Digital Transformation in the Shipping Industry: a Network-Based Systematic Review

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Abstract

The shipping industry is undergoing a profound digital transformation, driven by advancements in automation, artificial intelligence, blockchain, and the Internet of Things (IoT). These technologies enhance operational efficiency, optimize supply chain management, and improve sustainability by reducing emissions and fuel consumption. However, navigating this digital revolution requires a structured understanding of emerging trends, challenges, and opportunities. A network-based systematic review serves as a crucial methodological approach for researchers, enabling them to synthesize existing knowledge, identify research gaps, and develop informed strategies to leverage digital transformation effectively. By critically analyzing co-citation and co-authorship networks, modeling topics over time, and performing trend analysis, we gain insights on the current status of digital transformation within the shipping industry, ultimately guiding industry stakeholders and researchers ....XXXXXXXXXXXXx Our results show that XXXXXXXXXXXXXXXXXXXXX

Keywords: digital transformation, shipping industry, systematic literature review, complex networks

1. Introduction

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2. Literature Review

3. Methodology

You can describe your approach, methods, or framework here.

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3.1. Keyword identification and data collection

We asked experts in the shipping industry to identify the most relevant keywords related to the industry itself and to digital technologies and digital transformation. Their analysis resulted in 35 keywords, listed in Table 1.

[Table 1 about here.]

Data was collected from three research engines: EBSCO [4], ProQuest [2], and IEEE eXplore [5]. The search was performed on October the 22nd 2024. For each engine, we retrieved scientific articles containing any of the digital transformation related keywords and any of the shipping industry related keywords, in either their title or abstract. The exact query for each engine are available on request. We limited our results using the following criteria: *a* only English literature, and *b* only scientific contributions published in peer-reviewed journals. Table 2 shows the results.

[Table 2 about here.]

All search engines provided the digital object identifier for the articles. This allowed us to screen the resulting set and identify 2324 unique articles for the subsequent analysis. One challenge of using different data engines is the variety of attributes they return for each article. In order to have the same information for each article, we queried a fourth search engine for all the 2324 articles. We chose OpenAlex [3], which has been shown to be suitable for bibliometric analysis [1]. Our final result set comprised 2293 scientific publications.

3.2. Descrptive Statistics

We started our analysis evaluating descriptive statistics across our article set. More specifically, we calculated:

1. the distribution of the number of publications per year;
2. the distribution of publications across authors, identifying the most prolific authors;
3. the distribution of publications across insitutions, identifying the research centers with the highest number of publications;
4. the distribution of publications across countries.

4. Results

Present any results, tables, or figures.

5. Discussion

6. Conclusion

Summarize key findings and future work.

References

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[2] Cooke, R., 2017. Proquest ebook central. The Charleston Advisor 19, 39–43.

[3] Priem, J., Piwowar, H., Orr, R., 2022. Openalex: A fully-open index of scholarly works, authors, venues, institutions, and concepts. arXiv preprint arXiv:2205.01833 .

[4] Vaughan, J., 2011. Ebsco discovery services. Library Technology Reports 47, 30–38.

[5] Wilde, M., 2016. Ieee xplore digital library. The Charleston Advisor 17, 24–30.

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Table 1: List of keywords identified by experts.

Keyword	Type (Digit. Trans. or Shipping)
Digital transformation	Digit. Trans.
Digital innovation	Digit. Trans.
Digital ecosystems	Digit. Trans.
Digitization	Digit. Trans.
Digitalization	Digit. Trans.
Digital platforms	Digit. Trans.
Industry 4.0	Digit. Trans.
Smart technologies	Digit. Trans.
Data-driven transformation	Digit. Trans.
Automation	Digit. Trans.
Internet of Things	Digit. Trans.
Blockchain	Digit. Trans.
Data analysis	Digit. Trans.
Artificial intelligence	Digit. Trans.
Machine learning	Digit. Trans.
Big data	Digit. Trans.
Cloud computing	Digit. Trans.
Cyber-physical systems	Digit. Trans.
Digital twins	Digit. Trans.
Edge computing	Digit. Trans.
5G networks	Digit. Trans.
Predictive analytics	Digit. Trans.
Cybersecurity	Digit. Trans.
Supply chain integration	Digit. Trans.
shipping	Shipping
maritime	Shipping
Sea freight	Shipping
Smart ports	Shipping
Autonomous ships	Shipping
Fleet management	Shipping
Cargo tracking	Shipping
Digital shipyards	Shipping
Port digitalization	Shipping
Port automation	Shipping
Vessel performance	Shipping

Table 2: Number of retrieved articles per research engine.

Engine	No. of scientific articles
EBSCO	1904
ProQuest	2011
IEEE eXplore	300