. Second, it applies network science to define structural patterns in research collaborations and citation networks. Finally, it employs machine learning-based thematic clustering to uncover emerging research directions, offering insights into future advancements in digital shipping technologies. Through this multi-dimensional approach, the study provides a robust foundation for academia, industry professionals, and policymakers to support data-driven decisions to navigate the evolving landscape of digital transformation in the maritime sector.