

Maturity of Digital Transformation in the Shipping Industry: A Case Study Among Enterprises in Gulf Cooperation Council (GCC) Countries



Tif Said Suhail Al Mazroui ¹⁾, Maathir Mohammed Saud Al Alawi ¹⁾, Khafiya Sultan Hamood Al Wahaibi ¹⁾,
Bashayar Badar Saif Al Amri ¹⁾, Mohammed Muneerali Thottoli ^{1)*}

¹⁾Department of Accounting, University of Nizwa, Nizwa, Oman

^{*)}Corresponding Author : muneerali@unizwa.edu.om

Article Info	Abstract
<p>Keywords: Digital Maturity; Shipping; GCC; Digital Transformation; Case Study;</p> <p>Article history: Received: 27/12/2022 Last revised: 25/02/2023 Accepted: 26/02/2023 Available online: 26/02/2023 Published: 26/02/2023</p> <p>DOI: https://doi.org/10.14710/kapal.v20i1.51246</p>	<p>Digital maturity describes an organization's readiness and ability to change and implement models to remain competitive in the marketplace. Digital transformation (DT) can streamline processes, reduce errors, and increase the speed of operations in the shipping industry, leading to greater efficiency and cost savings. Companies that adopt DT effectively will be better positioned to compete in the rapidly evolving shipping industry. To achieve competitive benefits from the potential of DT, shipping businesses must understand their digital maturity state. The shipping industry lacks a uniform approach to DT, leading to inconsistencies in implementation and measurement. Many shipping companies are hesitant to adopt new technology and processes, leading to slow implementation and limited impact. Hence, the main goal of this case study is to determine the DT maturity of companies in the Gulf Cooperation Council (GCC) countries in shipping. This case study focuses on the maturity of DT in the shipping industry. With an exploratory approach, the aim of the research is to assess the level of DT maturity among shipping companies in the GCC region. This study employs firstly a qualitative, case study methodology and considered items shipping methods, market operating, services provided, technological initiatives, and the company's goals for technological development of three shipping companies, Asyad, Clarion, and Yht Cargo to analyze data. Then a literature review is compiled from 8 papers published between 2020-2023 in international peer-reviewed journals or conference proceedings, obtained through a bibliographic search in the Scopus database. The findings suggest that coercive and mimetic pressures are primarily responsible for digital change. The benefits of DT have been discovered to assist maritime companies use their resources more efficiently, resulting in increased operational efficiency, improved client connections, and increased sustainability.</p> <p>Copyright © 2023 KAPAL : Jurnal Ilmu Pengetahuan dan Teknologi Kelautan. This is an open access article under the CC BY-SA license (https://creativecommons.org/licenses/by-sa/4.0/).</p>

1. Introduction

The rise of the internet and the growth of digital technologies in the 1990s and 2000s led to a surge in research and analysis on digital transformation (DT) and its impact on organizations and society. Adopting digital solutions is vital for maintaining competitiveness in the logistics industry due to the potential for increased sustainability, efficiency, cost savings, and enhanced security. The integration of information systems technology in containerization is a key factor in the success of ports, as it enables improved decision-making, productivity, transparency, and operational efficiency [1,2]. The approaches that shipping companies use when developing in digital infrastructural facilities, installing digital technology systems, enabling competent digital personnel, and aiding organisations in achieving customer expectations have been defined as DT in shipping. Companies can, for example, exchange ship navigation and container delivery trajectories with customs in real time, allowing the commodities to be cleared quickly and the cargo owner's inventory to be reduced [3]. The integration and maturity of these applications and digital technologies will have profits for ship operations, and ship design such as enhancing safety, reducing energy and carbon emissions, and increasing operational efficiency to gain a competitive advantage thereby better protecting the marine environment and meeting goals. Because, as the shipping supply chain's leaders implement DT, supply chain partners will face increasing need to upgrade digital infrastructure and facilities, software, and operations in order to preserve collaborative relationships.

Furthermore, organisations and professional associations associated with the maritime shipping industry have increased normative pressure on DT promotion and guidelines, encouraging businesses to adhere to professional standards in order to gain the trust of stakeholders and customers. Meanwhile, untransformed firms are facing enormous mimetic pressure in the maritime transportation sector as a result of the unpredictability of the COVID-19 outbreak as well as the

demonstrable effects of competitors' DT. The perspectives of a company's decision-makers on an external scenario will impact their decisions dependent on the source or degree of the pressure [4]. As a consequence, depending on institutional isomorphism, institutional forces and the external environment may dictate a company's DT [5].

In current age of modern technologies, it is impossible to discuss 'business in context' improvement without addressing terms like DT, digitalization, and digital technology automation. The integration of new technical jargons into various platforms of engagement has become commonplace in the marine business. Various industry professionals, scholars, researchers, and key international marine institutions are investigating how digitization may optimise existing procedures while opening up new business prospects, facilitating commerce, and transforming supply chains [6]. The impact of the Fourth Industrial Revolution is expected to be far-reaching and substantial across the entire maritime industry ecosystem, encompassing a broad spectrum of activities. These activities include core maritime sectors such as fishing, shipbuilding, shipping, ports, and offshore energy, tangential industries such as equipment manufacturing and financial services, and indirect activities like miscellaneous manufacturing and logistics services [7].

In order to remain in the current economy, businesses must employ new solutions based on sophisticated digital technology [8]. The term "digitalization" refers to the transition from old procedures characterized by analog technology to an era marked by digital technology and the automation of business operations [9]. In terms of digitalization, the marine industry is considered to lag behind other industries such as aviation, mining, and manufacturing. Despite the fact that industries like seaports, logistics, and shipbuilding are embracing shipping management, digitalization and automation is still considered a late adopter [10, 11]. During the COVID-19, almost all of the problematic processes in the global economies were highlighted, leading to a better understanding and realisation of the digitalization prospects.

Various sectors of the transportation business have been confronted with challenges and requests to modify their operations. Traditional corporate structures and practises were becoming obsolete and inefficient, they noticed [12]. When technology are used inefficiently, they make it impossible to optimize corporate operations [13]. Shipping firms must understand where they stand in context of digital transformation (digital Maturity) and be able to assess their digitalization status since businesses who adopt disruptive technology ahead of their competitors acquire a significant competitive advantage [14]. To remain competitive, an organization's digital maturity characterizes its preparedness and capacity to convert and accept technology advancements based on trends. Most research either concentrates on the DT of transportation as a whole, or looks at the trend of digitalization specifically in the maritime transportation sector. A significant gap exists in research and academic literature that provides a comprehensive examination of DT in the maritime transportation sector [15].

Based on the literature, most studies on DT or digital maturity seem to be researched [8]. Additionally, other researchers have found evidence that digitally evolved organizations outperform their competitors in several financial performance dimensions [16]. Many GCC nations are prioritizing DT as part of their government vision and goals. For instance, in Saudi Arabia, technology will play a crucial role as an enabling factor and driving force in the National Transformation Program within the framework of Vision 2030 [17]. The impact of innovation on the empirical connection between digital enablers, DT strategies, and the overall performance of small and medium-sized manufacturing enterprises in the United Arab Emirates has been investigated by Abudaqa et al. [18]. However, a few studies on the maturity of DT in the shipping industry can be found in the GCC countries. Hence, the main goal of this case study is to determine the DT maturity of companies in the GCC countries in shipping using a case study approach by selecting variables such as shipping methods, market operations, services offered, technology initiatives, and the company's objectives for technological advancement, extracted from information available on the companies' websites.

2. Methods

This research, which aims to explore the digital transformation maturity in the shipping industry process, is conducted within an explanatory research paradigm with focuses on three shipping companies based in GCC countries: Asyad, Clarion, and Yht Cargo. This case study focuses on the maturity of digital transformation in the shipping industry. With an exploratory approach, the aim of the research is to assess the level of digital transformation maturity among shipping companies in the GCC region. This study employs a qualitative, case study methodology [19]. Through this approach, the researcher aims to gain insights into relevant industry trends. For instance, the case study of Asyad shipping Transport Company can provide a generalizable perspective for similar companies in the shipping sector.

2.1. Data Collection

A group of maritime companies in the GCC was identified and information was gathered from three firms based in the region that were pursuing maturity in digital transformation in the shipping industry. These companies were compared based on various factors, which were derived from a comprehensive analysis of the companies, including: shipping methods, market operations, services provided, technological initiatives, and the company's goals for technological development.

The data were collected through the websites of these companies on the company's website. For exploratory data collection, company websites and Google searches can be useful sources [20, 21]. As previously stated, these items shipping methods, market operating, services provided, technological initiatives, and the company's goals for technological development have been extracted from the information available on the companies' websites. The latest data was obtained for the year 2022 and are shown in Table 1.

2.2. Data Analysis

The websites of all the selected companies were accessed and a comparison table was created using Microsoft Excel. A comparison was made between the companies to determine the maturity of digital transformation in the shipping industry

and which company had a more advanced level of digital maturity. Based on the analysis, several recommendations were derived through in-depth research.

2.3. Review of articles

Finally, a literature review is compiled from 8 papers published between 2020-2023 in international peer-reviewed journals or conference proceedings, obtained through a bibliographic search in the Scopus database. Bibliometric R software was used to conduct the bibliometric analysis [22]. In order to carry out bibliometric analysis for the current research field of digital transformation in the shipping industry, relevant articles were identified by extracting data from Scopus-indexed journals. The authors used the keyword “digital transformation in shipping” to retrieve articles and refined their search terms and filters to obtain the most pertinent articles. The obtained results were then interpreted and analyzed to draw conclusions in light of the research topic. Figure 1 presents a summary of the data collection procedure for the bibliometric analysis on digital transformation in shipping.

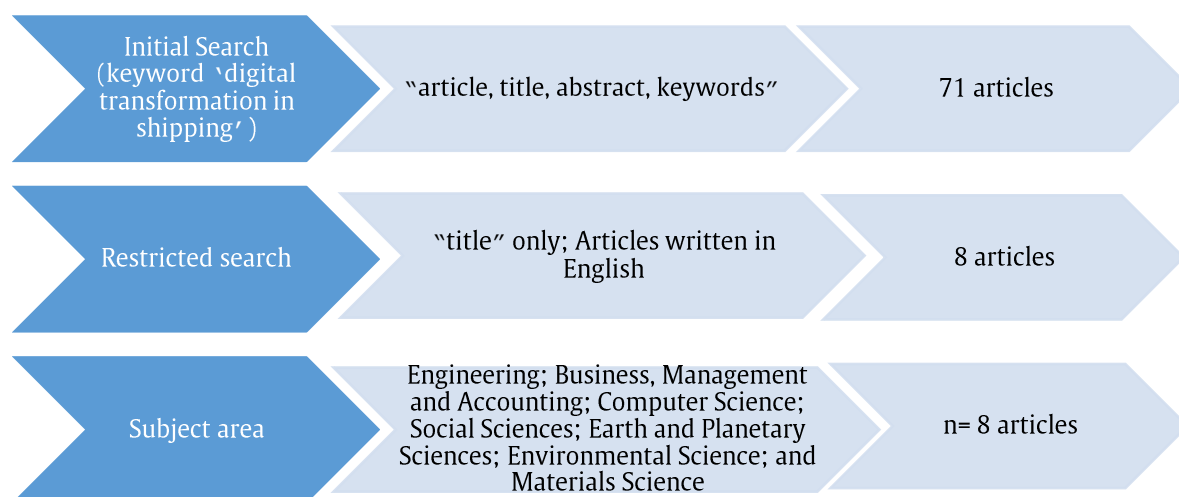


Figure 1. Data collection process

3. Results and Discussion

3.1. Case Study

Among the many available freight segments we chose the maritime shipping sector because of the lack of studies on it. In addition, due to the lack of awareness of the importance of digital transformation maturity in the shipping industry by some shipping companies¹. Maritime shipping is the oldest mode of transportation, with commercial cargo ships evolving over time into the massive commercial ships. In the past, given the historical significance of maritime commerce, several governments have developed merchant ship fleets to stress the freedom and ease with which their goods may be transported throughout the globe. During the last three decades, sea freight has become a popular trend for carrying out shipments. This is due to several reasons, including the better price compared to air freight. It also accommodates large quantities and needs a large space for heavy products such as machinery, equipment, cars, and others. In addition to the speed of delivery compared to land shipping. Wherefore, many large and medium companies have relied on sea freight because of its advantages, but with the passage of time it has become necessary to introduce technology into the world of sea freight to improve the quality of shipping and to gain more privileges to gain the continuity of companies to rely on sea freight more than before. According to [8], firms must adopt innovative solutions based on advanced digital technology to be competitive in the current market. That is because they recognized that traditional company structures and practices had become obsolete and ineffective [12]. The fundamental issue is that the firm lacks operational efficiency and so lacks a competitive edge due to a lack of technical and technological advancement. Furthermore, without the benefit of digital transformation, the shipping supply chain will be unable to continue collaborative communications and marketing. Companies who rely on the old way are under a lot of strain since they are unable to deal with a variety of issues, such as forecasting Covid-19. Furthermore, the firm will be unable to completely fulfill satisfy its clients as a result of their failure to perform their job in a timely and efficient manner, as well as their inability to track their orders. As a result, the greatest solution to these issues is for companies to continue to enhance their technology rather than rely on old ways. As digital technology and apps mature and integrate, they help companies achieve their objectives. Therefore of their adoption of such technology and applications, they will be able to help create the design of ships used for shipping, as well as improve the degree of safety, energy savings, and carbon reduction, so better safeguarding the maritime environment. In addition to their ability to carry out business more effectively, their ability to deliver goods with customs in real time aids in the removal of products from warehouses and the creation of more room for other products. It will also make it easier for the corporation to exchange ship navigation, and it will allow customers to follow shipments via the company's websites. Customers will also be able to complete

¹ <https://commons.wmu.se/>

transactions more quickly and will be more happy with the company's services. To confirm the veracity of this talk, we compare Clarion Shipping, Asyad and Yht Cargo and Logistic.

3.2. Overview of the companies

Clarion Shipping, located in Dubai, United Arab Emirates, is a global sea and air freight forwarder in addition to a multi-modal logistics and transportation service company. Through offices in the Sultanate of Oman (Muscat), Bahrain, Qatar (Doha), Saudi Arabia, Lebanon, and Djibouti, Clarion has built its own specialised market in the Middle East, East Africa, and the Gulf. Clarion's goal is to become one of world's leading shipping, forwarding, and logistics companies, providing full services and quality logistics solutions to customers all over the world through its operational systems and extensive network of own offices and agents². Clarion has worked on a variety of technological initiatives, including telecommunications, smoke detection, satellite phones, and routers. Given Clarion's significant expertise, it has the facilities and capability to adapt to its clients' demands while also providing a world-class experience. Technology is quickly changing and increasing in such a way that logistics service providers must be aware of and equipped with cutting-edge infrastructure in order to give the most efficient and adaptable services³.

Asyad Group offers unique freight forwarding services in the GCC by providing a complete logistics solution that is adaptable enough to satisfy both local and international businesses, whether they are already active in the Middle East and Africa market or wish to enter it. The group headed by Asyad consists of four businesses that provide supply and freight services such as: the Oman Rail Company, the Oman Shipping Company, the Oman Post Company, and the Oman Dry Dock Company. As a result of its diverse operations, Asyad is able to provide outstanding solutions to its international clients in the areas of transportation, freight forwarding, and shipment of goods by sea and land from point of arrival to point of delivery, warehousing services, integrated ship repair facilities, and an extensive rail network. Technology allows for a quick transition in logistics methods toward smart logistics by utilising novel platforms and systems of communication and integration via cutting-edge gadgets. Their aim is to research and develop new and dominant trends in logistics technology, showcase the best examples of the Sultanate's technological pioneers and assist them in their globalization efforts. It is keen to create partnerships with key companies and agencies in order to pilot and test these cutting-edge technology. Where it will aim to identify the best execution strategies and engage with key stakeholders to realise the Sultanate's national logistics technology objective⁴.

Yht Cargo and Logistic Company engaged in providing freight and logistics services. Work on marine shipping from China to Oman, Dubai, and South Africa is underway. They've been working in this industry for 17 years. In China, they have a number of warehouses. The work to earn client confidence by giving the greatest services at the most affordable costs⁵.

Table 1. Comparison between three Shipping Companies

	Asyad	Clarion	Yht Cargo and Logistic
Shipping methods	Sea, land and air freight	Sea, land and air freight	Sea
Market operating	Middle East, Africa, and Gulf	Middle East, East Africa, and South East Asia	From China to Dubai, Sultanate of Oman, and South Africa
Services provided	Asyad is able to provide outstanding solutions to its international clients in the fields of freight forwarding, transportation and delivery of goods by sea and land from point of receipt to point of delivery, and warehousing services, integrated ship repair facilities, and an extensive rail network.	Through its operating system and extensive network of its own offices and agents, it provides complete services and high-quality logistics solutions to customers around the world.	Working in the field of shipping from China to Dubai - Oman and South Africa. We have several warehouses in China.
Technological initiatives	Utilising novel platforms and systems of communication and integration via cutting-edge gadgets.	Telecommunications, smoke detection, satellite phones, and routers.	-
The company's goals for technological	Their aim is to research and develop new and dominant	Technology is quickly changing and increasing	-

² <https://www.uae-shipping.net/>

³ https://rocketreach.co/clarion-shipping-services-profile_b5c2b060f42e0edd

⁴ <https://asyad.om/ar/maritime/shipping-solutions>

⁵ https://yht-cargo-and-logistic.business.site/?utm_source=gmb&utm_medium=referral

development	trends in logistics technology, showcase the best examples of the Sultanate's technological pioneers and assist them in their globalization efforts.	in such a way that logistics service providers must be aware of and equipped with cutting-edge infrastructure in order to give the most efficient and adaptable services.
-------------	--	---

Source: The author and the websites of these companies ^{6, 7, 8, 9, 10, and 11}.

There are several distinctions between the three firms, as seen in the comparison. Asyad and Clarion Company has employed modern technologies in its work and aspires to continue to develop technology in order to realize its significance. However, because the Yht Cargo and Logistic Company did not rely on technology, we were not able to know enough information about it, but based on their website we were able to distinguish between it and other companies. As their website did not contain information that would make it easier for the customer to know the details, and this is the simplest thing that can be considered a technical development for the company. Thus, the company's lack of this feature confirms the lack of a digital transformation of the company.

3.3. Review results

Table 2 displays 8 documents from 8 distinct sources and 34 authors. The average year from publication is calculated by the bibliometric analysis software using the publication year information of the articles included in the dataset which shows 1.25 and the average number of citations per year per document is 0.3333. The timeframe covered is 2020 to 2023. There are no single-authored documents, but 34 authors contributed to the multi-authored documents. Table 2 provides further detail on the descriptive bibliometric analysis.

Table 2. Descriptive bibliometric analysis

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2020:2023
Sources (Journals, Books, etc)	8
Documents	8
Average years from publication	1.25
Average citations per documents	0.75
Average citations per year per doc	0.3333
References	368
DOCUMENT TYPES	
article	6
conference paper	2
DOCUMENT CONTENTS	
Keywords Plus (ID)	59
Author' s Keywords (DE)	41
AUTHORS	
Authors	34
Author Appearances	34
Authors of single-authored documents	0
Authors of multi-authored documents	34
AUTHORS COLLABORATION	
Single-authored documents	0
Documents per Author	0.235
Authors per Document	4.25

⁶ https://rocketreach.co/clarion-shipping-services-profile_b5c2b060f42e0edd

⁷ <https://asyad.om/ar/maritime/shipping-solutions>

⁸ https://yht-cargo-and-logistic.business.site/?utm_source=gmb&utm_medium=referral

⁹ <https://www.clarionshipping.com/industry/technology/>

¹⁰ <https://www.uae-shipping.net/>

¹¹ <https://commons.wmu.se/>

Co-Authors per Documents	4.25
Collaboration Index	4.25

The Table 3 summarizes the main findings from the 8 research articles on maturity of digital transformation in the shipping industry, including total citations (TC), TC per year, and normalized TC (NTC), a bibliometric indicator calculated by bibliometric analysis software, found in the Scopus database:

Table 3. Main research findings from previous studies

Authors	Title of the article	Name of the journal	Main findings	TC	TC per year	NTC
[23]	A contextual account of digital servitization through autonomous solutions: Aligning a digital servitization process and a maritime service ecosystem transformation to autonomous shipping	Industrial Marketing Management	They suggests that managing digital servitization (DS) through autonomous solutions requires the co-evolution of actors, stakeholders, and society in the service ecosystem, emphasizing the need for a systems perspective in DS management	3	1.5	3.75
[24]	Comparative analysis of blockchain technology to support digital transformation in ports and shipping	Journal of Intelligent Systems	Their study revealed that a notable move towards digitalizing ports and shipping, with an inclination to incorporate various technologies such as blockchain into existing port and shipping information management systems. Their study aimed at integrating technology into financial and document workflows, as well as enhancing device connectivity.	2	0.667	1.00
[25]	The effects of institutional pressures on shipping digital transformation in Taiwan	Maritime Business Review	Coercive and mimetic pressure are the fundamental causes of digital change. Competitors are gradually undertaking digital transformation and are becoming more well-known to customers, which is another constructive and significant source of pressure for shipping. In order to lead the maritime shipping sector, associations and professional shipping companies must stay abreast of the trend against DT and present guidelines and recommendations that can be followed. The advantages could be delivered in a big way by DT (i.e. improve efficiency, relationship with customers and sustainability)	1	0.5	1.25
[26]	Digital transformation of maritime logistics: Exploring trends in the liner shipping segment	Computers in Industry	Compared to other sectors like media, telecom, banking, retail and other modes of transportation, the shipping industry, which tends to be family-owned and operates on a network-based system, has been slow in embracing new innovations and is traditionally cautious in its adoption of advancements	0	0	0

[27]	Determinants of Digital Transformation in Container Shipping Lines: A Theory Driven Approach	Maritime Policy & Management	Among the critical success factors, organizational competency ranks as the highest, followed by technology adoption, stakeholders' expectations, and individual motivation	0	0	0
[28]	Implementing Vital Dynamic Capabilities to Succeed in Digital Transformation: A Multiple-Case Study in Maritime Container Shipping	IEEE Transactions on Engineering Management	The results emphasize that strategic agility, innovation ecosystems, and the restructuring of organizational structures are the most crucial secondary concepts for succeeding in DT in the maritime container shipping. Incorporating these key concepts into the sector is of great strategic importance and will drive the transformation of the maritime container shipping into a digitalized, efficient, and sustainable entity that prioritizes customer-centric service offerings	0	0	0
[29]	Optimization of Digital Transformation in Shipping	In OCEANS 2022-Chennai	Enabling real-time data exchange among all vessels, equipment and locations will equip crews with the ability to make effective management and optimization decisions for not just their individual ship but for the entire fleet. The growing demand for real-time data collection and analysis, driven by both regulatory and non-regulatory factors, calls for secure and trustworthy data exchange. To enhance fuel efficiency, shipping operators must find new ways to collaborate between ship and shore and adopt innovative technologies that promote standardization, integration and communication of maritime data. Robust and adaptable connectivity will help maritime shipping organizations overcome new challenges and proactively drive transformational changes that boost efficiency and profitability in the long term	0	0	0
[30]	Capability management in digital enterprises	Springer charm	Efficiently designed and operated modern information systems can deliver significant business value and serve as key drivers for business success, especially for purely online or digital enterprises	0	0	0

The literature review emphasizes the importance of digital transformation in the shipping industry, but also points out the limited awareness in the sector. The level of digital transformation maturity in shipping companies in GCC countries in areas such as shipping methods, market operations, services offered, technology initiatives, and the company's goals for technological advancement is not well documented. These challenges are particularly prevalent in the shipping industry, indicating a high level of barriers to digital transformation in this sector.

4. Conclusion

In many areas of life, the impact of digital transformation is becoming more apparent. Digital transformation is so important in the future scenario of shipping companies that many companies have started or have recruited management roles to accommodate this transformation. Digitalization is already changing the operations and strategies of shipping companies. The main goal of this case study is to determine the digital transformation maturity of companies in the GCC countries in shipping. This study follows a qualitative, case study approach. We compared three shipping companies in GCC

countries: Clarion Shipping, Asyad, and Yht Cargo and Logistics. There are several distinctions in technologies between the three firms, as seen in the comparison. With the passage of time it has become necessary to introduce technology into the world of sea freight to improve the quality of shipping and to gain more privileges to gain the continuity of companies to rely on sea freight more than before. So the biggest solution to these problems is for companies to keep improving their technology, rather than relying on the old ways. As digital technologies and applications mature and integrate, they can help companies achieve their goals. As a result of these technologies and applications, they will be able to help create ship designs for shipping and improve safety, energy efficiency and carbon reduction to better protect the marine environment. In addition to being able to conduct business more efficiently, their ability to deliver goods in real-time with customs helps get products out of warehouses and create more space for other products. It will also make it easier for companies to exchange ship navigation and allow customers to track shipments through the company's website.

Shipping is a component of the supply chain ecosystem, and digital integration distinguishes the firms that will compete in the market in the future. This study directly contributes to previous research on the maturity of digital transformation in the maritime research sector. The current status of digital maturity in shipping cannot be accurately quantified, and the scarcity of research publications shows that study into digital maturity in shipping is still in its early stages. On the basis of this study, the researchers suggest that future research should focus on the digital transformation of shipping companies in different industries. According to the research, GCC nations should expand digitization and examine the systems of shipping companies. Future studies should include interviews with senior executives from shipping companies. Also, Increasing the logistical capabilities of international shipping companies has a direct impact on increasing the market share and achieving competitive advantage through some logistical activities that are uniquely provided to customers. Additionally, advances and developments in logistics are based on technologies based on intelligent transportation systems that use computers, electronics, communications, and controls to address many of the challenges faced by maritime transportation systems, such as using intelligent transportation systems to obtain information about performance, weather conditions, and port congestion and integrate all of these information is provided to users of smart applications to improve freight levels, improve operational efficiency, improve safety and reduce energy consumption, thereby increasing the efficiency of maritime transport organizations

Websites

https://rocketreach.co/clarion-shipping-services-profile_b5c2b060f42e0edd
<https://asyad.om/ar/maritime/shipping-solutions>
https://yht-cargo-and-logistic.business.site/?utm_source=gmb&utm_medium=referral
<https://www.clarionshipping.com/industry/technology/>
<https://www.uae-shipping.net/>
<https://commons.wmu.se/>

References

- [1] D. H. Alahmadi, F. A. Baothman, M. M. Alrajhi, F. S. Alshahrani, and H. Z. Albalawi, "Comparative analysis of blockchain technology to support digital transformation in ports and shipping", *Journal of Intelligent Systems*, vol. 31, no. 1, pp. 55-69, 2021, <https://doi.org/10.1515/jisys-2021-0131>.
- [2] L. Heilig, S. Schwarze, and S. Voß, "An analysis of digital transformation in the history and future of modern ports", In *Proceedings of the 50th Hawaii International Conference on System Sciences*; 2017, <http://hdl.handle.net/10125/41313>.
- [3] H. M. Kuo, T. L. Chen, and C. S. Yang, C. S., "The effects of institutional pressures on shipping digital transformation in Taiwan", *Maritime Business Review.*, vol. 7, no. 2, pp. 175-191, 2022, <https://doi.org/10.1108/MABR-04-2021-0030>.
- [4] Z. Zhu, S. and Lin, "Understanding entrepreneurial perceptions in the pursuit of emerging e-business opportunities: the dimensions and drivers", *Computers in Human Behavior*, vol. 95, June, pp. 252-261, 2019, <https://doi.org/10.1016/j.chb.2018.02.015>.
- [5] B. Hinings, T. Gegenhuber, and R. Greenwood, "Digital innovation and transformation: an institutional perspective", *Information and Organization*, vol. 28, no. 1, pp. 52-61, 2018, <https://doi.org/10.1016/j.infoandorg.2018.02.004>.
- [6] UNCTAD, "Digitalization in Maritime Transport: Ensuring Opportunities for Development", UNCTAD Policy Brief No. 75, 2019, (UNCTAD/PRESS/PB/2019/4).
- [7] G. Aiello, A. Giallanza, and G. Mascarella, "Towards Shipping 4.0. A preliminary gap analysis", *Procedia Manufacturing*, vol. 42, pp.24-29, 2020, <https://doi.org/10.1016/j.promfg.2020.02.019>.
- [8] Y. Eremina, and J. L. Natalja. Bistрова, "Digital Maturity and Corporate Performance : The Case of the Baltic States", *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 5, no. 3, p.54, 2019, <https://doi.org/10.3390/joitmc5030054>
- [9] J. Bloomberg, "Digitization, Digitalization, and Digital Transformation: Confuse Them At Your Peril", *Forbes*, pp. 1–6, 2018.
- [10] M. Fruth and F. Teuteberg, "Digitization in maritime logistics—What is there and what is missing?," *Cogent Business & Management*, vol. 4, no. 1, p. 1411066, Jan. 2017, doi: 10.1080/23311975.2017.1411066
- [11] S. K. Rakoma, "A review of digital maturity models for shipping companies", *World Maritime University Dissertations*, p1734, 2021.

- [12] E. M. Medyakova, N. A. Kislitskaya, S. G. Kudinova, and V. A. Gerba, " COVID-19 as a trigger for global transport infrastructure digitalization," *IOP Conference Series: Materials Science and Engineering*, vol. 918, no. 1, p. 012227, Sep. 2020, doi: 10.1088/1757-899x/918/1/012227.
- [13] M. Jović , E. Tijan, S. Aksentijević , and B. Sotoš ek, " The role of electronic transportation management systems in seaport digitalization" , *32nd Bled EConference Humanizing Technology for a Sustainable Society, BLED 2019 - Conference Proceedings*, December, pp. 1– 15, 2020, <https://aisel.aisnet.org/bled2019/60>.
- [14] C. S. Yang, " Maritime shipping digitalization: Blockchain-based technology applications, future improvements, and intention to use" , *Transportation Research Part E: Logistics and Transportation Review*, vol. 131(July), 108– 117, 2019, <https://doi.org/10.1016/j.tre.2019.09.020>.
- [15] E. Tijan, M. Jović , S. Aksentijević , S. and A. Pucihar, " Digital transformation in the maritime transport sector" , *Technological Forecasting and Social Change*, vol. 170, no. 120879, 2021, <https://doi.org/10.1016/j.techfore.2021.120879>
- [16] R. Teichert, " Digital Transformation Maturity: A Systematic Review of Literature" , *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, vol. 67, no. 6, pp. 1673– 1687, 2019, doi 10.11118/actaun201967061673
- [17] M. Al-Ruithi, E. Benkhelifa, and K. Hameed, " Key issues for embracing the cloud computing to adopt a digital transformation: A study of saudi public sector" , *Procedia computer science*, vol. 130, pp. 1037-1043, 2018, <https://doi.org/10.1016/j.procs.2018.04.145>
- [18] A. Abudaqa, R. A. Alzahmi, H. Almujaeni, and G. Ahmed, " Does innovation moderate the relationship between digital facilitators, digital transformation strategies and overall performance of SMEs of UAE," *International Journal of Entrepreneurial Venturing*, vol. 14, no. 3, p. 330, 2022, doi: 10.1504/ijev.2022.124964.
- [19] P. Baxter, and S. Jack, " Qualitative case study methodology: Study design and implementation for novice researchers" , *The qualitative report*, vol. 13, no. 4, pp. 544-559, 2008.
- [20] M. M. Thottoli, and K. V. Thomas, " The impact of web marketing on corporate social responsibility (CSR) and firms' performance", *Rajagiri Management Journal*, vol. 17, no. 1, pp. 37-51, 2023, <https://doi.org/10.1108/RAMJ-03-2021-0022>.
- [21] M. M. Thottoli, and F. N. Al Harthi, "Corporate branding and firm performance: a study among Oman hotel industry", *Arab Gulf Journal of Scientific Research*, vol. 40, no. 3, pp. 214-234, 2022, <https://doi.org/10.1108/AGJSR-04-2022-0035>
- [22] M. Aria, and C. Cuccurullo, " bibliometrix: An R-tool for comprehensive science mapping analysis" , *Journal of informetrics*, vol. 11, no. 4, pp.959-975, 2017, <https://doi.org/10.1016/j.joi.2017.08.007>.
- [23] H. Makkonen, S. Nordberg-Davies, J. Saarni, and T. Huikkola, " A contextual account of digital servitization through autonomous solutions: Aligning a digital servitization process and a maritime service ecosystem transformation to autonomous shipping," *Industrial Marketing Management*, vol. 102, pp. 546– 563, Apr. 2022, doi: 10.1016/j.indmarman.2022.02.013.
- [24] D. H. Alahmadi, F. A. Baothman, M. M. Alrajhi, F. S. Alshahrani, and H. Z. Albalawi, " Comparative analysis of blockchain technology to support digital transformation in ports and shipping," *Journal of Intelligent Systems*, vol. 31, no. 1, pp. 55– 69, Dec. 2021, doi: 10.1515/jisys-2021-0131.
- [25] H.-M. Kuo, T.-L. Chen, and C.-S. Yang, " The effects of institutional pressures on shipping digital transformation in Taiwan," *Maritime Business Review*, vol. 7, no. 2, pp. 175– 191, Sep. 2021, doi: 10.1108/mabr-04-2021-0030.
- [26] Z. Raza, J. Woxenius, C. A. Vural, and M. Lind, " Digital transformation of maritime logistics: Exploring trends in the liner shipping segment," *Computers in Industry*, vol. 145, p. 103811, Feb. 2023, doi: 10.1016/j.compind.2022.103811.
- [27] K. F. Yuen, L. Y. Koh, J. H. Fong, and X. Wang, " Determinants of Digital Transformation in Container Shipping Lines: A Theory Driven Approach," *Maritime Policy & Management*, pp. 1– 16, Oct. 2022, doi: 10.1080/03088839.2022.2139420.
- [28] A. J. Wohlleber, M. Bock, H. Birkel, and E. Hartmann, " Implementing Vital Dynamic Capabilities to Succeed in Digital Transformation: A Multiple-Case Study in Maritime Container Shipping," *IEEE Transactions on Engineering Management*, pp. 1– 19, 2022, doi: 10.1109/tem.2022.3201770
- [29] C. Karunasena, R. Widyalankara, P. Sedrick, S. M. Disanayaka, H. Perera and P. Medagama, " Optimization of Digital Transformation in Shipping. In *OCEANS 2022-Chennai*, pp. 1-5, IEEE, Feb, 2022, DOI: 10.1109/OCEANSChennai45887.2022.9775264.
- [30] K. Sandkuhl and J. Stirna, (Eds.), *Capability management in digital enterprises*, no 1, Cham: Springer, 2018, DOI: <https://doi.org/10.1007/978-3-319-90424-5>.