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THE ENFORCEMENT AND CHALLENGES TO MARITIME CLAIMS IN A DIGITAL ERA

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Abstract

The rapid digitalization of the global maritime industry has significantly transformed the enforcement of maritime claims and the protection of mortgage interests in contemporary admiralty practice. Technological innovations such as electronic bills of lading, digital ship registries, block-chain transactions, automated shipping systems, and electronic payment platforms have improved efficiency in maritime commerce while simultaneously creating new legal and procedural challenges for mortgagees. The paper examined the enforcement of maritime claims by ranking and the emerging challenges confronting mortgagees in the digital era. The authors analysed the traditional hierarchy of maritime claims, including maritime liens, statutory claims, and registered ship mortgages, and evaluated how digital technologies influenced the enforcement and prioritization of such claims. Particular attention was given to issues relating to cyber-security threats, digital fraud, electronic documentation, cross-border jurisdictional disputes, and the recognition of digitally created security interests. The authors explored the adequacy of existing admiralty laws in addressing disputes arising from digital shipping operations and virtual maritime transactions. Adopting a doctrinal and comparative legal methodology, the paper relied on international conventions, statutes, judicial authorities, and scholarly literature. The paper maintained that while digitalization enhanced efficiency in maritime transactions, inadequate legal harmonization and weak regulatory frameworks exposed mortgagees to increased enforcement risks. The paper therefore concluded that recommending comprehensive legal reforms, digital regulatory standards, and stronger international cooperation ensured effective maritime claim enforcement in the evolving digital maritime environment.

Keywords: Maritime Law, Ship Mortgages, Maritime Claims Ranking, Digital Maritime Enforcement Terms and conditions of access and use can be found at <https://www.kbsjournals.com/index.php/kblsp>

1. Introduction

The maritime industry remains one of the most significant sectors of the global economy, facilitating international trade, transportation of goods, offshore energy operations, and commercial shipping activities across jurisdictions.¹ Over the years, the enforcement of maritime claims has evolved as an essential aspect of admiralty law aimed at protecting the rights and interests of parties engaged in maritime commerce. Maritime claims generally arise from disputes connected with ship ownership, carriage of goods, marine insurance, crew wages, salvage operations, collision damages, port services, and ship financing transactions². In situations involving multiple competing claims against a vessel, maritime law establishes a ranking or priority system that determines the order in which claimants are entitled to satisfaction from the proceeds of judicial sale or enforcement proceedings. This ranking system is particularly important in relation to ship mortgages, which constitute major security instruments in maritime financing.

Ship mortgages play a vital role in the shipping industry because ship acquisition and maintenance require substantial capital investment. Financial institutions and lenders often provide credit facilities to shipowners on the security of registered mortgages over vessels³. In the event of default, mortgagees are entitled to enforce their proprietary interests through admiralty procedures such as ship arrest and judicial sale. However, the enforcement of mortgage rights is frequently complicated by the existence of competing maritime claims that may rank ahead of registered ship mortgages. Maritime liens relating to crew wages, salvage claims, port charges, collision damages, and environmental liabilities are often accorded superior priority over mortgage interests. Consequently, mortgagees may encounter significant financial and legal risks during enforcement proceedings.

In recent years, the maritime industry has undergone rapid digital transformation through the integration of advanced technologies into shipping operations, maritime trade

¹ Jean-Paul Rodrigue et al, (2019), *Ports, Maritime Shipping and International Trade*, in *Port Economics, Management and Policy*, pp.1-10

² B. Francesco., (2016), *Enforcement of Maritime Claims*. In *The IMLI Manual on International Maritime Law: Volume II: Shipping Law*, Oxford University Press, p. 529–550

³ Grammenos, (2010), chapters on shipping finance and ship mortgage lending, p. 733–735)

documentation, logistics management, and financial transactions. Novelties such as electronic bills of lading, blockchain technology, automated ship management systems, digital ship registries, artificial intelligence, and electronic payment systems have significantly improved efficiency and transparency in maritime commerce.⁴ Nevertheless, these technological developments have also introduced new legal complexities and enforcement challenges within admiralty law. The emergence of cyber risks, digital fraud, electronic asset manipulation, data breaches, and jurisdictional uncertainties has altered the traditional framework governing maritime claims and ship mortgage enforcement.

The digitalization of maritime commerce has raised critical legal questions regarding the recognition, authentication, and enforceability of electronic shipping documents and digital security interests. In many jurisdictions, existing admiralty laws were developed primarily for conventional maritime transactions and may not adequately address disputes arising from digital shipping operations. The increasing use of blockchain-based transactions and electronic registries also creates uncertainty concerning the perfection and priority of maritime security interests⁵. Furthermore, the transnational nature of digital maritime commerce complicates issues relating to jurisdiction, conflict of laws, recognition of electronic evidence, and enforcement of foreign judgments across multiple jurisdictions.

Another concern in the digital era is maritime cyber-security. Shipping companies, ports, logistics operators, and financial institutions have become increasingly vulnerable to cyber-attacks, ransom-ware incidents, and unauthorized access to sensitive commercial information. Cyber-security breaches may disrupt shipping operations, compromise digital mortgage records, interfere with electronic payment systems, and create difficulties in tracing ownership and enforcement of rights.

⁴ S. Shin, et al, (2024). *Blockchain application in maritime supply chain: A systematic literature review and conceptual framework*. *Maritime Policy & Management*, 51(6), 1062–1095.

⁵ T. Krebs, (2024), *Electronic bills of lading, transnational and English law: Blocking the blockchain?* *Uniform Law Review*, 28(3–4), 323–338. <https://doi.org/10.1093/ulr/unad022>

The ranking of maritime claims has also become more complex in the digital environment. Courts and maritime regulators are increasingly confronted with disputes involving electronically generated claims, digital cargo documentation, automated contractual systems, and cross-border electronic transactions.⁶ Questions frequently arise concerning the evidentiary validity of digital records, the priority of electronically registered mortgages, and the legal status of claims arising from autonomous or technologically assisted shipping operations. In the absence of harmonized international legal standards governing digital maritime transactions, inconsistencies in national laws may further complicate enforcement proceedings and create uncertainty for lenders and maritime investors.⁷ As a matter of fact, digital security in maritime regime accommodates the protection of ships, ports, offshore installations, cargo systems, and maritime communication networks from cyber threats, digital interference, and unauthorized access. It has become a central issue in modern shipping due to the increasing reliance on digital technologies for navigation, cargo handling, engine control, communication, and maritime finance systems. The scope of digital security in maritime covers the safeguarding of interconnected systems used in the maritime industry, including electronic chart display and information systems, automatic identification systems, satellite communications, port management software, and integrated ship control systems. It also extends to digital platforms used in shipping documentation such as electronic bills of lading, block-chain-based registries, and maritime finance systems.

2. Theory, nature and scope of maritime claims

A leading authority on admiralty and maritime law conceptualises maritime claims as rights of action arising out of maritime transactions or occurrences that are sufficiently connected to maritime activity to justify the exercise of admiralty jurisdiction. According to him, maritime claims are not limited to physical injuries or vessel-related disputes but extend to a wide range of commercial and contractual obligations, including carriage of goods by sea, maritime contracts, marine insurance disputes, and claims arising from ship

⁶ Paul Todd, (2020), Electronic bills of lading, blockchains and smart contracts. *International Journal of Law and Information Technology*, 27(4), 339–371

⁷ Thomas Krebs. (2024). Electronic bills of lading, transnational and English law: Blocking the blockchain? *Uniform Law Review*, 28(3–4), 323–338.

services.⁸ Schoenbaum emphasizes that the defining feature of a maritime claim is its nexus to maritime commerce and navigation, rather than the location where the dispute arises. He further explains that maritime claims are enforceable through specialized admiralty procedures, particularly actions in rem against the vessel, which reflect the unique character of maritime law where the ship itself is treated as a legal entity for liability purposes. A renowned maritime law scholar defines maritime claims more functionally as claims arising from activities involving ships, shipping operations, or maritime commerce that give rise to rights enforceable against a vessel or its owners under admiralty law.⁹ Maritime claims are deeply tied to the concept of maritime liens and privileges, which attach to a vessel and travel with it irrespective of ownership changes. According to Tetley, maritime claims include both contractual and tortious obligations, such as salvage, towage, collision damage, crew wages, and supply of necessities, and are distinguished by their enforcement through specialized maritime remedies like arrest and judicial sale.

In respect of the judicial concept of maritime claims within Maritime Law has been developed through case law in admiralty courts, where judges have consistently emphasized that maritime claims are those claims sufficiently connected to maritime activity to justify the exercise of admiralty jurisdiction and enforcement against a vessel. Judicial authorities generally treat maritime claims as claims enforceable in rem against a ship, meaning that the vessel itself is regarded as the defendant in proceedings. This principle reflects the long-standing admiralty doctrine that “the ship is a legal person” capable of bearing liability independently of its owner.

A leading judicial approach is found in case of *The Bold Buccleugh*¹⁰ where the court recognized that a maritime lien is a privileged claim upon a ship arising from services rendered or damages caused, which travels with the vessel regardless of ownership changes. This case established that maritime claims are not merely personal claims against ship-owners but proprietary claims attached to the vessel itself. Similarly, courts

⁸ Thomas J. Schoenbaum, (2019), *Admiralty and Maritime Law*, 6th ed. St. Paul, MN: West Academic Publishing, p.411-443,

⁹ Tetley, W, (1998), *Maritime Liens and Claims*, 2nd ed, Montreal International shipping pub, p. 59–60

¹⁰ *Harmer v. Bell (The Bold Buccleugh)* (1851) 7 Moo, P.C. 267, 13 E.R. 884 (P.C.)

in common law jurisdictions have consistently held that maritime claims arise from maritime transactions or occurrences connected with navigation and commercial use of ships, including collisions, salvage, towage, crew wages, carriage of goods, and supply of necessities. In the case *Executive Jet Aviation, Inc. v City of Cleveland*,¹¹ it was clarified that maritime tort jurisdiction requires not only locality but also a significant relationship to traditional maritime activity, reinforcing the direct maritime character requirement for tort claims. Judicial interpretation extends the concept to include both contractual and tortious obligations, provided they have a direct maritime character.

The enforcement of maritime claims refers to the set of legal mechanisms through which a claimant secures satisfaction of obligations arising out of maritime transactions, particularly those connected with the operation, navigation, and commercial use of ships. Because vessels are inherently mobile and frequently move across jurisdictions, admiralty law developed specialised procedures that ensure claims can be effectively pursued even when the ship-owner is absent or beyond reach.

In Nigerian jurisprudence, courts interpreting the Admiralty Jurisdiction Act and exercising jurisdiction under admiralty law have affirmed that maritime claims are enforceable through arrest and judicial sale of vessels. The Federal High Court has repeatedly emphasized that the essence of maritime claims lies in their enforceability against the *res* that is, the ship, and their connection to maritime commerce rather than land-based transactions. Judicial authority reinforcing this principle can be seen in *M.V. Caroline Maersk v Nokoy Investment Ltd*,¹² where the Federal High Court affirmed that admiralty jurisdiction is fundamentally concerned with claims that attach to the ship as security, and that the arrest of the vessel is central to the enforcement of maritime rights, distinguishing such claims from ordinary civil or land-based disputes. The case arose from a dispute under the carriage of goods by sea, where frozen shrimps were shipped from Lagos to Spain and allegedly deteriorated during transit. The Supreme Court considered issues relating to carrier liability, limitation of liability under the Hague Rules, and the proper assessment of damages in maritime transport contracts. The appeal

¹¹ 409 U.S. 249 (1972)

¹² (2002) 12 NWLR (Pt. 782) 472; (2002) 6 SCNJ 208; (2002) 10 NSCQR 1303

originated from the Federal High Court, was affirmed by the Court of Appeal, and on appeal to the Supreme Court. The court came to the conclusion, set aside the damages awarded and remitted the case to the Federal High Court for proper reassessment of quantum, taking into account the Hague Rules limitation and any further evidence necessary to determine the applicable gold value conversion mechanism. Judicial decisions also distinguish maritime claims from ordinary civil claims by highlighting the availability of special remedies such as ship arrest, security for release, and priority ranking upon judicial sale. In *The Banco and other Vessels*,¹³ the English Court of Appeal reaffirmed that arrest of a ship is a distinctive admiralty remedy designed to secure maritime claims and ensure that the vessel stands as security for satisfaction of judgment, distinguishing admiralty actions from ordinary civil execution processes.

In Nigerian law, this distinction is reinforced by the Admiralty Jurisdiction Act 1991¹⁴ which expressly empower the Federal High Court to order arrest of vessels and detention until adequate security is provided for release. The statute also contemplates the enforcement of maritime claims through judicial sale and distribution of proceeds according to established priority rules. The Federal High Court has applied these principles in cases such as *Owners of the MV Araujo v. Sifax Nigeria Ltd*¹⁵ where the court emphasized that arrest of a vessel is not merely procedural but a substantive maritime security device, and that priority of claims upon judicial sale is a defining feature of admiralty jurisdiction that differentiates it from ordinary civil litigation. Courts further stress that maritime claims are governed by equitable principles aimed at balancing competing interests of lien holders, mortgagees, and unsecured creditors.

Maritime claims constitute rights of action arising from maritime transactions, shipping operations, and maritime-related obligations. These claims include both proprietary and non-proprietary claims enforceable in rem against a vessel. In the digital era, maritime claims increasingly originate from electronically generated transactions such as digital charter-parties, electronic bills of lading, block-chain-based freight contracts, and

¹³ The “Banco” and Other Vessels [1971] 1 Lloyd’s Rep 230

¹⁴ Sections 5–6, Admiralty Jurisdiction Act 1991, now LFN 2020

¹⁵ (2019) SC.417/2015,

automated shipping platforms. The digitalization of maritime commerce has expanded the scope of maritime claims while also altering the evidentiary and procedural foundations of enforcement. Significantly, there is need to consider the associated hierarchies of enforcement inclusive of administrative or court-related expenses, such as costs of arrest, custody, and judicial sale of the vessel. These are followed by maritime liens, which typically include claims for seafarers' wages, salvage operations, collision damages, and sometimes pollution-related liabilities. Maritime liens are given high priority because they arise directly from services rendered to or harm caused by the vessel. The hierarchy of maritime claims is the order in which competing claims against a vessel are satisfied from the proceeds of a judicial sale or enforcement of the ship (*res*). Although exact ranking may vary slightly across jurisdictions, common law admiralty systems including English, Nigerian, and general international practice influenced by maritime conventions and case law follow a broadly consistent structure. At the top of the hierarchy are claims secured by maritime liens, because these attach to the vessel itself and follow the ship regardless of ownership. The highest priority is usually given to salvage claims, reflecting the policy of encouraging preservation of life and property at sea¹⁶. Closely following are wages of seafarers, which are strongly protected due to the vulnerable position of crew members and the necessity of maintaining maritime labour. Next in order are typically claims arising from collision damage and other tort-based maritime liens, which compensate for loss or damage caused by the vessel's operation. After these come certain statutory or possessory liens depending on the jurisdiction.

After mortgages, statutory claims and general maritime claims such as claims for necessities supplied to the vessel bunkers, repairs, provisions are considered. These are often enforceable in rem but do not usually enjoy lien status unless elevated by statute. At the bottom of the hierarchy are unsecured ordinary civil claims, which are paid only if any surplus remains after satisfaction of higher-ranking maritime claims. In practical terms admiralty enforcement, is that, once a vessel is arrested and sold, the court distributes proceeds in this structured order to ensure fairness and predictability, especially where the value of the vessel is insufficient to satisfy all creditors. This

¹⁶ Lief Bleyen, (2016), *Judicial Sales of Ships: A Comparative Study*, 1st ed., Springer International Publishing, pp.125–152

ranking reflects a balance between protecting essential maritime interest crew, salvage, safety and preserving commercial security for lenders and suppliers.

In fact, a generally accepted hierarchy in common law admiralty practice includes the following:

- i. *Custodia legis* expenses- that is court costs, marshal's expenses, and costs of preserving and selling the vessel.
- ii. Seafarers' wages and employment-related claims.
- iii. Salvage and general average claims.
- iv. Maritime tort claims (collision, personal injury, death, property damage)
- v. Maritime liens generally.
- vi. Preferred ship mortgages
- vii. Claims for necessities and other statutory rights in rem
- viii. Ordinary unsecured creditors and non-maritime claims.

3. Framework on Maritime claims

Furthermore, it is pertinent to consider the enforcement mechanisms for maritime claims refer to the legal procedures and remedies available to a claimant to secure or recover satisfaction of a maritime debt or right against a vessel, its owner, or related maritime assets.¹⁷ These mechanisms are unique because maritime law treats ships as independent legal objects of liability the *res*, allowing direct action against the vessel itself.

Action in Rem: An Action *in rem* is a distinctive admiralty procedure whereby legal proceedings are brought directly against a maritime property, the *res*, usually a ship, rather than against its owner personally. The action treats the vessel itself as the defendant and allows a claimant to enforce a maritime claim by arresting the ship and, if necessary, having it sold by court order to satisfy the claim. An action in rem is the primary enforcement mechanism in admiralty law. It allows a claimant to proceed directly against the vessel rather than the ship-owner personally. The ship is treated as the defendant, and the court may exercise jurisdiction over it once it is within its territorial waters. This mechanism is especially useful where the owner is a foreigner or difficult to locate.

Ship Arrest: In legal terms, it is the judicial seizure of a ship by order of an admiralty court as security for a maritime claim, the vessel is prevented from sailing until adequate security is provided or the dispute is resolved. The arrest is directed against the vessel

¹⁷ Sarah C. Derrington., et al., *The Law and Practice of Admiralty Matters*, 2nd ed., OUP, p. 299–320

itself *the res*, rather than solely against the ship-owner, reflecting the unique character of maritime law where the ship is treated as a juridical asset liable for maritime obligations¹⁸. Ship arrest is the most widely used enforcement remedy. It involves the detention of a vessel by court order to secure a maritime claim. Once arrested, the ship cannot sail until security is provided or the dispute is resolved.¹⁹ In the case of *The Banco* (*The Monte Ulia v The Banco*)²⁰ one of the most cited authorities on ship arrest under the 1952 Arrest Convention. Arrest is often used to compel payment or ensure availability of the vessel for judgment satisfaction. The *S.S. Lotus Case* (*France v Turkey*).²¹ Although not a ship arrest case in the commercial sense, it is a leading international authority confirming wide state jurisdiction over maritime matters. In the Nigerian case of *MV Angara v Chrismatel Shipping Co Ltd.*,²² the Court of Appeal held that the purpose of arrest is to obtain security for judgment.

Judicial Sale of Vessel: A judicial sale of a vessel is the sale of a ship conducted under the authority and supervision of an admiralty court following its arrest in proceedings *in rem*, for the purpose of converting the vessel into a monetary fund from which maritime claims are satisfied according to their legal priority. In admiralty law, the vessel is first arrested as security for a maritime claim. If the claim is established or adequate settlement is not provided, the court may order the sale of the ship. The sale is not a private commercial transaction but a compulsory court-ordered disposal of the *res*, carried out to extinguish all existing claims against the vessel and transfer title to the purchaser free from prior encumbrances. If the claim is not satisfied after arrest, the court may order a judicial sale of the vessel. The ship is sold under court supervision, and the proceeds are distributed among claimants according to the established ranking of maritime claims. This process extinguishes prior encumbrances and transfers clean title to the purchaser.

¹⁸ See Article (1-2), International Convention Relating to the Arrest of Sea-Going Ships 1952. See also Section 5, (1-5), Admiralty Jurisdiction Act 1991

¹⁹ (1971) 1 All ER 524; [1971] P 137 (CA)

²⁰ [1971] P 137 (CA)

²¹ (PCIJ, 1927)

²² (2001) 8 NWLR (Pt 716) 685 (CA)

Security undertaking: Security for release of a ship means the financial or legal guarantee provided by a ship-owner or relevant party to an admiralty court as a condition for obtaining the release of an arrested vessel from detention. It operates as substitute for the ship itself, thereby ensuring that sufficient funds or assurance is available to satisfy a maritime claim if the claimant succeeds. In admiralty jurisdiction or practice, once a vessel is arrested to secure a maritime claim, it may be detained as the *res*, the subject matter of the action. However, to avoid disruption to maritime trade, courts allow the ship to be released if the owner provides adequate security, such as a bank guarantee, bail bond, letter of undertaking from a protection and indemnity club, or other approved financial assurance. The purpose of security for release is to replace the arrested vessel as the fund available to satisfy judgment, thereby balancing the claimant's right to security with the ship-owner's interest in continuing commercial operations by the ship-owner, provided the ship-owner provides adequate security, such as a bank guarantee or bail bond.

Attachment and Freezing Orders: Attachment and freezing orders are court-ordered interim remedies used to preserve assets pending the determination of a legal or maritime claim, by preventing a defendant from disposing of, removing, or dealing with property that may be needed to satisfy a future judgment. An attachment order is a judicial directive authorising the seizure or detention of specific property belonging to a defendant, including in maritime contexts where assets such as ships or cargo may be attached to secure a maritime claim. It operates to bring the property under the control of the court so that it remains available to satisfy any eventual judgment. While a freezing order also known in common law jurisdictions as a *Mareva injunction*²³ is an equitable remedy that restrains a defendant from dissipating or dealing with assets, whether within or outside the jurisdiction, so as to frustrate enforcement of a prospective judgment. Unlike attachment, a freezing order does not transfer possession of the asset to the court; rather, it imposes a legal prohibition on its disposal or transfer. Attachment orders or freezing injunctions over maritime assets or funds linked to the vessel or shipowner. This prevents dissipation of assets pending resolution of the claim.

²³ *Mareva Compania Naviera SA v International Bulk carriers SA* [1975] 2 Lloyd's Rep 509 (CA), *The Mareva* [1980] 1 All ER 213 (CA)

Garnishee Order in Maritime Law: A garnishee order is a court order issued in post-judgment proceedings directing a third party (the garnishee) who owes money to, or holds funds belonging to, a judgment debtor to pay those funds directly to the judgment creditor in satisfaction of a judgment debt. In the case of *Citizens International Bank Ltd v SCOA Nigeria Ltd*.²⁴ The court described garnishee proceedings as a means by which money belonging to a judgment debtor in the hands of a third party is attached to satisfy a judgment debt. In maritime law, a garnishee order is not a special admiralty remedy like ship arrest or an action *in rem*. Rather it is an ordinary judgment-enforcement mechanism that may be used after a maritime claimant has obtained a judgment against a ship-owner, charterer, carrier, mortgage debtor, or other maritime defendant. The question is how can a ship be arrested in a digital era?

4. Interrelation between Ship Mortgages and Digital Security

A ship mortgage is a secured interest over a vessel created to guarantee repayment of maritime financing obligations by the mortgagee. In modern shipping practice, ship mortgages are increasingly registered in electronic ship registries and supported by digital documentation systems. These developments improve efficiency but raise legal concerns regarding authenticity, priority, and enforceability²⁵ Digital mortgage systems rely on electronic databases, raising issues such as:

In respect of the nature of a ship mortgage, it is a security interest created over a vessel to secure repayment of a debt or performance of an obligation, usually in favour of a lender such as a bank or financial institution. Its nature is best understood as a hybrid legal construct combining contractual agreement, proprietary security, statutory regulation, and admiralty enforcement mechanisms. It is a security device rather than a transfer of ownership.²⁶ The mortgagor, that is the ship-owner, retains title and possession of the

²⁴ (2006) 18 NWLR (Pt 1011), p.332

²⁵ Murat Aydın, (2024), *Evaluation of Ship Registry Regulation Provisions on Establishment of a Ship Mortgage*, 82(2), İstanbul Hukuk Mecmuası, p.479

²⁶ Thomas J Schoenbaum, (2018), *Admiralty and Maritime Law* (6th ed, West Academic Publishing, p. 517–523.

vessel, while the mortgagee acquires a proprietary interest that operates as security for the loan. This proprietary character means that the mortgage attaches to the vessel itself and can, upon default, be enforced directly against the ship through admiralty proceedings. The mortgage is also statutory in nature, because its validity, registration, and priority are governed by maritime legislation in most jurisdictions. Registration is particularly important because it gives public notice of the mortgage and determines its ranking against other claims. Without proper registration, the mortgage may lose priority or, in some cases, enforceability against third parties. This statutory framework is reflected in instruments such as the Merchant Shipping Act 1995, which regulates the creation and priority of ship mortgages in English law and similar statutes in many Commonwealth jurisdictions.²⁷ Ship mortgage is international character. Ships operate across multiple jurisdictions, and ship financing often involves foreign lenders, flags of convenience, and cross-border security arrangements. This means that issues of conflict of laws, recognition of foreign mortgages, and enforcement in different jurisdictions are central to the effectiveness of the security. The ship mortgage is closely linked to admiralty jurisdiction and enforcement remedies.²⁸

International ships are becoming smart, sophisticated and more automated, they are increasingly exposed to cyber risks that can affect not only data integrity but also physical safety and operational performance. The maritime sector faces a wide range of cyber threats, including ransom-ware attacks, GPS spoofing, phishing attacks targeting crew and operators, malware infections in shipboard systems, and hacking of port infrastructure. These threats can lead to operational disruption, cargo diversion, financial loss, environmental damage, and even maritime accidents. International Maritime Organization has emphasized that cyber risk management should be treated as an integral part of safety management systems on-board ships, recognizing that cyber incidents can directly affect the safety of navigation and life at sea.

Cross-border recognition of electronic registration: Cross-border recognition of electronic registration is the legal acceptance and enforceability of electronically recorded ship

²⁷ *ibid*

²⁸ Thomas, (2014), *British Shipping Laws: Ship Mortgages* Informa, paras 1.1–1.10.

ownership, mortgages, and other maritime interests across different jurisdictions. In modern shipping practice, ship registries are increasingly digitized, allowing vessel ownership details, liens, and ship mortgages to be recorded electronically. However, because maritime commerce is inherently international in nature, vessels often operate, are financed, or are arrested in jurisdictions other than where they are registered.²⁹ This creates a legal challenge when one country must determine whether to recognize electronic records created in another country's digital registry system. The main issue is legal validity and evidentiary acceptance. Some jurisdictions recognize electronic registries and digital signatures as legally binding, while others still require paper-based certification or additional authentication. This inconsistency can create uncertainty for mortgagees, especially when enforcing security interests or seeking priority in admiralty proceedings.³⁰

Validity of digital signatures and block-chain entries: In Maritime Law, the validity of digital signatures and block-chain entries refers to where electronically authenticated documents and distributed ledger records are legally recognised.³¹ Digital signatures are electronic forms of authentication used to verify the identity of a signatory and confirm the integrity of a document. Their legal validity depends on whether they meet statutory requirements such as reliability, uniqueness, and secure verification. In jurisdictions that recognize electronic transactions, digital signatures are treated as equivalent to handwritten signatures, provided they are issued through approved certification systems.³² However, concerns may arise regarding forgery, hacking, or compromised private keys, which can undermine their reliability in admiralty disputes.

Block-chain entries, on the other hand, are records stored in decentralized digital ledgers that are designed to be tamper-resistant and transparent. In maritime operations, block-

²⁹ R. Galea., (2022), *Ship registration under international law: An analysis of the international efforts aimed at combatting fraudulent registration*, University of Malta, <https://www.um.edu.mt/library/oar/handle/123456789/105795> accessed 30 May 2026.

³⁰ Munim, et al., (2021), *Rise, Fall, and Recovery of Blockchains in the Maritime Technology Space*, Journal of Marine Science and Engineering 9(3), p.266.

³¹ E. C. De Mello Filho, (2025), *From "Flags of Convenience" to "Flags of Deceit,"* International & Comparative Law Quarterly, Pp. 121–137

³² Section 93(2–3), Evidence Act 2011 Nigeria, particularly which expressly provides that where a signature is required by law, an electronic or digital signature satisfies that requirement and is admissible if properly verified

chain is increasingly used for electronic bills of lading, cargo tracking, and ship registry systems. The legal issue, however, is whether block-chain records are admissible and enforceable as proof of ownership or contractual rights.³³ While block-chain is often considered highly secure due to its immutability, courts and regulators in many jurisdictions are still developing frameworks to determine its evidentiary weight, authenticity standards, and legal recognition in cross-border transactions. For mortgagees, the validity of digital signatures and block-chain entries is crucial because any uncertainty may affect the enforceability, priority, or proof of ship mortgages in enforcement proceedings or judicial sale.

This creates significant legal uncertainty, especially in determining priority of claims during enforcement proceedings such as ship arrest or judicial sale. Mortgagees may find themselves competing with other creditors who rely on different registry records to assert their rights over the same vessel.³⁴ The problem is further complicated by differences in national laws governing ship registration, as some jurisdictions apply strict “single registry” principles while others allow parallel or secondary registrations. This fragmentation increases the risk of conflicting mortgage claims across borders. For lenders and financial institutions, duplication of mortgage records undermines confidence in ship financing by weakening the security value of ship mortgages. It may also lead to litigation over priority, fraud allegations, or loss of security in enforcement proceedings. Duplication of mortgage records across jurisdictions therefore poses a serious challenge to legal certainty in maritime finance, and highlights the need for harmonized international registry standards and improved digital coordination systems.³⁵

a. Ship arrest in a digital environment

The phrase “digital arrest of a vessel” is not yet a formally defined term in admiralty statutes or established case law. However, in contemporary maritime and legal scholarship, it is used to describe the use of digital technologies to initiate, manage, or

³³ C. Muñoz-Sánchez, et al., (2026), *Blockchain Technology and Maritime Logistics: A Systematic Literature Review*, Logistics 10 (1):12

³⁴ Stephen Girvin, (2011), *Carriage of Goods by Sea*, 2nd ed, Oxford University Press, Chp. 31.

³⁵ Berlingieri, (2016), *Arrest of Ships*, 6th ed, Informa Law from Routledge, Vol I, p. 790

evidence the arrest of a ship through electronic systems rather than purely physical court processes. In doctrinal terms, it refers to the electronic or technology-enabled execution of admiralty arrest procedures, where courts, port authorities, or maritime registries use digital platforms to issue arrest warrants, record vessel detention status, and coordinate enforcement actions across jurisdictions.

Traditionally, ship arrest is a physical admiralty remedy whereby a court orders the detention of a vessel to secure a maritime claim.³⁶ In the digital era, however, the process is increasingly influenced by electronic systems and digital maritime infrastructure. A major development is the use of electronic filing systems for arrest applications, where claimants submit affidavits, supporting documents, and claims through court e-portals. Courts also rely on digital ship registries to verify ownership, mortgage status, and encumbrances before issuing arrest warrants. This improves efficiency but raises concerns about data accuracy and cyber-security integrity.

For mortgagees and maritime claimants, digital ship arrest enhances speed and transparency but also demands stronger legal safeguards to ensure authenticity, cybersecurity protection, and cross-border recognition of electronic records. Ship arrest in a digital environment represents a modernization of traditional admiralty practice, balancing technological efficiency with the need for legal certainty in maritime enforcement. In the digital era, arrest applications increasingly rely on electronic filings and digital evidence. Courts must verify electronic documentation before issuing arrest warrants, raising issues of authentication and admissibility. However, digitalization also introduces challenges such as cyber fraud, data manipulation, and unauthorized alteration of registry information, which may affect the validity of arrest applications. There are also jurisdictional issues where digital records are stored in multiple countries or cloud systems, complicating verification and enforcement.

³⁶ Chacón, Víctor Hugo, (2018), *Ship Arrest in the Republic of Panama and Its Harmonization with International Law* (NUS Law Working Paper No 2018/024

b. Digital Asset Valuation of Vessel

In the digital era, asset valuation has increasingly incorporated technological tools to determine a vessel's worth more accurately and efficiently. These tools include automated valuation models, real-time market databases, satellite tracking systems, and AI-driven maritime analytics. Such technologies allow courts, maritime marshals, and valuers to assess factors such as vessel age, condition, market demand, fuel efficiency, and operational history with greater precision.³⁷ Though, reliance on digital valuation systems introduces challenges. Market data inaccuracies, algorithmic bias, and lack of standardized valuation frameworks can lead to disputes over the true value of the vessel. Furthermore, cyber risks and data manipulation may compromise valuation integrity, potentially affecting the fairness of the judicial sale process. A court enforcing a ship mortgage generally orders a judicial sale of the vessel. Digital technologies create valuation difficulties because modern ships derive significant value from proprietary software, integrated navigation systems and digital maintenance records.

c. Electronic Evidence in Admiralty Proceedings

In Maritime Law, electronic evidence in admiralty proceedings refers to digitally generated, stored, or transmitted information that is tendered before a court to prove or disprove facts in maritime disputes. With the increasing digitalization of the shipping industry, admiralty courts now frequently rely on electronic forms of evidence in actions involving ship arrest, maritime claims, and enforcement of ship mortgages. Such evidence includes electronic bills of lading, digital charter-party agreements, mail-correspondence, Automatic Identification System tracking data, satellite imagery, block-chain-based shipping records, electronic ship registries, and automated logbooks. These materials are often crucial in establishing vessel identity, ownership, cargo movement, contractual obligations, and liability in maritime disputes.

A major issue in admiralty proceedings is the admissibility and authenticity of electronic evidence. Courts must ensure that digital records have not been altered, hacked, or

³⁷ Wang, Yu et al., (2021), Machine Learning-Based Ship Detection and Tracking Using Satellite Images for Maritime Surveillance, 13(5) *Journal of Ambient Intelligence and Smart Environments* 361–371.

manipulated. This often requires proof of integrity through metadata verification, digital signatures, block-chain validation, or expert forensic analysis. Another challenge is cross-border data governance, as maritime operations typically involve multiple jurisdictions and cloud-based data storage systems. This raises questions about applicable law, data access rights, and recognition of electronic evidence obtained from foreign jurisdictions. Electronic evidence is highly significant because it influences the ranking, enforcement, and outcome of maritime claims, particularly where digital records determine ownership, priority of mortgages, or existence of competing liens. Electronic evidence has strengthened efficiency and transparency in admiralty litigation, but it also demands stricter legal standards, cyber-security safeguards, and harmonized evidentiary rules to ensure reliability in modern maritime dispute resolution. Courts now rely heavily on electronic logs, satellite tracking data, block-chain records, and digital contracts. While these improve transparency, they also introduce evidentiary challenges such as data manipulation, hacking, and jurisdictional disputes over data storage.

d. Challenges to Ship Mortgagee in the Digital Era

In maritime law, ship mortgagees typically banks and financial institutions that provide financing secured by vessels face a range of evolving challenges due to the rapid digitalization of maritime commerce and enforcement systems. The major challenge is cyber-security risk. Digital ship registries, electronic mortgage records, and online financing platforms are vulnerable to hacking, ransom-ware attacks, and unauthorized access. Such breaches may compromise mortgage documentation or even alter ownership and encumbrance records, weakening the security position of mortgagees.

Another significant issue is legal uncertainty surrounding digital documentation. Electronic bills of lading, smart contracts, and block-chain-based registries are not uniformly recognized across jurisdictions. This lack of harmonization creates uncertainty regarding the validity, enforceability, and priority of mortgage rights in cross-border transactions. The principal challenge is the judicial recognition and admissibility of electronic mortgage instruments, digital signatures, and electronic registration records. While many jurisdictions have adopted legislation recognizing electronic documents,

differences in national laws may create uncertainty when a court is asked to enforce a mortgage registered electronically in another jurisdiction.

There could a problem in enforcing mortgages against digital assets. Modern ships generate valuable digital assets, including operational data, software licenses, digital maintenance records, and proprietary navigation systems. Traditional ship mortgages are primarily designed to cover the vessel and its appurtenances, creating uncertainty as to whether associated digital assets fall within the mortgage security.

Cross-border enforcement difficulties also pose problems. Since ships operate internationally, mortgagees often face challenges in enforcing security interests when vessels move between jurisdictions with different rules on electronic registration, digital signatures, and admiralty procedures. In the digital era, mortgage records may exist solely in electronic form. Courts must therefore determine whether foreign electronic registrations should be recognized and given legal effect. This challenge is particularly significant because registry systems vary considerably between jurisdictions and not all countries have fully digitized maritime registries;

Autonomous and Smart Ship Technologies: The emergence of autonomous and remotely operated vessels creates new risks for mortgagees. Liability regimes, insurance arrangements, and regulatory frameworks for autonomous shipping remain evolving and uncertain. Mortgagees are also affected by fraud and identity manipulation, including falsified digital identities, forged electronic signatures, and unauthorized modifications of registry entries. The development of autonomous and remotely operated vessels presents new enforcement questions, such as: How autonomous vessels should be arrested, whether software systems form part of the mortgage security and liability for operational failures caused by artificial intelligence systems.

Jurisdictional and Conflict-of-Laws issue. Digitalization has not eliminated the traditional international character of shipping. A mortgage may be electronically registered in one jurisdiction, the vessel may be physically located in another, and enforcement proceedings may occur in a third country. And slow judicial adaptation to digital systems

remains a constraint. Many admiralty courts still rely on hybrid procedures, creating inefficiencies in handling electronically generated evidence and digital mortgage disputes.

5. Recommendation

To ensure that ship mortgagees continue to enjoy effective protection of their security interests, legal frameworks, judicial procedures, and industry practices must evolve alongside technological developments. The paper recommends as follows:

Governments should amend maritime and admiralty laws to expressly recognize electronic ship mortgages, digital signatures, electronic certificates, and electronic registration systems. Clear statutory provisions would reduce uncertainty regarding the validity and enforceability of electronically created security interests. In jurisdictions such as Nigeria, legislative reforms should align with international standards on electronic commerce and electronic transferable records to facilitate cross-border recognition of digital maritime documents. Developing countries should incorporate principles contained in the United Nations Commission on International Trade Law Model Law on Electronic Transferable Records into national maritime legislation.

Reinforce digital ship registry systems. Ship registries should adopt secure and interoperable digital platforms capable of maintaining accurate records of vessel ownership, mortgages, and encumbrances. Reliable digital registries reduce the risk of fraud, conflicting registrations, and ownership disputes during enforcement proceedings. Implement robust authentication and verification mechanisms and use tamper-resistant technologies for maintaining mortgage records.

Enhance Cyber-security Standards for Mortgaged Vessels, because cyber-attacks can significantly affect the value and operation of vessels serving as security for loans, mortgagees should require borrowers to maintain adequate cyber-security safeguards. Include cyber-security compliance clauses in ship mortgage agreements and require periodic cyber-security audits of financed vessels.

Develop Judicial Capacity in Digital Maritime Matters: Judges, admiralty practitioners, and court personnel require specialized training to effectively address issues involving electronic evidence, block-chain transactions, digital registries, and cyber-security-related disputes. States should establish continuing judicial education programs on maritime technology and create specialized admiralty divisions equipped to handle digital maritime disputes.

Simplify cross-border recognition of electronic mortgages: Given the international nature of shipping, enforcement often involves multiple jurisdictions. Greater harmonization of legal standards would improve certainty for mortgagees seeking to enforce security interests abroad. Encourage states to adopt uniform rules concerning electronic ship mortgages, promote international agreements on the recognition of digital maritime security interests and strengthen cooperation between courts and maritime registries in different jurisdictions.

6. Conclusion

The enforcement of maritime claims by ranking remains a foundational principle of admiralty law today. However, the digital transformation of maritime commerce has introduced new complexities that significantly affect ship mortgagees. While traditional legal principles still apply in other jurisdictions, emerging technologies have created enforcement uncertainties, cybersecurity risks, and jurisdictional challenges. A balanced approach that integrates technological innovation with robust legal safeguards is essential to ensure effective protection of ship mortgagees while the court maintain fairness in the ranking of maritime claims in the digital era. The most effective way forward to the challenges facing ship mortgage enforcement in the digital era is the need of combination of legal reform, technological modernization, judicial capacity-building, cybersecurity enhancement, and international harmonization. Adapting traditional admiralty principles to contemporary digital realities, states can preserve the effectiveness of ship mortgages as a critical security mechanism in maritime finance by promoting confidence in the global shipping industry.